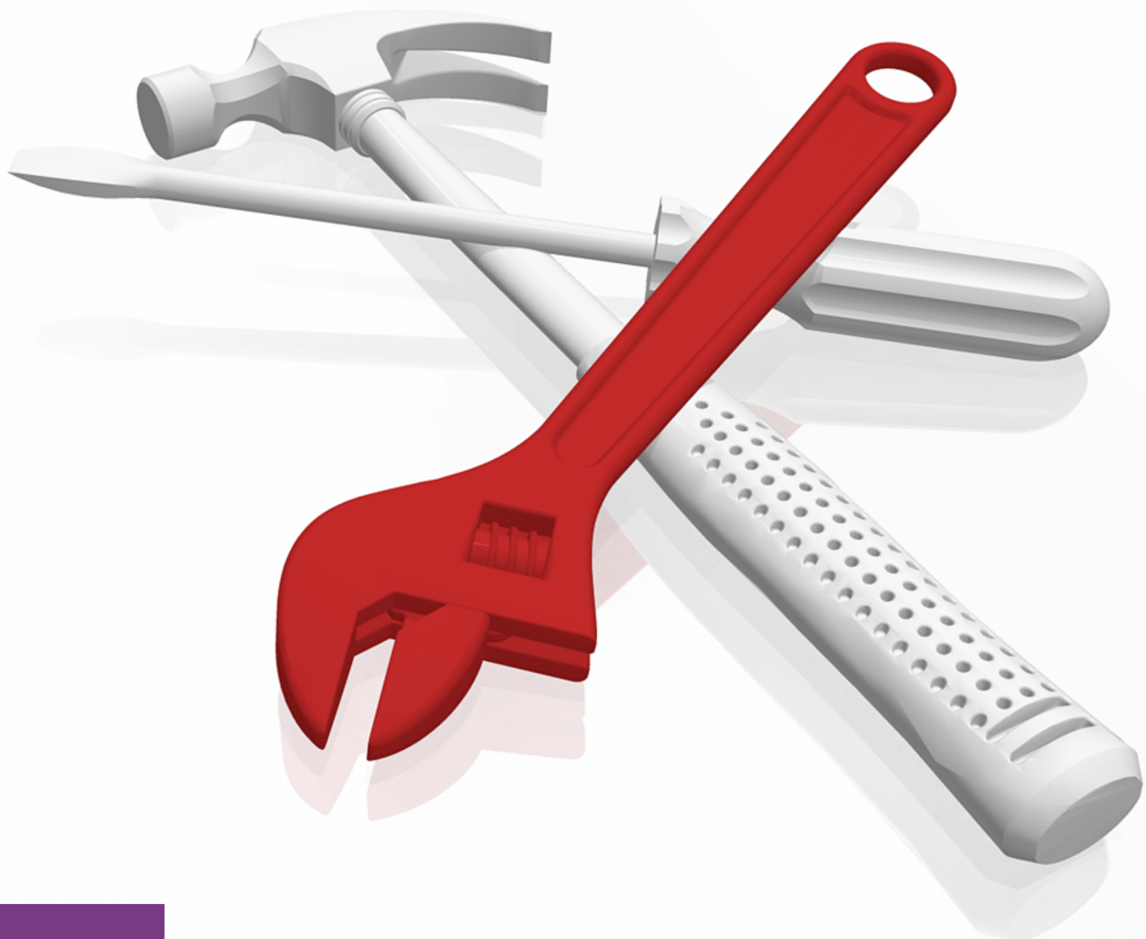
IBM z16 Configuration Setup

Ewerson Palacio
Octavian Lascu
Hongshuo Liu
Nelson Oliveira
Franco Pinto
Ryotaroh Sawada
Martin Söllig



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IBM z16 Configuration Setup

April 2024

SG24-8960-01

Note: Before using this information and the product it supports, read the information in "Notices" on page ix.

Second Edition (April 2024)

This edition applies to IBM z16 machine types 3931 and 3932.

Contents

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Preface

This IBM Redbooks® publication helps you install, configure, and maintain IBM z16™ machine types 3931 and 3932 systems. The IBM z16 systems offer new functions that require a comprehensive understanding of the available configuration options. This book presents configuration setup scenarios, and describes implementation examples in detail.

This publication is intended for systems engineers, hardware planners, and anyone who wants to understand an IBM Z® configuration and implementation. Readers should be familiar with IBM Z technology and terminology. For more information about the functions of IBM z16 systems, see *IBM z16 Technical Introduction*, SG24-8950, *IBM z16 (3931) Technical Guide*, SG24-8951 and *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

Authors

This book was produced by a team of specialists from around the world working at IBM Redbooks, Poughkeepsie Center.

Ewerson Palacio is an IBM Redbooks Project Leader. He holds a Bachelor of Science degree in Math and Computer Science. Ewerson worked for IBM Brazil for over 40 years and retired in 2017 as an IBM Distinguished Engineer. Ewerson co-authored many IBM Z publications, and created and presented at IBM Redbooks seminars around the globe.

Octavian Lascu is an IBM Redbooks Project Leader with over 30 years of experience in designing and implementing complex IT infrastructure projects.

Hongshuo Liu is an IT Specialist at IBM® Japan. She has 6 years of experience in the IBM Z field. Her areas of expertise include IBM Z hardware and IBM z/OS®. She is a member of a team that supports IBM Z hardware and software for multiple major banks.

Nelson Oliveira is a Product Services Consultant and Expert with IBM Brazil. He has 31 years of experience in the field of mainframe technology. His areas of expertise include IBM z/OS, Job Entry Subsystem 2 (JES2), IBM Parallel Sysplex®, high availability (HA), IBM Geographically Dispersed Parallel Sysplex (IBM GDPS®), and the IBM Z platform.

Franco Pinto is a senior systems engineer who leads the IBM z/OS operating system (OS) and UNIX team at a major bank in Switzerland. He has almost 30 years of experience in the mainframe and IBM z/OS fields. His areas of expertise include management sizing, planning, and supervising deployments of IBM Z.

Ryotaroh Sawada is a Consultant IT Specialist in Japan. He has 14 years of experience in technical support for IBM Z clients. His areas of expertise include IBM Z hardware, z/OS, and Systems Management on the mainframe. He co-authored *Extending z/OS System Management Functions with IBM zAware*, SG24-8070.

Martin Söllig is a Consultant IT Specialist in Germany. He has 31 years of experience working in the IBM Z field. He holds a degree in mathematics from the University of Hamburg. His areas of expertise include IBM z/OS and IBM Z hardware, specifically in Parallel Sysplex and GDPS environments, and also in cryptography on IBM Z.

Thanks to the following people for their contributions to this project:

Robert Haimowitz and Bill White
IBM Redbooks, Poughkeepsie Center

Tom Ambrosio, Patty Driever, Bill Lamastro, Ken Siwicki, Anthony Sofia, Dave Surman
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1

Introduction

This chapter describes the high-level goal of this book. This book covers scenarios that were devised based on best practices. The scenarios are described in subsequent chapters along with the tools that are used to implement the configurations.

> **Notes:** The IBM z16 generation is available as three configurations:
>
> - IBM z16 A01: IBM z16 A01 is built with a 19-inch format that scales 1 - 4 frames, depending on the configuration. IBM z16 A01 ensures continuity and upgradeability from IBM z15® T01 and IBM z14® M0x. It has five orderable features: Max39, Max82, Max125, Max168, and Max200.
> - IBM z16 A02: IBM z16 A02 is built with a 19-inch format single IBM Standard frame. The IBM z16 A02 ensures continuity and upgradeability from IBM z15 T02 and IBM z14 ZR1. There are four orderable features: Max5, Max16, Max32, and Max68.
> - IBM z16 AGZ: IBM z16 AGZ is a rack-mounted configuration. Core compute, I/O, and networking features may be installed into and powered by a client-designated rack with power distribution units (PDUs). IBM z16 AGZ ensures continuity and upgradeability from IBM z15 T02 and IBM z14 ZR1. The rack-mounted configuration options are under a combined IBM z16 AGZ warranty umbrella and orderable as Max5, Max16, Max32, and Max68.
>
> In the remainder of this document, IBM z16 refers to IBM z16 A01, IBM z16 A02 (single frame), and IBM z16 AGZ (rack-mounted bundle configuration) unless otherwise specified.

This chapter includes the following topics:

- High-level goal
- Scope
- Configuration tools

1.1 High-level goal

The goal of this book is to help you plan for and complete the configuration tasks for a successful installation of IBM z16 systems machine type 3931 and machine type 3932. It covers the planning and preparation tasks that are needed from when an IBM z16 system is delivered and physically installed, up to the point when a logical partition (LPAR) is ready to be activated.

This book describes the planning considerations and configuration examples in detail from both Hardware Management Appliance (HMA), Hardware Management Console (HMC), Support Element (SE), and input/output definition file (IODF) perspectives.

1.2 Scope

Before you perform the planning and preparation tasks that are covered in this book, some activities must be completed:

- Customers Configuration Design: Together with your team, IBM provides design and configuration information for the installation of the IBM z16 system that you plan to purchase.
- IBM Order to Manufacturing: Your IBM representative orders the wanted configuration. IBM makes available the download of the machine configuration as a CFReport. The CFReport file can be obtained from the IBM Resource Link® website (you must authenticate by using your registered IBMid) by using a Configuration Control Number (CCN) that is provided by your IBM representative.
- Physical installation: With support from IBM, the new order or the upgrade to an IBM z16 system is physically installed.
- HMC installation: In a new order IBM z16 machine, HMCs as separate physical equipment are no longer orderable. The HMC functions are provided by ordering the optional HMA feature. The HMA feature provides redundant HMC functions, and it is with the SE in the IBM Z CPC frame.
- With support from IBM, the physical HMCs (if present) are upgraded to the latest version. If necessary, contents such as user profiles and API settings are migrated.

  > **Note:** The most recent HMCs (Feature Code 0082, Feature Code 0083, Feature Code 0062, and Feature Code 0063) are supported by IBM z16.

- Trusted Key Entry (TKE) installation: With support from IBM, the (optional) TKE workstations are installed. If necessary, contents such as user profiles and API settings are migrated (if you replace the TKEs).

Figure 1-1 shows the steps that are required for each distinct scenario when preparing for the installation of the IBM z16 system, which includes the following steps:

- Upgrading an existing IBM z14 or z15 system to an IBM z16 system
- Installing a new IBM z16 system

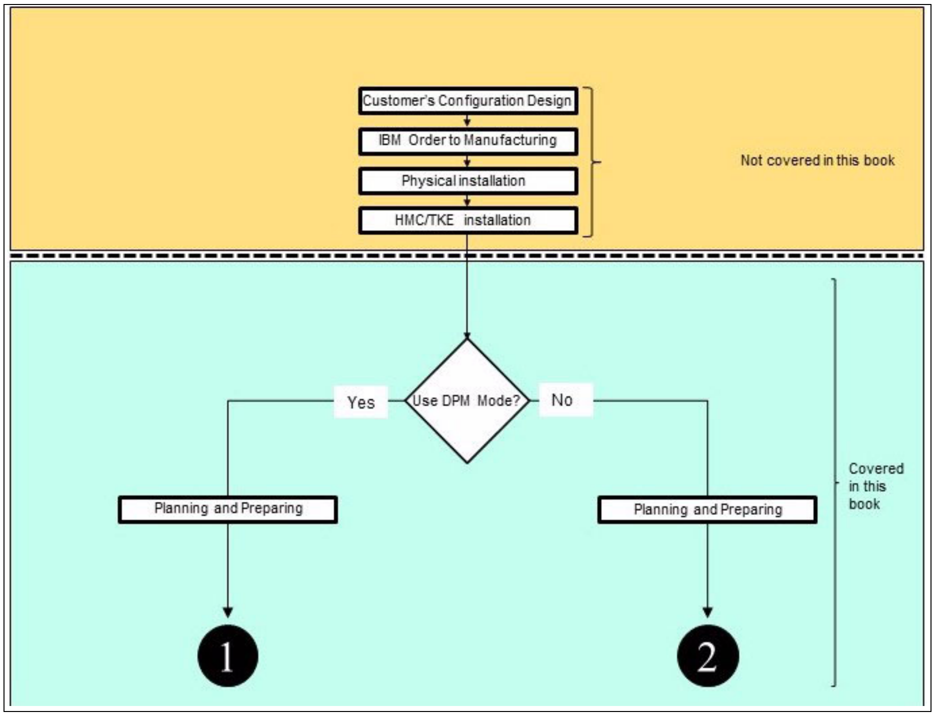


Figure 1-1 Showing the topics that are covered in this book

The flowchart in Figure 1-1 is divided into two different main sets of task streams:

- The upper stream (marked in light yellow) is based on actions that should be performed before hardware arrival, and they are not covered in this book.
- The lower stream (marked in light green) also accounts for the usage of Dynamic Partition Manager (DPM) as an option.

With DPM, system administrators have a quicker and simpler way to deploy Linux on IBM Z, IBM z/VM®, Kernel-based Virtual Machine (KVM), and Secure Service Container (SSC) LPARs. DPM is a wizard-like configuration method that runs in the HMC.

Important: When DPM is enabled, the IBM z16 system cannot run z/OS, IBM z/VSE®[a], 21st CS VSE^{n} R6.3, and z/TPF LPARs.

a. IBM z16 A01 is intended to be the last IBM Z server to be supported by z/VSE 6.2 (5686-VS6). z/VSE was withdrawn from marketing 5 September 2022. It is not supported on the IBM z16 A02 and IBM z16 AGZ. For more information about the VSE^{n} R6.3 operating system (OS), see the 21st Century Software website.

The flowchart in Figure 1-2 shows the required tasks to install DPM and define LPAR operating characteristics by using the HMC. The flowchart is divided into two task streams:

- The stream on the left side of the flowchart is based on actions that must be performed by IBM on the SE before the IBM z16 system is handed over to you.
- The other stream (the right side of the flowchart) describes the configuration flow for a partition by using the DPM application. With the input that is provided to DPM, a configuration is activated that is used on the IBM z16 system to host an OS.

The actions that are defined in the two streams must be performed in sequence.

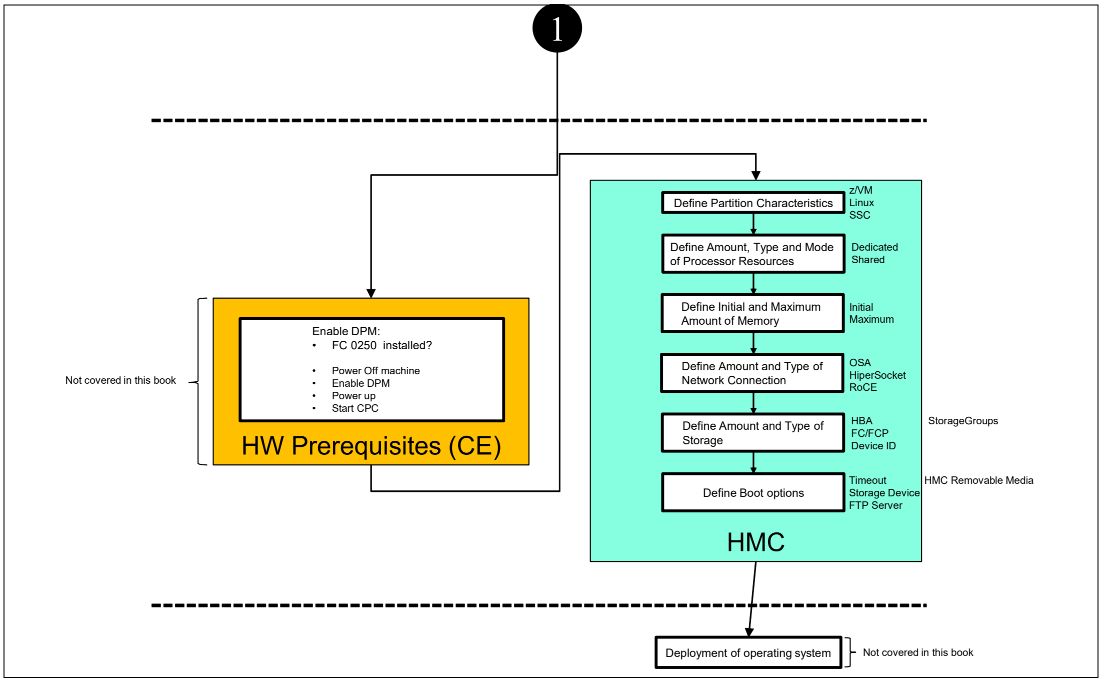


Figure 1-2 Installation flowchart that is applicable to both an IBM z16 system upgrade and a new installation that uses DPM

DPM automatically discovers and displays the system resources that are available for use in your Linux on IBM Z, z/VM, KVM, and SSC LPARs. When using DPM, the partition configuration data is created, which contains a description of all I/O functions and features that are used on the IBM z16 system, all compute and memory resources, and all crypto assignments.

Note: This book does not cover scenarios that use DPM. For more information about the usage of DPM, see *IBM Dynamic Partition Manager (DPM) Guide*, SB10-7182.

The flowchart that is presented in Figure 1-3 on page 5 describes more tasks that must be done to complete the installation. The flowchart is divided in two different task streams:

- One stream (the left side of the flowchart) is based on actions that must be performed on the HMC or the SE.
- The other stream (the right side of the flowchart) is based on definitions in the hardware configuration management program.

The actions that are defined in the two streams can have dependencies between them.

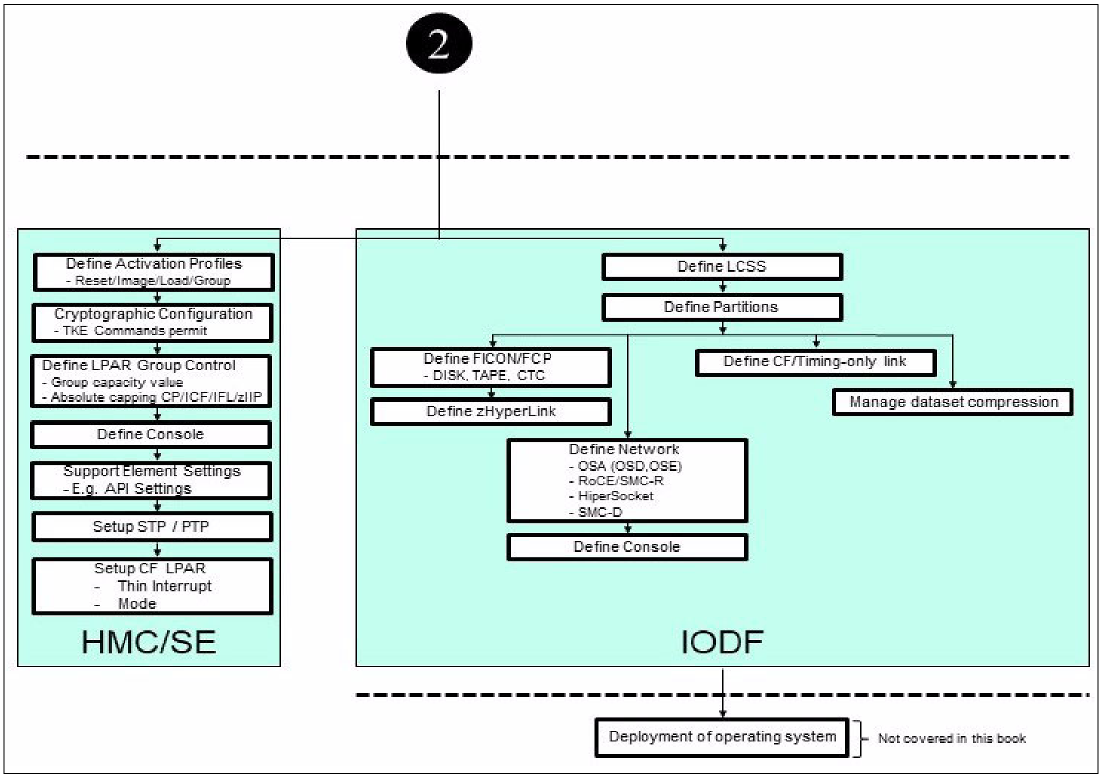


Figure 1-3 Installation flowchart for an IBM z16 system (applicable to a new system or an upgrade)

The HMC communicates with the SE (physically installed in the frame of the IBM z16 system as an appliance), which provides communication with the IBM z16 hardware. On the HMC/SE, you must set some parameters so that you can activate the number of LPARs that run a supported OS. To create an IODF (see Figure 1-3), you must perform a set of activities in an application (such as Hardware Configuration Definition (HCD), which needs a running z/OS system). The IODF can be created on a different system than the target system. There are many HMC/SE and IODF tasks that must be planned and prepared. For more information, see *I/O Configuration Using z/OS HCD and HCM*, SG24-7804.

These flowcharts are intended to act as a checklist rather than a step-by-step procedure. The steps in this book should provide enough information for you to replicate the approach in your environment.

For more information about how to deploy an OS (z/OS in this case), see *Mainframe from Scratch: Hardware Configuration and z/OS Build*, SG24-8329.

1.3 Configuration tools

Several tools are provided by IBM that can help you achieve a successful IBM z16 installation. Whenever possible throughout this book, lists are provided to help you go through the steps that are required to complete a specified task.

In addition to the tools and lists that are provided in this document, ensure that the planning and configuration steps align with other technical departments within your organization, such as storage and network administration, and with the capacity (workload) planning and cryptographic and security teams.

Configuration tools, like HCD, CHPID Mapping Tool (CMT), and the HMC and SE, are covered in Chapter 2, “Planning considerations” on page 7.

2

Planning considerations

This chapter describes planning and configuration considerations for the IBM z16 system. Whenever possible, worksheets that support the planning tasks are provided. Throughout this book, we provide various definition examples by using Hardware Configuration Definition (HCD) as the preferred method for the I/O configuration. Other tools, such as Hardware Configuration Manager (HCM) and input/output configuration program (ICP IOCP), are mentioned for reference only.

> **Naming:** The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

IBM z16 A02 and IBM z16 AGZ are identical for the scope of this publication. The basic difference is that IBM z16 A02 uses the traditional Factory Frame like IBM z15 T02. IBM z16 AGZ uses a new rack-mounted approach so that core compute, I/O, and network content can be installed in a client-supplied data center infrastructure (rack and power distribution units (PDUs)). Both systems have the same machine type (3932) and share features and functions.

This chapter also provides a short overview of tools that IBM provides to help with configuring your IBM z16 system, and information about where to obtain the tools and their intended use.

This chapter includes the following topics:

- Scenario descriptions
- Key tools
- Extra tools
- Hardware Management Console and Support Element tasks
- IODF configuration

2.1 Scenario descriptions

Throughout this book, we use two distinct scenarios to explain the tasks and procedures that are involved to successfully install and configure an IBM z16 system:

- Upgrading an existing IBM Z server to an IBM z16
- Installing a new IBM z16

2.1.1 Upgrading an existing IBM Z server to an IBM z16

This scenario assumes that an existing IBM Z is upgraded by using a miscellaneous equipment specification (MES) to an IBM z16 system. The scenario includes a planned outage period during the physical upgrade of the machine. The software environments that are supported by the old machine are not available during the upgrade period. The serial number of the old machine remains the same after the upgrade to the IBM z16 system.

2.1.2 Installing a new IBM z16

This scenario assumes that a new IBM z16 system is installed in an existing mainframe environment. The IBM z16 system is physically installed along an existing IBM Z machine. After the installation of the IBM z16 system successfully completes and the system is handed over by IBM, the software environment on the machine to be replaced must be stopped, and recabling actions must be performed.

When recabling is complete, postinstallation activities must be performed, and the software environment can be brought back online on the new system (IBM z16 system). An outage must be planned for this scenario, and a new serial number must be considered, so software keys for the new system must be available.

Note: Physical Hardware Management Consoles (HMCs) are not orderable for a new build IBM z16. The HMC functions for a new IBM z16 can be provided by the Hardware Management Appliance (HMA) optional feature (Feature Code 0129).

2.1.3 Planning for the scenarios

In the first scenario, the physical platform identity (machine serial number) that is configured remains the same. No hardware configuration files must be physically migrated to another platform. No changes to the software licenses are required for products that are tied to the machine serial number.

Note: Software licensing might change depending on the machine capacity.

In the second scenario, the physical platform that is configured changes. Hardware configuration files must be prepared on the existing machine, and must be migrated to the new IBM z16 system together with the attached cabling. The serial number changes with the activation of the IBM z16 system, which means that planning and preparing for software license changes must be considered beforehand.

In both scenarios, we assume that bringing up the existing features and functions has the highest priority. Adding new features and functions that are acquired with the system upgrade or installed in the new IBM z16 system have a lower priority. The elapsed time of the planned outage can vary, depending on the approach that is chosen in either scenario.

In both scenarios, some information must be obtained before starting the process of changing to or installing the new IBM z16 system:

- The new processor ID: The processor ID is used to assign a unique name to identify the processor in the HCD. For more information, see *z/OS HCD Users Guide*, SC34-2669.
- The CFReport file: The CFReport file is downloadable from IBM Resource Link by entering a Configuration Control Number (CCN). The CCN is provided by your IBM representative.
- The system serial number: If a new IBM z16 system will be installed, a new serial number is provided by your IBM representative.

Also, IBM does not provide fiber optic cables as features on the IBM z16 system. Therefore, a complete analysis of the I/O connectors that are used on existing systems that are upgraded to an IBM z16 system must be made to ensure that the appropriate fiber optic cabling is installed.

An equivalent study should be part of your preparation to install a new IBM z16 system so that all cabling is delivered to the data center before the installation date.

All required cables for the IBM z16 should be identified and placed on order. Labeling all cables is required for the installation. At a minimum, the labels should identify the physical channel ID (PCHID) number.

If you already received the configuration and PCHID reports from IBM, define your coupling links to fit your planned configuration to your new or upgraded central processor complex (CPC).

2.2 Key tools

IBM provides several tools to help with the complexity of configuring an IBM Z platform. This section summarizes the various tools that are available, and briefly outlines their benefits for the planning process.

Table 2-1 lists the machine types for the IBM Z platform. The examples in this book use tools, such as the HCD and channel path ID (CHPID) Mapping Tool (CMT), which refer to the machine type instead of names. For more information, see Chapter 4, “Preparing an input/output configuration program to use the CHPID Mapping Tool” on page 57.

Table 2-1 Machine types for IBM Z platforms

Name	Machine type
IBM z16 A02 and IBM z16 AGZ	3932
IBM z16 A01	3931
IBM z15 T02	8562
IBM z15 T01	8561

Name	Machine type
IBM z14 ZR1	3907
IBM z14	3906

2.2.1 IBM Resource Link

The first step in planning for the installation of the IBM z16 is to access IBM Resource Link. IBMid with Resource Link by providing a client site number, an ID, and a valid email address. Your IBM representative can assist you with the registration process. After you register for an IBM ID, you can customize your profile to accommodate the platforms that you are responsible for.

On the Resource Link website, you have access to various resources and tools that are designed to help the installation process. Several tools are available to simplify the installation process of an IBM z16 system. Even if you worked with most of these tools before, be sure to check for the latest versions that are relevant to the IBM z16.

The **Education** and **Library** tabs on the website provide information about the IBM Z family and some online tutorials. Under the **Tools** tab, you can download the latest version of the most frequently used tools and obtain system and configuration information.

2.2.2 Hardware Configuration Definition

HCD is a component that runs on IBM z/OS and IBM z/VM. It supplies an interactive dialog to generate the input/output definition file (IODF) and the input/output configuration data set (IOCDS).

Consider using HCD or HCM to generate the I/O configuration rather than writing your own IOCP statements. HCD performs validation as you enter the data, thus minimizing the risk of errors. This book provides examples for using HCD, with some examples that used HCM (see “Hardware Configuration Manager” on page 10).

New hardware (an IBM z16 system) requires program temporary fixes (PTFs) to enable definition support in HCD.

When defining devices in HCD, the hardware features can be selected according to the physical setup of the devices that are attached to the IBM z16. Detailed forms and charts that describe the environment facilitate the planning process.

For more information about HCD, see IBM Documentation.

Hardware Configuration Manager

HCM provides a GUI to HCD and the associated IODF. HCM runs on a workstation and can also define and store more information about the physical hardware to which the IODF is defined.

HCM does not replace HCD. It is used with HCD and the associated IODF. However, HCM can be used in a stand-alone mode after an IODF is built and the configuration files (`IODF##.HCM` or `IODF##.HCR`) are created on your HCM workstation.

For more information about HCM, see z/OS and z/VM HMC User’s Guide.

2.2.3 CHPID Mapping Tool

The CHPID Mapping Tool (CMT) provides a mechanism to map CHPIDs to PCHIDs on an IBM z16 system. Using the CMT is preferable to manually mapping the CHPIDs to PCHIDs. Using the CMT provides the best availability practices for a configuration.

Two files are needed to obtain an IODF file containing the correct PCHID numbers by using the CMT:

- A production IODF file without PCHID numbers. For more information about how to obtain this file, see Chapter 4, "Preparing an input/output configuration program to use the CHPID Mapping Tool" on page 57.
- The CFReport file reflecting the physical configuration of the ordered IBM z16, which is obtained from the Resource Link website. To obtain the CFReport, the corresponding machine CCN is required. The CCN is generated by your IBM Client Representative when building the order for your configuration.

2.2.4 HCD and the CMT

The HCD process flow for a new IBM z16 installation is shown in Figure 2-1.

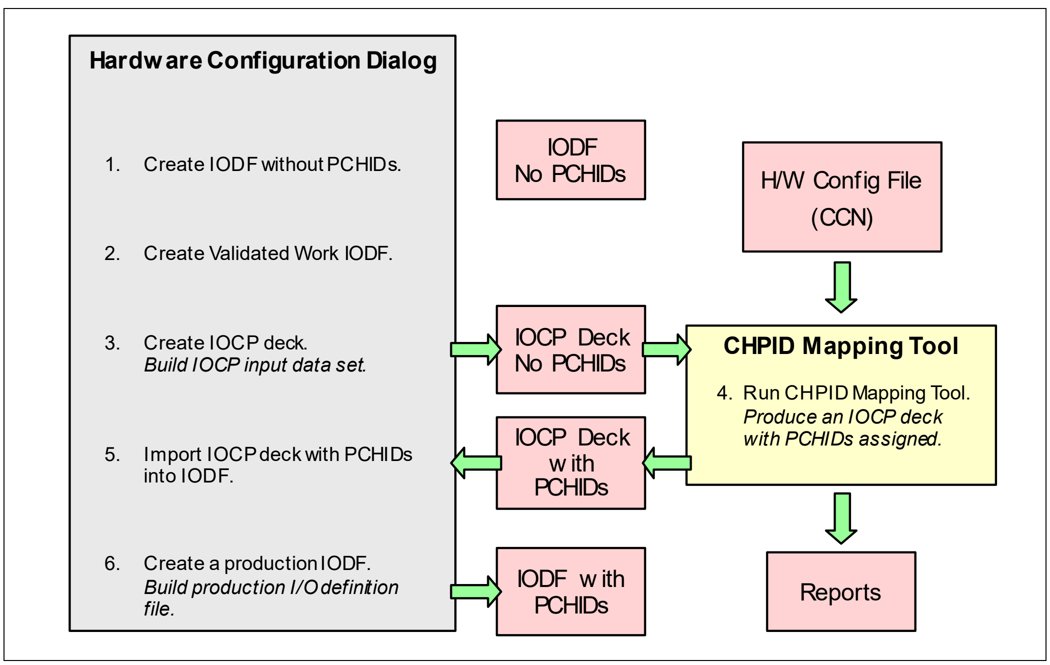


Figure 2-1 CMT: I/O configuration definition flow for a new installation

Part of the actions that are described in Figure 2-1 might also be valid for an upgrade, depending on the hardware configuration of the upgraded machine.

To download the CMT, log in to the Resource Link website with a registered Resource Link ID and select **Tools**.

For more information, see the *CHPID Mapping Tool Users Guide*, GC28-6984. For more information about how to use the CMT, see Chapter 4, "Preparing an input/output configuration program to use the CHPID Mapping Tool" on page 57.

2.3 Extra tools

The additional tools that are described in this section are not used in this book. However, they can help speed up the process of planning and configuring specific features or functions outside of this book.

2.3.1 Input/output configuration program

ICP IOCP Version 5 Release 5.0 or later is required for an IBM z16.[1] You can define the IBM z16 configuration by using only IOCP. However, using HCD is a best practice because of its verification and validation capabilities. By using ICP IOCP, it is possible to write an IOCDS in preparation for a CPC upgrade.

For more information about the changes and requirements for ICP IOCP, see *Input/Output Configuration Program User's Guide for ICP IOCP*, SB10-7177.

2.3.2 Worldwide Port Name Prediction Tool

The Worldwide Port Name Prediction Tool for Fibre Channel Protocol (FCP) Channels helps prepare configuration files that are required or generated by the IBM Z platform when FCP Channels are configured. This tool helps during the installation of new systems and system upgrades.

One of the most important configuration parameters are worldwide port names (WWPNs), which uniquely identify physical or virtual Fibre Channel (FC) ports. They are typically used in storage area network (SAN) switches to assign the corresponding ports to zones of a SAN. They are used in storage subsystems to grant access from these ports to specific storage devices that are identified by logical unit numbers (LUNs).

The capability of the WWPN Prediction Tool is extended to calculate and show WWPNs for both virtual and physical ports before system installation.

The WWPN Prediction Tool, which applies to a CPC in PR/SM mode, is available for download from IBM Resource Link and applies to all Fibre Connection (IBM FICON®) channels that are defined as CHPID type FCP (for communication with SCSI devices) on an IBM z16. You can access the tool on Resource Link by using your IBMid or going through the IBM Resource Link home page and then selecting **Tools** → **WWPN Tool**.

WWPN Persistence

The FCP WWPNs are determined based on the I/O serial number of the CPC, the IOCDS configuration details (for N_Port ID Virtualization and WWPNs), and the PCHID values (for physical WWPNs). When Feature Code 0099[2] (WWPN Persistence) is ordered as part of a new or upgraded configuration for an IBM z16 system, the I/O serial number part of the WWPN for the new IBM z16 system is the same serial number as for the source machine configuration.

[1] ICP IOCP Version 6 Release 1 Level 2 (6.1.2) is required for the IBM z16 A02 and IBM z16 AGZ.

[2] Feature Code 0099 is an information-only feature code that is required to initiate an ordering option to maintain IO serial numbers when a newly purchased system replaces an existing system within the customer’s data center. This option eliminates the need to reconfigure zoning in SAN switches and LUN masking in storage controllers.

2.3.3 Coupling Facility Structure Sizer

Moving to a new IBM z16 system means migrating to a higher Coupling Facility Control Code (CFCC) level (level 25). If your existing Coupling Facility (CF) data structures are adequately sized and you want to know how much these structures might need to grow to accommodate the same workload at the new CFCC level, you can use the current structure sizes to calculate the new sizes. The Coupling Facility Structure Sizer (CFSizer) Tool helps you evaluate the sizing of the CF structures.

Use the CFSizer tool to plan more accurately the amount of storage that must be allocated for CF partitions. You can access the tool at the CFSizer page.

2.3.4 Power estimation tool

The power estimation tool is a web-based tool that you use to estimate the power consumption for your IBM Z platform. For the IBM z16, based on the features that are installed on the machine, the tool also estimates its weight, air flow, exhaust temperature, individual phase currents, and power cord wattage.

For access to this tool, see IBM Resource Link.

2.3.5 Shared Memory Communications Applicability Tool

The Shared Memory Communications Applicability Tool (SMCAT) helps you determine the value that SMC - Remote Direct Memory Access over Converged Ethernet Express (SMC-R) and SMC - Direct Memory Access over Internal Shared Memory (SMC-D) can bring to your environment with minimal effort and impact.

SMCAT is integrated within the TCP/IP stack and gathers new statistics that are used to project Shared Memory Communications (SMC) applicability and benefits for the current system. For more information, see the Shared Memory Communications Applicability Tool[3].

2.3.6 IBM Z Batch Network Analyzer tool

The IBM Z Batch Network Analyzer (zBNA) tool is a PC-based productivity tool that provides a means of estimating the elapsed time for batch jobs solely based on the differences in CPU speeds for a base processor and a target processor, the number of engines on each system, and system capacities. Data sharing is not considered. zBNA provides a powerful, graphic demonstration of the z/OS batch window.

The zBNA Tool also provides the capability to project the benefits of using IBM Integrated Accelerator for zEnterprise Data Compression (zEDC) and the ability to estimate the benefit of zHyperLink I/O activity.

The zBNA tool and its Users Guide can be downloaded from the IBM Z Batch Network Analyzer (zBNA) Tool website.

[3] This link points to the z/OS R2V3 documentation site. The SMCAT is also available in z/OS V2R4, V2R5, and V3R1.

2.4 Hardware Management Console and Support Element tasks

This section introduces the configuration and management tasks that are available on the HMC and the Support Element (SE).

> **Note:** HMCs and HMAs provide the same functions. For more information about HMA details, see 2.4.5, “Hardware Management Appliance” on page 17.

2.4.1 Activation profiles

Activation profiles must be customized by using the HMC. Activation profiles are required for CPC and image activation. They are used to tailor the operation of a CPC and are stored in the SE that is associated with the CPC. There are four types of activation profiles:

- Reset: A reset profile is used to activate a CPC and its images.
- Image: An image profile is used to activate an image of a previously activated CPC.
- Load: A load profile is used to load a previously activated image with a control program or operating system (OS).
- Group: A group profile is used to define the group capacity value for all logical partitions (LPARs) belonging to that group.

The default profiles of each of these types are provided. The *Activate* task activates the CPC or image. Initially, the *Default* profile is selected. You can specify an activation profile other than Default. This feature provides the capability to have multiple profiles, for example, one for every IOCDS file that is managed by the CPC.

Reset profile

Every CPC in the processor cluster needs a *reset profile* to determine the mode in which the CPC Licensed Internal Code (LIC) is loaded and how much physical memory is available. Using the reset profile, you must provide the order in which the LPARs are activated during a Power on Reset (POR). The maximum number of reset profiles for each CPC is 26.

For more information about how to define a reset profile, see 5.3, “Creating a reset profile on the Support Element” on page 102.

Image profile

Each LPAR has an image profile. The image profile determines the number of CPs that the image uses and whether these CPs are dedicated to the partition or shared. It can also assign the amount of initial storage and reserved storage that are used by each partition, and points to the IOCDS slot in the SE that has the I/O configuration to load in the HSA. Depending on the SE model and machine type, the maximum number of image profiles that are allowed for each CPC can be in the range 64 - 255.

The parameters for each LPAR define these settings:

- General: The Profile name and its description, the partition identifier, and the mode of operation
- Processor: The number of logical central processors (CPs), IBM Z Integrated Information Processors (zIIPs), and the initial processing weight that is assigned to the LPAR
- Security: The security options for this LPAR, the BCPii permissions, the counter facility security options, the sampling facility security options, and the CP Assist for Cryptographic Functions (CPACF) key management operations

- Storage: The total amount and the initial amount of memory that is assigned to this LPAR and the Virtual Flash Memory (VFM) allocation to this LPAR (if VFM is present)
- Options: The I/O priority, defined capacity options, and the CP management cluster name
- Load: The load type and address parameters that are necessary to run an IPL for this LPAR
- Crypto: The Crypto Express parameters (see 2.4.2, “Cryptographic configuration” on page 15)

> **Note:** To help you gather the necessary input, a worksheet is provided with this book. For more information about downloading the worksheet that is associated with this material, see Appendix B, “Additional material” on page 401.

For more information about how to define an image profile, see 5.4, “Creating an image profile on the Support Element” on page 107.

Load profile

A *load profile* is needed to define the channel address of the device from which the OS is loaded. Depending on the SE model and machine type, the maximum number of load profiles for each CPC is 64 - 255.

Group profile

A *group profile* defines the group capacity value that can be customized to determine the allocation and management of processor resources that are assigned to the LPAR in a group. This profile does not contain the names of the LPAR images that make up the group.

2.4.2 Cryptographic configuration

The activation profile that you use to activate an LPAR prepares it for running software products that use the Crypto Express feature. Using the feature’s cryptographic facilities and functions requires customizing the LPAR’s activation profile to accomplish these tasks:

- Install the CPACF Data Encryption Standard (DES)/Triple Data Encryption Standard (TDES) Enablement feature if you are planning to use Integrated Cryptographic Service Facility (ICSF).
- Give the LPAR access to at least one Crypto Express feature. This goal is accomplished by selecting from the Usage Domain Index and the Cryptographic Candidate list.
- Load the LPAR with an OS, such as z/OS, that supports using cryptographic functions.

For more information about the cryptographic features, see 10.1, “Crypto Express8S” on page 234.

2.4.3 LPAR group control

Here are methods that can be used to limit the processor capacity usage for a single LPAR or a group of LPARs and help you control software cost:

- Edit Group Capacity: Use this method to define a group of LPARs on the same CPC and a limit for the combined capacity usage by those LPARs. The system can manage the group in such a way that the limit for Group Capacity in MSU per hour is not exceeded.
- Absolute Capping: Use this method to specify the absolute capping for the selected processor type to indicate the new setting. Absolute Capping is managed by IBM Processor Resource/System Manager (PR/SM) is independent of the OS running in the capped LPARs.

Both methods (Group Capacity and Absolute Capping) can be used concurrently and with LPAR capping.

Consider reevaluating the parameters in a scenario where the values must be migrated from a previous generation of the IBM Z to an IBM z16 system.

Tip: Capacity management by using capping technologies is an ongoing process that must be monitored and adjusted over time. Temporary or permanent capacity changes must also be considered when using capping technologies.

A good overview of the capping technologies and 4-hour rolling average (4HRA) optimization can be found in Capping Technologies and 4HRA Optimization.

2.4.4 Consoles and terminals

The Open Systems Adapter (OSA) Integrated Console Controller (ICC) (OSA-ICC) function of the OSA-Express 1000Base-T and the OSA-Express7S Gigabit Ethernet (GbE)[4] features support TN3270 enhancements (TN3270E) and non-Systems Network Architecture (SNA) distributed function terminal (DFT) 3270 emulation. Planning for an IBM z16 OSA-ICC implementation requires input from several disciplines within an organization:

- IBM Z I/O subsystem configuration
- OS configuration
- OSA-Express feature configuration
- Ethernet local area network (LAN) configuration
- Client TN3270E configuration

Note: IBM z16 is planned to be the last generation of IBM Z to support channel type OSC on the OSA-Express 1000Base-T Adapter.

IBM z16 is planned to be the last IBM Z to support the use of the Transport Layer Security protocol 1.0 (TLS 1.0) and 1.1 (TLS 1.1) for establishing secure connections to the SE, HMC, and OSA-ICC (channel path type OSC).[a]

a. IBM statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM sole discretion. Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision.

[4] Check with your IBM representative for the availability of support for OSA-Express7S GbE.

In HCD, the OSA-Express feature must be defined to operate as an ICC. The configuration requirements are as follows:

- IBM Z I/O subsystem configuration: The same basic rules for adding an OSA-ICC adapter apply as to any other new device.
- OS configuration: To have a Nucleus Initialization Program Console available, make sure that the correct device number is defined in the HCD OS “Work with consoles” dialog.

During an upgrade from an existing IBM Z platform to an IBM z16 system, the same definitions can be used for the new machine as on the source configuration.

The following planning topics must be considered:

- Reserve at least one OSA-Express port with the correct support to be defined as channel type OSC.
- Define 3270-X Devices in HCD to act as system consoles.
- Use OSA Advanced Facilities to configure the sessions.

The OSA-Express feature also requires configuration tasks to be performed on the HMC by using the OSA Advanced Facilities task. Collect information for the following parameters before starting the configuration activities:

- OSA-ICC server: Name, Host IP address, TCP port number, Gateway IP address, the network type, and the MTU size
- OSA-ICC session definitions: Channel subsystem (CSS), the Multiple Image Facility (MIF) (LPAR) ID, Device number, LU-name, client IP address, IP Filter, the session type, defer host disconnect (DHD), response mode (RSP9), and read timeout (RTO)

> **Note:** Consider defining multiple sessions per LPAR to allow access for several users concurrently.

For an upgrade of an existing IBM Z server to an IBM z16 system, these definitions can be exported from the source machine by using onboard HMC facilities and imported back again after the upgrade is complete.

For more information about the definitions, see Chapter 7, “Defining console communication” on page 185. For implementation details, see the *OSA-Express Integrated Console Controller Implementation Guide*, SG24-6364.

2.4.5 Hardware Management Appliance

The HMC is a closed system (appliance), which means that no other applications can be installed on it. The HMC application runs a set of management functions.

On a new build IBM z16, two virtual HMC and two SE appliances are delivered, packaged in the HMA (Feature Code 0129). The HMA was introduced with the IBM z15. They run on both of the two integrated 1U rack-mounted servers at the top of the IBM z16 A frame.

Figure 2-2 shows the physical location of the redundant 1U rack-mounted servers supporting the HMA on a fully equipped IBM z16 machine with the iPDU option installed.

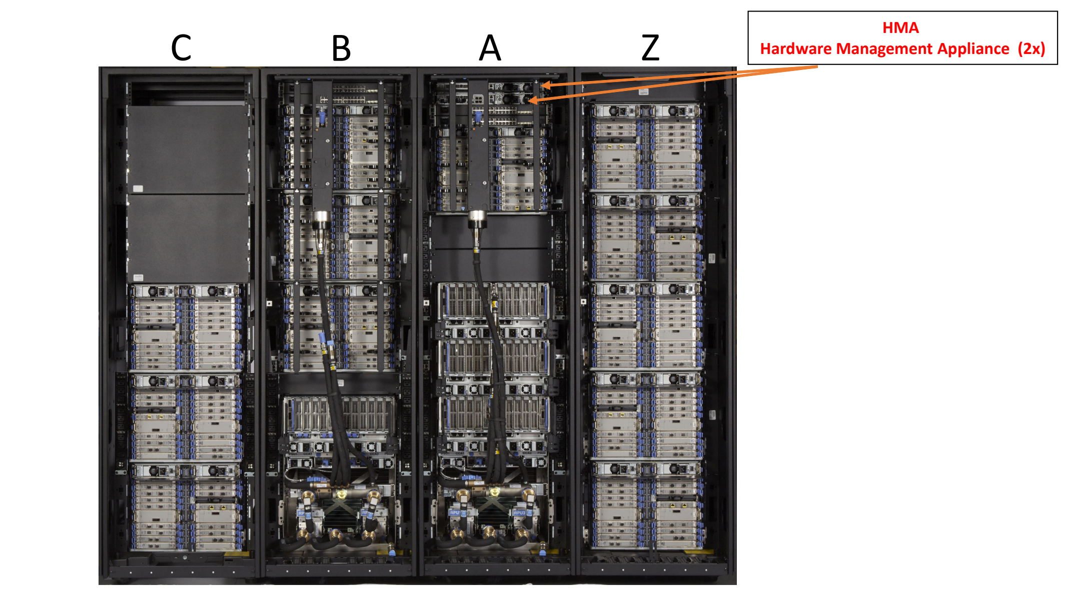


Figure 2-2 Location of the 1U HMA/SE servers in the A Frame of an IBM z16

Physical HMCs (tower or rack-mounted) cannot be ordered with a new IBM z16 machine. You can use an upgraded IBM z16 (either upgraded from an IBM z14 or an IBM z15) with previously ordered physical HMCs and no HMA. It is possible to order the HMA feature (Feature Code 0129) later as an MES.

Note: Stand-alone HMCs are still supported for IBM z16 only as carry forward for MES. However, the IBM z16 HMC code is the last level to support a stand-alone HMC.

For more information about feature codes for the supported physical HMCs, see 10.1 “HMC and SE introduction”, in *IBM z16 (3931) Technical Guide*, SG24-8951 or *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

2.4.6 Hardware Management Console considerations

With IBM z16 and HMA, the SE Console Appliance is a licensed application that provides the tasks that you use to monitor and operate your system. The appliance is included with each SE that is installed on the top of the IBM z16 A frame HMAs. One SE appliance runs as the designated Primary (or active) SE and the other as the designated Alternative (or backup) SE. As with the HMC, the SEs are closed systems, and no other applications can be installed on the same environment.

Figure 2-3 on page 19 shows the evolution of the HMC/SE environment, including the HMA offering that was introduced with IBM z15.

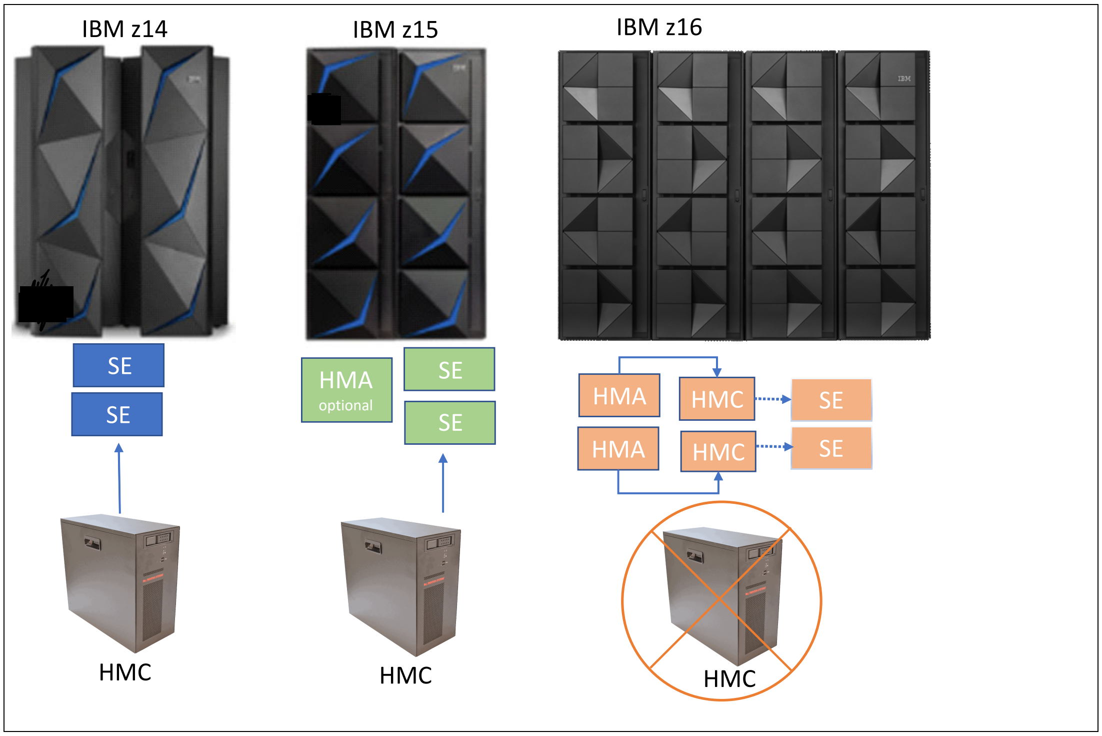


Figure 2-3 Evolution of the HMC/SE environment

The HMC is used to set up, manage, monitor, and operate one or more CPCs. It manages IBM Z hardware, its LPARs, and provides support applications. At least one HMC is required to operate an IBM Z. An HMC can manage multiple IBM Z CPCs. When tasks are performed at the HMC, the commands are routed to the Primary SE of the IBM z16. Then, the SE issues those commands to the targeted CPC.

For more information about feature codes for the supported physical HMCs, see 10.1 “HMC and SE introduction”, in *IBM z16 (3931) Technical Guide*, SG24-8951 or *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

HMC users

Passwords rules for all default users changed. In 2018, the state of California passed the “password law” that bans the use of default passwords in connected devices (see California SB-327). It requires that any default passwords that are included with connected devices are changed on installation or are unique per device.

These rules are implemented by IBM on all IBM z16 devices worldwide. Therefore, a first logon to the default user forces a password logon change. The client is responsible for maintaining the passwords.

> **Note:** Default users that are predefined on the IBM z16 machines are ACSADMIN and SERVICE. Former users such as ADVANCED, OPERATOR, SYSPROG, STORAGEADMIN and other individual users can be re-created by using the HMC ACSADMIN user ID.

However, default user roles ADVANCED, OPERATOR, STORAGEADMIN, and SYSPROG continue to be included, so you can create user IDs from them.

Because the password for the SERVICE default user must be changed, every client must establish a plan for the authorized access to the password for this user because of the following reasons:

- The IBM Systems Service Representative (IBM SSR) might be a different person for various visits.
- IBM SSRs might show up at any time (including the middle of the night) for planned (maintenance actions) or unplanned (repair actions) activities that involve an IBM Z server.

The client should be ready to provide the user ID and the password to the IBM SSR on arrival on the site.

- The client should maintain a list of unique Service IDs and passwords.
- The client must establish a process for the handover of user IDs and passwords to the IBM SSR to avoid service delays.

The configure data replication task

Data replication between the various HMCs is a simple and effective way to keep all the parameters and settings in sync.

As data is replicated from one HMC to another one, an internal level indicator for the data that is replicated is incremented each time that the data is altered on the data source. Each HMC tracks the level indicator for each type of data and does not accept data from a data source when the level indicator is not greater than what is on the receiving HMC.

The HMC data replication service setup is a wizard-guided process on the HMC. When logged on as an ACSADMIN, click **Task Index** on the left of the window, and then click **Configure Data Replication**. Figure 2-4 and Figure 2-5 on page 21 show the entry level for setting up the data replication task.

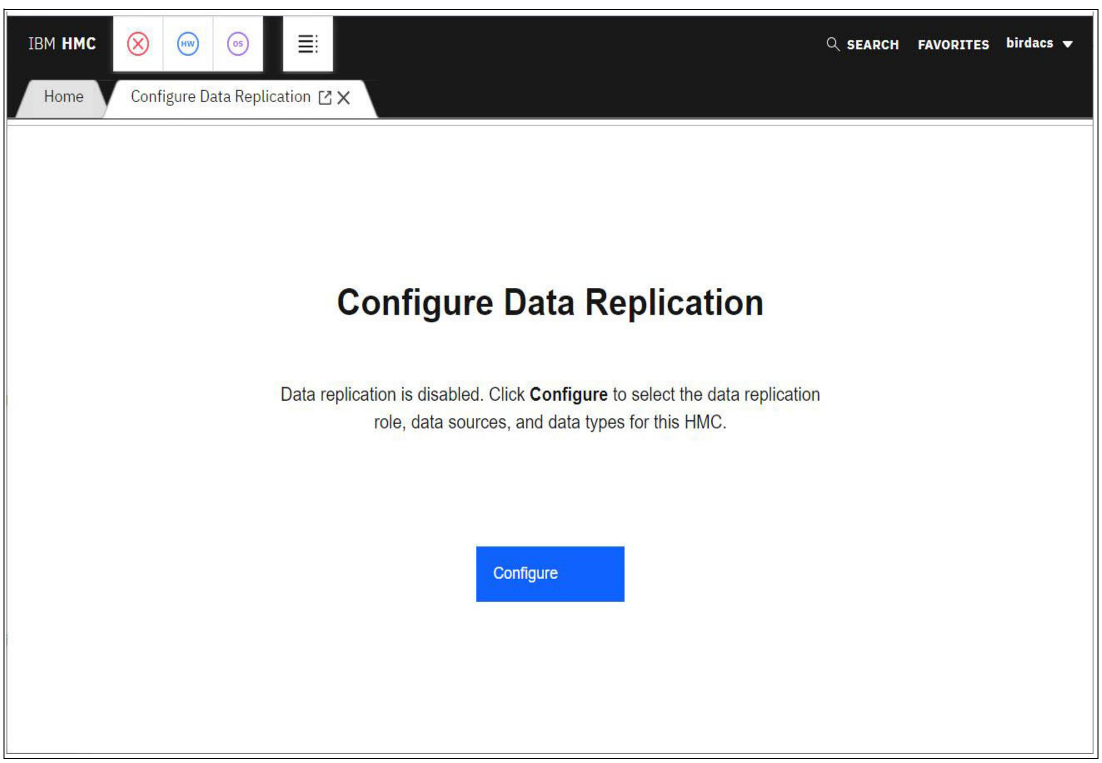


Figure 2-4 Entry window for configuring an HMC data replication task

Follow the windows and complete the setup of the data replication task.

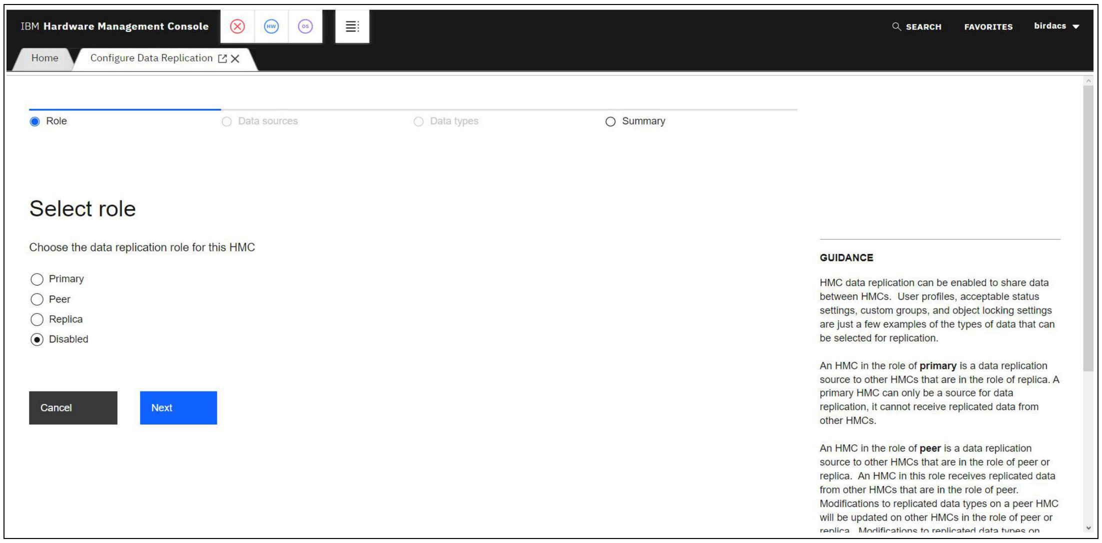


Figure 2-5 HMC role selection for replication

2.4.7 Support Element settings

The SEs that are supplied with the IBM z16 are two appliances that are supported by the 1U HMA servers. Both HMA units are installed at the top of the A frame. One runs the primary SE appliance, and the other runs the alternative SE.

Generally, the SE settings are considered part of the physical installation of the IBM z16, so they are not presented in this book. For a new IBM z16 system, a new range of TCP/IP addresses must be provided by the customer to the IBM SSR who performs the physical installation. As an extra measure of security, provisioning of a separate LAN segment for the management functions is preferred. During an upgrade from an older IBM Z platform to an IBM z16, the current settings on the SEs should be backed up for migration purposes.

In addition to the standard SE configuration, there might be other parameters that should be backed up, such as the API settings. These parameters can be accessed through the Customize API Settings task on the SE.

Any default user IDs that are part of a previous HMC level can be carried forward to new HMC levels as part of a MES upgrade or by selecting “User profile data for the Save / Restore customizable console data” or “Configuration Data Replication tasks”.

Figure 2-6 shows the main selection window on the SE.

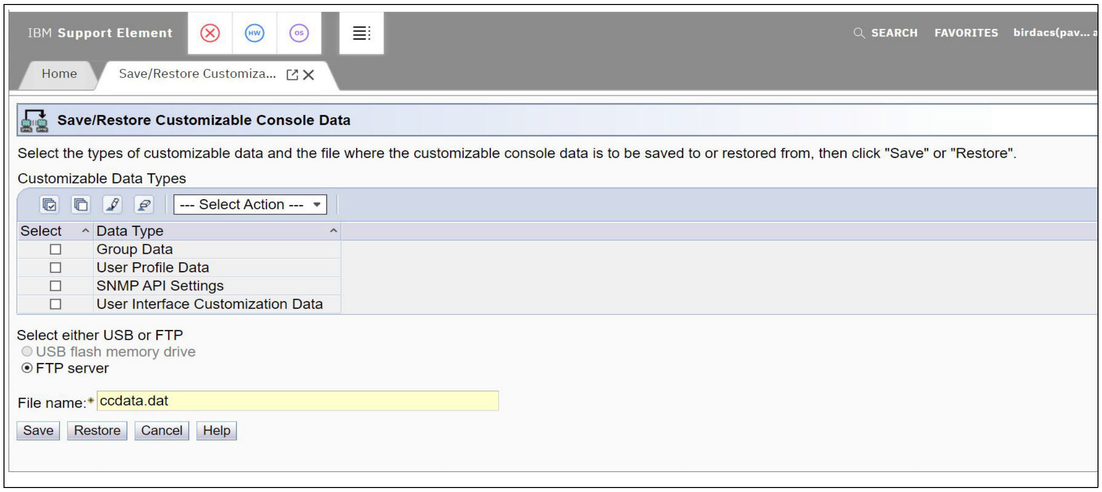


Figure 2-6 Save/Restore Customizable Console Data

In Figure 2-6, the option to save data to an FTP server is selected. At the time of writing, the USB Interfaces on the 1U SE servers were available to the client. However, it is a best practice to provide access to an FTP server for all the clients that are attached to the HMC LAN.

2.4.8 Precision Time Protocol

The Precision Time Protocol (PTP) standard enables accurate and precise synchronization of the real-time clocks of devices in networked distributed systems. The protocol is applicable to systems where devices communicate through networks, including Ethernet. The standard allows multicast communication, unicast communication, or both.

PTP enables heterogeneous systems that include clocks of various inherent precision, resolution, and stability to synchronize to a grandmaster clock. The protocol supports synchronization in the submicrosecond range with minimal network bandwidth and local clock computing resources. The protocol enhances support for synchronization to better than1 nanosecond.

2.4.9 Server Time Protocol

The Server Time Protocol (STP) synchronizes the time of day (TOD) clocks in various systems by using messages that are transported over coupling links. STP operates with the TOD-clock steering facility to provide a new timing mode, timing states, external interrupts, and machine check conditions.

2.4.10 PTP and STP planning considerations

The HMC provides a user interface to manage an STP-only CTN. Managing system time on an IBM z16 system with STP requires the appropriate HMC level (Version 2.16.0 minimum). SE menus for STP on an IBM z16 are no longer available.

STP connectivity for an IBM z16 system: Timing data is exchanged between IBM Z servers by using coupling links. An IBM z16 system can connect to an IBM z14 M0x, IBM z14 ZR1, an IBM z15 T01, an IBM z15 T02, or another IBM z16 system with compatible coupling links (N-2 generations coupling link). Make sure that you have the appropriate coupling and timing connectivity in your IBM z16 system before assigning a role in the Coordinated Timing Network (CTN) (Preferred Time Server (PTS), Backup Time Server (BTS), and Arbiter).

Consider the following items when setting up an HMC for STP or PTP:

- Physical connection to the time servers (PTP or Network Time Protocol (NTP)) is no longer established through the HMC but directly to the CEC.
- A CTN ID, which must be unique for all IBM Z servers that are part of the CTN.
- To synchronize IBM Z to an External Time Source (ETS), NTP or PTP server information (and network connectivity that uses the NTP, NTPS, or PTP protocol with optional Pulse Per Second (PPS)) must be provided.
- The time zone offset, Daylight Saving Time offset, and leap second offset.
- For the IBM Z serve that is part of a CTN, roles must be planned (PTS, BTS, Current Time Server (CTS), and Arbiter).
- As part of the migration, changing the CTS role of the server to be migrated must be done before migration to the new platform (IBM z16 system).

Note: Since IBM z15, support for STP stratum level 4[a] is provided. This feature helps avoid the extra complexity and expense of system reconfiguration. All systems that might become exposed to this situation should have this change installed. Stratum level 4 should be used only during a migration, and for a short period.

a. Stratum 4 is a temporary status to allow more options to move and replace machines and reconfigure CTN. Although STP stratum level 4 is supported, it should not be used for permanent configurations. Stratum 4 should be used for transitional configurations during CTN maintenance.

For more information, see Chapter 8, “Preparing for IBM Parallel Sysplex and Server Time Protocol” on page 201.

2.5 IODF configuration

This section describes I/O configuration considerations in the IODF.

2.5.1 Logical channel subsystems

The IBM Z platform manages I/O resources (LPARs, channel paths, and control units (CUs), and I/O devices) by housing them in multiple logical channel subsystems (LCSSs).

A *spanned channel path* is a channel that can be used by partitions in more than one LCSS. Use the same CHPID value across all LCSSs sharing a spanned channel. However, LCSSs that do not share a spanned channel can use that CHPID for other channels.

For more information, see *z/OS Hardware Configuration Definition Planning*, GA32-0907.

Your planning should consider multiple LCSSs so that you can logically partition your physical channel resources to accommodate large-scale enterprise workload connectivity and high-bandwidth demands. IBM z16 A01 supports six LCSSs and IBM z16 A02 and IBM z16 AGZ support three LCSSs. IBM z16 A01 has four Subchannel Sets (SSs) in each LCSS with up to 256 channels, for a total of 1536 channels. IBM z16 A02 and IBM z16 AGZ have three SSs in each LCSS with up to 256 channels, for a total of 768 channels.

Also, LCSSs provide for multiple SSs for expanding the number of I/O devices that are managed in each CSS. With IBM z16 A01, up to four SSs of approximately 64,000 device addresses are available. The base addresses are defined to SS0. IBM reserves 256 subchannels on set 0 and the alias addresses are defined to set 1, set 2, and set 3.

With IBM z16 A02 and IBM z16 AGZ, up to three SSs of approximately 64,000 device addresses are available. The base addresses are defined to set 0 (IBM reserves 256 subchannels on set 0) and the alias addresses are defined to set 1 and set 2.

Not all device types are eligible for nonzero SSs. SS0 can be used for any type of device. More SSs (for example, SS1) can be used only for certain classes of devices, such as parallel access volume alias devices.

For more information, see *IBM z16 (3931) Technical Guide*, SG24-8951 and *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952. Use multiple SSs to move devices of eligible device types to more SSs, and then define more physical devices to SS0.

2.5.2 Logical partitions

With the PR/SM feature, a single IBM Z can run multiple OSs and Coupling Facilities (CFs) in logical partition (LPAR) mode. Each OS and each CF has its own LPAR, which contains a separate set of system resources that includes these items:

- A portion of storage (memory).
- One or more central and specialty processors. The processors can be dedicated or shared.

Profile data can be exported on the older IBM Z platform and imported on the IBM z16 system. If the LPAR data is imported from an older IBM Z platform, consider the LPAR sizing before the LPAR migration to the IBM z16 system. For more information, see *Support Element Operations Guide* (link requires an IBM Resource Link valid user ID to access).

For more information about how to define LPARs in IODF, see Chapter 3, “Preparing for a new IBM z16 system” on page 37.

Planning considerations for Virtual Flash Memory

VFM (Feature Code 0644) is available in 512 GB increments of memory. IBM z16 A01 can have up to 12 VFM features (four VFM features for IBM z16 A02 and IBM z16 AGZ). While planning your memory, you must consider your VFM requirements.

With the introduction of VFM, there are no changes to the existing OS interface for handling the storage-class memory (SCM). The OS handles VFM the same way as it does Flash Express. The allocation of VFM storage is done during LPAR activation because the LPAR hypervisor manages the partition memory.

Both the initial and maximum amounts of VFM are specified in the LPAR image profile. VFM can be added to or deleted from OSs by using existing SCM commands after the LPAR is activated. VFM allocation and definition for all partitions can be displayed on the Storage Information window on the HMC and by using SCM commands in z/OS.

VFM allocation: The VFM values for Initial and Maximum allocations cannot be dynamically changed. One or more partitions must be activated (or reactivated) for VFM allocation changes to take effect.

As a best practice, assign the maximum amount that is installable for all LPARs that are candidates for using VFM, and set Initial allocation to 0 (zero) for the LPARs that do not require immediate activation of VFM. By doing so, you ensure that you can later use any available VFM when required.

At partition activation time, over-commitment of VFM storage is supported. This setting enables more storage to be added to partitions that is subject to the amount that is not assigned to other partitions.

For more information, see 10.2.3, “Configuring VFM” on page 267.

If the total amount of VFM that is allocated to all active partitions is equal to the LICC value but the sum of active partition maximums is larger than the installed amount, the client might be able to concurrently add VFM and increase allocations without reactivating partitions. This feature is illustrated in the following sections.

Non-disruptive migration

Here is an example of a non-disruptive migration:

- An IBM z16 has three VFM features that are installed (512 GB each), with a LICC value of 1.5 TB.
- LPAR A has 1.0 TB that is assigned, with a maximum value of 1.5 TB.
- LPAR B has 512 GB that is assigned, with a maximum value of 1.0 TB.
- Assign 1 TB to LPAR B, but this change is not possible within the constraints of the installed VFM.
- You can purchase and install another 512 GB VFM feature and install it concurrently. Now, up to 512 GB can be added concurrently to LPAR B without reactivating the LPAR.

Figure 2-7 shows the non-disruptive migration example.

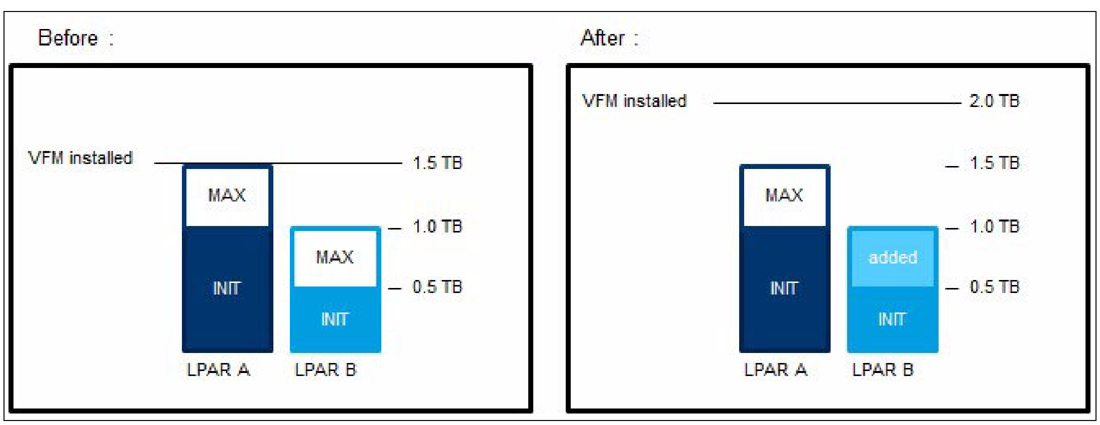


Figure 2-7 Non-disruptive VFM migration example

Disruptive migration

Here is an example of a disruptive migration:

- An IBM z16 has two VFM features that are installed (512 GB per feature), with a LICC value of 1.0 TB.
- LPAR A has 512 GB that is assigned, with a maximum value of 1.0 TB.
- LPAR B has 256 GB that is assigned, with a maximum value of 1.0 TB.
- Change LPAR A so that it can have up to 1.5 TB. This change falls outside the range of the maximum installed VFM.
- You can purchase and install two more 512 GB VFM features concurrently (assuming that the memory is ordered and available). Now, you must reactivate LPAR A with the new maximum VFM value of at least 1.5 TB and less than or equal to 2.0 TB.

> **Note:** Plan-Ahead Memory is not available on the IBM z16.

Figure 2-8 shows the disruptive VFM migration example.

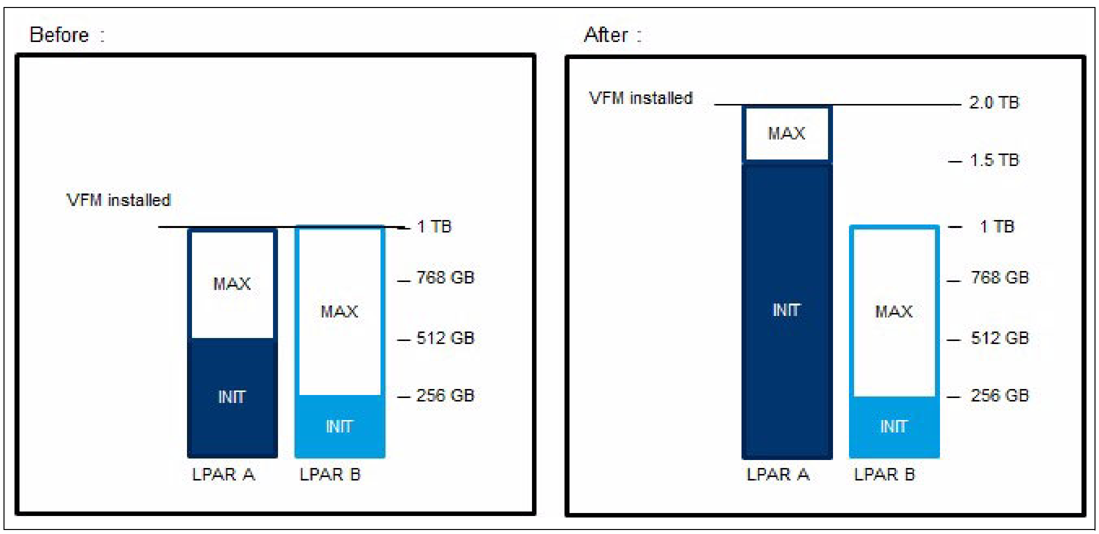


Figure 2-8 Disruptive VFM migration example

For more information about how to configure VFM, see 10.2, “Virtual Flash Memory” on page 266.

2.5.3 Storage connectivity

The FICON Express32S, FICON Express16SA[5], and FICON Express16S+ features provide connectivity to storage devices by using FICON or FCP protocols. FICON Express32S supports negotiation to 8, 16, or 32 gigabits per second (Gbps) link data rates. Two and 4 Gbps transfer rates can be achieved through a FICON Director with 8 or 16 Gbps Optics. FICON Express16S+ features support auto-negotiation to 4, 8, and 16 Gbps, and FICON Express 16SA supports 8 and 16 Gbps data link rates.

The FICON Express features support IBM High Performance FICON for IBM Z (zHPF). zHPF is an extension to the FICON architecture that provides performance improvement for single-track and multi-track operations.

[5] FiCON Express 16SA is not supported on IBM z16 A02 and IBM z16 AGZ.

On a new IBM z16 system, only the FICON Express32S features can be ordered. FICON Express16SA and FICON Express16S+ can be carried forward when upgrading from an older IBM Z.

> **Note:** With the FICON Express32S, FICON Express16SA, and FICON Express16S+ features, *both* ports must be configured either as channel type FC or FCP. A mixed configuration is *not* allowed.

For more information about how to configure the FICON Express32S feature, see Chapter 12, “Adding storage devices” on page 285.

IBM zHyperlink Express

zHyperLink Express is a short-distance IBM Z I/O channel that is designed for up to 10x lower latency than zHPF. zHyperLink is intended to speed up IBM Db2® for z/OS transaction processing and improve active log throughput. This feature is in the PCIe+ I/O drawer, and it is a 2-port card that is used for short-distance direct connectivity between an IBM z16 system and an IBM DS8000® system. It uses Peripheral Component Interconnect Express (PCIe) Gen3 technology with x16 lanes that are bifurcated into x8 lanes for storage connectivity.

zHyperLink Express is designed for distances up to 150 m and supports a link data rate of 8 GBps. A zHyperlink port is fully sharable between all partitions because 127 virtual functions (VFs) / PCIe function IDs (PFIDs) per link are supported.

IBM zHyperLink dramatically reduces the latency of direct access storage device (DASD) I/Os by interconnecting the IBM z16 system directly to the I/O bay of a DS8880 or later storage system. This feature improves the application response time without application changes. zHyperLink is fast enough to run I/Os synchronously so that the CPU can wait for the data, which results in the following advantages:

- No undispatch of the running task
- No CPU queuing delays to resume it
- No host CPU cache disruption
- Small I/O service time

The zHyperLink Express adapter takes one slot on an IBM z16 PCIe+ I/O drawer, and each adapter has a single PCHID with two ports. Up to 16 zHyperLink Express adapters can be installed in one IBM z16 system, which means that you can have up to 32 links.

FICON connectivity to each storage system is still required for these purposes:

- For initialization of the zHyperLink connection
- For I/Os that are not eligible for zHyperLink
- For fallback when a zHyperLink request fails (for example, a cache miss or busy condition)

For more information about the zHyperLink feature, see *IBM z16 (3931) Technical Guide*, SG24-8951, *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952, *IBM Z Connectivity Handbook*, SG24-5444, and *Getting Started with IBM zHyperLink for z/OS*, REDP-5493.

For more information about defining zHyperLink Express, see 15.2.5, “Defining a zHyperLink PCIe function” on page 389.

For more information about zHyperLink Express management, see “Managing zHyperLink Express” on page 393.

2.5.4 Network connectivity

This section provides planning considerations for deploying the following network-related features:

- OSA-Express features
- SMC:
  - SMC-R
  - SMC-D
- HiperSockets

OSA-Express

The OSA-Express features are installed in an IBM z16 PCIe+ I/O drawer. The features are available as different types and support several networking protocols. Depending on the types of OSA-Express features that are installed in the IBM z16 system, the following attachment characteristics are supported:

- Copper-based Ethernet (1000 Mbps)
- Fiber-based GbE Short Wave (SX), and Long Wave (LX)
- Fiber-based 10-GbE Short Reach (SR) and Long Reach (LR)
- Fiber-based 25-GbE SR and LR

Based on the intended usage, the operating modes must be defined with a channel type and device address. For configuration details, see Chapter 6, “Configuring network features” on page 131 and the *OSA-Express Implementation Guide*, SG24-5948.

Starting with Driver Level 22 (HMC V2.13.0), HMC is enhanced to leverage the Open Systems Adapter/Support Facility (OSA/SF) function. For the OSA-Express7S, OSA-Express6S, and OSA-Express5S features, OSA/SF on the HMC is required. The OSA/SF is used primarily for these purposes:

- Manage all OSA-Express ports.
- Configure all OSA-Express non-queued direct input/output (QDIO) ports.
- Configure local Media Access Control (MAC) addresses.
- Display registered Internet Protocol Version 4 (IPv4) addresses (in use and not in use). OSA/SF is supported on an IBM Z platform for QDIO ports.
- Display registered IPv4 or IPv6 Virtual MAC addresses and virtual local area network (VLAN) IDs that are associated with all OSA-Express features that are configured as QDIO Layer 2.
- Provide status information about an OSA-Express port and its shared or exclusive use state.

For more information about the use of OSA/SF on the HMC, see 6.3, “Customizing OSA-Express by using OSA Advanced Facilities” on page 134.

> **Note:** OSA-Express6S 1000Base-T adapter (Feature Code 0426) is the last generation of OSA-Express 1000Base-T adapters to support connections operating at 100 Mbps link speed. OSA-Express7S 1.2 1000ase-T (Feature Code 0458) supports 1000 Mbps duplex link speed only.

The following adapters are supported on an IBM z16:

- 10 GbE RoCE Express3 SR (Feature Code 0440)
- 10 GbE RoCE Express3 LR (Feature Code 0441)
- 25 GbE RoCE Express3 SR (Feature Code 0452)
- 25 GbE RoCE Express3 LR (Feature Code 0453)
- 10 GbE RoCE Express2.1 (Feature Code 0432)
- 25 GbE RoCE Express2.1 (Feature Code 0450)
- 10 GbE RoCE Express2 (Feature Code 0412)
- 25 GbE RoCE Express2 (Feature Code 0430)

SMC-R

The RoCE Express features are designed to help reduce CPU consumption for applications that use the TCP/IP stack without requiring application changes. Using the RoCE Express features also helps to reduce network latency by using the SMC-R protocol in z/OS 2.1 or later. For more information, see RFC 7609. SMC-R is transparent to applications and can be used for LPAR-to-LPAR communications on a single IBM Z platform or for server-to-server communications across multiple IBM Z platforms.

SMC-R uses existing IBM Z and industry standard communications technology:

- Remote Direct Memory Access (RDMA), which is based on queue pair (QP) technology that also uses an InfiniBand transport service type that is called reliable-connected QP (RC-QP), which provides these features:
  - Represents SMC Links in a logical point-to-point connection.
  - Transports data over unique RDMA network interface cards (RNICs) that are logically bound together to form Link Groups. Link Groups are used for high availability (HA) and load-balancing needs.

  Ports in the IBM Z RoCE Express features (also referred to as RNICs) are used as the physical transport layer for RDMA.
- Single-root I/O virtualization (SR-IOV) is a PCIe standard that defines extensions to PCIe specifications. SR-IOV enables sharing of RoCE Express ports between IBM z16 LPARs.

SMCv1 and SMCv2

SMCv1 connectivity is limited to hosts that are directly attached to a common single IP subnet. SMCv2 Introduces the key concepts of the SMC over multiple IP subnets. SMCv2 reuses the existing SMCv1 (CLC and LLC) messages. For more information about the SMC message (wire) flows, see RFC 7609.

SMC-R is an open protocol that was initially introduced in z/OS V2R1 on the IBM zEC12. SMC-R is defined in an informational RFC entitled IBM Shared Memory Communications over RDMA. For more information, see RFC7609.

SMC-D is a variation of SMC-R. SMC-D is closely related to SMC-R but is based on the Internal Shared Memory (ISM) capabilities that were introduced with the IBM z13® hardware model.

For more information about the RoCE Express features and SMC-R, see *IBM z16 (3931) Technical Guide*, SG24-8951, *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952, and *IBM z/OS V2R2 Communications Server TCP/IP Implementation Volume 1: Base Functions, Connectivity, and Routing*, SG24-8360.

Planning for an SMC-R configuration

Deployment of the RoCE Express features is supported in either point-to-point or switched configurations. When you plan to deploy RoCE Express features in a switched configuration, the switches must support the following requirements:

- Global Pause function frame (as described in the IEEE 802.3x standard) should be enabled.
- Priority Flow Control (PFC) should be disabled.
- Firewalls and IP Layer 3 routing are not supported.
- The SMC-Rv2 with RoCE Express2 and RoCE Express3 features lift the single IP subnet limitation for workloads across separate physical IBM Systems Z machines, spanning to multiple IP subnets.
- The 10 and the 25 GbE RoCE Express3 provides two physical ports with appropriate optics (no mix of LR and SR optics).
- For a 25 GbE RoCE Express3 in a switched configuration, the Switch port must support 25 GbE.

IBM provides the SMCAT, which helps determine the potential gains of using SMC-R in an environment (see 2.3.5, “Shared Memory Communications Applicability Tool” on page 13).

RoCE Express features port configuration:

For 10 GbE RoCE Express2 and later features, the port number is configured with the function ID (FID) number in HCD (or IOCDS), and the port number *must be* configured (there is *no default*).

When defining a FID in the TCP/IP profile for 10 GbE RoCE Express2 or later features, the port number is no longer applicable.

When preparing to deploy the RoCE Express features, consider the following items:

- The RoCE Express features are native PCIe features, so the following configuration items must be provided:
  - FID
  - Type
  - PCHID
  - Virtual function ID (VFID)
  - Port number
- Determine which LPARs will be shared by one RoCE Express port.
- Assign the VFs between the sharing LPARs as needed.

For configuration details, see 15.2.3, “Defining a RoCE PCIe function” on page 382.

For 10 GbE RoCE Express2 or later features’ management details, see “RoCE management” on page 387.

SMC-D

SMC-D uses ISM virtual PCIe (vPCIe) adapters to provide Direct Memory Access (DMA) communications between LPARs inside the same IBM Z server.

SMC-D is a protocol that allows TCP socket applications to transparently use ISM. ISM is a virtual channel like Internal Queued Direct (IQD) for HiperSockets. A virtual adapter is created in each z/OS LPAR. By using the SMC protocol, the memory is logically shared. The virtual network is provided by firmware.

SMC-R requires a TCP/IP connection and preserves the entire network infrastructure. SMC-D is also a "hybrid" solution. It uses a TCP connection to establish the SMC-D connection. The TCP path can be either through an OSA-Express port or through a HiperSockets connection. A TCP option (called SMCD) controls switching from TCP to "out of band" SMC-D. The SMC-D information is exchanged within the TCP data stream. Socket application data is exchanged through ISM (write operations). The TCP connection remains established to control the SMC-D connection.

SMC-Dv2 with ISMv2 lifts the single IP subnet limitation for an IBM Z (CPC), which extends the SMC-D solution and adds potential savings to more IBM Z workloads in the enterprise.

For more information about SMC-D, see *IBM Z Connectivity Handbook*, SG24-5444 and *IBM z/OS Communications Server 2.5 New Function Summary*, GC27-3664-50.

Planning for an SMC-D configuration

From a planning standpoint, SMC-D is like SMC-R, so the same considerations apply. The objective is to provide consistent operations and management tasks for both SMC-D and SMC-R. SMC-D uses a new virtual PCI adapter that is called ISM. The ISM interfaces are associated with IP interfaces (for example, HiperSockets or OSA-Express; ISM interfaces do not exist without an IP interface).

ISM interfaces are not defined in software. Instead, ISM interfaces are dynamically defined and created, and automatically started and stopped. You do not need to operate (start or stop) the ISM interfaces. Unlike Remote Direct Memory Access over Converged Ethernet (RoCE), ISM FIDs (PFIDs) are not defined in software. Instead, they are auto-discovered based on their PNet ID.

Before implementing SMC-R or SMC-D, check your environment for the following items:

- Run SMCAT to evaluate its applicability and potential value. For more information about SMCAT, see *IBM z/OS SMC Applicability Test (SMCAT)* and 2.3.5, "Shared Memory Communications Applicability Tool" on page 13.
- Review and adjust the available real memory and fixed memory usage limits (z/OS and CS) as needed. SMC requires fixed memory. Review the limits and provision more real memory for z/OS.
- Review the IP topology, VLAN usage considerations, and IPsec.
- Review changes to messages, monitoring information, and diagnostic tools. There are numerous updates to these items:
  - Messages (IBM Virtual Telecommunications Access Method (IBM VTAM®) and TCP stack)
  - The **`netstat`** command (status, monitoring, and display information)
  - CS diagnostic tools (VIT, Packet trace, CTRACE, and IPCS formatted memory dumps)

For more information about SMC-D and SMC-R planning and security considerations, see IBM Documentation, and select the links for SMC-R and SMC-D.

For more information about how to define SMC-D, see 15.2.2, “Defining an ISM PCIe function” on page 378.

For an overview about how to manage an SMC-D connection, see “ISM management” on page 382.

Native PCIe feature plugging and Resource Groups

Native PCIe feature support is provided by Resource Group (RG) code running on the integrated firmware processors (IFPs). The IFPs are allocated from the pool of non-client cores that are available for the whole system. Unlike other characterized cores, the customer does not pay for the IFPs. In IBM z16, two cores are characterized as IFPs that are dedicated solely for supporting the native PCIe features and initialized at POR if these features are present.

The IBM z16 has four RGs that have firmware for the following features:

- 10GbE and 25GbE RoCE Express3 (LR and SR)
- 10GbE and 25GbE RoCE Express2.1 (SR)
- 10GbE and 25GbE RoCE Express2 (SR)
- zHyperLink Express 1.1
- Coupling Express2 LR (CE LR)

For resilience, there are always four independent RGs on the system that share the IFP. For HA purposes, always use at least two PCIe features that are in different RGs, as shown in Figure 2-9.

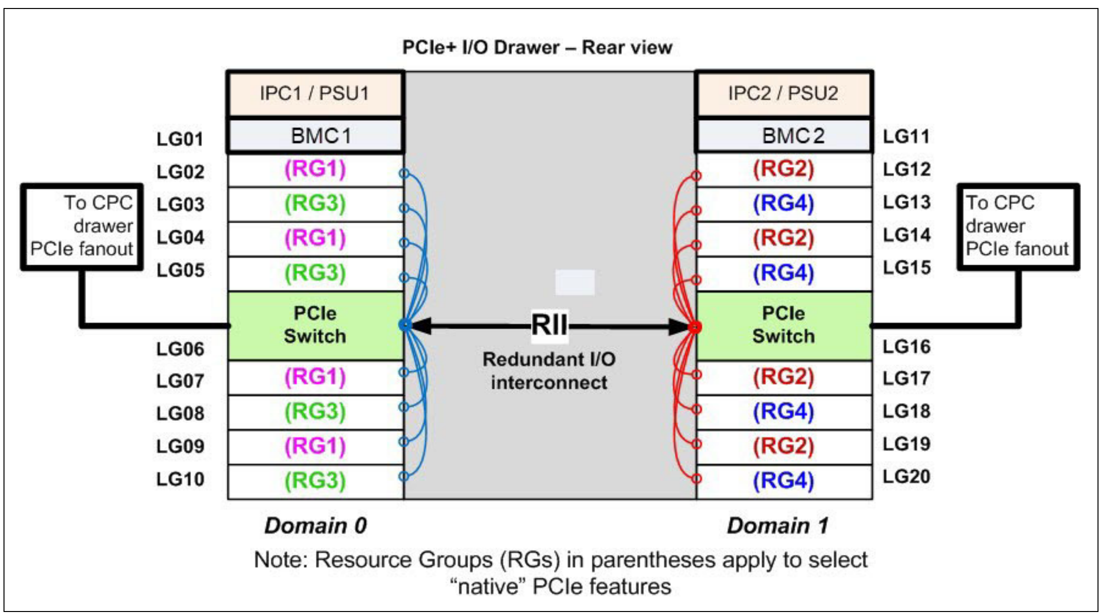


Figure 2-9 Relationship among PCIe+ I/O drawer slots, domains, and RGs in IBM z16

HiperSockets

HiperSockets provides the fastest TCP/IP communications between z/OS, z/VM, IBM z/VSE[6] and 21st Century Software VSE^n 6.3, and Linux LPARs within an IBM z16 system because they act like internal VLANs by using LIC and supporting device drivers in the OSs. HiperSockets establishes a network with higher availability, security, simplicity, performance, and cost-effectiveness than can be achieved by using an external IP network.

The HiperSockets function is based on the OSA-Express QDIO protocol, so HiperSockets is called *internal queued direct input/output* (IQDIO). LIC emulates the link control layer of an OSA-Express QDIO interface and uses no physical cabling or external networking connections. Data access is performed at memory speeds, bypassing external network delays and providing users with high-speed logical LANs with minimal system and network impact.

HiperSockets can be defined as MIF-shared in a CSS and as spanned channels across multiple CSSs. A HiperSockets CHPID can be seen as an *internal LAN* to the server. The level of sharing is determined by the LPARs that you want to grant access to that LAN.

HiperSockets is supported by the following OSs:

- All in-service z/OS releases
- All in-service z/VM releases
- All in service z/VSE[7] releases
- 21st Century Software VSE^n 6.3
- Linux on IBM Z

On an IBM z16 system, HiperSockets support the following functions:

- HiperSockets broadcast

  Supported across HiperSockets on IPv4 for applications. Applications that use the broadcast function can propagate the broadcast frames to all TCP/IP applications that are using HiperSockets. This support is applicable in Linux, z/OS, and z/VM environments.

- VLAN support

  VLANs are supported by Linux on IBM Z and z/OS for HiperSockets. VLANs can reduce processing impact by enabling networks to be organized by traffic patterns rather than physical location. This enhancement enables traffic flow on a VLAN connection both over HiperSockets and between HiperSockets and OSA-Express Ethernet features.

- IPv6 support on HiperSockets
- HiperSockets Network Concentrator

  Traffic between HiperSockets and OSA-Express can be transparently bridged by using the HiperSockets Network Concentrator. This configuration eliminates intervening network routing processing impact, resulting in increasing performance and a simplified network configuration. This improvement is achieved by configuring a connector Linux system that has HiperSockets and OSA-Express connections that are defined to it.

- HiperSockets Layer 2 support

  HiperSockets supports two transport modes on the IBM z16 Layer 2 (Link Layer) and Layer 3 (Network and IP Layer).

[6] z/VSE is not supported on IBM z16 A02 and IBM z16 AGZ.
[7] z/VSE is not supported on IBM z16 A02 and IBM z16 AGZ.

As with Layer 3 functions, HiperSockets Layer 2 devices can be configured as primary or secondary connectors or multicast routers. These configurations enable high performance and HA Link Layer switches between the HiperSockets network and external Ethernet.

- HiperSockets multiple write facility

  HiperSockets performance is increased by enabling streaming of bulk data over a HiperSockets link between LPARs. Multiple writes with fewer I/O interrupts reduce the processor usage of both the sending and receiving LPARs, and it is supported in z/OS.

- HiperSockets Completion Queue

  The HiperSockets Completion Queue function is designed to allow HiperSockets to transfer data synchronously if possible, and asynchronously if necessary. This function combines ultra-low latency with more tolerance for traffic peaks.

  With the asynchronous support, during high volume situations, data can be temporarily held until the receiver has buffers that are available in its inbound queue. This function provides end-to-end performance improvement for LPAR-to-LPAR communication.

- HiperSockets Virtual Switch Bridge Support

  The z/VM virtual switch is enhanced to transparently bridge a guest virtual machine (VM) network connection on a HiperSockets LAN segment. z/VM 6.2 or later, TCP/IP, and Performance Toolkit APARs are required for this support. This bridge enables a single HiperSockets guest VM network connection to also directly communicate with the following devices:

  - Other guest VMs on the virtual switch
  - External network hosts through the virtual switch OSA UPLINK port

- zIIP-Assisted HiperSockets for large messages

  In z/OS, HiperSockets is enhanced for zIIP usage. Specifically, the z/OS Communications Server enables HiperSockets Multiple Write Facility processing for large outbound messages that originate from z/OS to be run on a zIIP.

  z/OS application workloads that are based on XML, HTTP, SOAP, Java, and traditional file transfer can benefit from zIIP enablement by lowering general-purpose processor usage.

  When the workload is eligible, the HiperSockets device driver layer processing (write command) is redirected to a zIIP, which unblocks the sending application.

For more information about the technical details of each function, see *IBM Z Connectivity Handbook*, SG24-5444.

2.5.5 Coupling and timing links

Support for Parallel Sysplex includes the CFCC and coupling links. Coupling connectivity in support of Parallel Sysplex environments is provided on the IBM z16 by the following features:

- CE LR. The feature (Feature Code 0434) has 2-port coupling link connectivity for a distance up to 10 km (6.2 miles).
- Integrated Coupling Adapter Short Reach (ICA SR and ICA SR1.1) (Feature Code 0172 and Feature Code 0176).
- Internal Coupling (IC) channels operate at memory speed.

The number of physical coupling links and logical coupling CHPIDs that is supported by each IBM z16 can be found in *IBM Z Connectivity Handbook*, SG24-5444.

All coupling link types, except IC links, can be used to carry STP or PTP messages.

> **Note:** The CE2-LR is a 2-port card that occupies one PCIe+ I/O drawer slot. Therefore, an IBM z16 that is configured as a Stand-Alone Coupling Facility (SACF) must have at least one PCIe+ I/O drawer for LR coupling.

Planning consideration

The relationship between one or more CF link connections among CPCs must be configured in HCD to enable the exchange of CF link signals. HCD generates the CU and device definitions automatically if the CPCs are known within the same IODF file and the adapter ID (AID) or PCHIDs are not reserved by other definitions.

> **Coupling connectivity for IBM z16:** IBM z16 supports coupling connectivity back to IBM z14 M0x, IBM z14 ZR1, and IBM z15 T01 and IBM z15 T02. Coupling is supported only through ICA SR, ICA SR 1.1, and CE LR links.
>
> No N-3 connectivity from IBM z16 back to the IBM z13® and IBM z13s® generation exists.
>
> To manage an IBM z16 system in a CTN, HMC level 2.16.0 or later must be used. The IBM z16 SE no longer supports STP menus.

As described in this section, depending on the type of the CF link hardware, CF links operate up to a set distance. Physical placement of the CPCs or CFs must be considered to avoid exceeding the maximum distance that is supported by the CF link. For the CE2-LR links, Dense Wavelength Division Multiplexing (DWDM) technology can be used to extend the maximum length of the CF links.

For a list of qualified devices, log in to the IBM Resource Link website with a registered Resource Link ID.

STP or PTP signals can be exchanged between two CPCs without any CF LPARs that are involved. If physical coupling links are established between two CPCs, HCD enables the configuration of STP links (timing-only links).

For more information, see *z/OS HCD User's Guide*, SC34-2669, and Chapter 8, "Preparing for IBM Parallel Sysplex and Server Time Protocol" on page 201.

2.5.6 Planning considerations for hardware data compression

This section provides planning considerations for enabling hardware data compression on an IBM z16 system.

The IBM z16 processor chip has two integrated accelerators in its design: the compression coprocessor (CMPCS), which is present on every core, and the IBM Integrated Accelerator for zEDC (one for each chip, which is integrated into the nest). The compression coprocessor and IBM Integrated Accelerator for zEDC use an algorithm for data compression that enables the reduction in the size of data to save storage space or increase the data transfer throughput. This on-chip compression capability delivers industry-leading throughput and replaces the zEDC Express adapter on the IBM z14 system and earlier IBM Z platforms.

Here is a short summary about planning considerations for hardware data compression:

1. Planning the installation:
   - Update the IFAPRDxx PARMLIB member in z/OS 2.2 or later.
   - Plan for IPLs before activating the software feature for the first time.
2. z/OS: Verifying the prerequisites: Look up the `IBM.Function.zEDC` FIXCAT for proper PTFs.
3. z/OS: Enabling the Priced Software Feature. Enabling the priced feature provides native compression support for use without using the zlib Java library.

3

Preparing for a new IBM z16 system

This chapter describes two scenarios when preparing for an IBM z16 installation:

- Upgrading an existing IBM z15 T01 or IBM z15 T02 to an IBM z16 A01, IBM z16 A02, or IBM z16 AGZ while maintaining your existing serial number. An upgrade includes a frame, drawers (central processor complex (CPC) and I/O), and new or carry-forward I/O features.
- Installing a new IBM z16 A01, IBM z16 A02, or IBM z16 AGZ into an existing environment.

Because many environments exist, the results that are achieved in your environment might differ from the ones that are described here.

> **Naming:** The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

This chapter includes the following topics:

- Supported hardware features
- Saving and restoring Open Systems Adapter-Express configuration data
- Upgrading an IBM z15 to an IBM z16 while maintaining the serial number
- Installing a new IBM z16 system into an existing IBM Z environment

3.1 Supported hardware features

This section lists the channel path ID (CHPID) types and hardware features for the IBM z16 A01 (3931), and IBM z16 A02, and IBM z16 AGZ (3932). There are no new CHPID types for the IBM z16 system.

Here are the hardware features that are new or available for order:

- Feature Code 0434 - Coupling Express2 Long Reach (LR)
- Feature Code 0176 - Integrated Coupling Adapter SR1.1
- Feature Code 0440 - 10GbE RoCE Express3 SR
- Feature Code 0441 - 10GbE RoCE Express3 LR
- Feature Code 0452 - 25GbE RoCE Express3 SR
- Feature Code 0453 - 25GbE RoCE Express3 LR
- Feature Code 0451 - zHyperLink Express1.1
- Feature Code 0909 - Crypto Express8S (1 port)
- Feature Code 0908 - Crypto Express8S (2 port)
- Feature Code 0454 - OSA-Express7S 1.2 GbE Long Wave (LX)
- Feature Code 0455 - OSA-Express7S 1.2 GbE SX
- Feature Code 0456 - OSA-Express7S 1.2 10GbE LR
- Feature Code 0457 - OSA-Express7S 1.2 10GbE SR
- Feature Code 0458 - OSA-Express7S 1.2 1000Base-T
- Feature Code 0459 - OSA-Express7S 1.2 25GbE SR
- Feature Code 0460 - OSA-Express7S 1.2 25GbE LR
- Feature Code 0461 - FICON Express32S LX
- Feature Code 0462 - FICON Express32S Short Wave (SX)
- Feature Code 0644 - IBM Virtual Flash Memory (VFM)

Here are the CHPID types that can be migrated (carry forward):

- Fibre Channel (FC) and Fibre Channel Protocol (FCP)
- OSC, OSD, and OSE
- CS5, CL5, and ICP
- Internal Queued Direct (IQD)

> **Note:** For the IBM z16 (machine type 3931) and later systems, the OSA-Express 1000 Base-T adapters for System Management (OSM) are no longer required to enable Dynamic Partition Manager (DPM) mode on the system.

Here are the hardware features that can be migrated (carry forward).

> **Note:** OSA Express7S is not supported and cannot be migrated (carry forward) in an upgrade to an IBM z16 A02 or to an IBM z16 AGZ.

- Feature Code 0172 - ICA SR
- Feature Code 0176 - ICA SR1.1
- Feature Code 0412 - 10GbE RoCE Express2
- Feature Code 0422 - OSA-Express6S GbE LX
- Feature Code 0423 - OSA-Express6S GbE SX
- Feature Code 0424 - OSA-Express6S 10 GbE LR
- Feature Code 0425 - OSA-Express6S 10 GbE SR
- Feature Code 0426 - OSA-Express6S 1000Base-T Ethernet
- Feature Code 0430 - 25GbE RoCE Express2
- Feature Code 0431 - zHyperLink Express
- Feature Code 0432 - 10GbE RoCE Express2.1

- Feature Code 0450 - 25GbE RoCE Express2.1
- Feature Code 0451 - zHyperLink Express1.1
- Feature Code 0893 - Crypto Express6S
- Feature Code 0899 - Crypto Express7S (1 port)
- Feature Code 0898 - Crypto Express7S (2 port)
- Feature Code 0425 - OSA-Express6S 10 GbE SR
- Feature Code 0426 - OSA-Express6S 1000Base-T Ethernet
- Feature Code 0449 - OSA-Express7S 25GbE SR1.1
- Feature Code 0442 - OSA-Express7S GbE LX
- Feature Code 0443 - OSA-Express7S GbE SX
- Feature Code 0444 - OSA-Express7S 10GbE LR
- Feature Code 0445 - OSA-Express7S 10GbE SR
- Feature Code 0446 - OSA-Express7S 1000Base-T
- Feature Code 0427 - FICON Express16S+ LX
- Feature Code 0428 - FICON Express16S+ SX
- Feature Code 0436 - FICON Express16SA LX[1]
- Feature Code 0437 - FICON Express16SA SX[1]

Here are the CHPID types that are not migrated (no carry forward):

- CIB
- OSN
- OSX
- OSM

Here are the features that are not migrated (no carry forward):

- Feature Code 0413 - OSA-Express5S GbE LX
- Feature Code 0414 - OSA-Express5S GbE SX
- Feature Code 0415 - OSA-Express5S 10GbE LR
- Feature Code 0416 - OSA-Express5S 10GbE SR
- Feature Code 0417 - OSA-Express5S 1000Base-T
- Feature Code 0411 - RoCE Express 10 GbE SR
- Feature Code 0418 - FICON Express16S LX
- Feature Code 0419 - FICON Express16S SX
- Feature Code 0409 - FICON Express8S LX
- Feature Code 0410 - FICON Express8S SX
- Feature Code 0890 - Crypto Express5S
- Feature Code 0420 - IBM zEnterprise® Data Compression (zEDC) Express
- Feature Code 0429 - OSA-Express7S 25 GbE SR
- Feature Code 0433 - Coupling Express LR

For more information about the supported I/O features, see *IBM Z Connectivity Handbook*, SG24-5444.

[1] Feature Codes 0436 and 0437 (FICON Express16SA LX and SX) are *not* supported on IBM z16 A02 and IBM z16 AGZ.

3.2 Saving and restoring Open Systems Adapter-Express configuration data

The three processes for Open Systems Adapter-Express (OSA-Express) cards that you might need to use when upgrading or replacing your processor are described here.

Using Open Systems Adapter/Support Facility to save and restore OSE OSA Address Table configuration data

For more information about how to save and restore any OSA-Express configuration data such as the OSA Address Table (OAT), see 7.3.1, "Saving and restoring the OSA-ICC configuration" on page 192.

Exporting and importing OSA-ICC configuration data with Open Systems Adapter Advanced Facilities

If you are unfamiliar with the exporting and importing process for Open Systems Adapter (OSA) Integrated Console Controller (ICC) (OSA-ICC) Server and Session configuration data, see 7.3, "Defining a new OSA-ICC configuration by using OSA Advanced Facilities" on page 186.

Using OSA Advanced Facilities to set OSA parameters

For more information about the process of changing the OSA port speed or Media Access Control (MAC) addresses, see 6.3, "Customizing OSA-Express by using OSA Advanced Facilities" on page 134.

3.3 Upgrading an IBM z15 to an IBM z16 while maintaining the serial number

This section describes the steps to upgrade an existing IBM z15 that is defined in your input/output definition file (IODF) to an IBM z16 and keeping the system serial number.[2]

3.3.1 Scenario overview

This scenario describes the configuration steps to upgrade an existing 8561 (IBM z15 T01) to a 3931 (IBM z16 A01).

> **Note:** The following steps apply to an upgrade of an existing IBM z15 T02 to an IBM z16 A02 or to an IBM z16 AGZ M/T 3932.

The key factors include:

- Hardware Configuration Definition (HCD) requires a new CPC (processor) ID for the 3931 or 3932 processor.
- Keep the same CPC name for the 3931 or 3932 (this item is optional; the CPC name can be changed).

[2] For experienced Hardware Configuration Definition (HCD) users, there is another way of performing this upgrade: Change the Processor Type and Model of the existing IBM z15 processor definition to an IBM z16, and then use the Build Production feature.

- The 3931 or 3932 processor channels connect to the same switch ports and access the same control unit (CU) interfaces.
- The CU interfaces connect to the same switch ports.
- The starting IODF is the current 8561 *production* IODF.
- The target IODF is a new 3931 or 3932 *work* IODF.
- HCD actions:
  - Migrate updated input/output configuration program (IOCP) statements.
  - Build a production IODF.
  - Remote write IODF to the input/output configuration data set (IOCDS).
- Hardware Management Console (HMC) actions:
  - Build the Reset Profile and point to the required IOCDS.
  - Build and verify the Image Profiles.
  - Build and verify the Load Profiles.
  - Perform a Power on Reset (POR).

This example uses an 8561 (IBM z15 T01) processor with a Processor ID of `ARIES` with six channel subsystems (CSSs) (CSS ID=0 - CSS ID=5). This system is replaced by a 3931 (IBM z16 A01) with a Processor ID of `PAVO` and six CSSs. The CPC name `ARIES` and serial number are not changed.

Table 3-1 summarizes the migration options and tool requirements. The process steps are described in “HCD: Migrating the existing 8561 IODF” on page 42.

Table 3-1 I/O configuration that is migrated to a 3931 or 3932 system

Options and tools	Comments
Processor ID	Must change the Processor ID to a new ID.
CPC name	Local System Name. Generally should be the same name.
Channel to switch port connections	Same ports.
CU to switch port connections	Same ports.
Starting IODF	Current active *production* IODF.
Target IODF	Create a *work* IODF.
HCD action	Repeat and change.
CHPID Mapping Tool (CMT)	Optional, but good for verifying configurations.
CFReport file (Configuration Control Number (CCN))	Required for the CMT.
IOCP (Import from validated work IODF.)	Yes.
CMT actions (physical channel ID (PCHID) reset)	Yes.
CMT IOCP Output	Yes.
CMT Reports	Yes, CHPID and CHPID to CU Report.

HCD: Migrating the existing 8561 IODF

The following steps explain how to upgrade an existing 8561 processor in your IODF to the new 3931 processor by using HCD. Then, you migrate the I/O configuration and logical partitions (LPARs) from the 8561 to the 3931. Using HCD, the sequence of operations is as follows:

1. Creating the work IODF from the current 8561 production IODF.
2. Repeating the 8561 processor to be replaced.
3. Coupling Link information messages.
4. Deleting any unsupported items in the repeated 8561.
5. Add replacements for the unsupported items that were deleted in step 4.
6. Changing the 8561 to a 3931 and deleting the 8561.
7. Reconnecting the CF channel paths that were not migrated.
8. Using Open Systems Adapter/Support Facility to save and restore OSE OSA Address Table configuration data.
9. Exporting and importing OSA-ICC configuration data with Open Systems Adapter Advanced Facilities.
10. Using OSA Advanced Facilities to set OSA parameters.

3.3.2 Creating the work IODF from the current 8561 production IODF

HCD is the tool that is used to make a work IODF, but you start from the production IODF that contains the 8561 processor that you are upgrading (for example, `SYS9.IODF80`).

3.3.3 Repeating the 8561 processor to be replaced

To repeat the 8561 processor in HCD, complete the following steps:

1. From the main HCD panel, select option `1.3. Processor List`.
2. In the Processor List (Figure 3-1), enter `r` (for repeat) next to the 8561 that you want to upgrade, and press Enter.

```
                                Processor List        Row 1 of 3 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
r ARIES    8561     T01      LPAR  0123458561 Aries
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
```

Figure 3-1 Processor List: Repeating processor

3. The Identify Target IODF panel opens. Do *one* of the following actions:
   - To retain all the other processor definitions in the IODF, press Enter.
   - Enter a different target IODF data set name. In this case, only the processor that you are repeating is retained in the target IODF.

4. The Create Work I/O Definition File panel prompts you to enter the data set name of the target IODF (for example, `SYS9.IODF81.WORK`).
5. The Repeat Processor panel opens (Figure 3-2). Enter the Processor ID of the new 3931 (in this example, `PAVO`), keep all the other fields unchanged, and press Enter.

```
*---------------------------- Repeat Processor ------------------------------*
|                                                                            |
|                                                                            |
| Specify or revise the following values.                                    |
|                                                                            |
| Processor ID . . . . . . . . . PAVO____                                    |
|                                                                            |
| Processor type . . . . . . . : 8561                                        |
| Processor model  . . . . . . : T01                                         |
| Configuration mode . . . . . : LPAR                                        |
|                                                                            |
| Serial number  . . . . . . . . 0123458561                                  |
| Description  . . . . . . . . . Aries                                       |
|                                                                            |
| Specify SNA address only if part of a processor cluster:                   |
|                                                                            |
| Network name . . . . . . . . . IBM390PS  +                                 |
| CPC name . . . . . . . . . . . ARIES     +                                 |
|                                                                            |
| Local system name  . . . . . . ARIES                                       |
*-------------------------------------*                                      |
| New IODF SYS9.IODF81.WORK defined.    |                                    |
*-------------------------------------*--------------------------------------*
```

Figure 3-2 Repeat Processor: Defining a new Processor ID

3.3.4 Coupling Link information messages

You might receive severity messages (E, I, or W). As shown in Figure 3-3 (`CBDG441I`), severity I messages are displayed because the Coupling Facility (CF) Link CHPIDs were not copied to the 3931 definition.

```
*------------------------------- Message List --------------------------------*
|   Save  Query  Help                                                           |
| ---------------------------------------------------------------------------  |
|                                                                  Row 1 of 73 |
| Command ===> ____________________________________________ Scroll ===> CSR    |
|                                                                               |
| Messages are sorted by severity. Select one or more, then press Enter.       |
|                                                                               |
| / Sev Msg. ID  Message Text                                                   |
| _ I   CBDG441I The Coupling Facility connection between channel path         |
| #              0.80 of processor ARIES and channel path 0.81 of              |
| #              processor ARIES is not copied.                                |
| _ I   CBDG441I The Coupling Facility connection between channel path         |
| #              0.81 of processor ARIES and channel path 0.80 of              |
| #              processor ARIES is not copied.                                |
| _ I   CBDG441I The Coupling Facility connection between channel path         |
| #              0.82 of processor ARIES and channel path 0.83 of              |
| #              processor ARIES is not copied.                                |
| _ I   CBDG441I The Coupling Facility connection between channel path         |
| #              0.83 of processor ARIES and channel path 0.82 of              |
| #              processor ARIES is not copied.                                |
| _ I   CBDG441I The Coupling Facility connection between channel path         |
| #              0.88 of processor ARIES and channel path 0.88 of              |
*------------------------------------------------------------------------------*
```

Figure 3-3 Message List: Showing CBDG441I

To resolve this issue, complete the following steps:

1. Scroll until you reach the end of the messages and see the `CBDG271I requested action on object ARIES successfully processed` message.
2. Press PF3 or PF12 to continue. As shown in Figure 3-4, there is an extra 8561 processor that is named `PAVO`.

```
                                Processor List       Row 1 of 4 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ ARIES    8561     T01      LPAR  0123458561 Aries
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
_ PAVO     8561     T01      LPAR  0123458561 Aries
```

Figure 3-4 Processor List: Repeated processor

3.3.5 Deleting any unsupported items in the repeated 8561

If you are upgrading a processor that contains any CHPID types of OSN, OSX or OSM, then these types must be deleted from the IODF before changing the processor type to 3931 or 3932.

Note: IBM z16 machine types 3931 and 3932 do *not* support any InfiniBand coupling links, so all CHPIDs of type CIB must be deleted in an IODF for machine type 3931 and 3932. Also, if necessary, replace them with either CHPID type CS5 or CL5.

To delete unsupported CHPIDs, complete the following steps:

1. From the Processor List panel, select the newly created `PAVO` processor and then press Enter, as shown in Figure 3-5.

```
                                Processor List       Row 1 of 4 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ ARIES    8561     T01      LPAR  0123458561 Aries
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
s PAVO     8561     T01      LPAR  0123458561 Aries
```

Figure 3-5 Processor List: Selected processor

2. On the Channel Subsystem List panel, select definitions in `CSS ID 0`, as shown in Figure 3-6.

```
                            Channel Subsystem List    Row 1 of 6 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel subsystems, then press Enter.  To add, use F11.

Processor ID . . . : PAVO         Aries

  CSS Devices in SS0    Devices in SS1    Devices in SS2    Devices in SS3
/ ID  Maximum + Actual  Maximum + Actual  Maximum + Actual  Maximum + Actual
s 0   65280     6440    65535     0       65535     0       65535     0
_ 1   65280     8680    65535     0       65535     0       65535     0
_ 2   65280     4376    65535     0       65535     0       65535     0
_ 3   65280     4158    65535     0       65535     0       65535     0
_ 4   65280     0       65535     0       65535     0       65535     0
_ 5   65280     0       65535     0       65535     0       65535     0
```

Figure 3-6 Channel Subsystem List: Selected CSS

3. Within the selected CSS, set a filter, as shown in Figure 3-7.

```
  Goto  Filter  Backup  Query  Help
----- *-------------------------------------* ------------------------------
      | 1  1. Set Filter                    | t      Row 1 of 69 More:
Comma |    2. Clear Filter                  | ______________ Scroll ===> CSR
      |    3. Count rows on (filtered) list |
Selec *-------------------------------------* nter. To add use F11.

Processor ID . . . . : PAVO        Aries
Configuration mode . : LPAR
Channel Subsystem ID : 0

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 10    10C   FC    SPAN  01  01 26       No  TS7760A
_ 11    228   FC    SPAN  01  01 27       No  TS7760A
_ 12    10D   FC    SPAN  02  02 26       No  TS7760A
_ 13    229   FC    SPAN  02  02 27       No  TS7760A
_ 24    1E1   FCP   SHR   __  __ __       No  ______________________________
_ 25    124   FCP   SPAN  __  __ __       No  ______________________________
_ 34    108   FCP   SHR   __  __ __       No  ______________________________
_ 35    14C   FCP   SPAN  __  __ __       No  ______________________________
_ 40    200   FC    SPAN  01  01 2C       No  DASD
_ 41    101   FC    SPAN  02  02 2C       No  DASD
```

Figure 3-7 Channel Path List: Set Filter

4. In the Filter Channel Path List panel, select the channel path type `OSM`, as shown in Figure 3-8.

```
*----------------------- Filter Channel Path List ------------------------*
|                                                                          |
|                                                                          |
| Specify or revise the following filter criteria.                         |
|                                                                          |
| Channel path type  . OSM                                                 |
| Operation mode . . . ____  +                                             |
| Managed  . . . . . . _    (Y = Yes; N = No)   I/O Cluster ________   +   |
| Dynamic entry switch __    +                                             |
| Entry switch . . . . __    +                                             |
| CF connected . . . . _    (Y = Connected; N = Not connected)             |
| CHID AID/P PCHID/P   _____                                               |
|                                                                          |
| Description  . . . . ________________________________                    |
|                                                                          |
| Partition  . . . . . ________  +                                         |
| Connected to CUs . . _    (Y = Connected; N = Not connected)             |
|                                                                          |
|                                                                          |
|                                                                          |
|                                                                          |
*--------------------------------------------------------------------------*
```

Figure 3-8 Filter Channel Path type: Type OSM for channel path type

5. The Channel Path List panel shows channel definitions only for channel path type `OSM`. Delete these definitions as shown in Figure 3-9 on page 47, and press Enter.

```
                              Channel Path List     Filter Mode. More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Aries
Configuration mode . : LPAR
Channel Subsystem ID : 0

        CHID+              Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
d D4    116   OSM   SPAN  __  __ __       No  _______________________________
d D5    118   OSM   SPAN  __  __ __       No  _______________________________
```

Figure 3-9 Channel path list: Delete all channel definitions for type OSM

6. Confirm that spanned channels are deleted from all accessing CSSs by pressing Enter, as shown in Figure 3-10.

```
*--------------------- Confirm Delete Channel Path ---------------------*
|                                                            Row 1 of 2 | --
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                       |
| Scroll forward to view the complete list of channel paths to be       |
| deleted. Press ENTER to confirm delete request. Press F12 to cancel   |
| delete request.                                                       |
|                                                                       |
| Processor ID . . . . : PAVO         Aries                             |
| Channel Subsystem ID : 0                                              |
|                                                                       |
|                    CHID                                               |
| CHPID   Type  Mode  AID/P                                             |
| D4      OSM   SPAN  116                                               | __
| D5      OSM   SPAN  118                                               | __
| ************************* Bottom of data ************************** | **
|                                                                       |
|                                                                       |
|                                                                       |
|                                                                       |
*-----------------------------------------------------------------------------*
| Spanned channel paths are deleted from all accessing channel subsystems. |
*-----------------------------------------------------------------------------*
```

Figure 3-10 Confirm Delete Channel Path panel

3.3.6 Changing the 8561 to a 3931 and deleting the 8561

You can either keep the original copy of the 8561 (`ARIES`) or delete it from the IODF. In this example, keep it in the IODF for a few more steps.

To change the 8561 to a 3931, complete the following steps:

1. Enter `c` (for change) next to `PAVO` to change the 8561 to a 3931 and press Enter. The Change Process Definition panel opens (Figure 3-11).
2. Make the following updates, and press Enter:
   - Update `Processor type` to `3931`.
   - Update `Processor model` to `A01`.
   - Update the 8561 part of the `Serial number` to `3931` (that is, 012345*8561* to 012345*3931*).
   - Update `Description` to `Pavo`.
   - Update `Local system name` to `PAVO`.

Note: Because in this example we use HCD to write an IOCDS to this 8561 in preparation for an upgrade, we must leave the Network name and CPC name set to `IBM390PS` and `ARIES`. These settings must be updated in the IODF after the 8561 is upgraded to a 3931.

```
*------------------------ Change Processor Definition ------------------------*
|                                                                             |
|                                                                             |
| Specify or revise the following values.                                     |
|                                                                             |
| Processor ID . . . . . . . . : PAVO                                         |
| Support level:                                                              |
| 8561 support                                                                |
| Processor type . . . . . . . . 3931      +                                  |
| Processor model  . . . . . . . A01       +                                  |
| Configuration mode . . . . . . LPAR      +                                  |
|                                                                             |
| Serial number  . . . . . . . . 0123453931  +                                |
| Description  . . . . . . . . . Pavo                                         |
|                                                                             |
| Specify SNA address only if part of a processor cluster:                    |
|                                                                             |
| Network name . . . . . . . . . IBM390PS  +                                  |
| CPC name . . . . . . . . . . . ARIES     +                                  |
|                                                                             |
| Local system name  . . . . . . PAVO                                         |
|                                                                             |
|                                                                             |
*-----------------------------------------------------------------------------*
```

Figure 3-11 Processors: Change Processor Definition

3. You might receive messages about the MCS_1 firmware partition for Dynamic I/O configuration for a Stand-alone Coupling Facility (SACF), as shown in Figure 3-12. The firmware LPAR is defined and activated by default on IBM z16. Press PF3 to continue.

```
*-------------------------------- Message List ---------------------------------*
|   Save  Query  Help                                                           |
| --------------------------------------------------------------------------    |
|                                                                   Row 1 of 10 |
| Command ===> ___________________________________________ Scroll ===> CSR      |
|                                                                               |
| Messages are sorted by severity. Select one or more, then press Enter.        |
|                                                                               |
| / Sev Msg. ID  Message Text                                                   |
| _ I   CBDA349I Partition number 0B (named MCS_1) in channel subsystem         |
| #              05 for processor PAVO was deleted.                             |
| _ I   CBDA349I Partition number 0C (named *) in channel subsystem 05          |
| #              for processor PAVO was deleted.                                |
| _ I   CBDA349I Partition number 0D (named *) in channel subsystem 05          |
| #              for processor PAVO was deleted.                                |
| _ I   CBDA349I Partition number 0E (named *) in channel subsystem 05          |
| #              for processor PAVO was deleted.                                |
| _ I   CBDA349I Partition number 0F (named *) in channel subsystem 05          |
| #              for processor PAVO was deleted.                                |
| ***************************** Bottom of data ****************************** |
|                                                                               |
|                                                                               |
|                                                                               |
*-------------------------------------------------------------------------------*
```

Figure 3-12 Processors: Message List

4. The Update Channel Path Identifiers panel opens (Figure 3-13). No changes are made in this example.

```
*-------------------- Update Channel Path Identifiers ----------------------*
|                                                                 Row 1 of 69 |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                             |
| Specify any changes to the channel path identifiers in the list below.     |
|                                                                             |
| Processor ID . . . . : PAVO         Pavo                                   |
| Channel Subsystem ID : 0                                                   |
|                                                                             |
| CHPID  Type  Side  Until CHPID   New CHPID +                               |
| 10     FC          __            10                                        |
| 11     FC          __            11                                        |
| 12     FC          __            12                                        |
| 13     FC          __            13                                        |
| 24     FCP         __            24                                        |
| 25     FCP         __            25                                        |
| 34     FCP         __            34                                        |
| 35     FCP         __            35                                        |
| 40     FC          __            40                                        |
| 41     FC          __            41                                        |
| 42     FC          __            42                                        |
| 43     FC          __            43                                        |
| 44     FC          __            44                                        |
*-----------------------------------------------------------------------------*
```

Figure 3-13 Processors: Update Channel Path Identifiers

5. Press Enter for each CSS ID.
6. The repeated 8561 processor is successfully changed to a 3931-A01, as shown in Figure 3-14.

```
                                Processor List       Row 1 of 4 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ ARIES    8561     T01      LPAR  0123458561 Aries
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
_ PAVO     3931     A01      LPAR  0123453931 Pavo
```

Figure 3-14 Processor List: Changed processor

3.3.7 Deleting the 8561 processor definition

Now that the 8561 is repeated and changed to a 3931, the original 8561 definition (ARIES) must be deleted so that the required CF links can be restored.

To delete the 8561 processor definition, complete the following steps:

1. Enter `d` (for delete) next to the `ARIES` processor in the Processor List panel (Figure 3-15).

```
                                Processor List       Row 1 of 4 More:
Command ===> ______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
d ARIES    8561     T01      LPAR  0123458561 Aries
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
_ PAVO     3931     A01      LPAR  0123453931 Pavo
```

Figure 3-15 Processor List: Deleting the processor

2. Press Enter to confirm the deletion of the processor (Figure 3-16).

```
                                Processor List       Row 1 of 3 More:
Command ===> ______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
_ PAVO     3931     A01      LPAR  0123453931 Pavo
```

Figure 3-16 Processor List: Processor deleted

3.3.8 Reconnecting the CF channel paths that were not migrated

Manually redefine the CF Links that you want from the `PAVO` (previously `ARIES`) processor to any other processor, along with any internal CF links that you want. To help in this effort, you can get a CF connection report from the previous production IODF containing the 8561. Alternatively, you can make a note of all `CBDG441I` error messages that you received in 3.3.7, “Deleting the 8561 processor definition” on page 50.

3.3.9 Additional steps and tasks

When you are ready to map the PCHIDs from the IBM z16 CFReport file to the CHPIDs in your exported IODF, go to Chapter 4, “Preparing an input/output configuration program to use the CHPID Mapping Tool” on page 57.

To define the I/O configuration for your system, go to Chapter 5, “Building the production input/output definition file and setting up the central processor complex” on page 91.

3.4 Installing a new IBM z16 system into an existing IBM Z environment

This section describes the steps for adding an IBM z16 A01 into an existing IBM Z environment.

3.4.1 Scenario overview

This scenario shows the configuration steps for defining a new 3931 processor in an existing hardware environment. The same steps apply to a new 3932, IBM z16 A02, or IBM z16 AGZ. The process has the following key considerations:

- HCD requires a new processor ID for the 3931 or 3932.
- HCD requires a new CPC name for the 3931 or 3932.
- The 3931 or 3932 processor connects to new switch ports and new CU interfaces.
- The CU interfaces connect to the same switch ports as they did previously.
- The starting IODF is the current production IODF.
- The target IODF is a new work IODF with a 3931 or 3932 defined.
- HCD actions: Migrate updated IOCP statements.
  - Build a production IODF.
  - Remote write an IODF to IOCDS.
- The HMC actions:
  - Build Reset Profile and point to required IOCDS.
  - Build and verify Image Profiles.
  - Build and verify Load Profiles.
  - Run a POR.

This example defines a new 3931 (IBM z16 A01) processor with a Processor ID of `PAV02` and with six CSSs (CSS ID=0 - CSS ID=5). The CPC name of `PAV02` and serial number of 02-71A08 are used for the 3931.

Table 3-2 summarizes the tool requirements.

Table 3-2 I/O configuration for a new (additional) 3931 processor

New (additional) 3931 processor	New (additional) 3931 processor to connect to the new switch ports and same CUs to which existing processors connect
Processor ID	Requires a new Processor ID.
CPC name	Requires a new CPC name.
Channel to switch port connections	Extra ports.
CU to switch port connections	Same ports.
Starting IODF	Current active production IODF.
Target IODF	Create a work IODF.
HCD action	Add processor.
CMT Program	Optional, but good for verifying configurations.
CFReport File (CCN)	Required for the CMT.
IOCP (import from validated work IODF)	Yes.

New (additional) 3931 processor	New (additional) 3931 processor to connect to the new switch ports and same CUs to which existing processors connect
CMT actions (PCHID reset)	Yes.
CMT IOCP Output	Yes.
CMT Reports	Yes, CHIPID Report and CHIPID to CU Report.

HCD: Creating a 3931 IODF

The following steps explain how to define an additional 3931 processor in your existing IODF to the existing I/O configuration by using HCD:

1. Creating a work IODF from the current production IODF.
2. Adding the 3931 processor.
3. Using Open Systems Adapter/Support Facility to save and restore OSE OSA Address Table configuration data.
4. Exporting and importing OSA-ICC configuration data with Open Systems Adapter Advanced Facilities.
5. Using OSA Advanced Facilities to set OSA parameters.

3.4.2 Creating a work IODF from the current production IODF

HCD is the tool that is used to make a work IODF. In this example, we start from the current production IODF that contains the existing hardware environment that will be connected to the new 3931 processor (for example, `SYS9.IODF80`).

3.4.3 Adding the 3931 processor

To add the 3931 processor, complete the following steps:

1. From the HCD main menu, select option `1.3. Processor List`.
2. In the Processor List (Figure 3-17), press PF11, or enter `add` on the CLI to add a processor, and press Enter.

```
                                Processor List        Row 1 of 3 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
_ PAVO     3931     A01      LPAR  0123453931 Pavo
```

Figure 3-17 Processor List: Adding a processor

The Add Processor panel opens (Figure 3-18).

```
 *------------------------------- Add Processor -------------------------------*
|                                                                              |
|                                                                              |
| Specify or revise the following values.                                      |
|                                                                              |
| Processor ID . . . . . . . . . ________                                      |
| Processor type . . . . . . . . ________  +                                   |
| Processor model  . . . . . . . ________  +                                   |
| Configuration mode . . . . . . LPAR      +                                   |
| Number of channel subsystems . . _       +                                   |
|                                                                              |
| Serial number  . . . . . . . . __________                                    |
| Description  . . . . . . . . . ________________________________              |
|                                                                              |
| Specify SNA address only if part of a processor cluster:                     |
|                                                                              |
| Network name . . . . . . . . . ________  +                                   |
| CPC name . . . . . . . . . . . ________  +                                   |
|                                                                              |
| Local system name  . . . . . . ________                                      |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 3-18 Add Processor: Data fields to be updated

3. Specify the appropriate values. For example, specify the following settings, as shown in Figure 3-19 on page 55:

Processor ID	PAV02
Processor type	3931
Processor model	A01
Number of channel subsystems	(Keep this blank for now.)
Serial number	071A083931
Network name	IBM390PS
CPC name	PAV02
Local System Name	(Keep this blank for now.)

```
*------------------------------- Add Processor -------------------------------*
|                                                                              |
|                                                                              |
| Specify or revise the following values.                                      |
|                                                                              |
| Processor ID . . . . . . . . . . PAV02                                       |
| Processor type . . . . . . . . . 3931      +                                 |
| Processor model  . . . . . . . . A01       +                                 |
| Configuration mode . . . . . . . LPAR      +                                 |
| Number of channel subsystems . . _         +                                 |
|                                                                              |
| Serial number  . . . . . . . . . 071A083931                                  |
| Description  . . . . . . . . . . ________________________________            |
|                                                                              |
| Specify SNA address only if part of a processor cluster:                     |
|                                                                              |
| Network name . . . . . . . . . . IBM390PS  +                                 |
| CPC name . . . . . . . . . . . . PAV02___  +                                 |
|                                                                              |
| Local system name  . . . . . . . ________                                    |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 3-19   Add Processor: Data fields updated

4. Press Enter. The Create Work I/O Definition File panel opens and prompts you to enter the data set name of the target IODF (for example, `SYS9.IODF81.WORK`).
5. Press Enter. You now have a 3931 processor that is named `PAV02` (Figure 3-20).

```
                                 Processor List       Row 1 of 4 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
_ PAVO     3931     A01      LPAR  0123453931 Pavo
_ PAV02    3931     A01      LPAR  071A083931 ______________________________
******************************* Bottom of data *****************************




*-----------------------------------------------------------------*
| Definition of processor PAV02 has been extended to its maximum |
| configuration.                                                  |
*-----------------------------------------------------------------*
```

Figure 3-20   Processor List: New processor added

The message at the bottom of the panel is generated because the HCD automatically populated the processor with all allowed CSSs and reserved partitions. In HCD, when you define a new or redefine a processor as a 3931, HCD no longer defines or allow you to define partitions 0xB to 0xF in CSS5. These partitions are reserved for IBM internal use. HCD automatically defines the maximum configuration of 6 CSSs and 85 LPARs.[3]

6. Enter `s` next to `PAV02`, and press Enter. The Channel Subsystem List panel opens. Here you can see six CSSs (CSS0 - CSS5) that are defined with the default `MAXDEV` values for `SS0` of `65280` set by HCD and `65535` set for `SS1`, `SS2`, and `SS3` (Figure 3-21).

```
                            Channel Subsystem List    Row 1 of 6 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel subsystems, then press Enter.  To add, use F11.

Processor ID . . . : PAV02

  CSS Devices in SS0    Devices in SS1    Devices in SS2    Devices in SS3
/ ID  Maximum + Actual  Maximum + Actual  Maximum + Actual  Maximum + Actual
_ 0   65280     0       65535     0       65535     0       65535     0
_ 1   65280     0       65535     0       65535     0       65535     0
_ 2   65280     0       65535     0       65535     0       65535     0
_ 3   65280     0       65535     0       65535     0       65535     0
_ 4   65280     0       65535     0       65535     0       65535     0
_ 5   65280     0       65535     0       65535     0       65535     0
```

Figure 3-21 Channel Subsystem List: Four Subchannel Sets

3.4.4 Additional steps and tasks

When you are ready to map the PCHIDs from the IBM z16 CFReport file to the CHPIDs in your exported IODF, go to Chapter 4, “Preparing an input/output configuration program to use the CHPID Mapping Tool” on page 57.

To define the I/O configuration for your system, go to Chapter 5, “Building the production input/output definition file and setting up the central processor complex” on page 91.

[3] For IBM z16 A02 and IBM z16 AGZ 3932, HCD automatically defines the maximum configuration of three CSSs and 40 LPARs.

4

Preparing an input/output configuration program to use the CHPID Mapping Tool

This chapter describes in detail how to use the channel path ID (CHPID) Mapping Tool (CMT).

> **Naming:** The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.
>
> **Note:** The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Validating the work input/output definition file
- Creating the input/output configuration program file for the CHPID Mapping Tool
- Assigning CHIDs to CHPIDs by using the CMT
- Importing the CFReport file into the CMT
- Importing the IOCP file into the CMT
- Resolving CHPIDs with CHID conflicts
- Hardware resolution
- Manual mapping to resolve CIB CHPIDs
- Processing Automatic Mapping and CU Priority
- CHPIDs not connected to control units
- Creating CMT reports

- Creating an updated IOCP file
- Additional steps and processes

4.1 Validating the work input/output definition file

To validate the work input/output definition file (IODF) by using the Hardware Configuration Definition (HCD) component, complete the following steps:

1. Select HCD option `2.12. Build validated work I/O definition file`. Review the message list and correct any errors.
2. Press PF3 to continue. The `Requested action successfully processed` message is displayed.
3. Select HCD option `6.4. View I/O Definition File Information`. The IODF type is now indicated as `Work - Validated` (see Figure 4-1).

```
················ View I/O Definition File Information ·················
·                                                                     ·
·                                                                     ·
· IODF name  . . . . . . : 'SYS9.IODF81.WORK'                         ·
· IODF type  . . . . . . : Work - Validated                           ·
· IODF version . . . . . : 5                                          ·
·                                                                     ·
· Creation date  . . . . : 2022-03-13                                 ·
· Last update  . . . . . : 2022-03-13  03:32                          ·
·                                                                     ·
· Volume serial number . : IODFPK                                     ·
· Allocated space  . . . : 3000    (Number of 4K blocks)              ·
· Used space . . . . . . : 1266    (Number of 4K blocks)              ·
·    thereof utilized (%)  91                                         ·
· Activity logging . . . : No                                         ·
· Multi-user access  . . : No                                         ·
· Backup IODF name . . . :                                            ·
·                                                                     ·
· Description  . . . . . :                                            ·
·                                                                     ·
·                                                                     ·
·                                                                     ·
· ENTER to continue.                                                  ·
```

Figure 4-1 View I/O Definition File Information: Validated work IODF

4.2 Creating the input/output configuration program file for the CHPID Mapping Tool

To create the input/output configuration program (IOCP) input data set for the CMT, complete the following steps:

1. Select HCD option `2.3. Build IOCP input data set`, and press Enter (see Figure 4-2).

```
······· Activate or Process Configuration Data ·······
·                                                    ·
·                                                    ·
· Select one of the following tasks.                 ·
·                                                    ·
· 3   1.  Build production I/O definition file       ·
·     2.  Build IOCDS                                ·
·     3.  Build IOCP input data set                  ·
·     4.  Create JES3 initialization stream data     ·
·     5.  View active configuration                  ·
·     6.  Activate or verify configuration           ·
·         dynamically                                ·
·     7.  Activate configuration sysplex-wide        ·
·     8.  (no longer supported)                      ·
·     9.  (no longer supported)                      ·
·     10. Build I/O configuration data               ·
·     11. Build and manage processor cluster         ·
·         IOCDSs, IPL attributes and dynamic I/O     ·
·         changes                                    ·
·     12. Build validated work I/O definition file   ·
·                                                    ·
·                                                    ·
·                                                    ·
```

Figure 4-2 Activate or Process Configuration Data: Building IOCP for PAVO

2. HCD displays the list of available processors (see Figure 4-3). Select the `PAVO` processor by entering a forward slash (/) next to it and pressing Enter.

```
························· Available Processors ··························
·                                                            Row 1 of 4 ·
· Command ===> __________________________________________________________ ·
·                                                                       ·
· Select one.                                                           ·
·                                                                       ·
·   Processor ID  Type     Model    Mode  Description                   ·
·   ARIES         8561     T01      LPAR  Aries                         ·
·   HYDRA         8562     LT2      LPAR  Hydra                         ·
·   LEPUS         3907     ZR1      LPAR  Lepus                         ·
· / PAVO          3931     A01      LPAR  Pavo                          ·
· *************************** Bottom of data **************************** ·
·                                                                       ·
```

Figure 4-3 Available Processors: Selecting a processor for the IOCP file

3. HCD displays a panel on which you enter information about the IOCP input data set to create (see Figure 4-4). Complete the following fields:
   – Title1: `IODF84`
   – IOCP input data set: `'SYS9.IODF84.IOCPIN.PAVO'`
   – Input to Stand-alone IOCP: `Yes`
   – Job statement information: Complete this information for your installation.

```
························· Build IOCP Input Data Set ··························
·                                                                         ·
·                                                                         ·
· Specify or revise the following values.                                 ·
·                                                                         ·
· IODF name . . . . . . . . . : 'SYS9.IODF84.WORK'                        ·
· Processor ID  . . . . . . . : PAVO                                      ·
· Title1 . IODF84________________________________________________________ ·
· Title2 : SYS9.IODF84.WORK - 2022-03-13 03:32                            ·
·                                                                         ·
· IOCP input data set                                                     ·
· 'SYS9.IODF84.IOCPIN.PAVO'______________________________                 ·
· Input to Stand-alone IOCP?  Yes  (Yes or No)                            ·
·                                                                         ·
· Job statement information                                               ·
· //ZNEXT04H JOB (ACCOUNT),'ZNEXT04'                                      ·
· //*                                                                     ·
· //*                                                                     ·
· //*                                                                     ·
· //*                                                                     ·
· //*                                                                     ·
```

Figure 4-4 Build IOCP Input Data Set: Data fields to be updated

4. Press Enter. HCD submits a batch job to create the data set.
5. Using an editor or browser tool of your choice, verify that the data set that you created exists and contains IOCP statements (see Figure 4-5). In this example, we used Time Sharing Option (TSO). This data set is used as an input into the CMT.

```
 ID    MSG1='IODF84',                                          *
      MSG2='SYS9.IODF84.WORK - 2022-03-13 03:32',             *
      SYSTEM=(3931,1),LSYSTEM=PAVO,                           *
      TOK=('PAVO',008003331A08393103325863012207 2F00000000,000*
      00000,'22-03-13','03:32:58','........','........')
RESOURCE PARTITION=((CSS(0),(PAVO0A,A),(PAVO0B,B),(PAVO01,1),(*
      PAVO02,2),(PAVO03,3),(PAVO04,4),(PAVO05,5),(PAVO06,6),(P*
      AVO07,7),(PAVO08,8),(PAVO09,9),(*,C),(*,D),(*,E),(*,F)),*
      (CSS(1),(PAVO1A,A),(PAVO1B,B),(PAVO1C,C),(PAVO1D,D),(PAV*
      O1E,E),(PAVO1F,F),(PAVO11,1),(PAVO12,2),(PAVO13,3),(PAVO*
      14,4),(PAVO15,5),(PAVO16,6),(PAVO17,7),(PAVO18,8),(PAVO1*
      9,9)),(CSS(2),(PAVO2A,A),(PAVO2B,B),(PAVO2C,C),(PAVO21,1*
      ),(PAVO22,2),(PAVO23,3),(PAVO24,4),(PAVO25,5),(PAVO26,6)*
      ,(PAVO27,7),(PAVO28,8),(PAVO29,9),(*,D),(*,E),(*,F)),(CS*
      S(3),(PAVO3A,A),(PAVO3B,B),(PAVO3C,C),(PAVO3D,D),(PAVO3E*
      ,E),(PAVO3F,F),(PAVO31,1),(PAVO32,2),(PAVO33,3),(PAVO34,*
      4),(PAVO35,5),(PAVO36,6),(PAVO37,7),(PAVO38,8),(PAVO39,9*
      )),(CSS(4),(PAVO41,1),(PAVO42,2),(PAVO43,3),(PAVO44,4),(*
```

Figure 4-5 IOCP input data set: Contents (truncated)

Part of the TOK statement is now replaced with dots (see Example 4-1).

Example 4-1 IOCP file (TOK statement)

```
TOK=('PAVO',008003331A083931033258630122072F00000000,000*
00000,'22-03-13','03:32:58','........','........')
```

These dots ensure that this IOCP file cannot be written to a processor and used for a Power on Reset (POR). This precaution is needed because this IOCP file was created from a validated work IODF and not a production IODF. IOCP files that can be used for a POR can be generated only from a production IODF.

> **Important:** When an IOCP file is exported by using HCD from a validated work IODF, it must be imported back into HCD after the *channel IDs* (CHIDs) are complete by using the CMT. The IOCP file cannot be used directly by IOCP until the CHIDs are added.

6. Download this IOCP file from z/OS to the CMT workstation. Use a workstation file transfer facility such as FTP or the one in the IBM Personal Communications Workstation Program, or any equivalent 3270 emulation program. Be sure to use `TEXT` as the transfer type. In this example, the file is named `ARIESin.iocp`.

4.3 Assigning CHIDs to CHPIDs by using the CMT

In this section, you use the IOCP statements from HCD and the 3931 order process file (CFReport). Use the CMT to assign CHIDs to each of the CHPIDs for the 3931.

For this process, the CMT must be downloaded. For more information about downloading and installing the CMT, see 2.2.3, “CHPID Mapping Tool” on page 11. If the CMT is already installed, verify that the latest updates are installed.

The version of the CMT that is used for the following captures is Version 6.22. Check for the latest version by going to IBM Resource Link.

For more information, see the *CHPID Mapping Tool User’s Guide*, GC28-7024.

Use the CMT to complete the following steps:

1. Import the CFReport file into the CMT.
2. Import the IOCP file into the CMT.
3. Resolve CHPIDs with a CHID conflict.
4. Process the hardware resolution.
5. Manually resolve the CL5 or CS5 CHPIDs.
6. Set the priority for single-path control units (CUs) and other CUs that override the CMT default priorities and Automatic Mapping.
7. Resolve the CHPIDs that are not connected to CUs.
8. Create the CMT reports.
9. Create an updated IOCP file for transfer back into the IODF file.

4.4 Importing the CFReport file into the CMT

To import the CFReport file into the CMT, complete the following steps:

1. Start the CMT on your workstation.
2. The CMT asks for a project name and location of the CMT work files. In our example, we used `PAVO` as the project name (Figure 4-6).

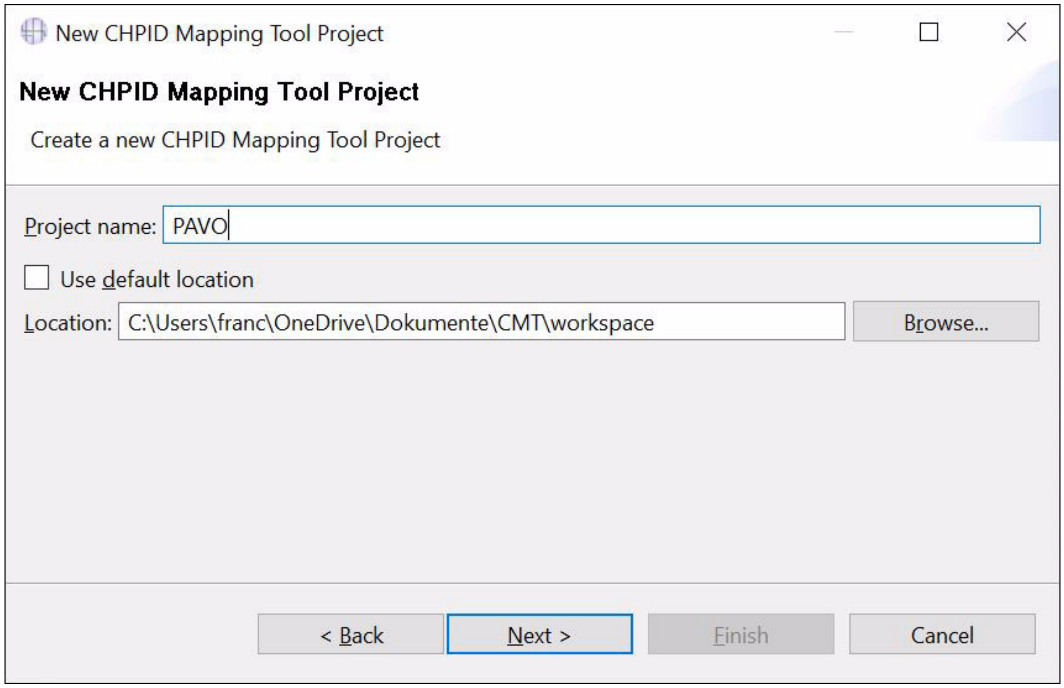


Figure 4-6 Creating a CHPID Mapping Tool Project

3. Specify the CFReport. The IOCP input file window opens. For this step, we input only the CFReport file.

> **Attention:** To import the CFReport file into the CMT, a Customer Number must be in the CFReport file.

4. Import the CFReport file into the CMT by specifying the name in the CFReport file field, and then click **Finish** (see Figure 4-7).

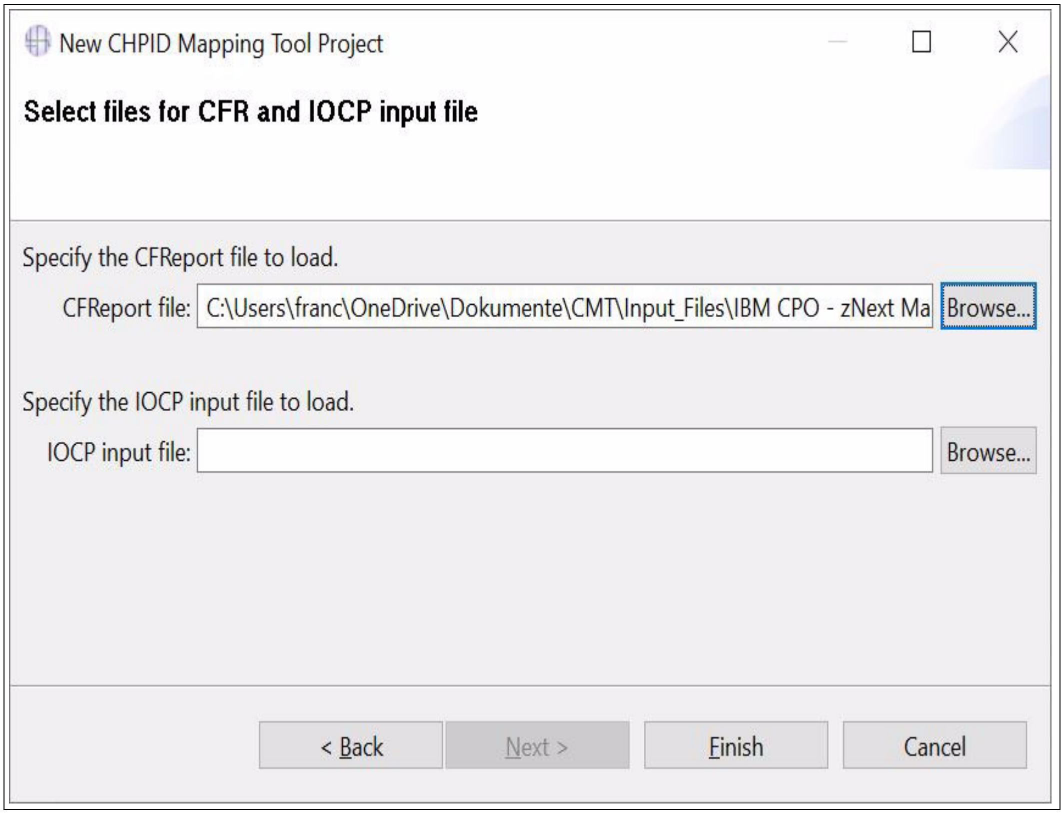


Figure 4-7 Specifying the CFReport file

If you click **Finish** but did not select an IOCP file, you receive the message that is shown in Figure 4-8. Click **OK**.

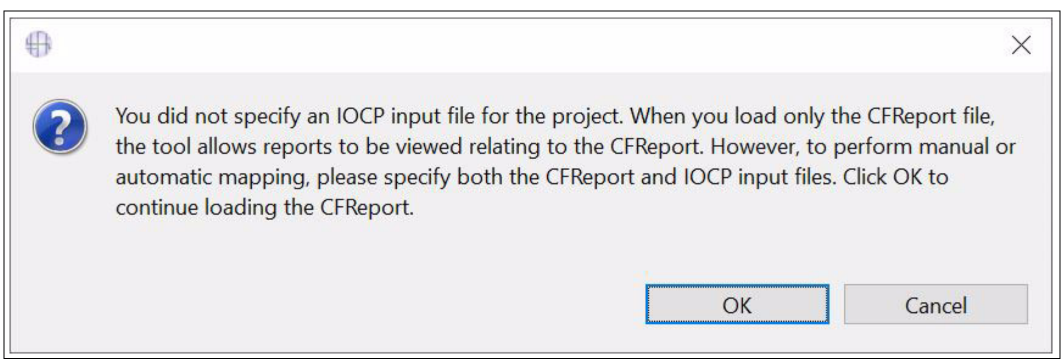


Figure 4-8 Warning message for not specifying an IOCP file

A window shows the progress of reading the CFReport file (see Figure 4-9).

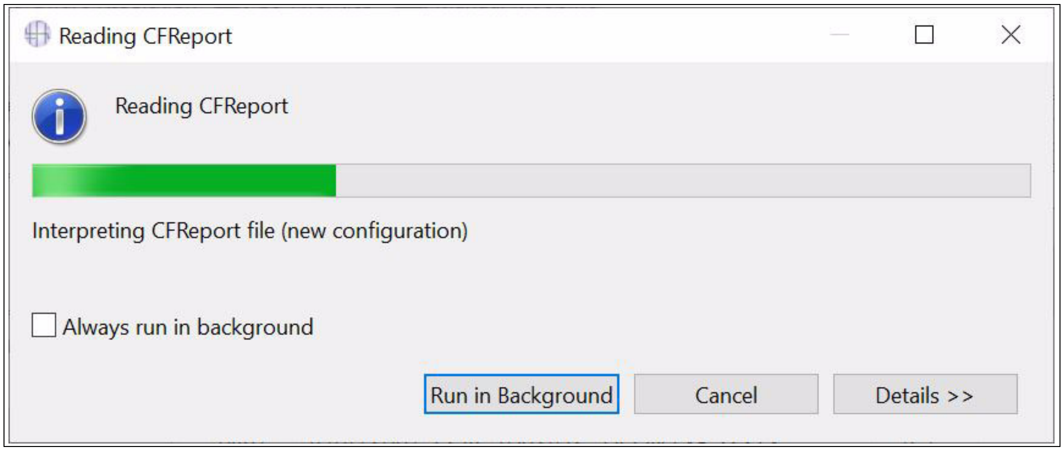


Figure 4-9 Reading the CFReport file

The information from the CFReport file is shown in the Hardware pane (see Figure 4-10).

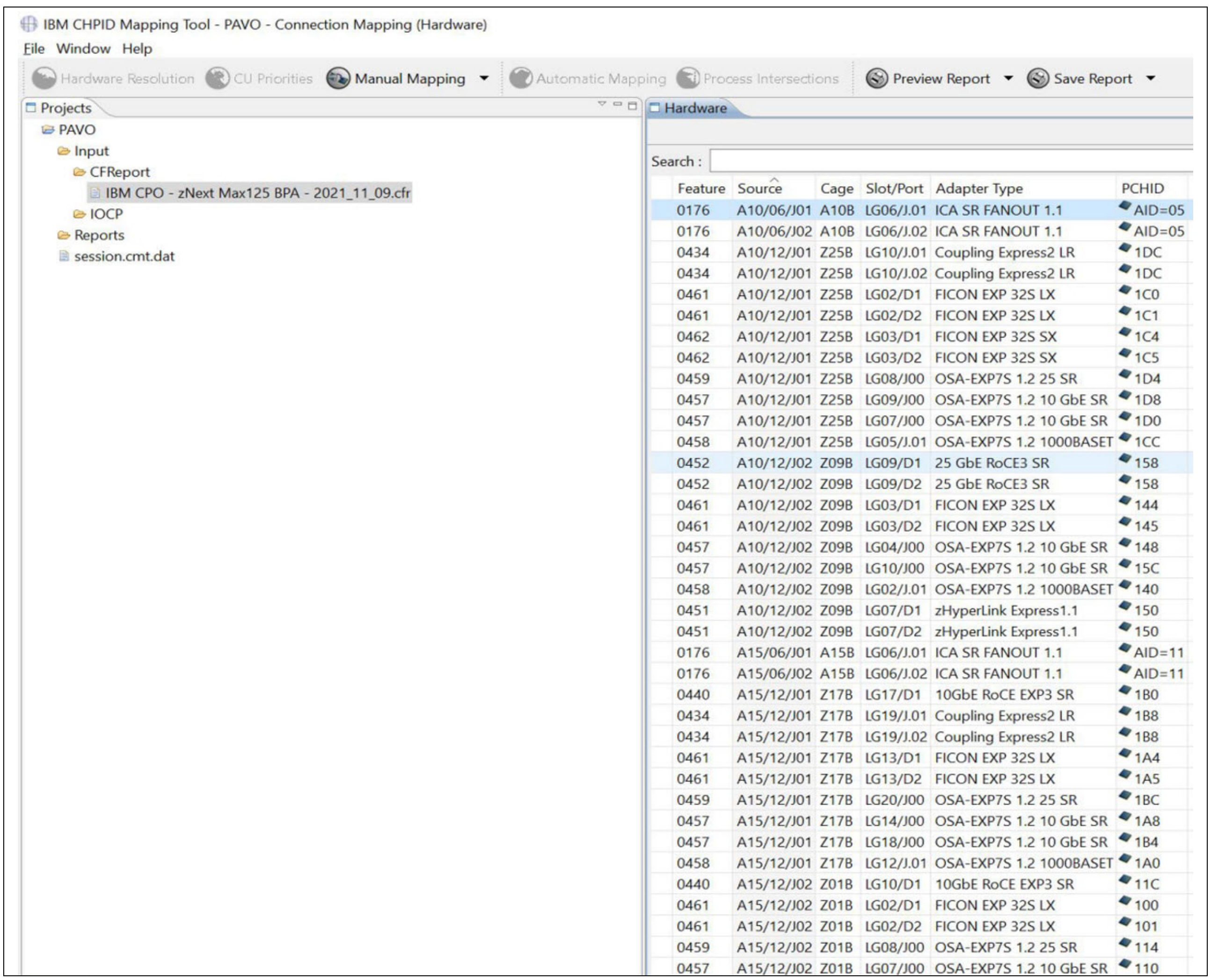


Figure 4-10 Imported CFReport file

4.5 Importing the IOCP file into the CMT

To import the validated 3931 IOCP file into the CMT, complete the following steps:

1. Right-click anywhere in the Projects window and select **Import IOCP input file** (see Figure 4-11).

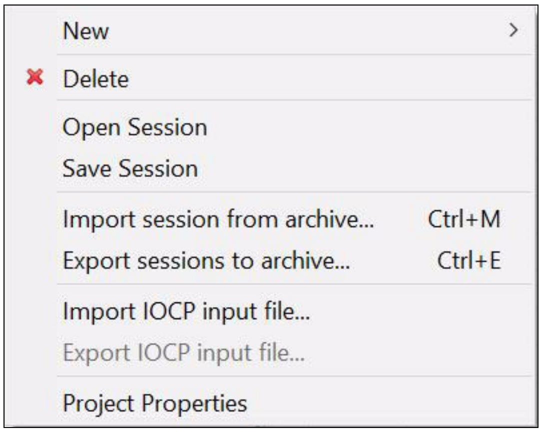


Figure 4-11 Importing the IOCP file

2. Select the IOCP file on your workstation to import into the CMT, and click **Finish** (see Figure 4-12).

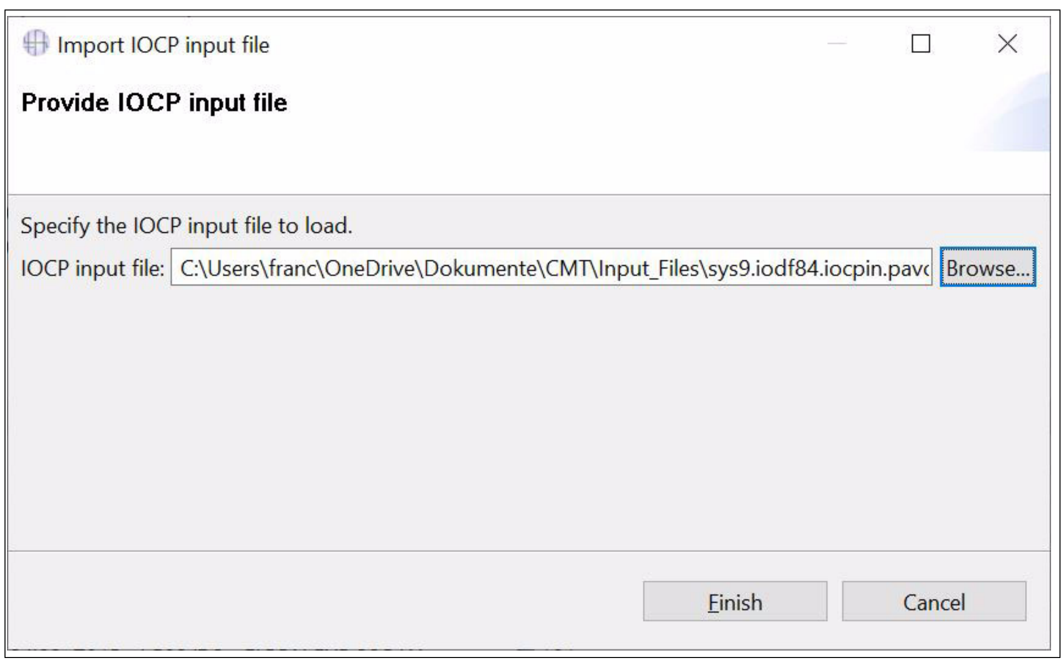


Figure 4-12 Specifying the IOCP file for import

3. In the Projects window, under the **Input** tab, expand the **IOCP** tab, right-click the IOCP file, and select **Read Selected IOCP** (see Figure 4-13).

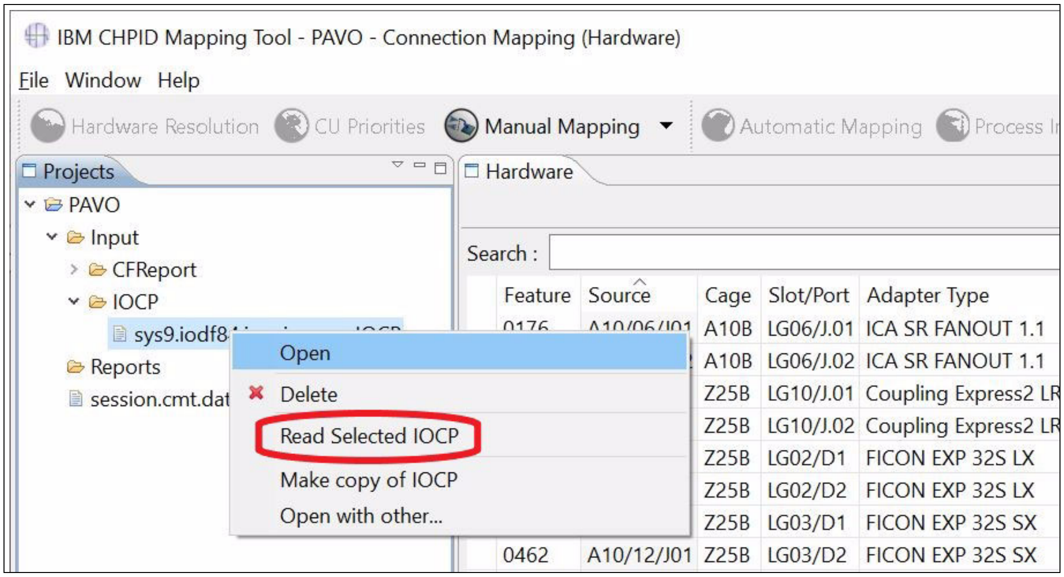


Figure 4-13 Reading the selected IOCP

A dialog box opens and shows the progress information (see Figure 4-14).

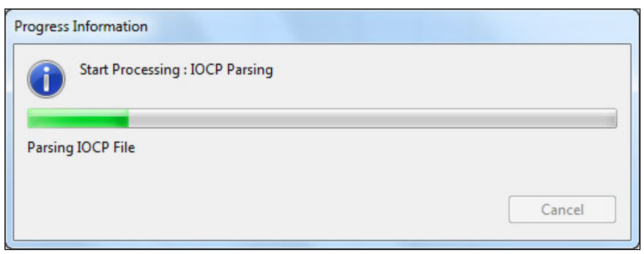


Figure 4-14 Processing the IOCP file

Another window might open and show a selection regarding what type of upgrade you are performing (Figure 4-15 on page 67):

– IOCP file represents current configuration
– IOCP file represents proposed configuration

In our example, we select **IOCP file represents proposed configuration** because we added more I/O during the upgrade process from a 3906 processor to an 8561 processor. Click **OK**.

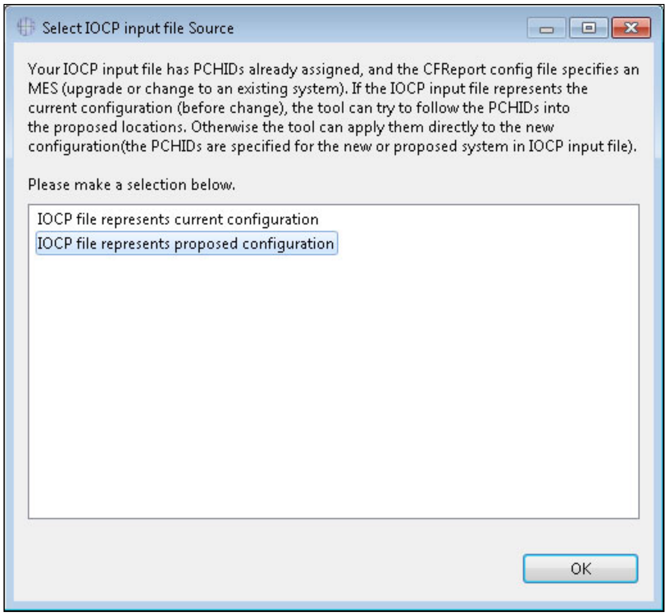


Figure 4-15 Processing the IOCP file

The CMT shows the information from the CFReport file and the IOCP file in the Hardware Resolution pane. By default, the Hardware Resolution view (see Figure 4-16) includes three tabbed panes:

- Projects
- Hardware Resolution
- Adapter Type Summary

Hardware Resolution is in the middle pane and the Adapter Type Summary is on the right.

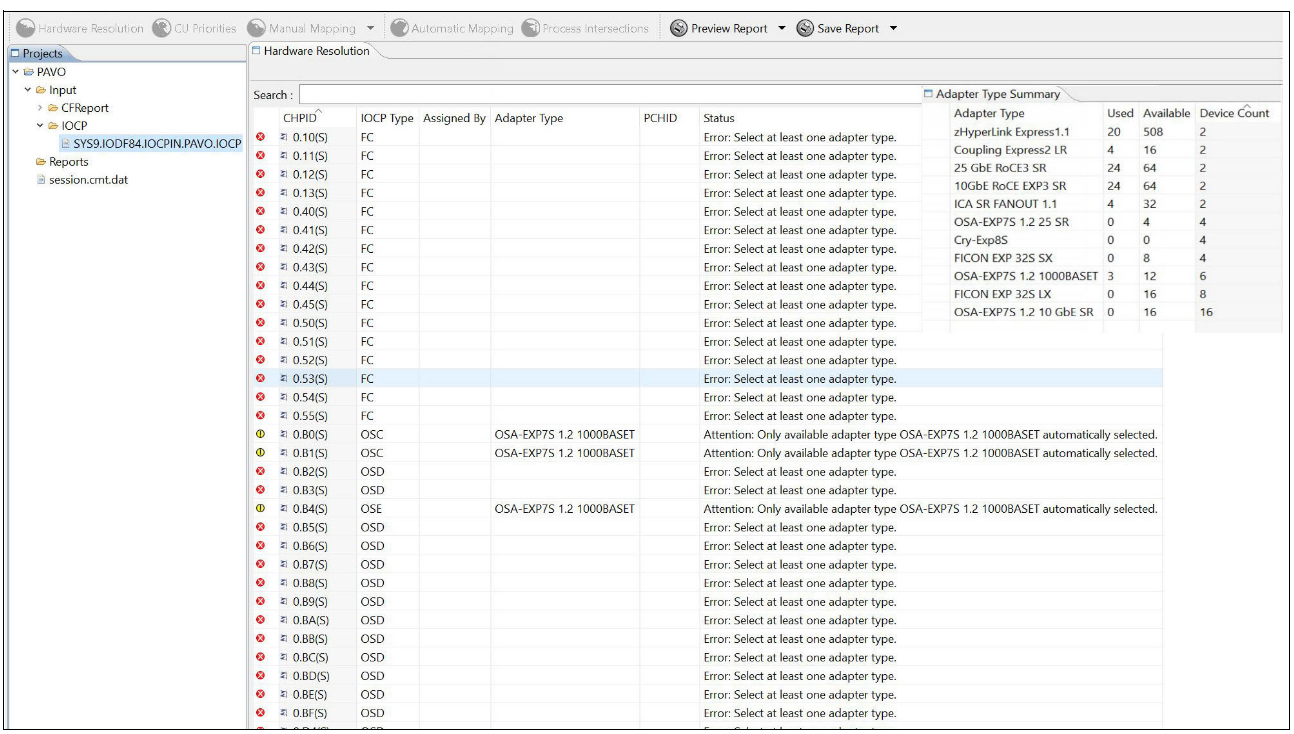


Figure 4-16 Hardware Resolution after Imported IOCP file

The Adapter Type Summary pane shows a table with helpful information. It summarizes the number of used and available channels for the hardware channel types (used, available, and device count).

In the example, the CMT might show some of the following output:

- Hardware Resolution: This window lists all CHPIDs that were found, and the Status column shows the CHPID information to be investigated. In the example, we investigate the status. Table 4-1 lists the status messages and possible resolutions.

Table 4-1 Status messages and possible resolutions

Status	Explanation	Resolution (if required)
No hardware found.	Adapter ID (AID) values or physical channel ID (PCHID) values are present that are not found in the hardware. This situation might occur when you replace hardware for a miscellaneous equipment specification (MES) and the IOCP file contains a CHID value for the old hardware (The IOCP file contains a CHID value for the hardware being removed).	If you have any CHPIDs of IOCP type CIB or CS5, the CMT cannot automatically assign these CHPIDs. If the AID assignment in the IOCP file is not valid, you can reset it during hardware resolution. Then, you can use manual mapping to assign the CHPIDs to AIDs. For CIB or CS5 CHPIDs, complete the following steps: 1. Remove the AID values. 2. Do one of the following tasks: - Inside the CMT, perform manual mapping to associate these CHPIDs with AIDs. - Assign the AID values outside the tool, for example, by using HCD. 3. Replace the IOCP file.
Select at least one adapter type.	An adapter type is not assigned to the current row.	Assign an adapter type to the IOCP type.
Adapter_type is not compatible with *IOCP_type*.	The adapter type that is assigned to the CHPID is not compatible with the IOCP type that is specified by the IOCP file.	See Figure 4-16 on page 67.
The required hardware for type *IOCP_type* is not available. Example: Required hardware for type Fibre Channel (FC) is not available.	The CMT found no hardware for the specified IOCP type.	You need to change the IOCP file or obtain more hardware.
CHID_1 moved to a new CHID: *CHID_2*. Example: 520 moved to 1E2.	You are replacing hardware for an MES, and the IOCP file contains a CHID value for the old hardware, which is being removed. This CHID value moved from an old machine to the CHID value for the new hardware. *CHID_1* is the first CHID value (for example, 520) and *CHID_2* is the second CHID value (for example, 1E2).	This status is an informational message; no hardware resolution is required. The message informs you of the new location so you can change this value if you prefer a different assignment.
Only available adapter type.	Channel tape suggests one specific adapter type.	The CMT assigns a new adapter.

- Process the CU Priorities and Automatic Mapping by selecting one or more of these options:
  - **Reset CHPIDs assigned by Automatic Mapping**: Selecting this option resets all CHPIDs that were processed by prior availability runs in this session.

    By default, this option is selected.
  - **Reset CHPIDs assigned by Manual Mapping**: Selecting this option resets CHPIDs that were assigned a CHID in the Manual window. If this option is not selected (it has no checkmark), then availability CHIDs for these CHPIDs are not reset.

    By default, this option is not selected.
  - **Reset CHPIDs assigned by IOCP (Potential recabling)**: If some of the CHPIDs are assigned in the IOCP Input file, selecting this option resets the CHPIDs. Selecting this option might require recabling after availability assignments.

    Generally, select this option.
  - **Reset CHPIDs assigned by CMT for config files**: The CFReport file indicates that you are doing an MES or upgrade, and you have channels or CHPIDs (or both) that might have configuration files that are associated with them. The MES or upgrade might move some of those channel cards.

    Regardless of whether the channels are moving or not, the CMT either assigns CHIDs to the logical CHPID definitions to keep the CHPID definition associated with its current configuration file, or it moves the definition to the new location where the channel is moving.

    If you reset the CMT assignments, back up the configuration file data before the MES, and restore that data to the new location (the CHID where the affected CHPIDs are assigned) before you use the CHPIDs.

    By default, this option is not selected.

  If no options are selected, availability works only on CHPIDs that have no CHIDs assigned.

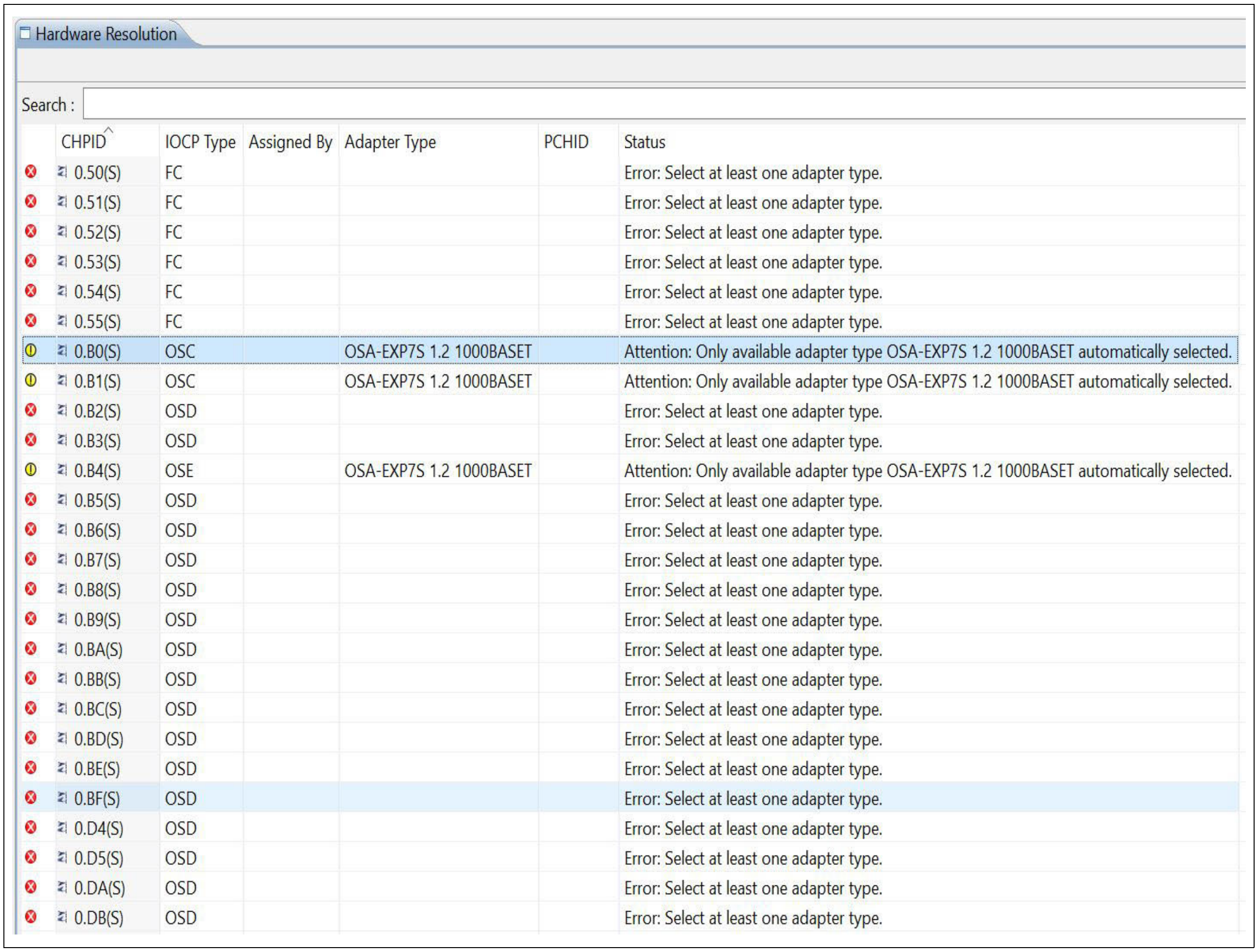
  To give the CMT the most choices when you use the availability option, select **Reset CHPIDs assigned by IOCP**.

  Attention: If you select **Reset CHPIDs assigned by IOCP**, it resets any previously mapped CHPID assignments, which might require recabling of the server.

  However, if you select **Reset CHPIDs assigned by Automatic Mapping**, review the intersects from availability processing carefully to ensure that preserving the prior CHPID-to-CHID relationship does not cause unacceptable availability.

4.6 Resolving CHPIDs with CHID conflicts

The CMT shows the CHPIDs with CHID conflicts (see Figure 4-17).



Hardware Resolution

Search :

	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	0.50(S)	FC				Error: Select at least one adapter type.
	0.51(S)	FC				Error: Select at least one adapter type.
	0.52(S)	FC				Error: Select at least one adapter type.
	0.53(S)	FC				Error: Select at least one adapter type.
	0.54(S)	FC				Error: Select at least one adapter type.
	0.55(S)	FC				Error: Select at least one adapter type.
	0.B0(S)	OSC		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.
	0.B1(S)	OSC		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.
	0.B2(S)	OSD				Error: Select at least one adapter type.
	0.B3(S)	OSD				Error: Select at least one adapter type.
	0.B4(S)	OSE		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.
	0.B5(S)	OSD				Error: Select at least one adapter type.
	0.B6(S)	OSD				Error: Select at least one adapter type.
	0.B7(S)	OSD				Error: Select at least one adapter type.
	0.B8(S)	OSD				Error: Select at least one adapter type.
	0.B9(S)	OSD				Error: Select at least one adapter type.
	0.BA(S)	OSD				Error: Select at least one adapter type.
	0.BB(S)	OSD				Error: Select at least one adapter type.
	0.BC(S)	OSD				Error: Select at least one adapter type.
	0.BD(S)	OSD				Error: Select at least one adapter type.
	0.BE(S)	OSD				Error: Select at least one adapter type.
	0.BF(S)	OSD				Error: Select at least one adapter type.
	0.D4(S)	OSD				Error: Select at least one adapter type.
	0.D5(S)	OSD				Error: Select at least one adapter type.
	0.DA(S)	OSD				Error: Select at least one adapter type.
	0.DB(S)	OSD				Error: Select at least one adapter type.

Figure 4-17 CHPIDs with PCHID conflicts

In the first column of every row, the Hardware Resolution pane contains one of the following symbols:

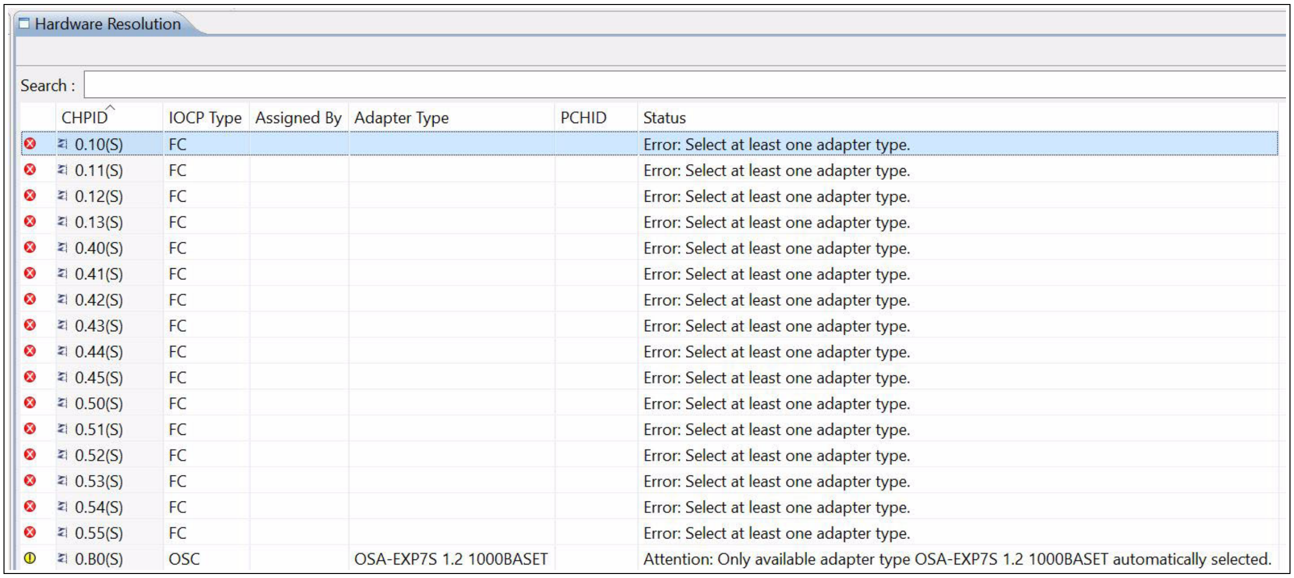
- An X in a red circle: This symbol indicates an error.
- An exclamation mark in a yellow circle: This symbol indicates a warning or attention message.
- A green checkmark: This symbol indicates that the tool successfully resolved the specified Channel Type.

In this example, here are the reasons that we must hardware resolution issues:

- The CHID channel type changed.
- The defined CHID is not compatible with the channel path at a particular location.
- Enough ports exist in the hardware.
- A type mismatch exists between a CHPID and its associated channel type.

4.7 Hardware resolution

In the example, the CMT displays an X in the first column of the Hardware Resolution panel (see Figure 4-18) that is related to these error types: `Select at least one adapter type`.



	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	0.10(S)	FC				Error: Select at least one adapter type.
	0.11(S)	FC				Error: Select at least one adapter type.
	0.12(S)	FC				Error: Select at least one adapter type.
	0.13(S)	FC				Error: Select at least one adapter type.
	0.40(S)	FC				Error: Select at least one adapter type.
	0.41(S)	FC				Error: Select at least one adapter type.
	0.42(S)	FC				Error: Select at least one adapter type.
	0.43(S)	FC				Error: Select at least one adapter type.
	0.44(S)	FC				Error: Select at least one adapter type.
	0.45(S)	FC				Error: Select at least one adapter type.
	0.50(S)	FC				Error: Select at least one adapter type.
	0.51(S)	FC				Error: Select at least one adapter type.
	0.52(S)	FC				Error: Select at least one adapter type.
	0.53(S)	FC				Error: Select at least one adapter type.
	0.54(S)	FC				Error: Select at least one adapter type.
	0.55(S)	FC				Error: Select at least one adapter type.
	0.B0(S)	OSC		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.

Figure 4-18 Hardware resolution status errors

> **Note:** For more information about these error messages, see the *CHPID Mapping Tool User's Guide*, GC28-7024.

The options that must be reset are as follows:

- Resetting Incompatible (Hardware - I/O) Entries: (*not* shown in example).
- Resetting "Error: No hardware found" entries: (*not* shown in example).
- Resetting "Select at least one adapter type": (shown in example).
- Resetting "Required hardware for type IOCP_type not available": (*not* shown in example).
- Resetting "CHID_1 moved to new channel ID: CHID_2": (*not* shown in example).

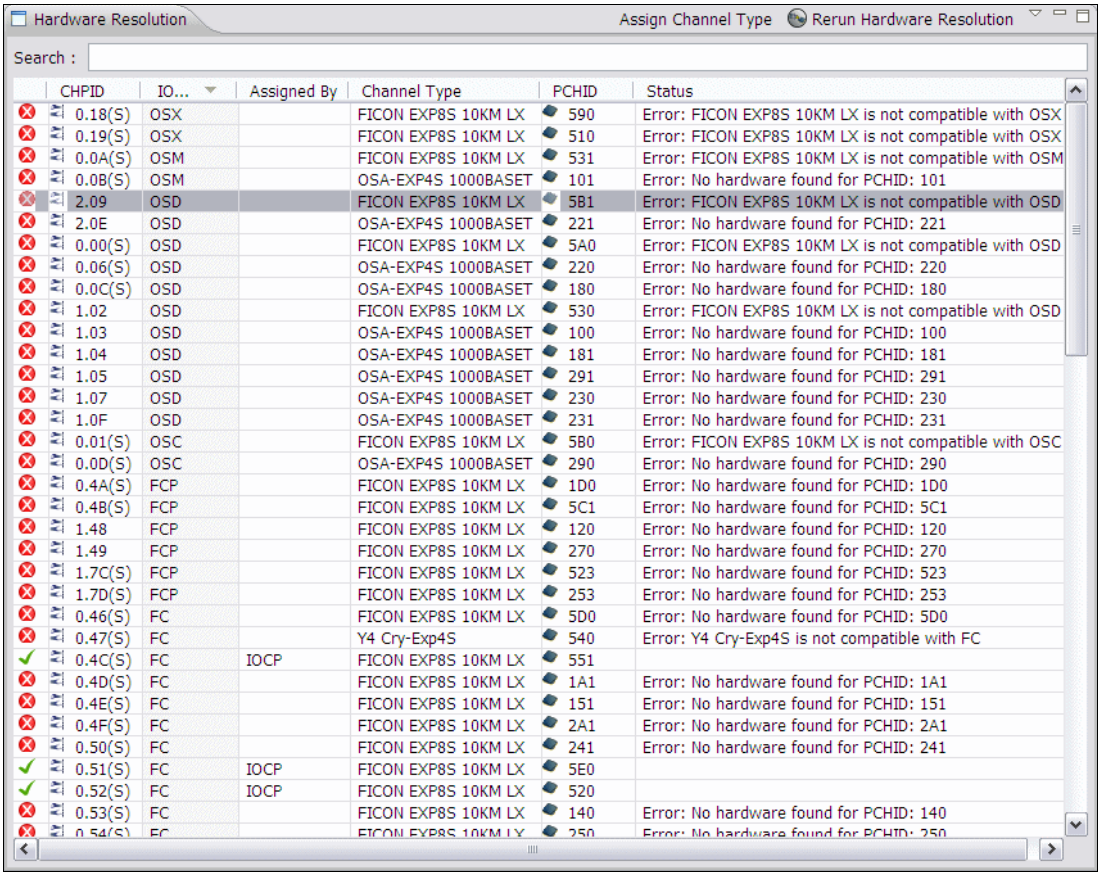
4.7.1 Resetting Incompatible (Hardware - I/O) Entries

The Channel type that is assigned for the CHPID is not compatible with the IOCP type that is specified by the IOCP file. For this mismatch, you might receive the following message:

```
Error: Channel_type is not compatible with IOCP_type.
```

You can resolve this problem by resetting the CHID. For example, if the IOCP type is OSD, but the CHID is associated with a Fibre Connection (FICON) card. You cannot assign the OSD type on the FICON card.

The CMT example displays the error message in the Status column (see Figure 4-19).



CHPID	IO...	Assigned By	Channel Type	PCHID	Status
0.18(S)	OSX		FICON EXP8S 10KM LX	590	Error: FICON EXP8S 10KM LX is not compatible with OSX
0.19(S)	OSX		FICON EXP8S 10KM LX	510	Error: FICON EXP8S 10KM LX is not compatible with OSX
0.0A(S)	OSM		FICON EXP8S 10KM LX	531	Error: FICON EXP8S 10KM LX is not compatible with OSM
0.0B(S)	OSM		OSA-EXP4S 1000BASET	101	Error: No hardware found for PCHID: 101
2.09	OSD		FICON EXP8S 10KM LX	5B1	Error: FICON EXP8S 10KM LX is not compatible with OSD
2.0E	OSD		OSA-EXP4S 1000BASET	221	Error: No hardware found for PCHID: 221
0.00(S)	OSD		FICON EXP8S 10KM LX	5A0	Error: FICON EXP8S 10KM LX is not compatible with OSD
0.06(S)	OSD		OSA-EXP4S 1000BASET	220	Error: No hardware found for PCHID: 220
0.0C(S)	OSD		OSA-EXP4S 1000BASET	180	Error: No hardware found for PCHID: 180
1.02	OSD		FICON EXP8S 10KM LX	530	Error: FICON EXP8S 10KM LX is not compatible with OSD
1.03	OSD		OSA-EXP4S 1000BASET	100	Error: No hardware found for PCHID: 100
1.04	OSD		OSA-EXP4S 1000BASET	181	Error: No hardware found for PCHID: 181
1.05	OSD		OSA-EXP4S 1000BASET	291	Error: No hardware found for PCHID: 291
1.07	OSD		OSA-EXP4S 1000BASET	230	Error: No hardware found for PCHID: 230
1.0F	OSD		OSA-EXP4S 1000BASET	231	Error: No hardware found for PCHID: 231
0.01(S)	OSC		FICON EXP8S 10KM LX	5B0	Error: FICON EXP8S 10KM LX is not compatible with OSC
0.0D(S)	OSC		OSA-EXP4S 1000BASET	290	Error: No hardware found for PCHID: 290
0.4A(S)	FCP		FICON EXP8S 10KM LX	1D0	Error: No hardware found for PCHID: 1D0
0.4B(S)	FCP		FICON EXP8S 10KM LX	5C1	Error: No hardware found for PCHID: 5C1
1.48	FCP		FICON EXP8S 10KM LX	120	Error: No hardware found for PCHID: 120
1.49	FCP		FICON EXP8S 10KM LX	270	Error: No hardware found for PCHID: 270
1.7C(S)	FCP		FICON EXP8S 10KM LX	523	Error: No hardware found for PCHID: 523
1.7D(S)	FCP		FICON EXP8S 10KM LX	253	Error: No hardware found for PCHID: 253
0.46(S)	FC		FICON EXP8S 10KM LX	5D0	Error: No hardware found for PCHID: 5D0
0.47(S)	FC		Y4 Cry-Exp4S	540	Error: Y4 Cry-Exp4S is not compatible with FC
0.4C(S)	FC	IOCP	FICON EXP8S 10KM LX	551	
0.4D(S)	FC		FICON EXP8S 10KM LX	1A1	Error: No hardware found for PCHID: 1A1
0.4E(S)	FC		FICON EXP8S 10KM LX	151	Error: No hardware found for PCHID: 151
0.4F(S)	FC		FICON EXP8S 10KM LX	2A1	Error: No hardware found for PCHID: 2A1
0.50(S)	FC		FICON EXP8S 10KM LX	241	Error: No hardware found for PCHID: 241
0.51(S)	FC	IOCP	FICON EXP8S 10KM LX	5E0	
0.52(S)	FC	IOCP	FICON EXP8S 10KM LX	520	
0.53(S)	FC		FICON EXP8S 10KM LX	140	Error: No hardware found for PCHID: 140
0.54(S)	FC		FICON EXP8S 10KM LX	250	Error: No hardware found for PCHID: 250

Figure 4-19 Channel_type is not compatible with IOCP_type

Complete the following steps:

1. Select the channel type **OSD**. The Status is `Error: FICON EXP8S is not compatible with OSD`. Right-click in the row and select **Reset Incompatible (Hardware - I/O) Entries** to remove the CHID values for only those rows (see Figure 4-20).

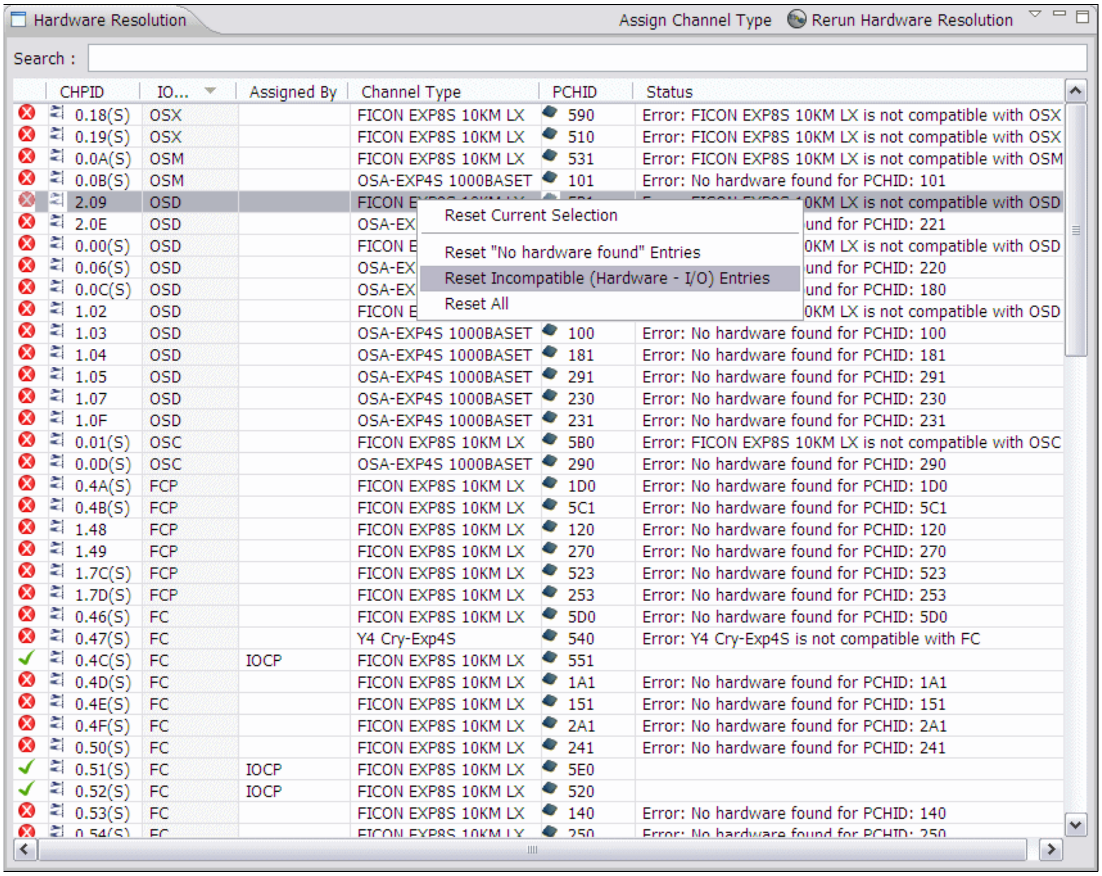
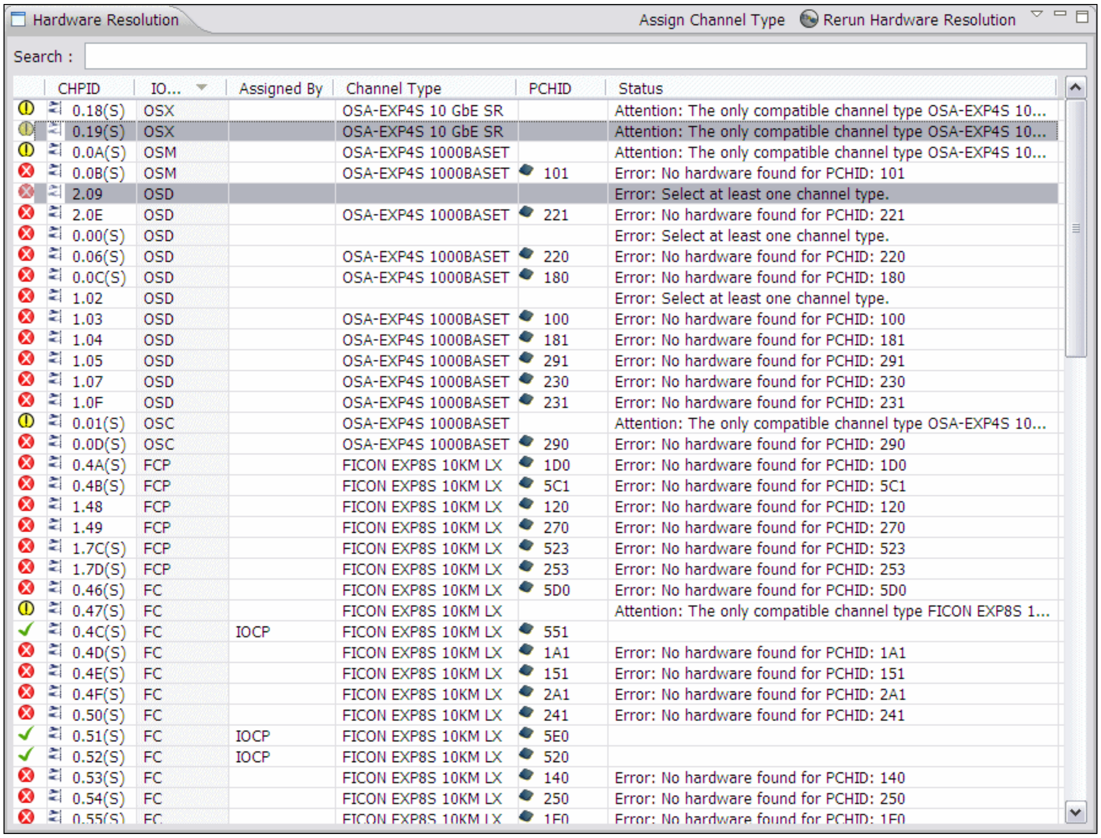


Figure 4-20 Channel_type is not compatible with IOCP_type OSD

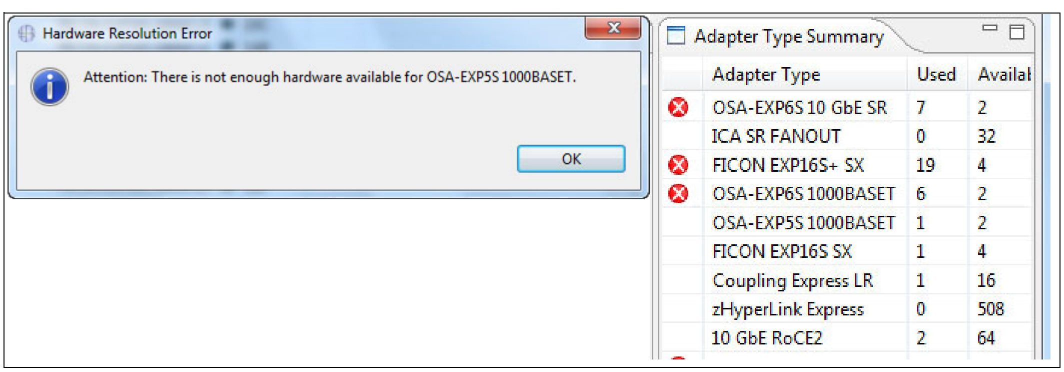
The tool replaces the X in a red circle with an Attention icon (exclamation mark in a yellow circle), changes the status message, and removes the CHID information (see Figure 4-21).



CHPID	IO...	Assigned By	Channel Type	PCHID	Status
0.18(S)	OSX		OSA-EXP4S 10 GbE SR		Attention: The only compatible channel type OSA-EXP4S 10...
0.19(S)	OSX		OSA-EXP4S 10 GbE SR		Attention: The only compatible channel type OSA-EXP4S 10...
0.0A(S)	OSM		OSA-EXP4S 1000BASET		Attention: The only compatible channel type OSA-EXP4S 10...
0.0B(S)	OSM		OSA-EXP4S 1000BASET	101	Error: No hardware found for PCHID: 101
2.09	OSD				Error: Select at least one channel type.
2.0E	OSD		OSA-EXP4S 1000BASET	221	Error: No hardware found for PCHID: 221
0.00(S)	OSD				Error: Select at least one channel type.
0.06(S)	OSD		OSA-EXP4S 1000BASET	220	Error: No hardware found for PCHID: 220
0.0C(S)	OSD		OSA-EXP4S 1000BASET	180	Error: No hardware found for PCHID: 180
1.02	OSD				Error: Select at least one channel type.
1.03	OSD		OSA-EXP4S 1000BASET	100	Error: No hardware found for PCHID: 100
1.04	OSD		OSA-EXP4S 1000BASET	181	Error: No hardware found for PCHID: 181
1.05	OSD		OSA-EXP4S 1000BASET	291	Error: No hardware found for PCHID: 291
1.07	OSD		OSA-EXP4S 1000BASET	230	Error: No hardware found for PCHID: 230
1.0F	OSD		OSA-EXP4S 1000BASET	231	Error: No hardware found for PCHID: 231
0.01(S)	OSC		OSA-EXP4S 1000BASET		Attention: The only compatible channel type OSA-EXP4S 10...
0.0D(S)	OSC		OSA-EXP4S 1000BASET	290	Error: No hardware found for PCHID: 290
0.4A(S)	FCP		FICON EXP8S 10KM LX	1D0	Error: No hardware found for PCHID: 1D0
0.4B(S)	FCP		FICON EXP8S 10KM LX	5C1	Error: No hardware found for PCHID: 5C1
1.48	FCP		FICON EXP8S 10KM LX	120	Error: No hardware found for PCHID: 120
1.49	FCP		FICON EXP8S 10KM LX	270	Error: No hardware found for PCHID: 270
1.7C(S)	FCP		FICON EXP8S 10KM LX	523	Error: No hardware found for PCHID: 523
1.7D(S)	FCP		FICON EXP8S 10KM LX	253	Error: No hardware found for PCHID: 253
0.46(S)	FC		FICON EXP8S 10KM LX	5D0	Error: No hardware found for PCHID: 5D0
0.47(S)	FC		FICON EXP8S 10KM LX		Attention: The only compatible channel type FICON EXP8S 1...
0.4C(S)	FC	IOCP	FICON EXP8S 10KM LX	551	
0.4D(S)	FC		FICON EXP8S 10KM LX	1A1	Error: No hardware found for PCHID: 1A1
0.4E(S)	FC		FICON EXP8S 10KM LX	151	Error: No hardware found for PCHID: 151
0.4F(S)	FC		FICON EXP8S 10KM LX	2A1	Error: No hardware found for PCHID: 2A1
0.50(S)	FC		FICON EXP8S 10KM LX	241	Error: No hardware found for PCHID: 241
0.51(S)	FC	IOCP	FICON EXP8S 10KM LX	5E0	
0.52(S)	FC	IOCP	FICON EXP8S 10KM LX	520	
0.53(S)	FC		FICON EXP8S 10KM LX	140	Error: No hardware found for PCHID: 140
0.54(S)	FC		FICON EXP8S 10KM LX	250	Error: No hardware found for PCHID: 250
0.55(S)	FC		FICON EXP8S 10KM LX	1F0	Error: No hardware found for PCHID: 1F0

Figure 4-21 Results of resetting the incompatible type

2. The CMT now displays messages about any CHPID types that were imported from the IODF into the CMT that do not have any associated hardware support in the CFReport file (see Figure 4-22). Click **OK**. The same figure also shows the Adapter Type Summary details.



Adapter Type	Used	Availal
OSA-EXP6S 10 GbE SR	7	2
ICA SR FANOUT	0	32
FICON EXP16S+ SX	19	4
OSA-EXP6S 1000BASET	6	2
OSA-EXP5S 1000BASET	1	2
FICON EXP16S SX	1	4
Coupling Express LR	1	16
zHyperLink Express	0	508
10 GbE RoCE2	2	64

Figure 4-22 Required hardware unavailable

There are excessive numbers of OSC CHPID types in the example IODF to show how the CMT handles this condition.

You can use the *overdefine* option to change the CHID value to an asterisk (*) in the IODF. This way, you can retain the OSD CHPID definitions in the IODF so that you can install OSD CHIDs in the processor later.

Tip: Other CHPID types can also be overdefined by entering an asterisk (*) for the CHID value. Overdefining is now supported for CIB and CS5 type CHPID definitions.

Alternatively, you can remove the OSD CHPID definitions from the IODF.

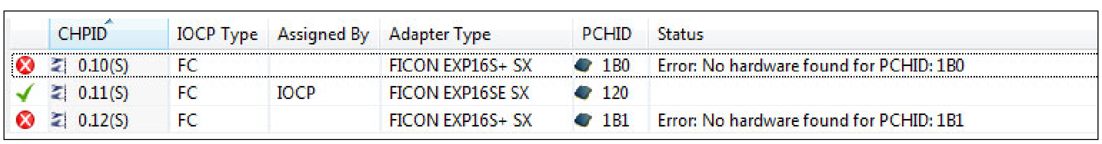
3. Return to the IODF and change the CHID values for the OSD CHPIDs (or any other CHPIDs that have no supporting hardware in the CFReport) to an asterisk (*).
4. Revalidate the IODF by using HCD option 2.12.
5. Re-create the IOCP statements file and transfer it to your workstation.
6. Import the IOCP file by right-clicking the Projects window and selecting **Import IOCP File**.

Tip: If you look at the IOCP statements file now, the OSD CHPIDs are omitted from the file, but they are still defined in the IODF.

Now, when you click **Reset “*Channel-Type* is not compatible with IOCP_*type*”**, the CMT prompts you to resolve some hardware errors.

4.7.2 Resetting “Error: No hardware found” entries

An X in a red circle in the first column indicates an error, and the Status column shows the message `Error: No hardware found` (see Figure 4-23).

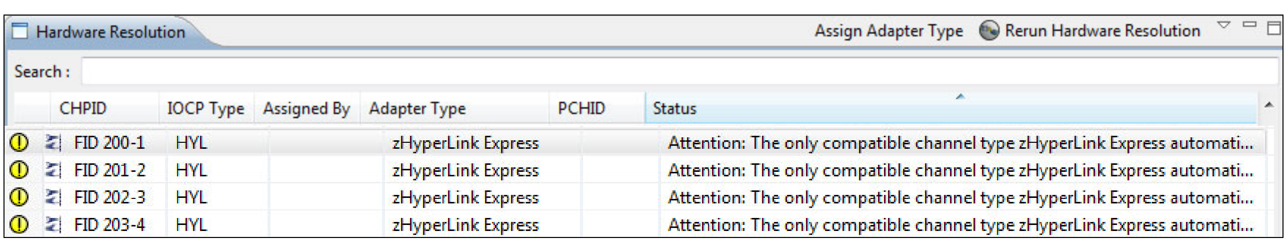


	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	0.10(S)	FC		FICON EXP16S+ SX	1B0	Error: No hardware found for PCHID: 1B0
	0.11(S)	FC	IOCP	FICON EXP16SE SX	120	
	0.12(S)	FC		FICON EXP16S+ SX	1B1	Error: No hardware found for PCHID: 1B1

Figure 4-23 Error: No Hardware found

In the example, select the channel type **FC**. The status is `Error: No Hardware found`. Right-click in the row and select **Reset “No hardware found” Entries** to remove the CHID values for those rows.

The tool replaces the X with an Attention icon, changes the status message, and removes the CHID information (see Figure 4-24).



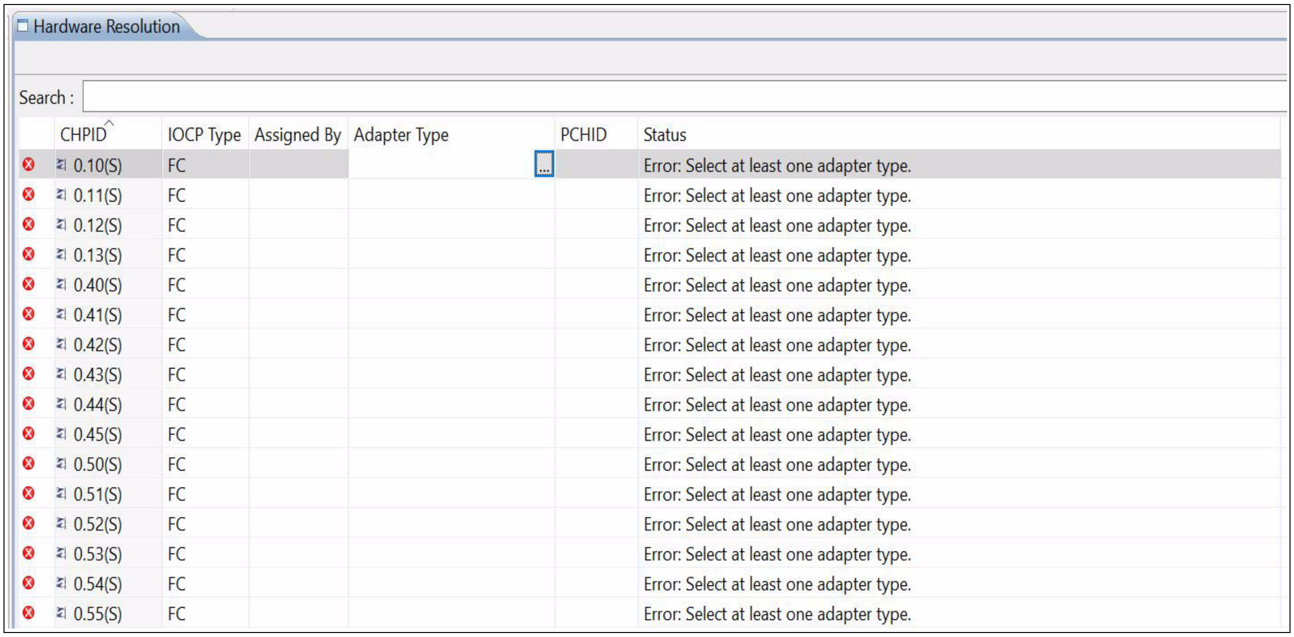
	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	FID 200-1	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...
	FID 201-2	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...
	FID 202-3	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...
	FID 203-4	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...

Figure 4-24 Results of resetting “No hardware found”

4.7.3 Resetting “Select at least one adapter type”

The adapter type is not assigned to the current row. Assign an adapter type to the IOCP type by completing the following steps:

1. Click the **Adapter Type** column in the target row. The tool displays an arrow in the Channel Type column of the target row (see Figure 4-25).



Hardware Resolution

Search :

CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
0.10(S)	FC		...		Error: Select at least one adapter type.
0.11(S)	FC				Error: Select at least one adapter type.
0.12(S)	FC				Error: Select at least one adapter type.
0.13(S)	FC				Error: Select at least one adapter type.
0.40(S)	FC				Error: Select at least one adapter type.
0.41(S)	FC				Error: Select at least one adapter type.
0.42(S)	FC				Error: Select at least one adapter type.
0.43(S)	FC				Error: Select at least one adapter type.
0.44(S)	FC				Error: Select at least one adapter type.
0.45(S)	FC				Error: Select at least one adapter type.
0.50(S)	FC				Error: Select at least one adapter type.
0.51(S)	FC				Error: Select at least one adapter type.
0.52(S)	FC				Error: Select at least one adapter type.
0.53(S)	FC				Error: Select at least one adapter type.
0.54(S)	FC				Error: Select at least one adapter type.
0.55(S)	FC				Error: Select at least one adapter type.

Figure 4-25 Selecting at least one adapter type

2. Click the ellipses (**...**).
3. The tool displays a list of available and compatible card types for the CHPID, as shown in see Figure 4-26 on page 77. Select an adapter type and click **OK**.
4. In the **Adapter Type Summary** tab, observe that the Used and Available totals change.

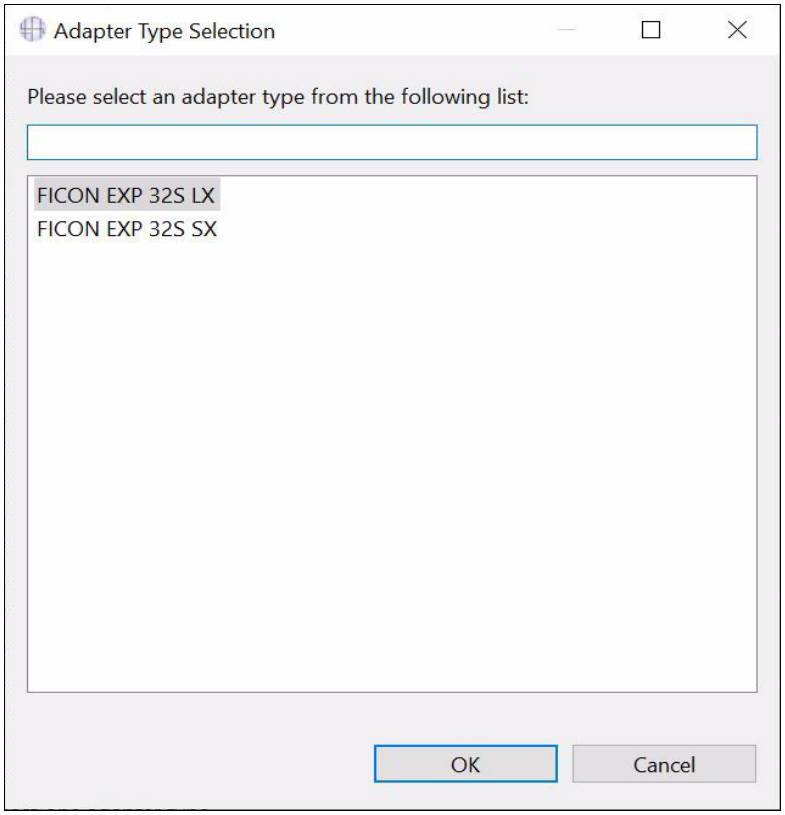


Figure 4-26 Adapter Type Selection

4.7.4 Resetting "Required hardware for type IOCP_type not available"

The CMT found no hardware for the specified IOCP type, as shown in this example message:

```
Required hardware for type CS5 not available.
```

Change the IOCP file or obtain more hardware.

4.7.5 Resetting "CHID_1 moved to new channel ID: CHID_2"

When moving from old hardware to new hardware, for example, during a MES, the CHID value that is assigned to a feature can change. This message indicates that the IOCP file contains a CHID value for the old machine that is being removed. The CHID value is changed from the old machine to the CHID value for the new machine.

For example, *CHID_1* is the first CHID value representing the old hardware (for example, 1B0) and *CHID_2* is the new value representing the new hardware (for example, 533). In essence, the feature is present in both the old and new hardware, but its location (CHID) changed.

This status is an informational message. No hardware resolution is required. The message informs you of the new location so you can change it if you prefer a different assignment.

After you assign all Adapter Types, the **Manual Mapping** button becomes available.

4.8 Manual mapping to resolve CIB CHPIDs

> **Note:** This section applies only when you upgrade from an IBM z14 (3906) to an IBM z16 (3931).

In some situations, the Automatic Mapping option is not available. You cannot use automatic mapping until all CIB or CS5 CHPIDs are resolved. You can use manual mapping to resolve this task.

To resolve the CIB or CS5 CHPIDs, assign the available CHPIDs by completing the following steps:

1. Click **Manual Mapping** (see Figure 4-27).

Figure 4-27 Manual Mapping

2. Ensure that the tool is set to display Manual Mapping by clicking **Hardware** → **I/O** (see Figure 4-28).

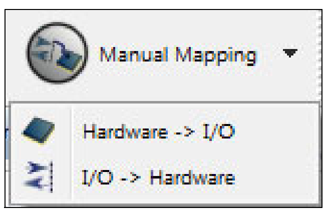


Figure 4-28 Manual Mapping of Hardware -> I/O

3. Click every row that has type Integrated Coupling Adapter Short Reach (ICA SR) in the Channel Type column. The tool displays all the available CHPIDs with IOCP type (see Figure 4-29).

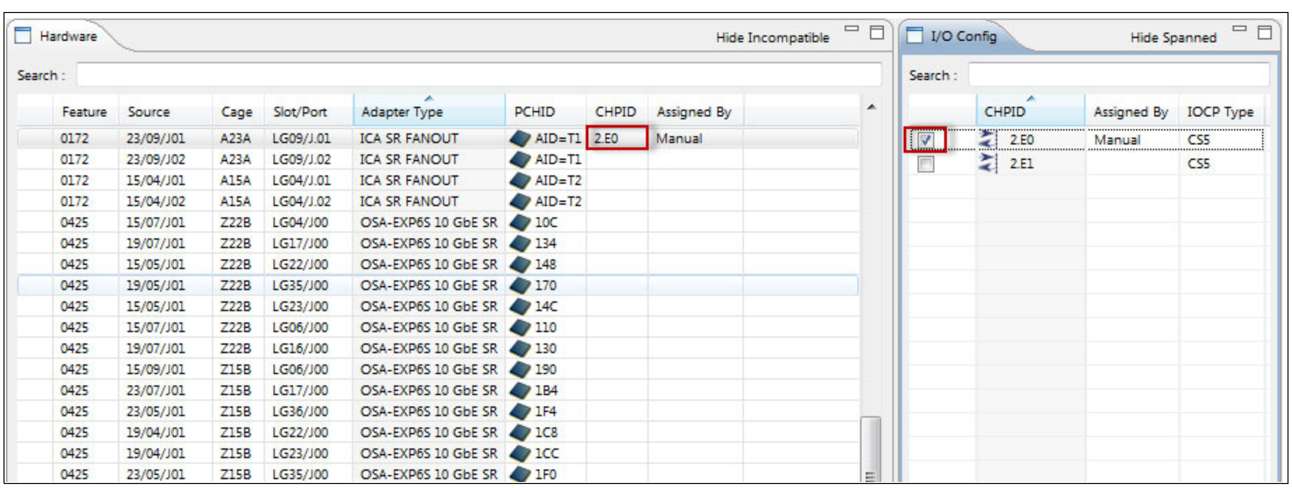


Figure 4-29 Adapter Type of HCA3 and associated CHPIDs that are assigned

4. Select one or more empty check boxes in the I/O Config pane to assign the CHPID. In the Hardware pane, the CHPID number is inserted in the CHPID column. In the Assigned By column, the value of Manual is inserted.
5. If you select more than one CHPID for an ICS SR adapter type, you see the Multiple --> value (see Figure 4-30) inserted into the CHPID and Assigned By columns.

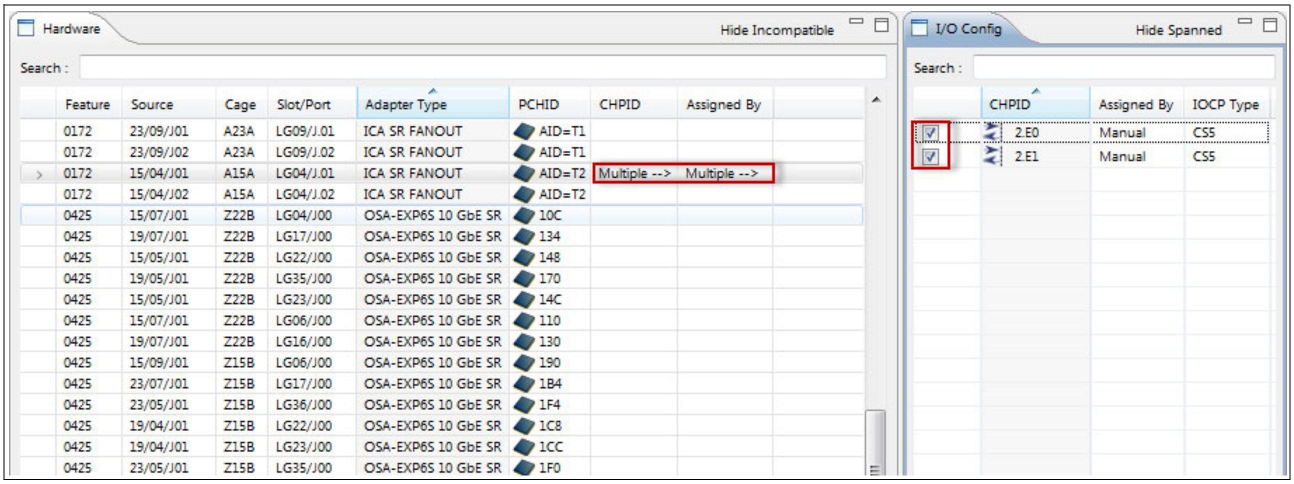


Figure 4-30 Adapter Type of HCA3 and associated multiple CHPID that are assigned

The Automatic Mapping button becomes available after you assign all the CHPIDs of IOCP type CIB or CS5.

4.9 Processing Automatic Mapping and CU Priority

If you are importing an IOCP statements file from an IBM z15 that had CU Priority values defined, review the CU Priority values first. Then, the CMT can perform the availability functions for an IBM z16.

Assign priorities if you want to make some CUs more important (in the CMT processing order) than others, or have two (or more) CUs that you want the CMT to process at the same time.

Perform the first availability function by completing these steps:

1. Click **Automatic Mapping**.
2. The Reset CHPID Assignments window opens with Reset choices (see Figure 4-31). For the example, select the following two options and then click **OK**:
   - **Reset CHPIDs assigned by Automatic Mapping**
   - **Reset CHPIDs assigned by IOCP (Potential recabling required!)**

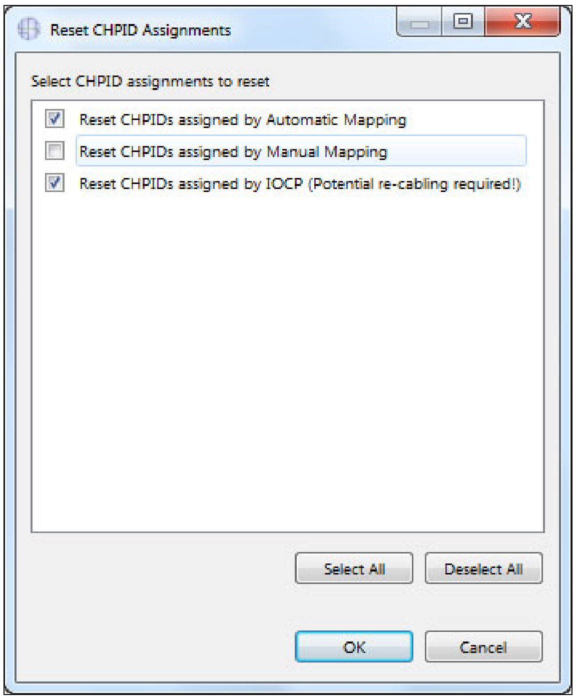


Figure 4-31 Resetting CHPID Assignments

> **Tip:** The following fourth choice is also available, but only for an upgrade or an MES:
>
> **Reset CHPIDs assigned by CMT for config files.**

3. Click **OK** to confirm the reset (see Figure 4-32).

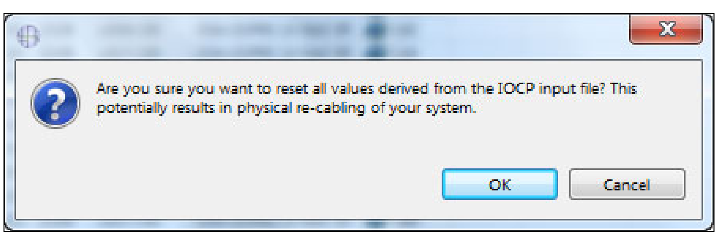


Figure 4-32 Resetting CHPID assignments warning message

4. The availability rules might differ from a previous IBM zSystems™ family, so remove all CHID assignments that are still in the IOCP.
5. Click **OK**.
6. After the CMT resets the CHPIDs, it displays the result of the process (see Figure 4-33 on page 81). Click **OK**.

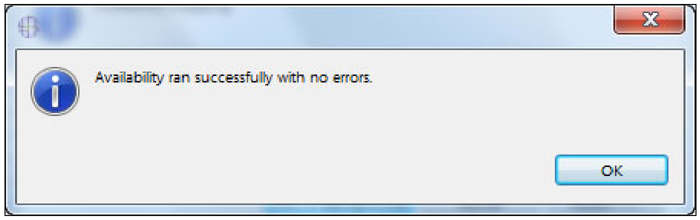


Figure 4-33 Availability ran successfully with no errors message

7. Click **OK** (see Figure 4-34).

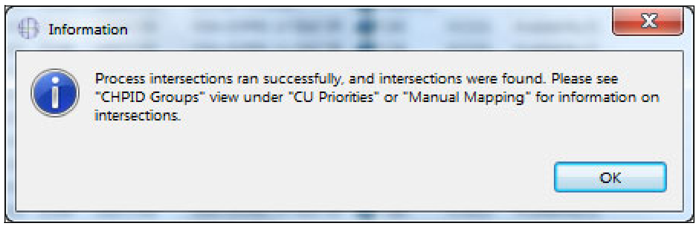


Figure 4-34 Process Intersections run successfully message

The possible intersects are as follows:

C Two or more assigned channels use the same adapter.

S Greater than half the assigned PCHIDs use the same InfiniBand or STI link.

M All assigned channels are supported by the same MBA group.

B More than half the assigned channels are supported by the same book.

D Assigned channels are on the same daughter card.

Tip: Intersect messages inform you of a potential availability problem that is detected by the CMT. However, they do not necessarily indicate an error. It is your responsibility to evaluate whether the condition must be corrected.

8. Click **Manual Mapping**. In the **CHPID Groups** tab, observe any intersect warnings that were found during automatic mapping and decide whether they are acceptable (see Figure 4-35). The example returned the “C” intersect. This warning indicates that there are multiple definitions on the same I/O card.

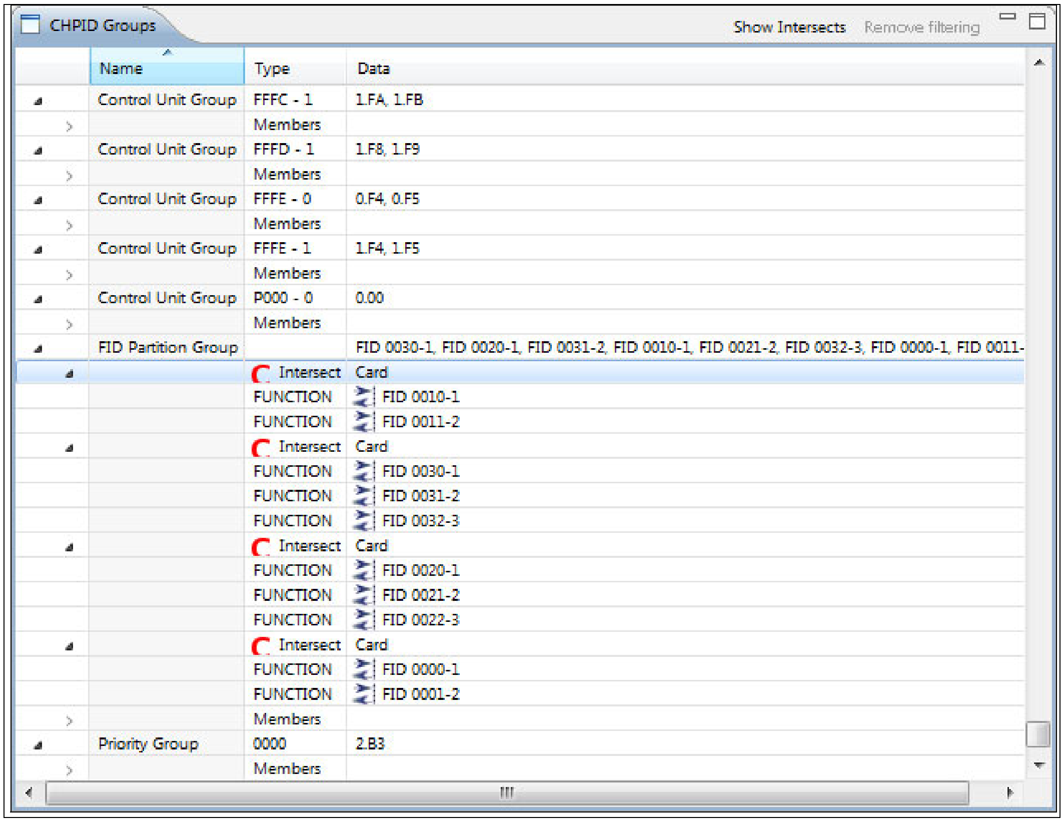


Figure 4-35 B Intersect examples

You can now display the results of the channel mapping. You can also sort the report in various ways. For example, you can see how the CMT ranked CUs.

Check and set values for items such as OSC CHPIDs and Fibre Connection (FICON) channel-to-channel (FCTC) CHPIDs to ensure that the CMT allocates these CHPIDs with high CHID availability by completing the following steps:

1. Click **CU Priorities**. By default, this pane is in the center at the top.
2. In the CU Priorities pane, search in the CU Number column for the CUs that you want to set a priority for.
3. Type a priority number for the CU in the Priority column for each row. The CMT makes more related changes in the CHPID Groups panes.

4.10 CHPIDs not connected to control units

In the CU Priorities window, click the **CU Number** column (see Figure 4-36). The CMT shows at the end of the list all CHPIDs that are defined in the IOCP input that are not connected to CUs. In the list of CU numbers, the letter “S” precedes all coupling CHPIDs, and the letter “P” precedes all non-coupling CHPIDs.

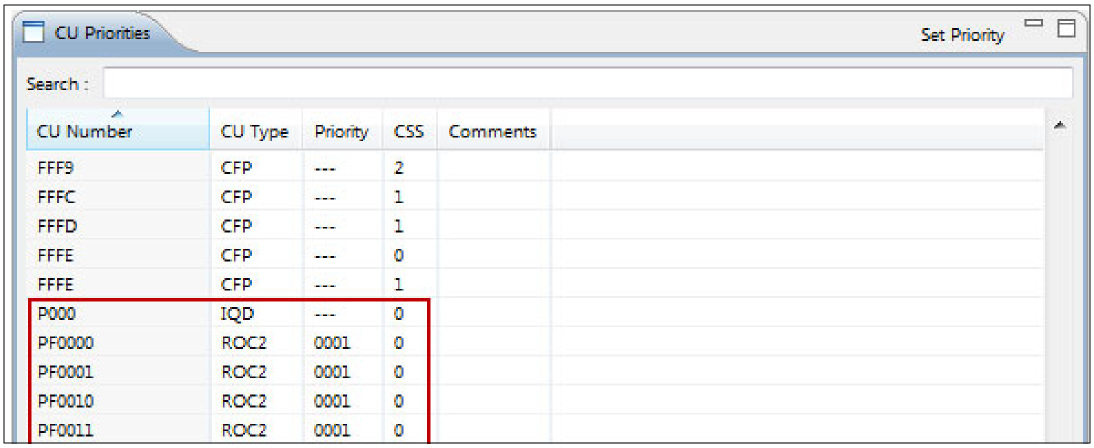


Figure 4-36 CHPIDs not connected to control units

Review the list for the following reasons:

- You might have forgotten to add a CHPID to a CU, so you must update the IOCP source before you continue in the CMT.
- The unconnected CHPIDs might be extra channels that you are ordering in anticipation of new CUs.
- The unconnected CHPIDs might be coupling links that are being used in Coupling Facility (CF) images (they do not require CUs).

If there are extra CHPIDs for anticipated new CUs, consider grouping these CHPIDs with a common priority. Having a common priority enables the availability mapping function to pick CHIDs that can afford your new CU availability.

4.11 Creating CMT reports

The CMT offers built-in reports, which are available from the top of the window. You can also print the information from the report by clicking **Print**. Figure 4-37 shows the options to create a Preview Report or Save Report.

Figure 4-37 Preview Report and Save Report buttons

Click **Preview Report** or **Save Report** to display choices (a list of types of reports). The choices are the same except that **Save Report** lists an extra selection (see Figure 4-38).

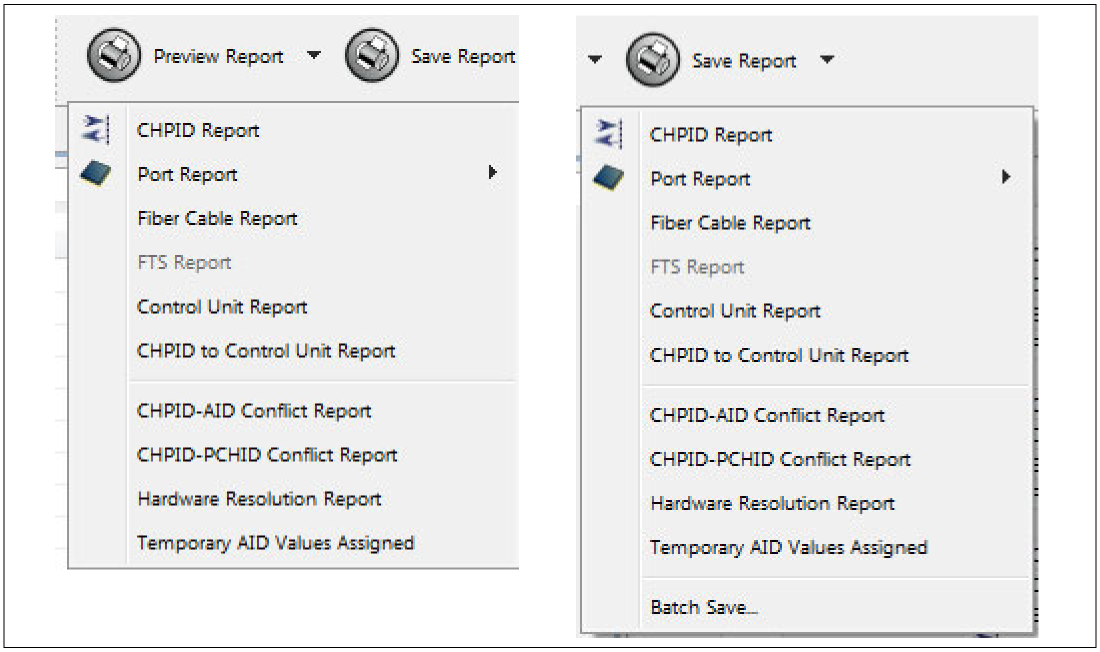


Figure 4-38 Preview Report and Save Report menus

For simplicity, only three reports are described in this example:

- The CHPID Report
- The Port Report sorted by location
- The CHPID to Control Unit Report

However, all built-in reports are printed in the same way.

The person who installs the I/O cables during system installation needs one of these reports. The Port Report sorted by location report is preferable. The installer can use this report to help with labeling the cables. The labels must include the CHID or cage, slot, and port information before system delivery.

4.11.1 CHPID Report

To create the CHPID Report, complete the following steps:

1. Select **Preview Report** → **CHPID Report** (see Figure 4-39).

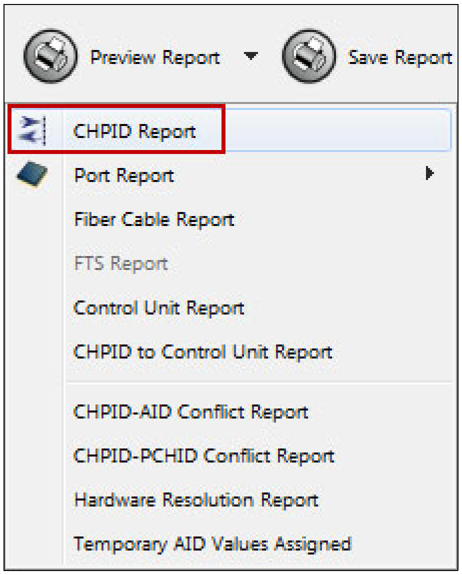
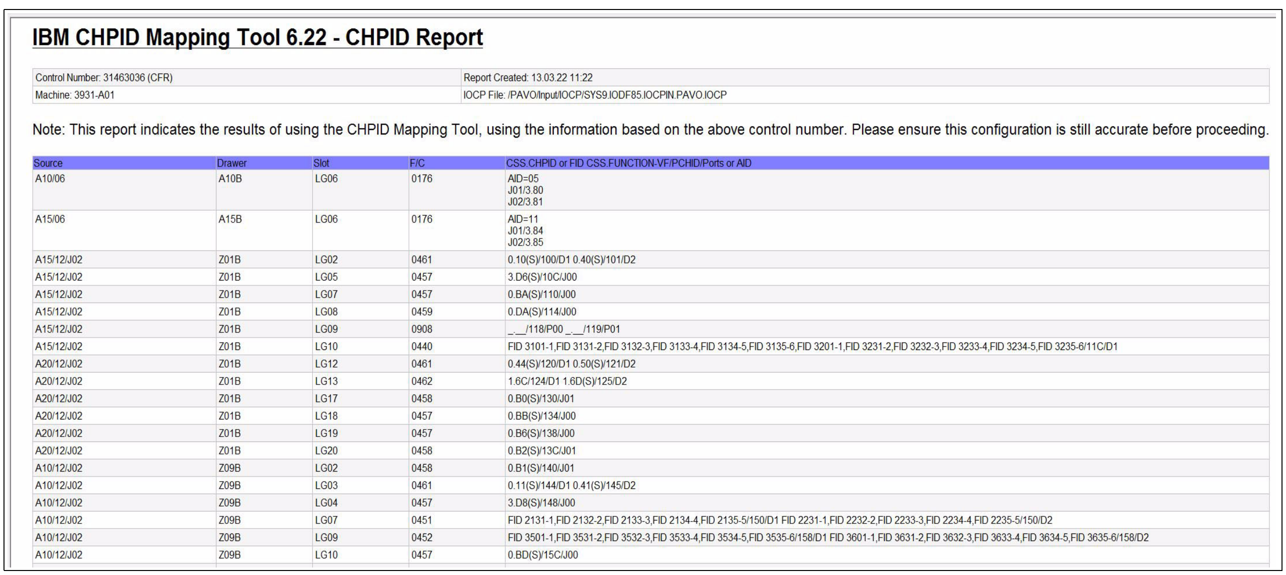


Figure 4-39 Preview report: CHPID Report

The CMT displays the CHPID Report in a **Report** tab within the CMT (see Figure 4-40).



IBM CHPID Mapping Tool 6.22 - CHPID Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:22
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before proceeding.

Source	Drawer	Slot	F/C	CSS.CHPID or FID CSS.FUNCTION-VF/PCHID/Ports or AID
A10/06	A10B	LG06	0176	AID=05 J01/3.80 J02/3.81
A15/06	A15B	LG06	0176	AID=11 J01/3.84 J02/3.85
A15/12/J02	Z01B	LG02	0461	0.10(S)/100/D1 0.40(S)/101/D2
A15/12/J02	Z01B	LG05	0457	3.D6(S)/10C/J00
A15/12/J02	Z01B	LG07	0457	0.BA(S)/110/J00
A15/12/J02	Z01B	LG08	0459	0.DA(S)/114/J00
A15/12/J02	Z01B	LG09	0908	_.__/118/P00 _.__/119/P01
A15/12/J02	Z01B	LG10	0440	FID 3101-1,FID 3131-2,FID 3132-3,FID 3133-4,FID 3134-5,FID 3135-6,FID 3201-1,FID 3231-2,FID 3232-3,FID 3233-4,FID 3234-5,FID 3235-6/11C/D1
A20/12/J02	Z01B	LG12	0461	0.44(S)/120/D1 0.50(S)/121/D2
A20/12/J02	Z01B	LG13	0462	1.6C/124/D1 1.6D(S)/125/D2
A20/12/J02	Z01B	LG17	0458	0.B0(S)/130/J01
A20/12/J02	Z01B	LG18	0457	0.BB(S)/134/J00
A20/12/J02	Z01B	LG19	0457	0.B6(S)/138/J00
A20/12/J02	Z01B	LG20	0458	0.B2(S)/13C/J01
A10/12/J02	Z09B	LG02	0458	0.B1(S)/140/J01
A10/12/J02	Z09B	LG03	0461	0.11(S)/144/D1 0.41(S)/145/D2
A10/12/J02	Z09B	LG04	0457	3.D8(S)/148/J00
A10/12/J02	Z09B	LG07	0451	FID 2131-1,FID 2132-2,FID 2133-3,FID 2134-4,FID 2135-5/150/D1 FID 2231-1,FID 2232-2,FID 2233-3,FID 2234-4,FID 2235-5/150/D2
A10/12/J02	Z09B	LG09	0452	FID 3501-1,FID 3531-2,FID 3532-3,FID 3533-4,FID 3534-5,FID 3535-6/158/D1 FID 3601-1,FID 3631-2,FID 3632-3,FID 3633-4,FID 3634-5,FID 3635-6/158/D2
A10/12/J02	Z09B	LG10	0457	0.BD(S)/15C/J00

Figure 4-40 CHPID Report

> **Tip:** You can save individual reports as multiple reports in batch.

2. Click **Save Report**.

In the example, when you click **CHPID Report**, an option window opens (see Figure 4-41). Specify a file name and an external path (location) of where to save the file. If you want to save the report in HTML, select **HTML**. The tool selects **PDF** by default. The window is similar for all types of reports. Click **Finish**.

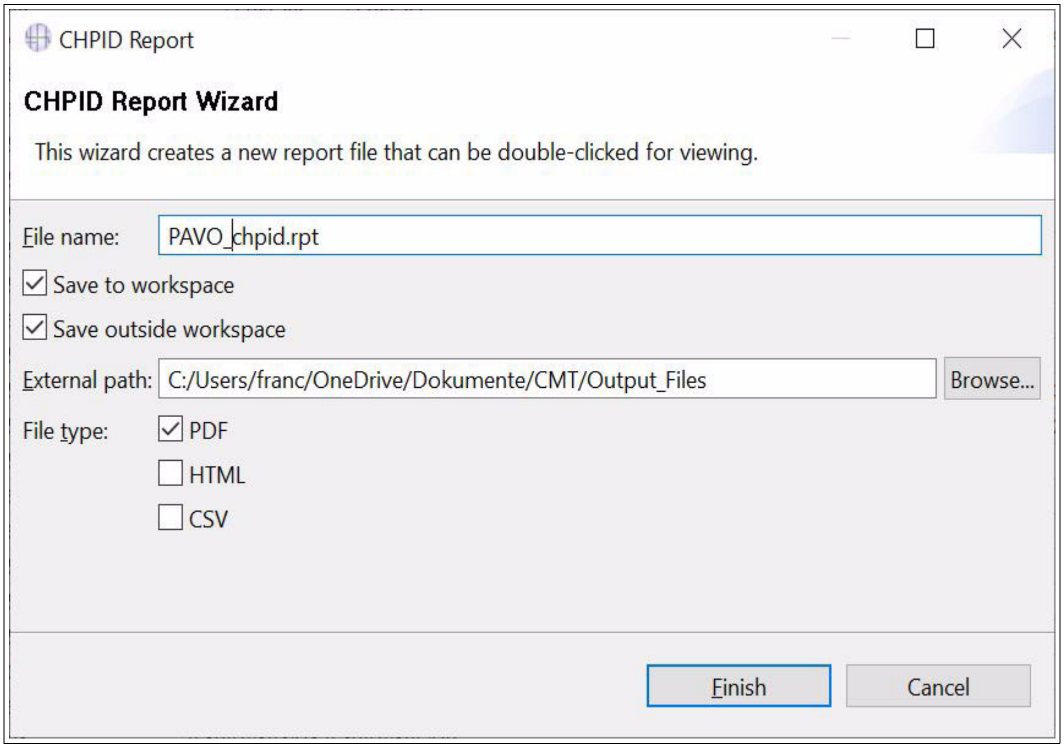
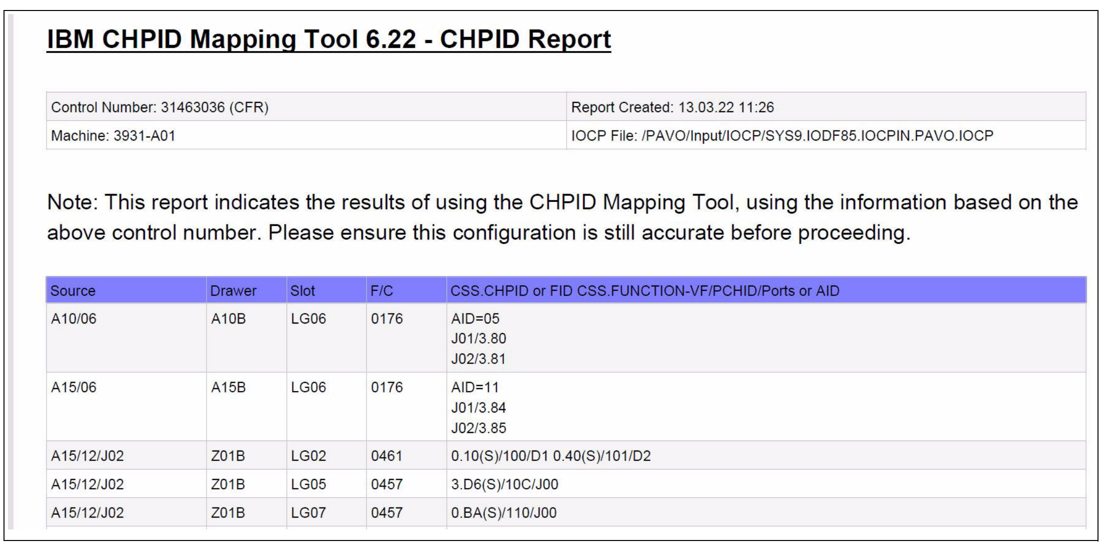


Figure 4-41 Saving the CHPID Report

The CHPID Report is created by the CMT (see Figure 4-42).



IBM CHPID Mapping Tool 6.22 - CHPID Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:26
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before proceeding.

Source	Drawer	Slot	F/C	CSS.CHPID or FID CSS.FUNCTION-VF/PCHID/Ports or AID
A10/06	A10B	LG06	0176	AID=05 J01/3.80 J02/3.81
A15/06	A15B	LG06	0176	AID=11 J01/3.84 J02/3.85
A15/12/J02	Z01B	LG02	0461	0.10(S)/100/D1 0.40(S)/101/D2
A15/12/J02	Z01B	LG05	0457	3.D6(S)/10C/J00
A15/12/J02	Z01B	LG07	0457	0.BA(S)/110/J00

Figure 4-42 CHPID Report example in PDF format

At the end of this CHPID Report is a list of CHPIDs with modified CHID and AID assignments (see Figure 4-43). This report is valuable for moving cables.

CHPIDs or FUNCTIONs	Previous PCHID/AID-Port	PCHID/AID-Port	Current Location	F/C
0.10(S)	1B0	12C	A31BLG15D1	0437
0.11(S)	120	208	Z01BLG04D1	0437
0.12(S)	1B1	1E4	B17BLG13D1	0437
0.13(S)	121	184	B25BLG03D1	0437
0.22	100	104	A31BLG03D1	0437
0.23	180	204	Z01BLG03D1	0437
0.24	101	164	B33BLG13D1	0437
0.25	181	144	B33BLG03D1	0437
0.26	12C	200	Z01BLG02D1	0437

Figure 4-43 List of CHPIDs that have modified PCHID/AID assignments

4.11.2 CHPID to Port Report sorted by location

To create the Port Report sorted by location, select **Preview Report** → **Port Report** → **Sorted by Location**. The CMT displays the CHPID to Port Report in a **Report** tab within the CMT (see Figure 4-44).

IBM CHPID Mapping Tool 6.22 - CHPID to Port Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:34
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before pro

Frame / Cage	Slot or Fanout	AID or PCHID/Port	Source	Adapter Type	Assigned CHPID or Assigned FUNCTION	CHPID Origin or Function Origin
A10B	LG06	AID=05 / J.01	A10/06/J01	ICA SR FANOUT 1.1	3.80	IOCP
A10B	LG06	AID=05 / J.02	A10/06/J02	ICA SR FANOUT 1.1	3.81	IOCP
A15B	LG06	AID=11 / J.01	A15/06/J01	ICA SR FANOUT 1.1	3.84	IOCP
A15B	LG06	AID=11 / J.02	A15/06/J02	ICA SR FANOUT 1.1	3.85	IOCP
Z01B	LG02	100 / D1	A15/12/J02	FICON EXP 32S LX	0.10(S)	IOCP(S)
Z01B	LG02	101 / D2	A15/12/J02	FICON EXP 32S LX	0.40(S)	IOCP(S)
Z01B	LG05	10C / J00	A15/12/J02	OSA-EXP7S 1.2 10 GbE SR	3.D6(S)	IOCP(S)
Z01B	LG07	110 / J00	A15/12/J02	OSA-EXP7S 1.2 10 GbE SR	0.BA(S)	IOCP(S)
Z01B	LG08	114 / J00	A15/12/J02	OSA-EXP7S 1.2 25 SR	0.DA(S)	IOCP(S)
Z01B	LG09	118 / P.00	A15/12/J02	Cry-Exp8S		
Z01B	LG09	119 / P.01	A15/12/J02	Cry-Exp8S		
Z01B	LG10	11C / D1	A15/12/J02	10GbE RoCE EXP3 SR	FID 3101-1 , FID 3131-2 , FID 3132-3 , FID 3133-4 , FID 3134-5 , FID 3135-6 , FID 3201-1 , FID 3231-2 , FID 3232-3 , FID 3233-4 , FID 3234-5 , FID 3235-6	IOCP

Figure 4-44 CHPID to Port Report sorted by location

4.11.3 CHPID to CU Report

This report is created in a way that is like the CHPID Report. Click **Preview Report** → **CHPID to Control Unit Report**. The CMT displays the CHPID to Control Unit Report in a **Report** tab within the CMT (see Figure 4-45).

IBM CHPID Mapping Tool 6.22 - CHPID to CU Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:37
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before proceeding.

CSS	CHPID	Type	Source	Port	PCHID/AID-Port	CU Number	CU Type	Priority
0	10	FC	A15/12/J02	Z01B LG02 D1	100	3280	3490	4000
						3281	3490	4050
						3282	3490	4100
						3283	3490	4150
						3284	3490	4200
						3285	3490	4250
						3380	3490	4300
						3384	3490	4350
0	11	FC	A10/12/J02	Z09B LG03 D1	144	3280	3490	4000
						3281	3490	4050
						3282	3490	4100
						3283	3490	4150
						3284	3490	4200
						3285	3490	4250
						3380	3490	4300
						3384	3490	4350
0	12	FC	A20/09/J02	Z17B LG03 D1	184	3280	3490	4000
						3281	3490	4050
						3282	3490	4100
						3283	3490	4150
						3284	3490	4200
						3285	3490	4250
						3380	3490	4300
						3384	3490	4350

Figure 4-45 CHPID to CU Report

4.12 Creating an updated IOCP file

Now, use the CMT to create an updated IOCP file that must be imported back into the IODF by using HCD. This IOCP statements file now has CHIDs that are assigned to CHPIDs.

To create the IOCP, complete the following steps:

1. Select **File** → **Export IOCP input file** (see Figure 4-46).

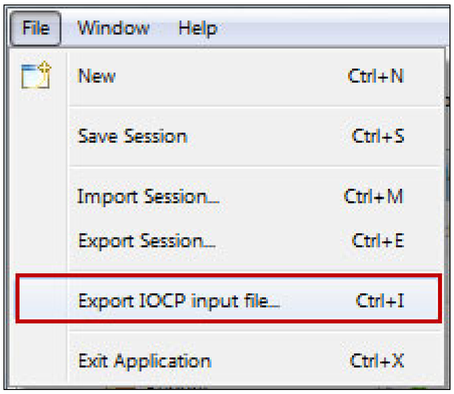


Figure 4-46 Export IOCP input file

2. Enter the Export Path and IOCP Name for the IOCP output file and click **Finish** (see Figure 4-47).

> **Requirement:** This file must be uploaded to the z/OS image on which you have the work IODF that you used previously to create the IOCP input data set.

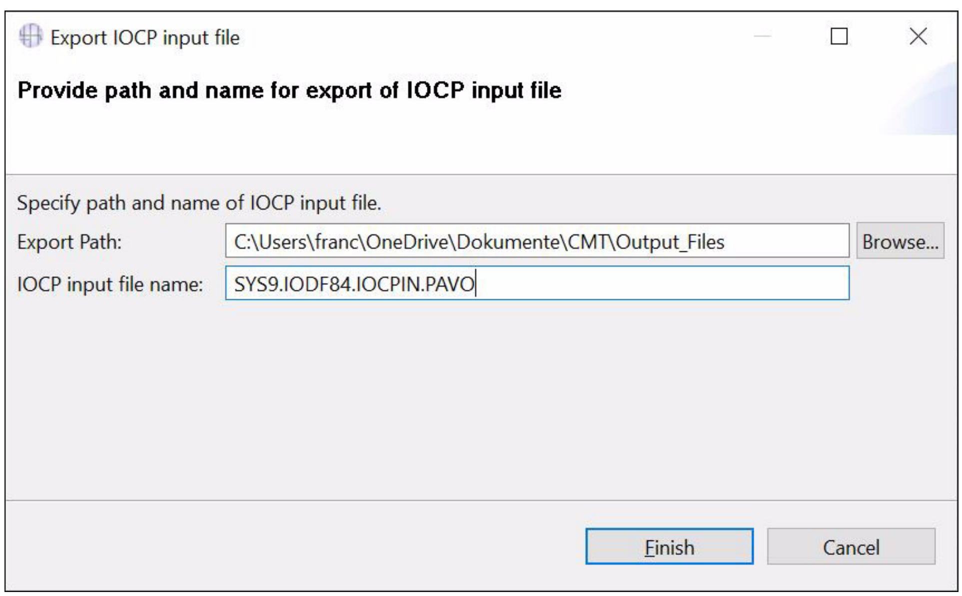


Figure 4-47 Exporting the IOCP File

3. Select **File** → **Save Session** (see Figure 4-48).

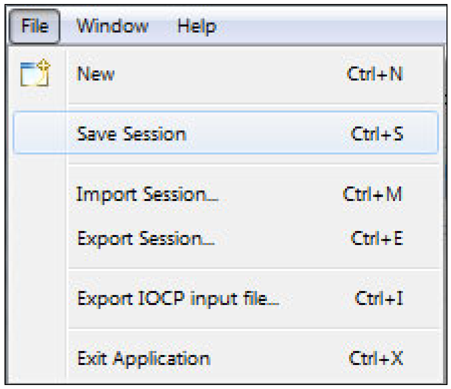


Figure 4-48 Save Session

You might want to save your project before exiting the CMT application.

4.13 Additional steps and processes

You might want to perform a PCHID migration before building a production IODF. For more information, see *CHPID Mapping Tool User's Guide,* GC28-7024.

For your next steps, go to Chapter 5, “Building the production input/output definition file and setting up the central processor complex” on page 91.

5

Building the production input/output definition file and setting up the central processor complex

This chapter describes the tasks that are needed to build a production input/output definition file (IODF) and set up the central processor complex (CPC).

> **Naming:** The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.
>
> **Note:** The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Building the new production IODF
- Writing the input/output configuration program to the old CPC by using HCD
- Creating a reset profile on the Support Element
- Creating an image profile on the Support Element
- Performing a Power on Reset on the new CPC
- Building and verifying load (IPL) profiles
- Building and verifying LOADxx members in SYS#.IPLPARM
- Communicating information about the new CPC

5.1 Building the new production IODF

To use the definitions that were updated in Hardware Configuration Definition (HCD), create a production IODF from your work IODF. Then, write the IODF to the input/output configuration data set (IOCDS) by using Write IOCDS in preparation for the upgrade.

Complete the following steps:

1. From the HCD main panel, select option `2. Activate or process configuration data` (see Figure 5-1).

```
 z/OS V2.5 HCD
Command ===> _____________________________________________________

                           Hardware Configuration

Select one of the following.

2   0.  Edit profile options and policies
    1.  Define, modify, or view configuration data
    2.  Activate or process configuration data
    3.  Print or compare configuration data
    4.  Create or view graphical configuration report
    5.  Migrate configuration data
    6.  Maintain I/O definition files
    7.  Query supported hardware and installed UIMs
    8.  Getting started with this dialog
    9.  What's new in this release

For options 1 to 5, specify the name of the IODF to be used.

I/O definition file . . . 'SYS9.IODF81.WORK'                     +
```

Figure 5-1 Hardware Configuration: Activate or process configuration data

2. The Activate or Process Configuration Data panel opens (see Figure 5-2). Select option `1. Build production I/O definition file`, and then press Enter.

```
+------ Activate or Process Configuration Data ------+
|                                                    |
|                                                    |
| Select one of the following tasks.                 |
|                                                    |
| 1   1.  Build production I/O definition file       |
|     2.  Build IOCDS                                |
|     3.  Build IOCP input data set                  |
|     4.  Create JES3 initialization stream data     |
|     5.  View active configuration                  |
|     6.  Activate or verify configuration           |
|         dynamically                                |
|     7.  Activate configuration sysplex-wide        |
|     8.  (no longer supported)                      |
|     9.  (no longer supported)                      |
|     10. Build I/O configuration data               |
|     11. Build and manage processor cluster         |
|         IOCDSs, IPL attributes and dynamic I/O     |
|         changes                                    |
|     12. Build validated work I/O definition file   |
|                                                    |
|  F1=Help     F2=Split    F3=Exit     F9=Swap       |
| F12=Cancel                                         |
```

Figure 5-2   Activate or Process Configuration Data: Build production I/O definition file

3. HCD displays the Message List panel (see Figure 5-3). Verify that you have only severity “W” (warning) messages and that they are normal for the configuration. Correct any other messages that should not occur and try to build the production IODF again. Continue this process until you have no messages that indicate problems.

```
+------------------------------- Message List --------------------------------
|   Save  Query  Help
| --------------------------------------------------------------------------
|                                                                Row 1 of 99
| Command ===> ___________________________________________ Scroll ===> CSR
|
| Messages are sorted by severity. Select one or more, then press Enter.
|
| / Sev Msg. ID  Message Text
| _ W   CBDG098I For operating system DBSV4SU4 and device type OSA the
| #              default of LOCANY=YES is not used for following device
| #              groups: 1910,16 1930,16
| _ W   CBDG098I For operating system DBSV5SU4 and device type OSA the
| #              default of LOCANY=YES is not used for following device
| #              groups: 1910,16 1930,16
| _ W   CBDG098I For operating system DBSV6SU4 and device type OSA the
| #              default of LOCANY=YES is not used for following device
| #              groups: 1910,16 1930,16
| _ W   CBDG098I For operating system PERF4SU4 and device type OSA the
| #              default of LOCANY=YES is not used for following device
|  F1=Help        F2=Split       F3=Exit        F4=Prompt      F5=Reset
|  F7=Backward    F8=Forward     F9=Swap       F10=Actions    F12=Cancel
| F13=Instruct   F22=Command
+-----------------------------------------------------------------------------
```

Figure 5-3 Message List: Building a production IODF

4. Press PF3 to continue.
5. The Build Production I/O Definition File panel opens (see Figure 5-4). Complete the Production IODF name and Volume serial number fields, and then press Enter.

```
+-------------- Build Production I/O Definition File ---------------+
|                                                                   |
|                                                                   |
| Specify the following values, and choose how to continue.        |
|                                                                   |
| Work IODF name . . . : 'SYS9.IODF81.WORK'                         |
|                                                                   |
| Production IODF name . SYS9.IODF81__________________________      |
| Volume serial number . IODFPK  +                                  |
|                                                                   |
| Continue using as current IODF:                                   |
| 2   1.  The work IODF in use at present                           |
|     2.  The new production IODF specified above                   |
|                                                                   |
|                                                                   |
|                                                                   |
|  F1=Help    F2=Split   F3=Exit    F4=Prompt  F9=Swap   F12=Cancel |
+-------------------------------------------------------------------+
```

Figure 5-4 Build Production I/O Definition File: Data fields to be updated

6. The Define Descriptor Fields panel opens (see Figure 5-5). Press Enter to accept the descriptor fields that are selected by HCD, or enter different values and then press Enter.

```
+-------------------- Define Descriptor Fields --------------------+
|                                                                  |
|                                                                  |
| Specify or revise the following values.                          |
|                                                                  |
| Production IODF name  . : 'SYS9.IODF81'                          |
|                                                                  |
| Descriptor field 1  . . . SYS9                                   |
| Descriptor field 2  . . . IODF81                                 |
|  F1=Help      F2=Split     F3=Exit      F5=Reset     F9=Swap     |
| F12=Cancel                                                       |
+------------------------------------------------------------------+
```

Figure 5-5 Define Descriptor Fields: Data fields to be updated

HCD displays the following message, which indicates that the production IODF was successfully created:

```
Production IODF SYS9.IODF81 created.
```

To implement the configuration on the 8561 processor in preparation for its upgrade to a 3931 processor, go to 5.2, "Writing the input/output configuration program to the old CPC by using HCD" on page 95.

5.2 Writing the input/output configuration program to the old CPC by using HCD

Now that you have a production IODF that is named `SYS9.IODF81`, you can now write the input/output configuration program (IOCP) data from the IODF to the IOCDS on the CPC that you want to upgrade (for example, ARIES).

The IOCDS are available for Power on Reset (POR) after the processor is upgraded.

To update the IOCDS by using HCD option 2.11, complete the following steps:

1. From the HCD main panel, select option `2. Activate or process configuration data` (see Figure 5-6). Ensure that the IODF is the production IODF that was created in 5.1, “Building the new production IODF” on page 92, and then press Enter.

```
 z/OS V2.5 HCD
Command ===> ______________________________________________________

                           Hardware Configuration

Select one of the following.

2   0.  Edit profile options and policies
    1.  Define, modify, or view configuration data
    2.  Activate or process configuration data
    3.  Print or compare configuration data
    4.  Create or view graphical configuration report
    5.  Migrate configuration data
    6.  Maintain I/O definition files
    7.  Query supported hardware and installed UIMs
    8.  Getting started with this dialog
    9.  What's new in this release

For options 1 to 5, specify the name of the IODF to be used.

I/O definition file . . . 'SYS9.IODF81'                          +
```

Figure 5-6 Hardware Configuration: Activate or process configuration data

2. The Activate or Process Configuration Data panel opens (see Figure 5-7). Select option `11. Build and manage processor cluster IOCDSs, IPL attributes and dynamic I/O changes`, and then press Enter.

```
+------ Activate or Process Configuration Data ------+
|                                                    |
|                                                    |
| Select one of the following tasks.                 |
|                                                    |
| 11  1.  Build production I/O definition file       |
|     2.  Build IOCDS                                |
|     3.  Build IOCP input data set                  |
|     4.  Create JES3 initialization stream data     |
|     5.  View active configuration                  |
|     6.  Activate or verify configuration           |
|         dynamically                                |
|     7.  Activate configuration sysplex-wide        |
|     8.  (no longer supported)                      |
|     9.  (no longer supported)                      |
|     10. Build I/O configuration data               |
|     11. Build and manage processor cluster         |
|         IOCDSs, IPL attributes and dynamic I/O     |
|         changes                                    |
|     12. Build validated work I/O definition file   |
|                                                    |
|  F1=Help     F2=Split    F3=Exit     F9=Swap       |
| F12=Cancel                                         |
```

Figure 5-7 Activate or Process Configuration data: Build and manage processor cluster IOCDSs, IPL attributes, and dynamic I/O changes

This example assumes that you have connectivity to the 8561 processor that is being upgraded over the Hardware Management Console (HMC) local area network (LAN) to write an IOCDS.

If the CPC being upgraded is not accessible from the HMC LAN, create a IOCP file from HCD, then use the stand-alone IOCP process to update the IOCDS.

You can create an IOCP file by using the same process that you used to create an IOCP file for the channel path ID (CHPID) Mapping Tool (CMT).

Tip: The Support Element (SE) can read an IOCP file that is written to a USB flash memory drive.

3. The Processor Cluster List panel opens (see Figure 5-8). In the list, select the 8561 processor being upgraded by typing a forward slash (/) to update one of its IOCDSs, and then press Enter.

```
Processor Cluster List                 Row 1 of 4
Command ===> ______________________________________________ Scroll ===> CSR

Select one or more CPCs, then press Enter.

  --------------CPC--------------   IODF
/ SNA Address        Type   Model   Processor ID
/ IBM390PS.ARIES     8561   T01     PAVO
_ IBM390PS.HYDRA     8562   LT2     HYDRA
_ IBM390PS.LEPUS     3907   ZR1     LEPUS
# IBM390PS.PAVO      3931   A01
```

Figure 5-8 IBM Z cluster list: Selecting a processor for IOCDS replace

4. The Actions on selected CPCs panel opens (see Figure 5-9). Select option `1. Work with IOCDSs`, and then press Enter.

```
+----------------- Actions on selected CPCs ------------------+
|                                                             |
|                                                             |
| Select by number or action code and press Enter.            |
|                                                             |
| 1_  1.  Work with IOCDSs . . . . . . . . . . (s)            |
|     2.  Work with IPL attributes . . . . . . (i)            |
|     3.  Select other processor configuration (p)            |
|     4.  Work with CPC images  . . . . . . . .(v)            |
|     5.  Activate hardware changes only . . . (a)            |
|     6.  View current active configuration . .(c)            |
|     7.  Download active configuration . . . .(d)            |
|                                                             |
|  F1=Help     F2=Split    F3=Exit     F9=Swap    F12=Cancel  |
+-------------------------------------------------------------+
```

Figure 5-9 Actions on selected CPCs: Work with IOCDSs

5. The IOCDS List panel opens (see Figure 5-10). Select the IOCDS that you want to update for the 8561 replacement by typing a forward slash (/) next to it, and then press Enter.

```
IOCDS List          Row 1 of 4 More:
Command ===> ______________________________________________ Scroll ===> CSR

Select one or a group of IOCDSs, then press Enter.

                                          -----Token Match----- Write
/ IOCDS       Name     Type   Status      IOCDS/HSA IOCDS/Proc. Protect
_ A0.PAVO     IODF78   LPAR   Alternate   No        No          No
_ A1.PAVO     IODF79   LPAR   Alternate   No        No          No
_ A2.PAVO     IODF80   LPAR   POR         No        No          Yes
/ A3.PAVO     IODF77   LPAR   Alternate   No        No          No
```

Figure 5-10 IOCDS List: Selecting IOCDS for replacement

6. The Actions on selected IOCDSs panel opens (see Figure 5-11). Select option `1. Update IOCDS`, and then press Enter.

```
+---------------- Actions on selected IOCDSs -----------------+
|                                                              |
|                                                              |
| Select by number or action code and press Enter.             |
|                                                              |
| 1_  1.  Update IOCDS . . . . . . . . . . . . (u)             |
|     2.  Switch IOCDS . . . . . . . . . . . . (s)             |
|     3.  Enable write protection  . . . . . . (e)             |
|     4.  Disable write protection . . . . . . (w)             |
|                                                              |
|                                                              |
|                                                              |
+--------------------------------------------------------------+
```

Figure 5-11 Actions on selected IOCDSs: Update IOCDS

7. The Build IOCDSs panel opens (see Figure 5-12). Verify that all the information is correct. Complete the `Title1` field, set `Write IOCDS in preparation of upgrade` to `Yes`, and then press Enter.

```
+------------------------------ Build IOCDSs -------------------------------+
|                                                                Row 1 of 1 |
| Command ===> ___________________________________________ Scroll ===> CSR   |
|                                                                           |
| Specify or revise the following values.                                  |
|                                                                           |
| IODF name . . . . . . . . . : 'SYS9.IODF81'                              |
|                                                                           |
| Title1 . IODF81__________________________________________________________ |
| Title2 : SYS9.IODF81 - 2022-03-09 21:43                                  |
|                                                                           |
|                            Write IOCDS in                                 |
| IOCDS       Switch IOCDS  preparation of upgrade                          |
| A3.PAVO     No            Yes                                            |
| ***************************** Bottom of data ****************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|  F1=Help       F2=Split      F3=Exit       F5=Reset      F7=Backward      |
|  F8=Forward    F9=Swap      F12=Cancel                                    |
+---------------------------------------------------------------------------+
```

Figure 5-12 Build IOCDSs: Verifying IODF

> **Tip:** Specifying `Yes` in the `Write IOCDS in preparation of upgrade` field is required only when you replace or upgrade the existing hardware and want to write the IOCDS for a 3931 processor from the existing hardware. The `Yes` value enables the writing of an IOCDS that contains information that the current hardware does not recognize.

8. Because Yes was specified for the Write IOCDS in preparation of upgrade field, HCD displays a confirmation panel (see Figure 5-13). Press Enter to continue.

```
+---------- Confirm Write IOCDS in preparation of processor upgrade ----------+
|                                                                 Row 1 of 1 |
| Command ===> ___________________________________________ Scroll ===> CSR   |
|                                                                            |
| Scroll forward to view the complete list of IOCDSs that will be written   |
| regardless of processor type in preparation of a processor upgrade. Press  |
| F3 or F12 to cancel, press ENTER to confirm the write request.             |
|                                                                            |
| The processor receiving the IOCDSs must be a CMOS processor.             |
|                                                                            |
| You will not be able to perform a POR by using the new IOCDS until your       |
| processor has been upgraded. Do not make the new IOCDS the active one on   |
| your processor. Do not activate any I/O configuration changes in the IODF  |
| until your processor has been upgraded. Keep the old processor definition  |
| in an IODF until after the upgrade.                                        |
|                                                                            |
| IOCDS                                                                      |
| A3.PAVO                                                                    |
| ***************************** Bottom of data ****************************** |
|                                                                            |
|                                                                            |
|  F1=Help       F2=Split      F3=Exit       F7=Backward    F8=Forward       |
|  F9=Swap      F12=Cancel                                                   |
+----------------------------------------------------------------------------+
```

Figure 5-13 Build IOCDSs: Confirm Write IOCDS

9. The Job Statement Information panel opens (see Figure 5-14). Enter the job statements as required by the installation, and press Enter. HCD submits the job to update the IOCDS.

Tip: Route the job to run on the image to which you are logged on. In that way, you know that the image can “see” the new 3931 processor to update its IOCDS.

```
+------------------------- Job Statement Information -------------------------+
|                                                                            |
|                                                                            |
| Specify or revise the job statement information.                           |
|                                                                            |
|                                                                            |
| Job statement information                                                  |
| //WIOCP   JOB (ACCOUNT),'NAME',MSGCLASS=T                                  |
| //*                                                                        |
| //*                                                                        |
| //*                                                                        |
| //*                                                                        |
| //*                                                                        |
|  F1=Help       F2=Split      F3=Exit       F5=Reset      F6=Previous       |
|  F9=Swap      F12=Cancel                                                   |
+----------------------------------------------------------------------------+
```

Figure 5-14 Job Statement Information: Option to override job statement cards

10.Verify the job output to ensure that the IOCDS was written without error and to the correct IOCDS. You receive the following messages:

```
ICP057I IOCP JOB WIOCP    SUCCESSFUL.  LEVEL A3 IOCDS REPLACED.

Sev  Msgid    Message Text
 I  CBDA674I  IOCP successfully completed for A3.PAVO.
```

11.Now, if you return to HCD option 2.11 and view the IOCDS, notice that the Systems Network Architecture (SNA) Address is still `IBM390PS.ARIES` (see Figure 5-15).

```
Processor Cluster List                  Row 1 of 4
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more CPCs, then press Enter.

  --------------CPC--------------   IODF
/ SNA Address        Type   Model   Processor ID
_ IBM390PS.ARIES     8561   T01     PAVO
_ IBM390PS.HYDRA     8562   LT2     HYDRA
_ IBM390PS.LEPUS     3907   ZR1     LEPUS
# IBM390PS.PAVO      3931   A01
```

Figure 5-15   Processor Cluster List: Selecting a processor for IOCDS verify

12.Also, when you select `IBM390PS.ARIES`, notice that IOCDS A3 (to which you wrote the upgrade IODF) has a status of `Invalid` (see Figure 5-16). This error occurs because you specified `Yes` for the `Write IOCDS in preparation for upgrade` field, and the IOCDS contains IOCP statements and code that are relevant only for a 3931 processor.

The status switches when this processor is upgraded to a 3931 processor. The 8561 IOCDS status changes to `Alternate` and the 3931 IOCDSs changes to `Invalid`.

Tip: Generally, rewrite the IOCDS that is written in preparation for the upgrade at your earliest convenience. Subsequent miscellaneous equipment specifications (MESs) might cause an IOCDS that is written in preparation for an upgrade to become invalid.

```
 IOCDS List          Row 1 of 4 More:
Command ===> _______________________________________________ Scroll ===> CSR

Select one or a group of IOCDSs, then press Enter.

                                        -----Token Match----- Write
/ IOCDS       Name     Type   Status     IOCDS/HSA IOCDS/Proc. Protect
_ A0.PAVO     IODF78   LPAR   Alternate  No        No          No
_ A1.PAVO     IODF79   LPAR   Alternate  No        No          No
_ A2.PAVO     IODF80   LPAR   POR        No        No          Yes
_ A3.PAVO     IODF81   LPAR   Invalid    No        Yes         No
 ****************************** Bottom of data ****************************
```

Figure 5-16   IOCDS List: IOCDS verified with a status of Invalid

5.3 Creating a reset profile on the Support Element

To build and activate your reset profile by using the HMC, complete the steps in this section.

5.3.1 Background activities that occurred

The following activities are upgraded to a 3931-A01 processor.

- A new HMC is installed with the correct driver level to support the 3931 processor, and it is connected to the customer HMC network.
- The upgraded 3931 processor (in this example PAVO) was defined to the new HMC:
  - The 8561 processor, now upgraded to a 3931 processor, underwent a POR with the Diagnostic (DEFAULT) IOCDS.
  - The 3931 processor had a new IOCP written to its IOCDS from the IODF (IODF81) by using HCD Option 2.11.
  - The 3931 processor is now ready to be customized with specific customer definitions.

5.3.2 Building the reset profile and pointing it to the required IOCDS

Now that the IOCP file is written to an IOCDS, build a reset (POR) profile to point to that IOCDS. This reset profile performs a POR for the new 3931 processor after it is upgraded and handed over from the IBM System Services Representative (IBM SSR).

To build the profile, complete the following steps:

1. Log on to the HMC workstation that is supplied with the 3931 processor with SYSPROG authority, or use a remote web browser and select the new 3931 processor.
2. Under Systems Management, click **Systems Management** to expand the list.
3. Under Systems Management, click the radio button next to the system to select it (in this example, PAVO).
4. In the Tasks window, click **Operational Customization** to expand it, and select **Customize/Delete Activation Profiles** (see Figure 5-17 on page 103).

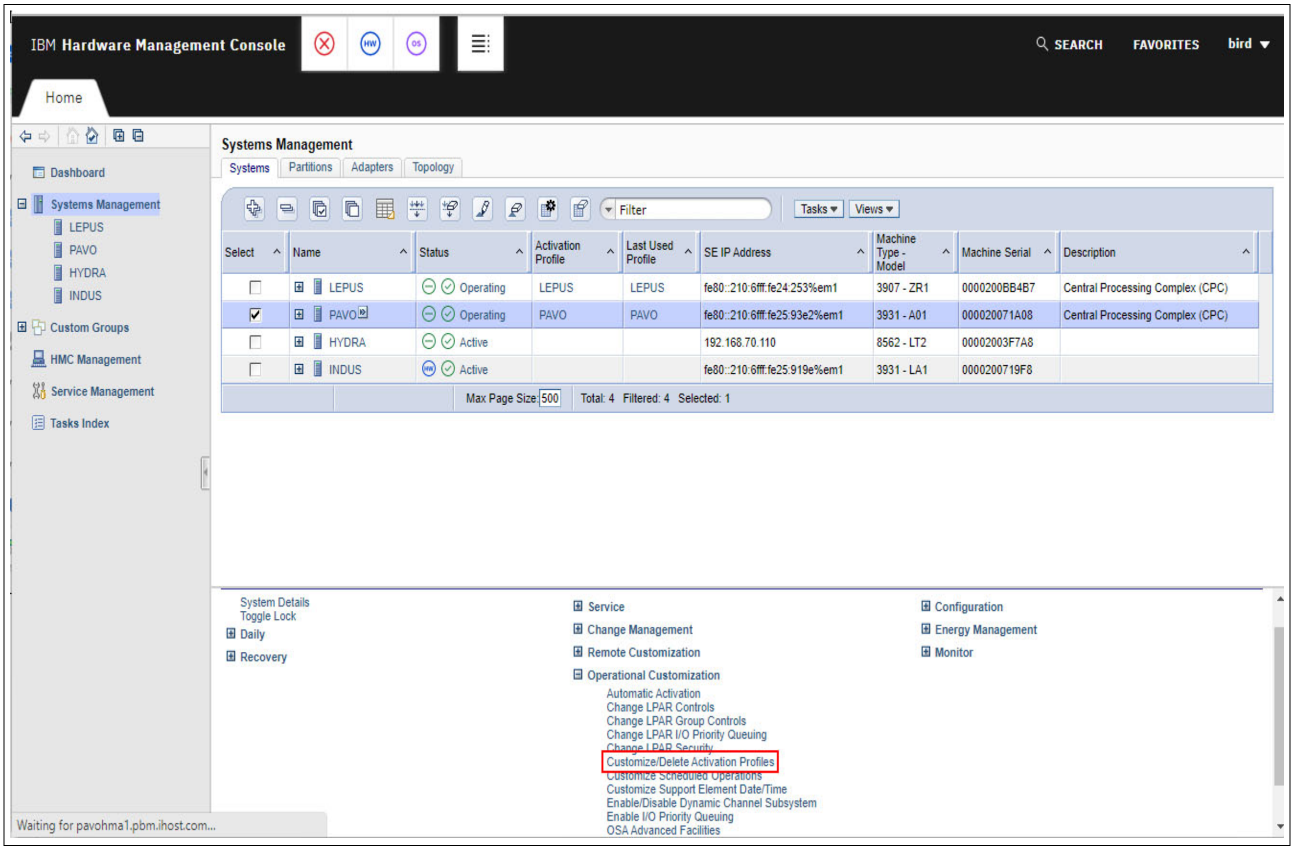


Figure 5-17 Customize/Delete Activation Profiles

5. Select the **DEFAULT** reset profile and click **Customize profile**.
6. Save this DEFAULT profile with a new profile name to be used when the POR is required (for example, TESTRESET).
7. Select the new **TESTRESET** profile and click **Customize profile**.
8. Click the IOCDS that you updated in the previous step. The ACTB0PDL message appears (see Figure 5-18).

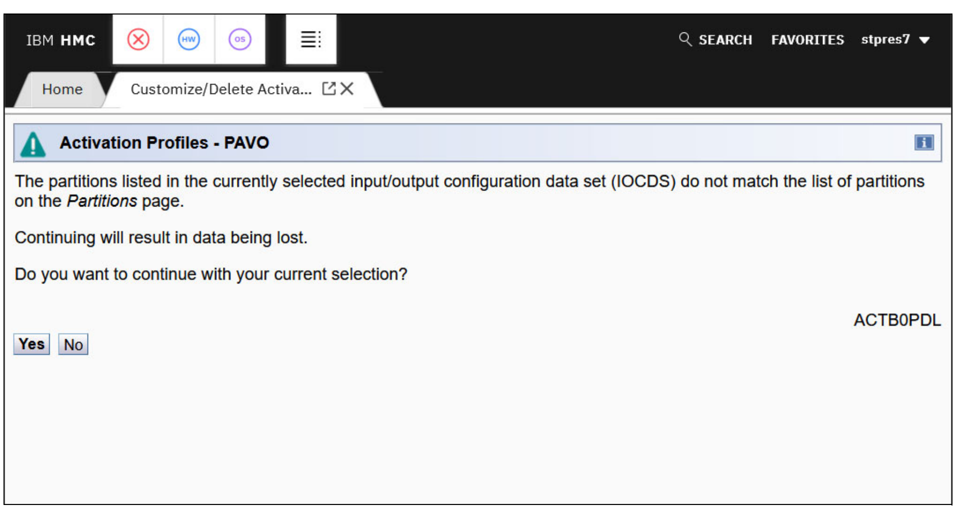


Figure 5-18 Activation Profiles: ACTB0PDL message

9. Depending on the circumstances, you can click **Yes** or **No**. You might want to review the Partition Activation List now. For this example, click **Yes**.
10. The HMC retrieves any image profiles that match the logical partition (LPAR) names that are defined in the IOCDS that was selected. You can create image profiles for those LPAR names that it cannot retrieve.

    In our example, we select **Automatically create all new images using the choices specified on this panel** and **Use the selected profile as a template when automatically creating new image profiles: DEFAULT**. Click **OK** (see Figure 5-19).

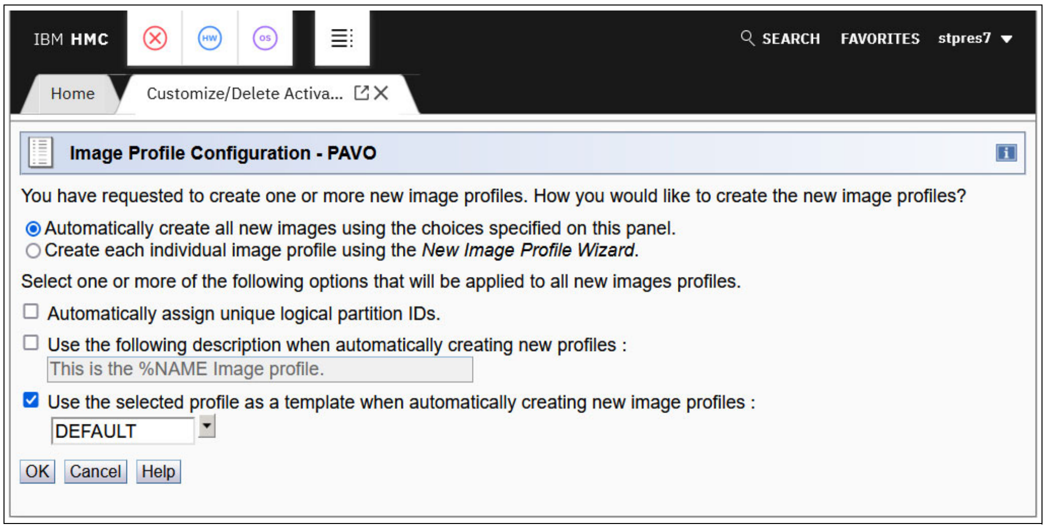


Figure 5-19 Image Profile automatic build options

11.Note the list of LPARs that were retrieved and built based on the LPARs that were defined in the selected IOCDS. Click **Save** (see Figure 5-20).

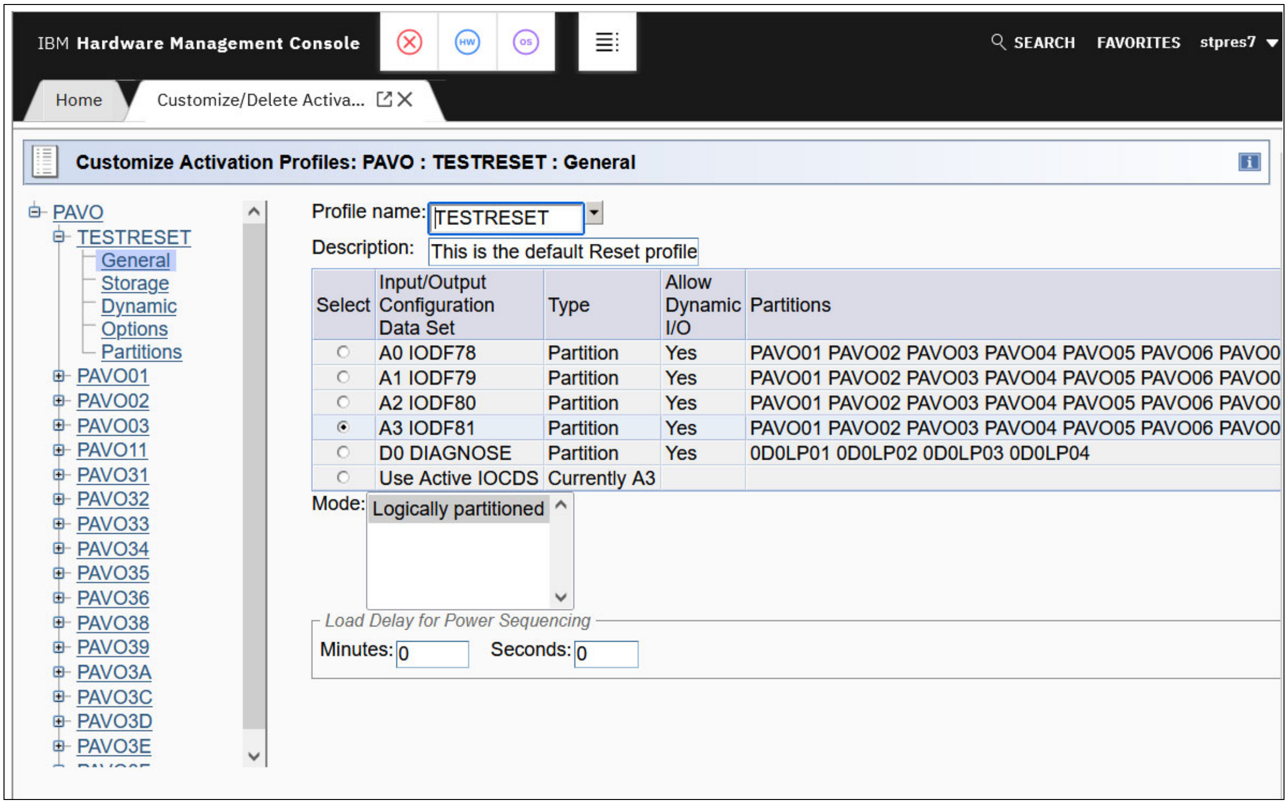


Figure 5-20 Reset and Image Profile list: Selecting IOCDS

For planning information, see Chapter 2, “Planning considerations” on page 7.

5.3.3 Setting up and verifying the reset profile

To set up and verify the reset profile, complete these steps:

1. Click **Partitions** to display the list of LPARs in the partition activation list.

   This window lists all the partitions that were retrieved by the automatic build for reset profile TESTRESET. The partition list also determines all the image profiles that would be activated if the CPC was POR.

   Here, you can tailor which image profiles are displayed and activated, and also the order of activation and the order in which they are displayed in the reset profile.

   Typing over or removing the number in the Order field determines how you want the partitions in the reset profile to behave, that is, they are removed or the order is changed.

2. After you make your determinations, click **Save** (see Figure 5-21).

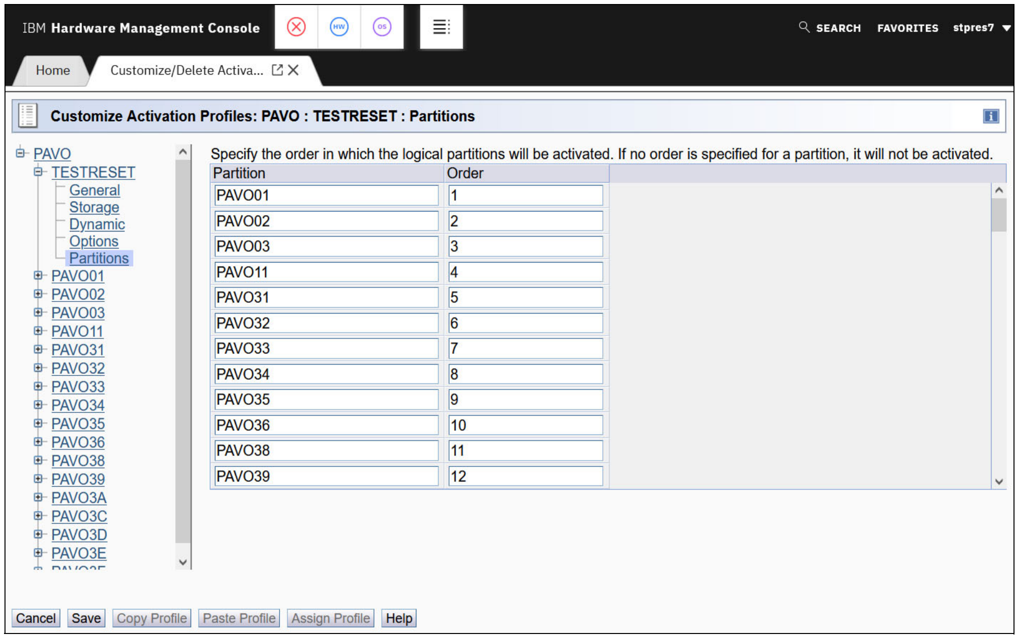


Figure 5-21 Reset and Image profile list: Updating the partition list

3. If you have any Coupling Facility (CF) partitions that are defined, HMC prompts whether you want to change the partition activation order because it is preferential but not essential that CF LPARs are activated before z/OS LPARs. Click **Yes** or **No** (see Figure 5-22).

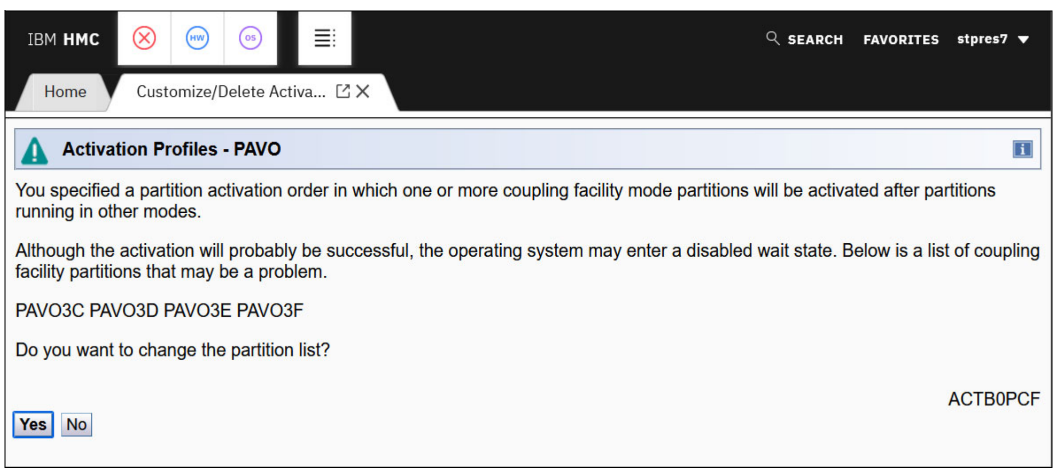


Figure 5-22 Reset and Image Profiles list: Coupling Facility LPAR verification

5.4 Creating an image profile on the Support Element

Image profiles contain all the specific parameters that relate to the partition, which include the following ones:

- General
- Processor
- Security
- Storage
- Options
- Load
- Crypto
- Time Offset

Click one of the image profiles to set up the partition parameters. In our example, we select **PAVO33**.

5.4.1 Image Profile: General page

The General page is displayed first (see Figure 5-23).

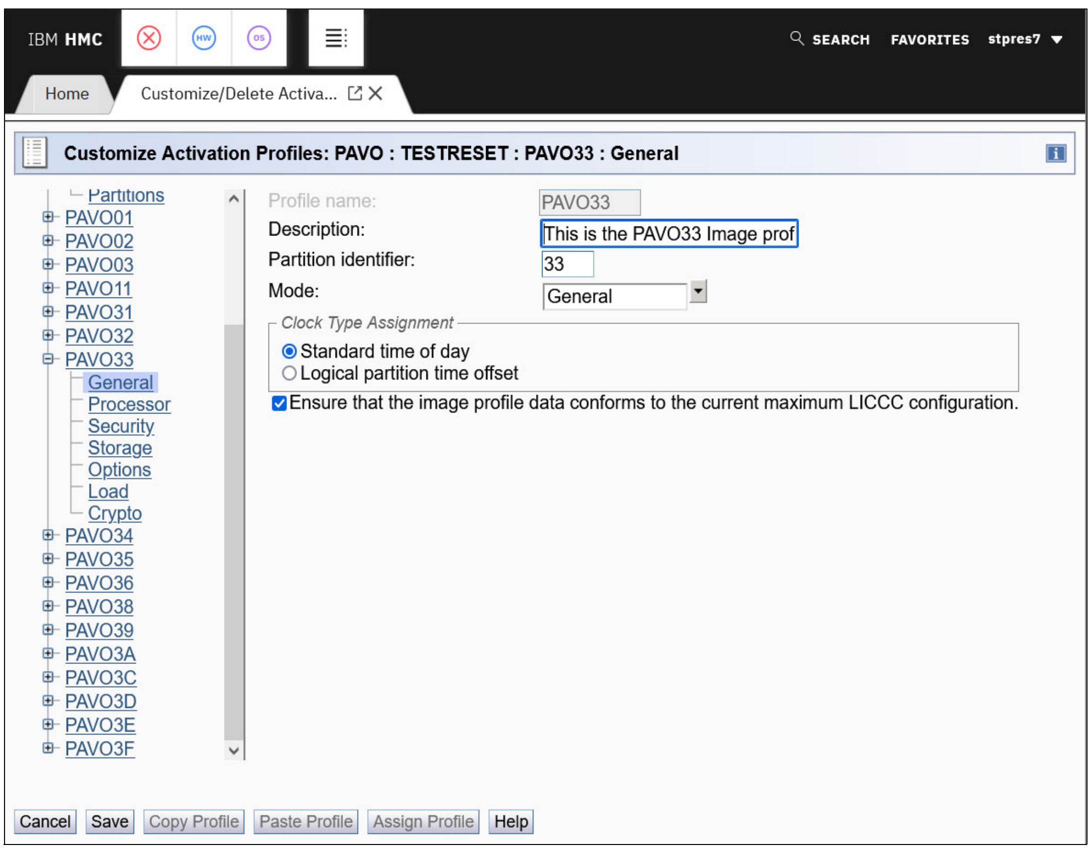


Figure 5-23 Image Profile: General

Review the following settings:

- Description
- Partition identifier
- Mode
- Clock Type Assignment:
  - Standard time of day (TOD)
  - LPAR time offset

5.4.2 Image Profile: Processor page

Click the **Processor** link to set up the partition CPU and weight information (see Figure 5-24).

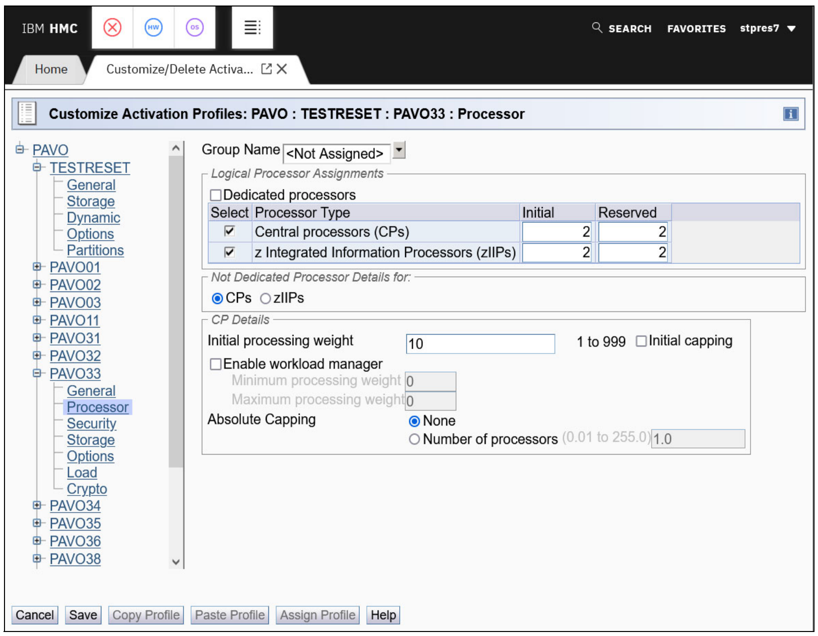


Figure 5-24 Image Profile: Processor

Review the following settings:

- Dedicated processors checkbox: Select first if you want to set dedicated central processors (CPs), IBM Z Integrated Information Processors (zIIPs), IFLs, or Internal Coupling Facilities (ICFs).
- CPs for Initial and Reserved.
- zIIPs for Initial and Reserved.
- Not dedicated Processor Details for CPs and zIIPs, IFLs, or ICFs.
- Initial processing weight.
- Initial capping.
- Enable workload manager.
- Absolute capping.

5.4.3 Image Profile: Security page

Next, click the **Security** link to set up the partition security parameters (see Figure 5-25). Review the following settings:

- Partition Security Options
- BCPii Permissions
- Counter Facility Security Options
- Sampling Facility Security Options
- CFACF Key Management Options

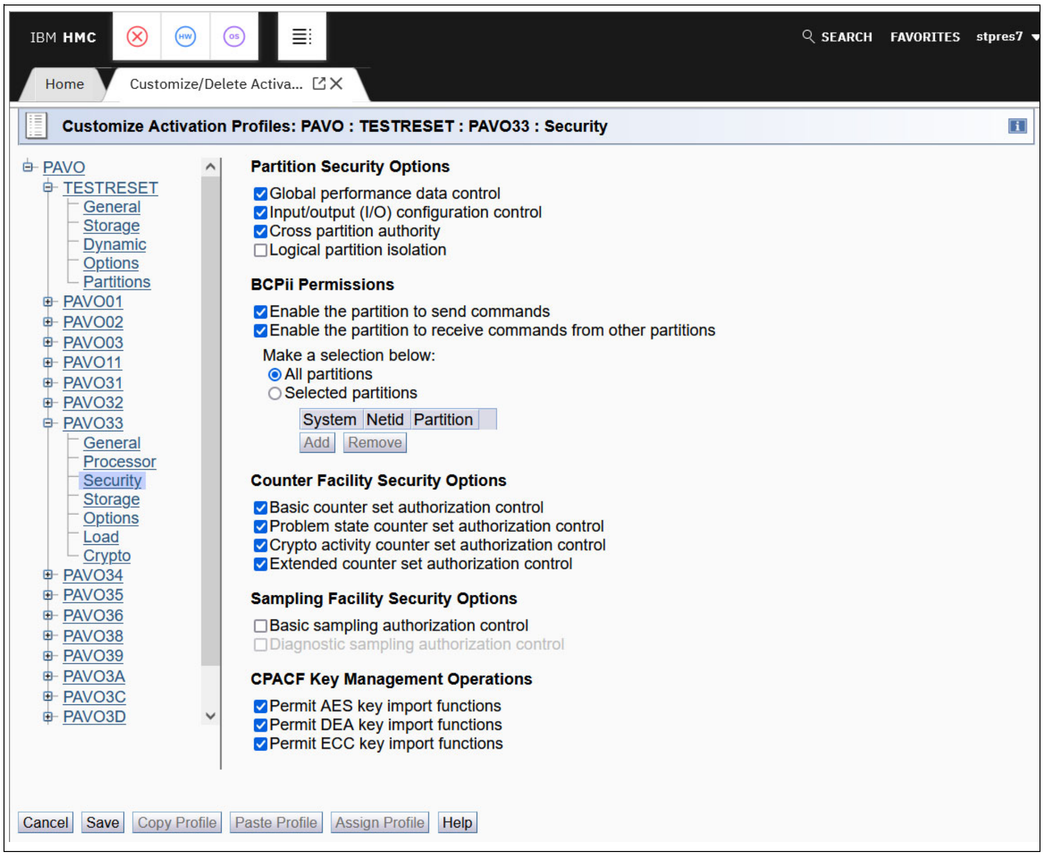


Figure 5-25 Image Profile: Security

5.4.4 Image Profile: Storage page

Click **Storage** to set up the partition Initial and Reserved storage and Virtual Flash Memory (VFM) Initial and Maximum values (see Figure 5-26). Review the following settings:

- Central Storage Amount, Initial, and Reserved
- Virtual Flash memory Initial and Maximum

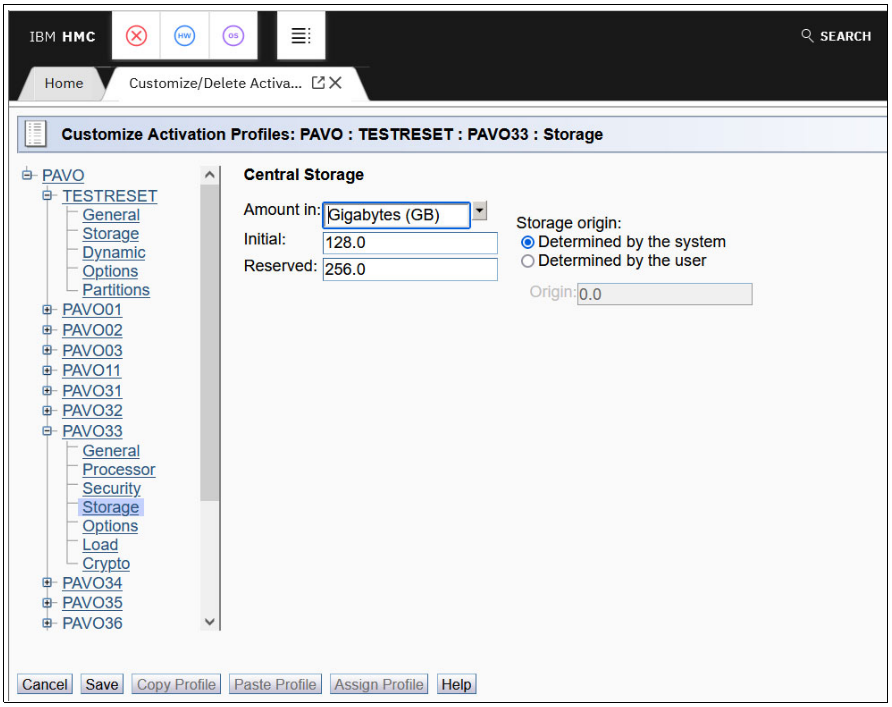


Figure 5-26 Image Profile: Storage

5.4.5 Image Profile: Options page

Click the **Options** link to set up the partitions defined capacity (see Figure 5-27).

Review the following settings:

- Minimum input/output (I/O) priority
- Maximum input/output (I/O) priority
- Defined capacity
- CP management cluster name

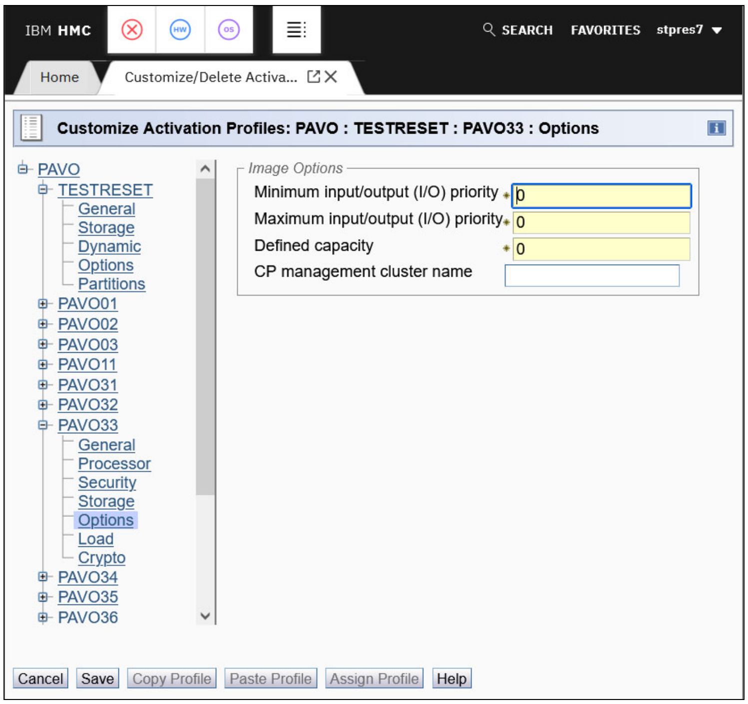


Figure 5-27 Image Profile: Options

5.4.6 Image Profile: Load page

Click the **Load** link if you want to set up any automatic load (IPL) parameters when the partition is activated by using a POR or image profile activation. If you prefer not to use IPL to load a z/OS system into a partition during a POR or image profile activation, then you can set up and activate load profiles, and then use them when they are required. This topic is mentioned in the following section (see Figure 5-28).

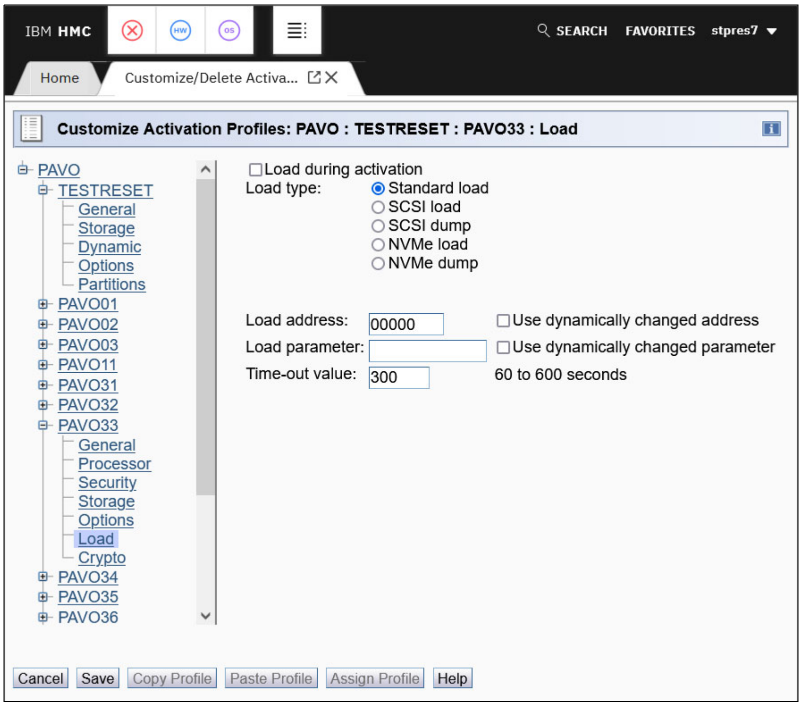


Figure 5-28 Image Profile: Load

5.4.7 Image Profile: Crypto page

Click the **Crypto** link to define the Crypto Domain Index IDs and the number of Crypto that are engines that are assigned to that Domain ID, and whether they are only a candidate or a candidate and online (see Figure 5-29). Review the following settings:

- Assigned Domains, which is where you first assign a Domain Index ID.
- Assigned Cryptos, which is where you assign which of and how many of the installed Crypto engines are assigned to the Domain ID and this partition.

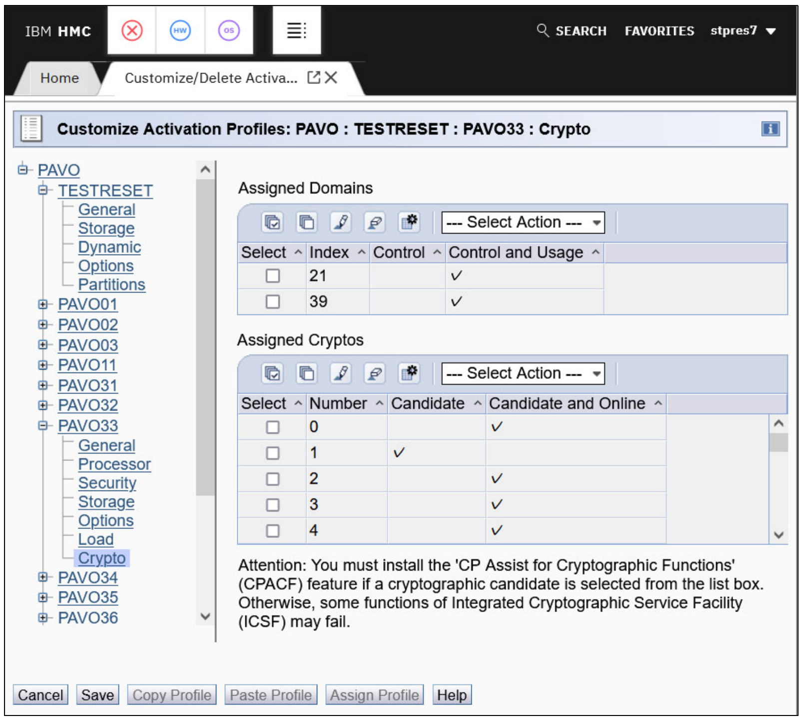


Figure 5-29 Image Profile: Crypto

5.4.8 Image Profile: Time Offset

If you selected **Logical partition time offset** in the General window, then an extra window opens in the image profile that is called Time Offset. Here, you can select the partition time offset against the CPC time as set by the Server Time Protocol (STP) (see Figure 5-30). Review the following settings:

- Offset: Days, hours, and minutes
- Decrease or Increase time value

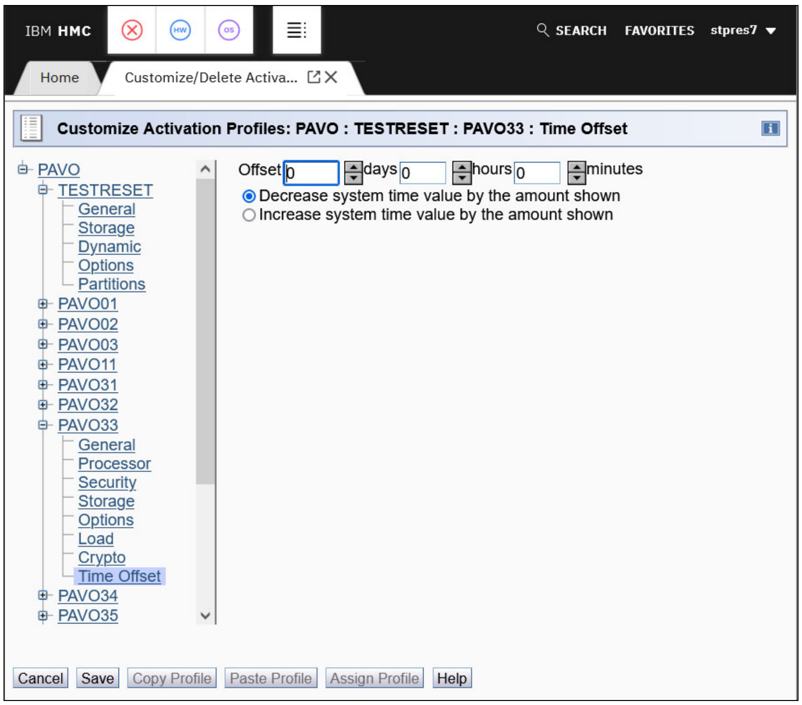


Figure 5-30 Image Profile: Time Offset

5.4.9 Image Profile: Saving

After you customize all the required image profiles for this reset profile, click **Save** to save the reset (and image) profiles for POR. If you have only a few LPARs that require activation, then perhaps it is simpler to deactivate and activate those image profiles individually. (It depends on your situation.) HMC asks for confirmation to continue to save. Click **OK** (see Figure 5-31).

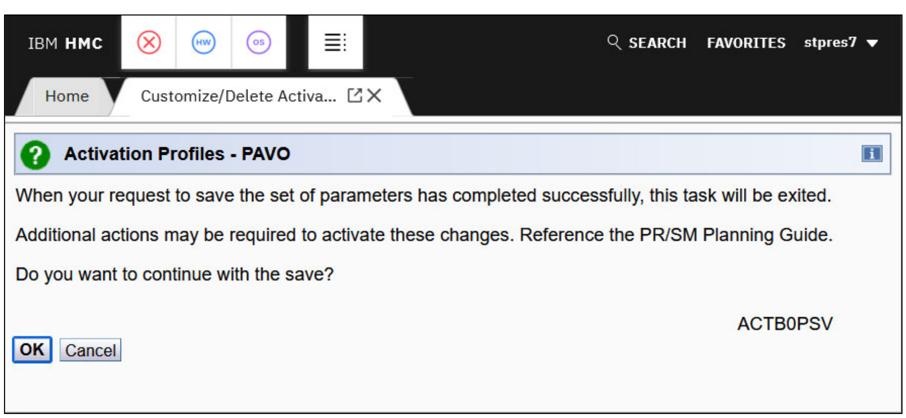


Figure 5-31 Reset and Image profile: Confirmation to save

For planning information, see Chapter 2, “Planning considerations” on page 7.

5.5 Performing a Power on Reset on the new CPC

Note: This section’s activities are based on the IBM z16 A01 (3931). However, they can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

When the 8561 processor is upgraded to a 3931 processor, your IBM SSR performs a POR with a Diagnostic IOCDS.

After this process is complete and the IBM SSR is satisfied with the status of the processor, they hand over the processor to you. Then, you can run another POR by using the reset profile that was created in 5.3.2, “Building the reset profile and pointing it to the required IOCDS” on page 102.

The 3931 processor is now ready to be activated (POR) by using the production reset profile. This process is optional but preferred depending on how many partitions that you defined on the processor.

5.5.1 Coupling Facility Links

After the POR completes with your specific customer configuration and the coupling links come online to the CF and z/OS LPARs on this CPC and any links to other CPCs, verify that they are online and established a link. One way to do this process is to display the CHPID by using Channel Problem Determination on the HMC.

To use the Channel Problem Determination process, complete the following steps:

1. Log on by using SYSPROG authority to the HMC for the new 3931 processor.
2. Click **Systems Management** to expand the list.
3. Under Systems Management, click the radio button next to the system to select it (in this example, **PAVO**).

4. In the Tasks window, click **Recovery** to expand it, and select **Single Object Operations** (see Figure 5-32).

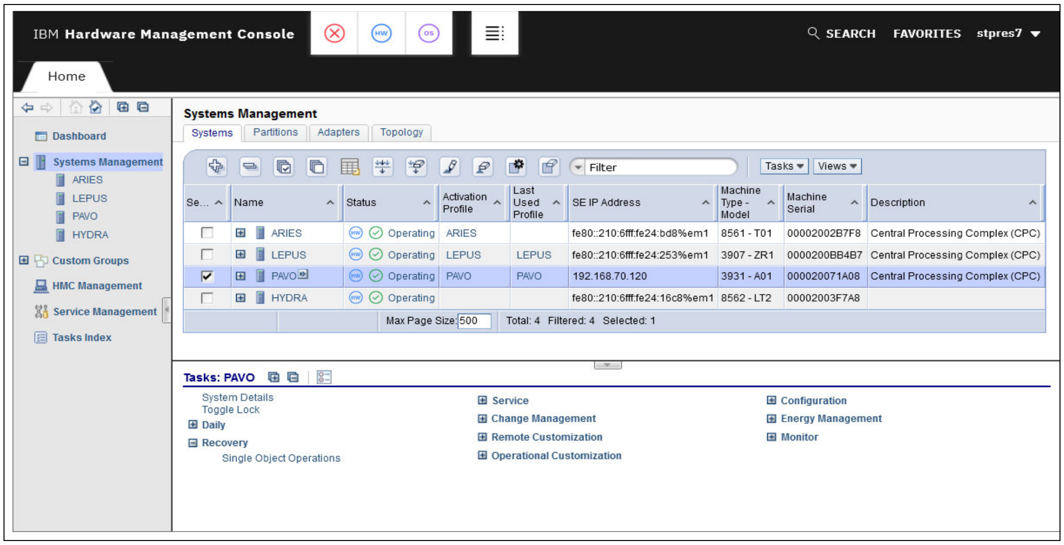


Figure 5-32 Systems Management: Main window

5. Click **OK** on the confirmation window.
6. Click **System Management** to expand the list.
7. Under Systems Management, click the CPC name to expand the options (in this example, **PAVO**).
8. Click **Partitions** to expand the list of partitions.
9. Scroll through the list of partitions until you find one of the CF partitions or z/OS partitions to which the coupling links are connected (in our example, we select **PAVO3E**).
10. Click the partition name to expand the options under the partition name.
11. Click **CHPIDs** to display the CHPID list that is specific to this LPAR (see Figure 5-33).

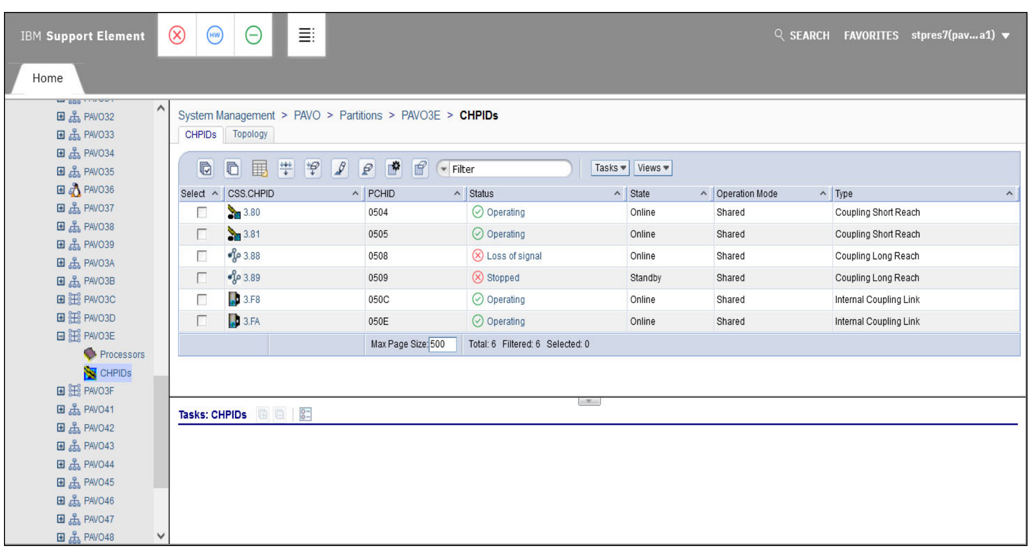


Figure 5-33 System Management: Single Object Operation

12. Select the CHPID that you want to verify. We view CHPID 3.80 (CSS=3, CHPID=80).

13. There are two ways to show the options for this CHPID: Either click the **>>** symbol next to the CHPID to expand its options, or click **CHPID Operations** to expand the options and then click **Channel Problem Determination** (see Figure 5-34).

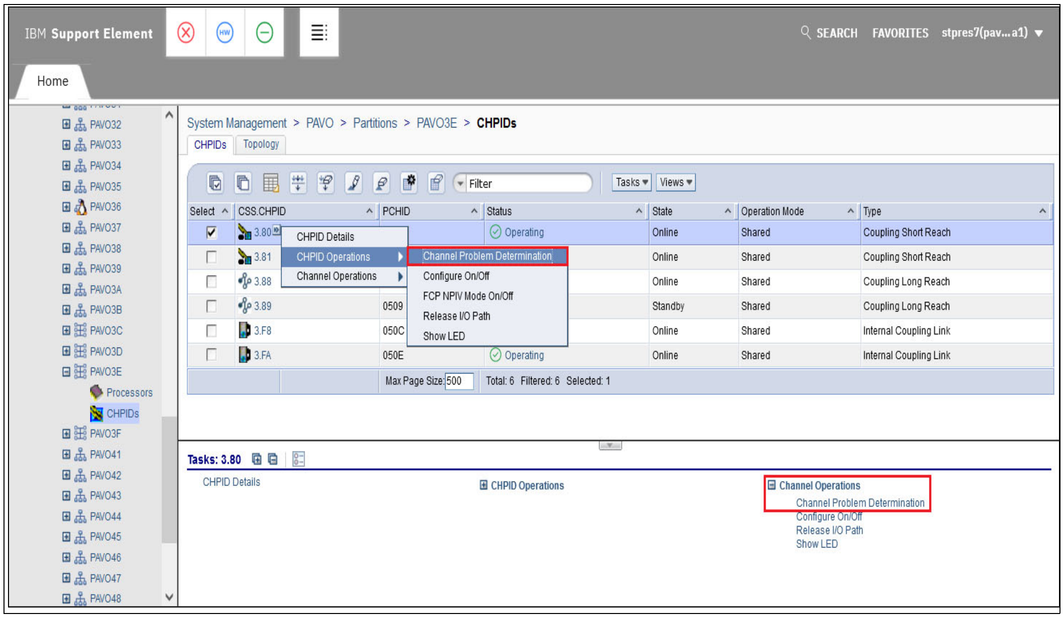


Figure 5-34 System Management: CHPID Operations

14. The HMC shows the Channel Problem Determination options. Select **Analyze channel information**, and then click **OK** (see Figure 5-35).

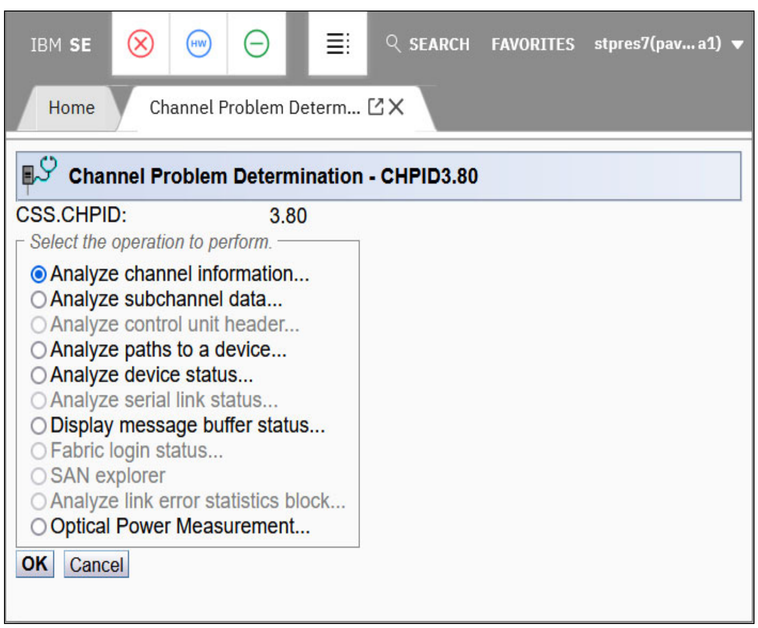


Figure 5-35 Channel Problem Determination: Analyze channel information

Note the following items (see Figure 5-36):

– State: Online
– Status: Operating
– Node type: Attached
– Node status: Valid
– Type/model: 8561-T01 (device that the CHPID is connected to)
– Seq. number: 2B7F8 (serial number of the device that the CHPID is connected to)
– Tag: 80 (in this case, the destination CHPID of CHPID 80)

Note the physical channel ID (PCHID) of 0504. This PCHID number is allocated by the CPC when this particular CHPID (Integrated Coupling Adapter Short Reach (ICA SR)) is defined to the HSA configuration.

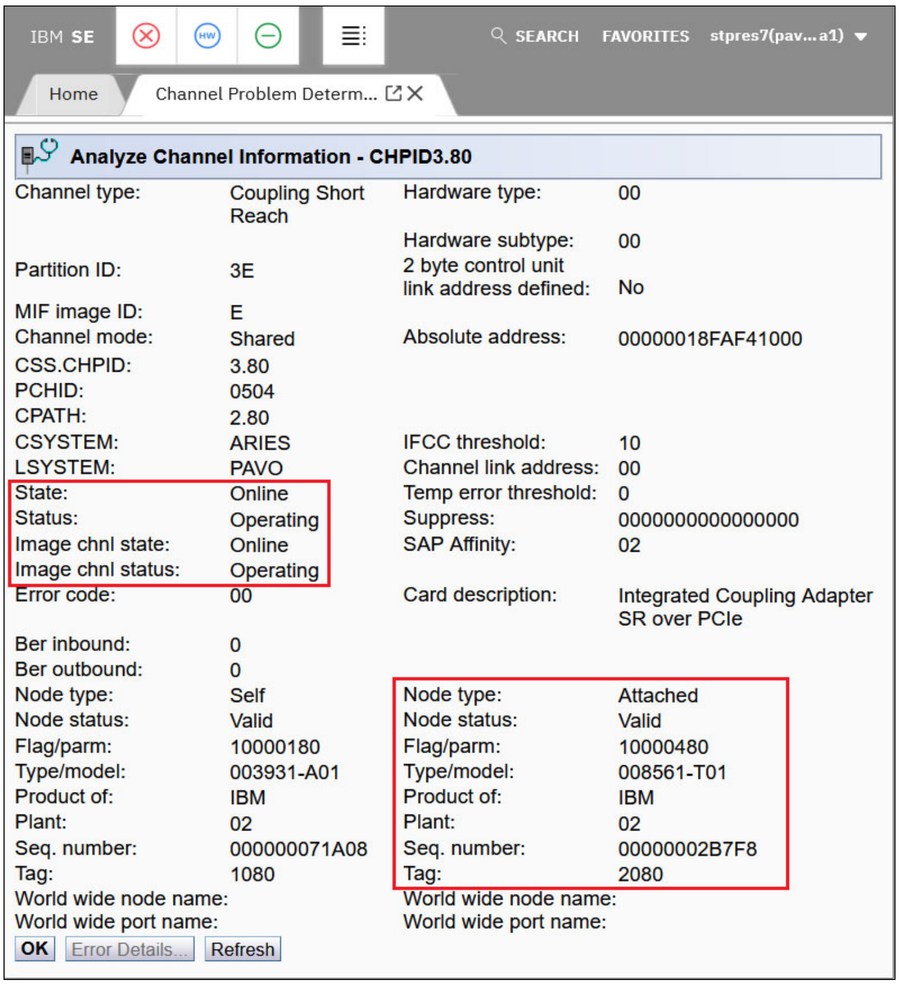


Figure 5-36 Channel Problem Determination: Display

This window verifies that the CHPID is online and operating, and also what the CHPID (cable) is connected to.

15. Continue to verify all other CF links that are defined and online.

5.5.2 Dynamic I/O configuration for a Stand-Alone Coupling Facility

Many customers have Stand-Alone Coupling Facilities (SACFs). A true SACF cannot change the I/O configuration dynamically because of a missing HCD running on the CPC. Changing the I/O configuration for such a CPC is cumbersome and error-prone, and it requires a POR of the CPC.

Dynamic configuration capabilities for SACFs were added to the IBM z14 system (driver level 36) and is available on the IBM z15 and IBM z16 systems.

To prepare your environment to use this implementation, ensure that the following perquisites are in place. A short description of the new options on the processors cluster list is included at the end of 5.5.3, “Remote dynamic activation of I/O configurations for SACFs, Linux on IBM Z, and z/TPF” on page 120.

- The target and the source CPCs must be a IBM z14 (Driver level 36) or later system.
- The following z/OS APARs[1] for dynamic I/O configuration for SACF should be installed so that their functions are available:
  - OA54912
  - IO25603
  - OA53952
  - OA55404
- Ensure that the SACF has the correct support level selected like one of the levels that are shown in Figure 5-37.

```
+-------------------------- Supported Processors -------------------|
|Command===>________________________________________________________|
| Select one to view more details.
|
|   Processor
|   Type-Model Support Level
|   3906-M03   3906 support
|   3906-M03   3906 GA2 support        <===
|   3906-M04   3906 support
|   3906-M04   3906 GA2 support        <===
|   3906-M05   3906 support
|   3906-M05   3906 GA2 support        <===
|   3907-LR1   3907 LinuxONE support
|   3907-LR1   3907 GA2 support
|   3907-ZR1   3907 support
|   3907-ZR1   3907 GA2 support        <===
|   3931-A01   3931 support            <===
|   8561-LT1   8561 LinuxONE support
|   8561-T01   8561 support            <===
|   8562-LT2   8562 LinuxONE support
|   8562-T02   8562 support            <===
+--------------------------------------------------------------------
```

Figure 5-37 Support level that is needed

For more information, see 9.6, “Dynamic I/O for Stand-alone Coupling Facility” on page 229.

[1] For z/OS V2R3.

5.5.3 Remote dynamic activation of I/O configurations for SACFs, Linux on IBM Z, and z/TPF

IBM extended the Dynamic Activation of I/O configurations to Linux on IBM Z and z/TPF running on an IBM z16 CPC. This new support is applicable only when both the driving CPC and the target CPC are z16 with the required firmware support (Bundle S24 or higher) and when the driving system's z/OS level is 2.3 or higher with APAR OA65559.

The remote activation of dynamic changes avoids the need for disruptive hardware/firmware actions (Power-on Reset or Initial Microcode Load (IML)) to be taken to instantiate those configuration changes, reducing, or completely eliminating the client workload impact that would otherwise have resulted from taking these disruptive actions.

IBM z16 provides a supported capability to drive these hardware-only I/O configuration changes from a driving z/OS HCD instance to a remote target CPC, which is a CFy, Linux on IBM Z, and z/TPF.

Complete the following steps:

1. Provide the necessary authorization rights on your z/OS system that you use to initiate the hardware only activation. Use profiles `CBD.CPC.ACTIVATE.NetId.NAU` in class FACILTY NetId and NAU, as defined on the SE and shown in the Processor Cluster List panel:
   - READ is required for viewing and downloading the active configuration.
   - UPDATE is required for activating hardware changes only.

   > **Note:** For more information about this topic, see "Defining IBM RACF® profiles" in *z/OS HCD User's Guide*, SC34-2669.

2. Verify the RESET profile.

   Verify that the RESET profile has **Allow dynamic changes to the channel subsystem input/output definition** selected, as shown in Figure 5-38.

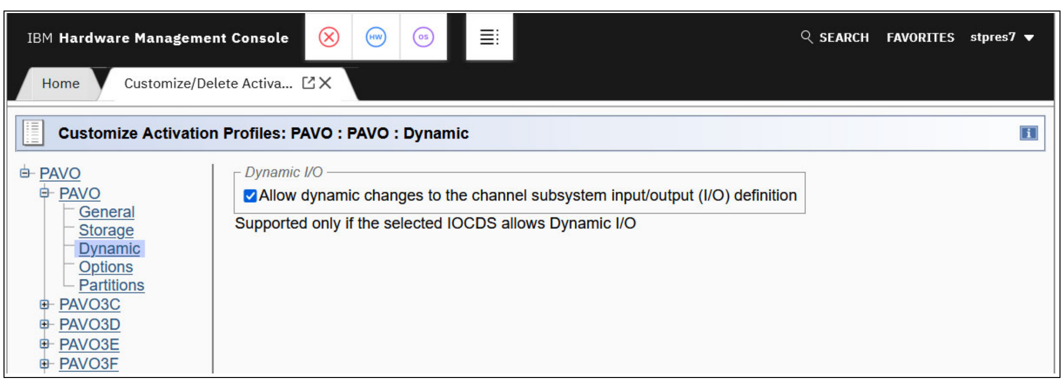


Figure 5-38 Allow dynamic changes to the channel subsystem input/output definition selected

3. After you perform the initial POR, update the reset profile by selecting **Use Active IOCDS**, which is necessary for future activations and PORs for the POR to complete by using the current IOCDS that was activated and written by using the HCD, as shown in Figure 5-39 on page 121.

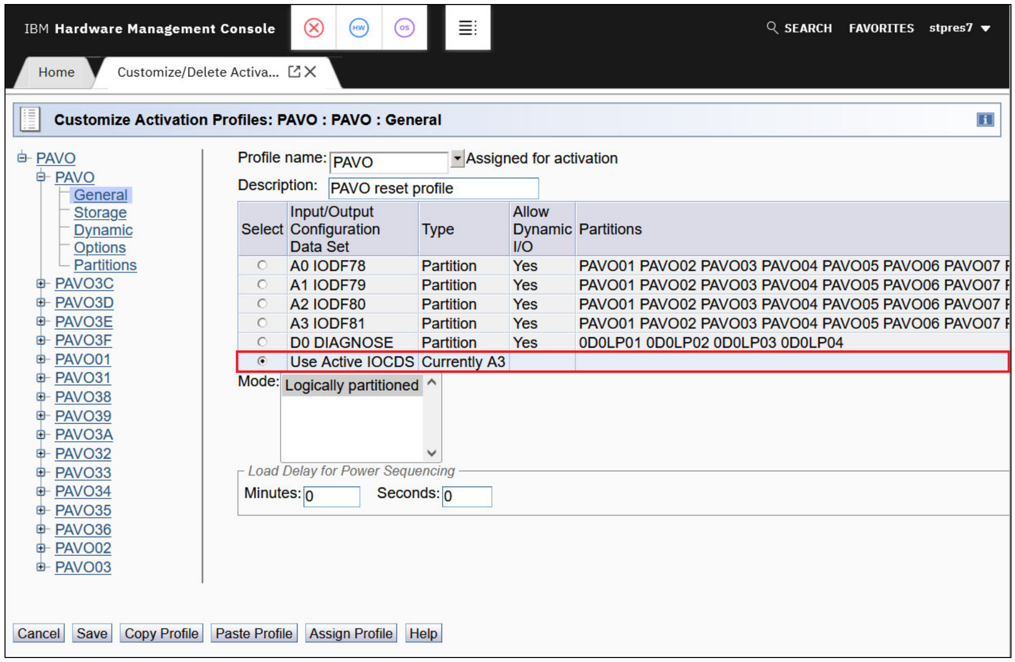


Figure 5-39 Using Active IOCDS

Note: The system is prepared for Dynamic I/O config for SACF. IBM z16 A01, IBM z16 A02, and IBM z16 AGZ systems support dynamic I/O config for SACF without the MCS_1 partition.

4. Make the necessary connectivity changes in your production IODF.
5. Activate the hardware configuration from an updated HCD/Hardware Configuration Manager running in z/OS LPAR on a remote IBM z14 (driver level 36) or later by selecting HCD option `2.11 Activate Hardware changes only (a)`, as shown in Figure 5-40.

```
Goto  Query  Help
------------- +----------------- Actions on selected CPCs ------
              |
Command ===>  |
              | Select by number or action code and press Enter.
Select one or |
              | 5_  1.  Work with IOCDSs . . . . . . . . . . (s)
  ----------- |     2.  Work with IPL attributes . . . . . . (i)
/ SNA Address |     3.  Select other processor configuration (p)
/ IBM390PS.AR |     4.  Work with CPC images  . . . . . . . .(v)
_ IBM390PS.HY |     5.  Activate hardware changes only . . . (a)
_ IBM390PS.LE |     6.  View current active configuration . .(c)
_ IBM390PS.PA |     7.  Download active configuration . . . .(d)
************* |
              |  F1=Help     F2=Split     F3=Exit     F9=Swap
              +--------------------------------------------------
```

Figure 5-40 Activate hardware changes only

After selecting `Activate hardware changes only (a)` with no recovery required, the activation parameters are presented, as shown in Figure 5-41.

```
+------------------- Activate New Hardware Configuration --------------------+
| CBDPDY50                                                                   |
|                                                                            |
| Specify or revise the values for IODF activation.                          |
|                                                                            |
| Source IODF . . . . . . : SYS9.IODF81                                      |
| Processor ID  . . . . . : ARIES                                            |
|                                                                            |
| Target IODF . . . . . . : SYS9.IODF82                                      |
| Processor ID  . . . . . . ARIES     +                                      |
|                                                                            |
| Test only  . . . . . . . . . . . . . . . . . . . . . Yes  (Yes or No)      |
| Allow hardware deletes (FORCE, FORCE=DEVICE) . . . . No   (Yes or No)      |
| Delete partition access to CHPIDs unconditionally                          |
| (FORCE=CANDIDATE)  . . . . . . . . . . . . . . . . . No   (Yes or No)      |
|                                                                            |
|  F1=Help     F2=Split    F3=Exit     F4=Prompt   F5=Reset    F9=Swap      |
| F12=Cancel                                                                 |
+----------------------------------------------------------------------------+
```

Figure 5-41 Activation parameters

Note: The parameters are the same as for hardware and software (full) activation, but without a target operating system (OS) configuration and Eligible Device Table (EDT). It is a hardware-only change.

The result is presented the same way as before. After some time (the activation runs synchronously and blocks the screen), you see the results as the normal HCD Message List. It is written to the HCD message log and SYSLOG.

On the HCD panel (message list), you can see something similar to what is shown in Figure 5-42.

```
+------------------------------- Message List --------------------------------+
¦   Save  Query  Help                                                         ¦
¦ ------------------------------------------------------------------------    ¦
¦ CBDPMSGO                                                       Row 1 of 4 ¦
¦ Command ===> ___________________________________________ Scroll ===> PAGE   ¦
¦                                                                             ¦
¦ Messages are sorted by severity. Select one or more, then press Enter.      ¦
¦                                                                             ¦
¦ / Sev Msg. ID  Message Text                                                 ¦
¦ _ E   CBDA887I Following devices are to be added to processor ARIES:        ¦
¦ #              0.FF84-0.FF8F,1.FF84-1.FF8F                                  ¦
¦ _ E   CBDA889I Following control units are to be modified for processor     ¦
¦ #              ARIES: 0.FFCC,1.FFCC                                         ¦
¦ _ E   CBDD800I All change requests were successfully executed               ¦
¦ **************************** Bottom of data ****************************** ¦
¦                                                                             ¦
¦  F1=Help       F2=Split      F3=Exit       F4=Prompt     F5=Reset           ¦
¦  F7=Backward   F8=Forward    F9=Swap      F10=Actions   F12=Cancel          ¦
¦ F13=Instruct   F22=Command                                                  ¦
+-----------------------------------------------------------------------------+
```

Figure 5-42 Activation result

6. Similar to any other activation process, you should write a IOCDS to SACF, switch to the newly written IOCDS, and ensure that `Use Active IOCDS` is selected in the RESET profile.

7. Configure the newly added hardware to SACF and Activate New image message:

 – On the CF side, check the status by running the **`Display CHP`** command and configure channels online by running the **`Configure xx online`** command from the Operating System Messages task for the respective CF LPAR, as shown in Figure 5-43.

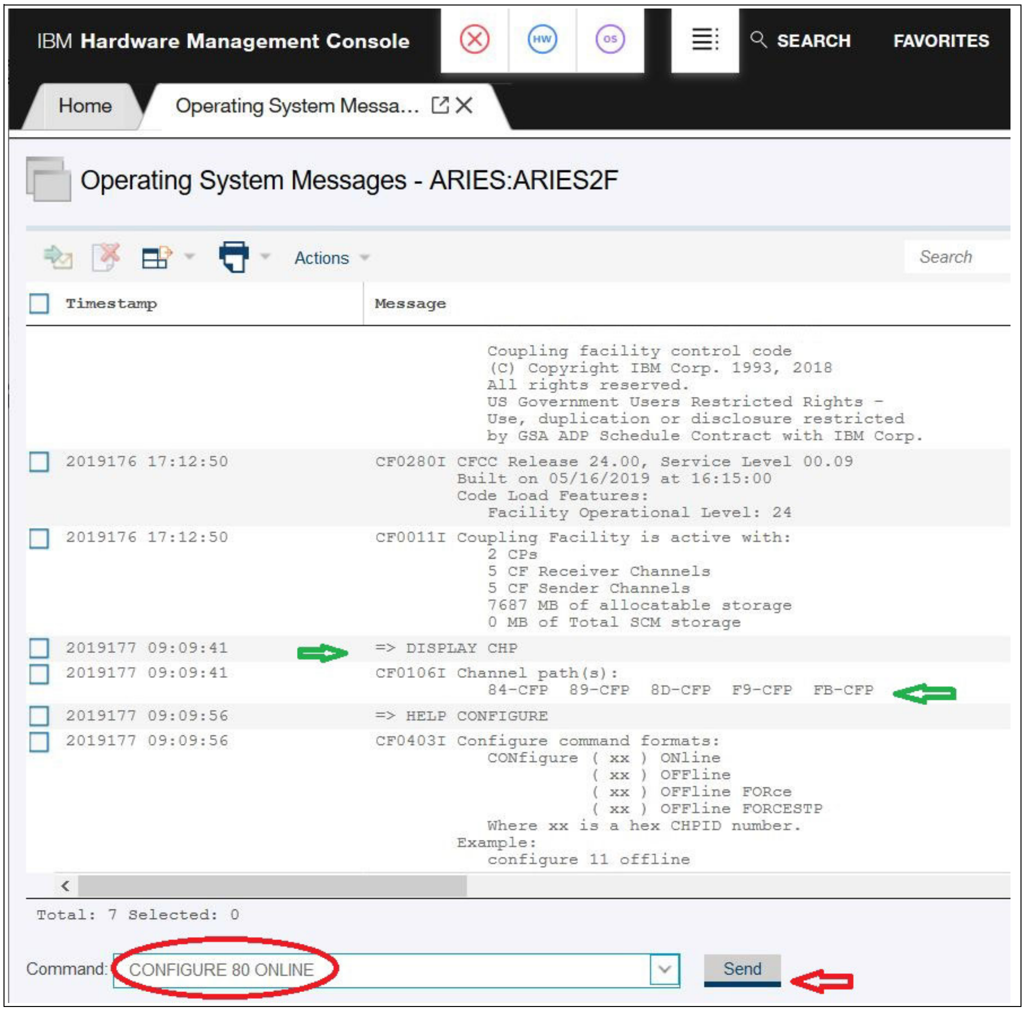


Figure 5-43 CF Operating System Message

 – On the z/OS side:

 i. Activate IODF in z/OS LPARs by using the best practice approach.

 Software changes (with VALIDATE) in all images and hardware changes in the last image per CPC. Write IOCDSs to z/OS CPCs and switch IOCDSs.

 ii. Ensure that newly added links are ONLINE to the respective z/OS LPARs.

 There are some commands that you can use to check the links, such as displaying the CHPIDs status or displaying the CF connectivity:

```
DISPLAY M=CHP
DISPLAY CF
DISPLAY CF,CFNAME=
```

 If some links are not in the expected state on the z/OS side, you can try to put them online by running the **`CF CHP(xx),online`** command.

Here are the new options on the Processor Cluster List (HCD option 2.11) for SACF activation:

- Use `View current active configuration (c)` to get information about the active configuration for the selected processor, as shown in Figure 5-44.

```
+------------------------ View Active Configuration -------------------------+
| CBDPDY60                                                                   |
|                                                                            |
| Source IODF . . . . . . : SYS9.IODF82                                      |
| Processor ID  . . . . . : ARIES                                            |
|                                                                            |
| HSA token . . . . . . . : ARIES    22-02-08 14:15:57                       |
|                                                                            |
| Recovery required . . . : No                                               |
| Target IODF . . . . . . : SYS9.IODF82                                      |
| Processor ID  . . . . . : ARIES                                            |
|                                                                            |
|  F1=Help     F2=Split    F3=Exit     F9=Swap    F12=Cancel                 |
+----------------------------------------------------------------------------+
```

Figure 5-44   View Active Configuration

Note: The IBM z16 does not support the `(d)` option, `Download active configuration`.

- Use `Activate hardware changes only (a)` to activate a Dynamic I/O configuration for SACF, as shown in step 5 on page 121.

5.6 Server Time Protocol configuration

Now that the CF links are verified as connected and online, you can set up the STP configuration.

The STP or Manage System Time option on the HMC under Configuration uses a GUI.

Note: SE 2.15.0 (IBM z15 system) or later no longer supports the System (Sysplex) Time task. The System (Sysplex) Time task was replaced by the Manage System Time task on the HMC.

For more information about the new GUI and how to set up the STP Coordinated Timing Network (CTN), see Chapter 8, “Preparing for IBM Parallel Sysplex and Server Time Protocol” on page 201.

5.7 Building and verifying load (IPL) profiles

The CPC underwent POR, the images profiles are defined and activated, the CF links are verified, and the STP and its roles are set up. Now, you can define a load (IPL) profile to use to activate (perform an IPL) an LPAR.

To build a load profile, complete the following steps:

1. Log on by using SYSPROG authority to the HMC for the new 3931 processor.
2. Under Systems Management, click **Systems Management** to expand the list.
3. Under Systems Management, select the radio button next to the system to select it (in this example, **PAVO**).
4. On the Tasks window, click **Operational Customization** to expand it, and select **Customize/Delete Activation Profiles** (see Figure 5-45).

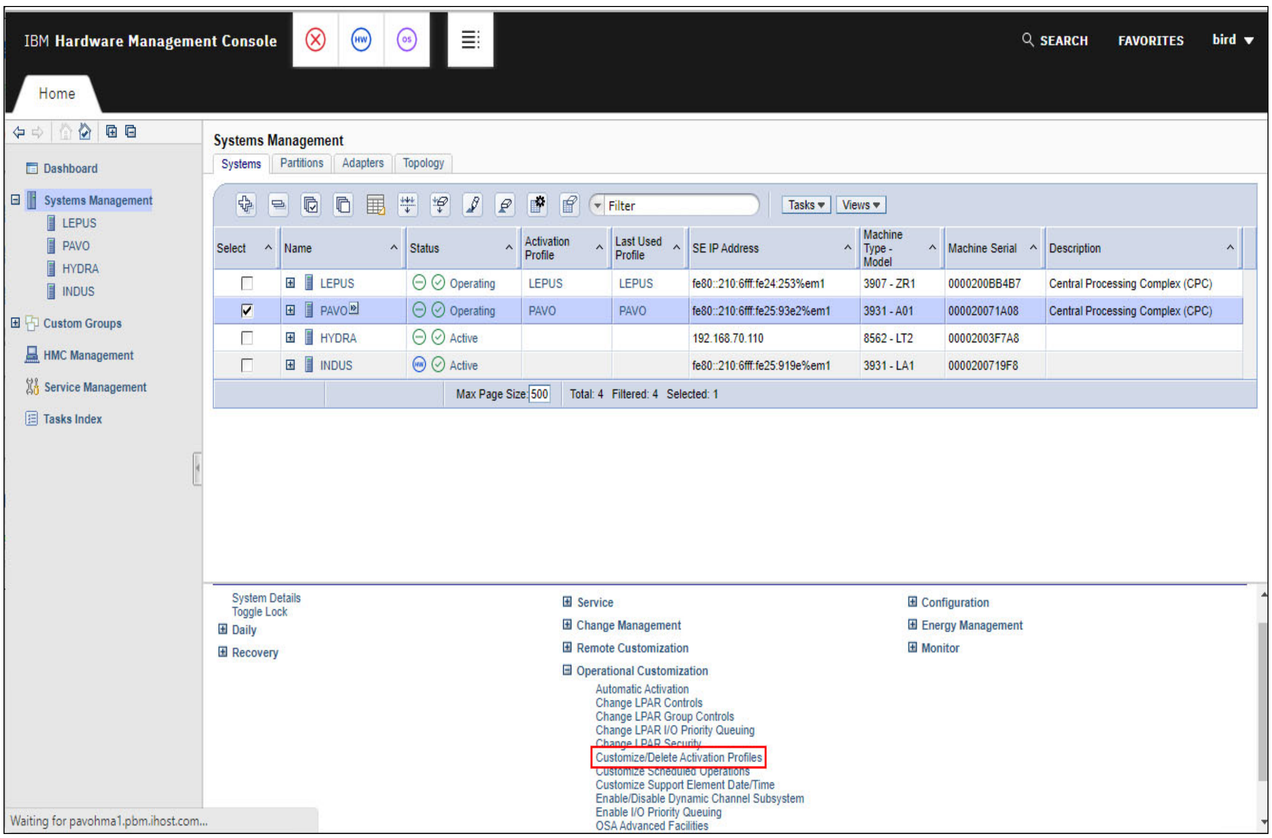


Figure 5-45 Systems Management: Main display

5. Select the DEFAULTLOAD load profile and click **Customize profile**. See Figure 5-46 on page 127

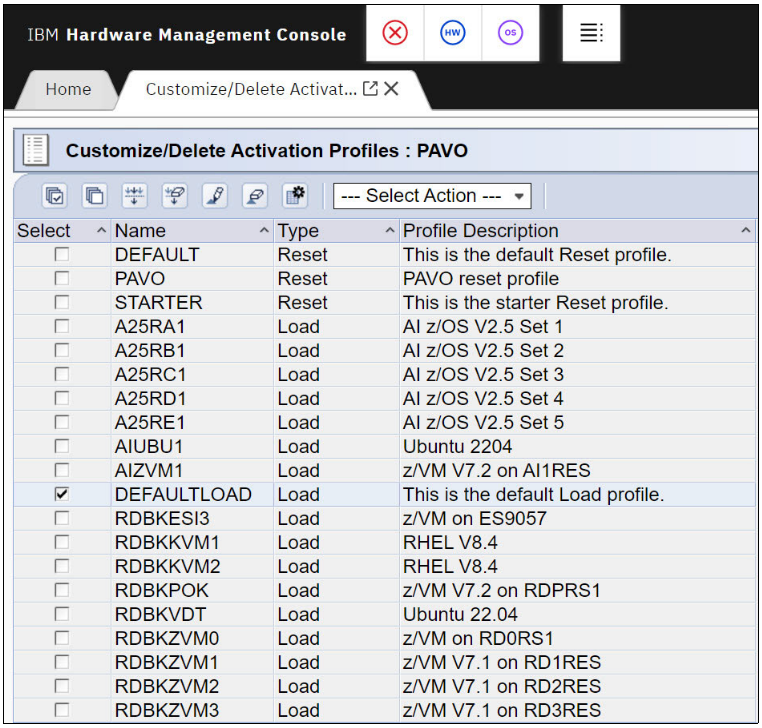


Figure 5-46 DEFAULTLOAD load profile

6. Enter the required parameters that are specific to your installation to perform an IPL:
   - Profile name: Type your preferred profile name over DEFAULTLOAD.
   - Description: Enter your preferred description.
   - Load type: Standard load.
   - Load address: The device address of the IPL volume (911E).
   - Load parameter: 944301M1:
     - 9443: The device address of the IODF volume
     - 01: The suffix of the LOADxx member in SYS#.IPLPARM on device 9443
     - M: Automatic IPL
     - 1: SYS1.NUCLEUS

Figure 5-47 shows an example.

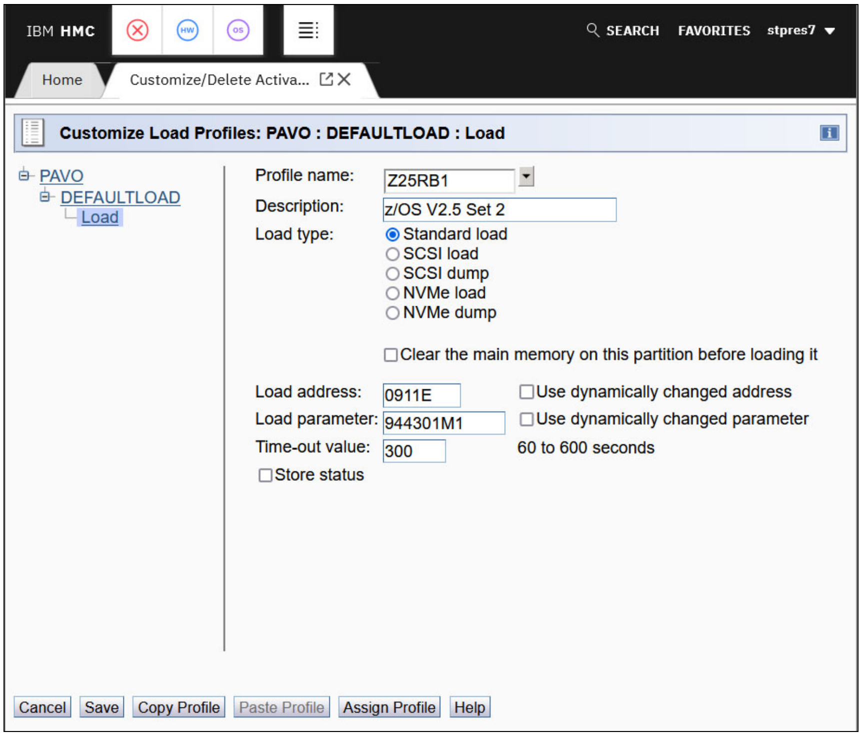


Figure 5-47 Customize Load Profiles: Load

7. Click **Save**, and then click **OK** to continue to the Save window (see Figure 5-48).

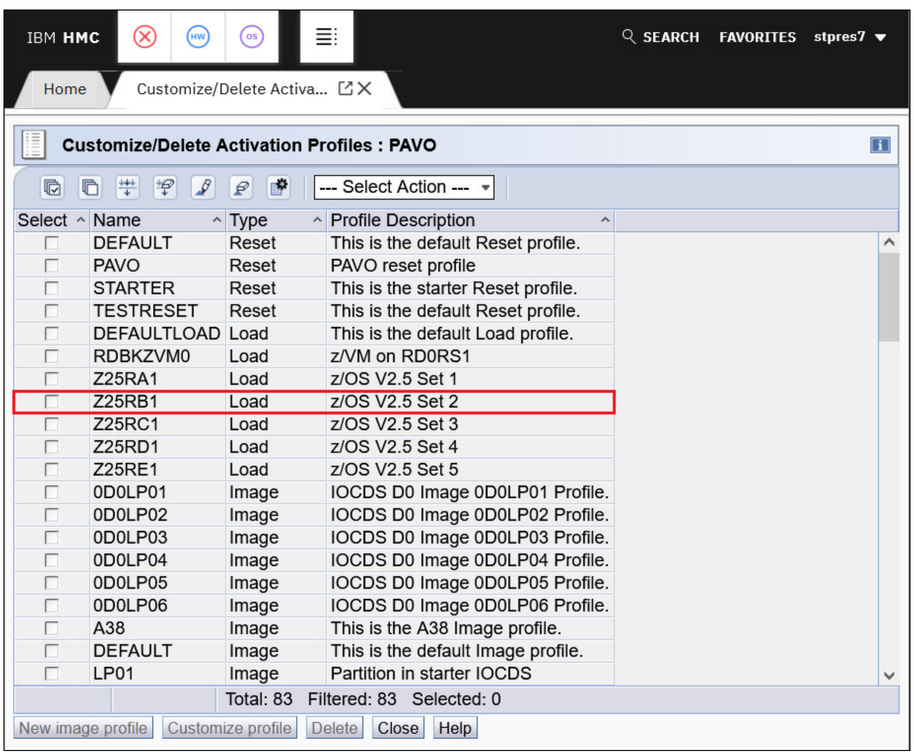


Figure 5-48 Customize Load Profiles: New Load profile

For planning information, see Chapter 2, “Planning considerations” on page 7.

5.8 Building and verifying LOADxx members in SYS#.IPLPARM

A LOADxx suffix is required to perform an IPL. This data set member is stored in SYS#.IPLPARM on the volume that the IODF is written to. In our example, this volume is 9443 (IODFPK). The # is the value that you use in your installation for SYS# data sets. The # may be any number 0 - 9, for example, SYS0.IPLPARM.

If you prefer to use the **HWNAME** keyword to point to the Processor ID, update this parameter to point to the new Processor ID (in this example, from PAVO). Sometimes the **LPARNAME** keyword is also used in the LOADxx members, and it might need to be reviewed or updated, such as PAVO33.

> **Note:** If you are going to share a LOADxx member with many partitions, then the **HWNAME** and **LPARNAME** keywords are required.

To build and verify LOADxx members in SYS#.IPLPARM, complete the following steps:

1. Log on by using Time Sharing Option (TSO) to a system that has access to the SYS#.IPLPARM data set that is on the IODF volume that you use to perform the IPL.
2. Edit data set SYS#.IPLPARM and edit member LOADxx. Figure 5-49 shows the settings that are used in our example.

```
File  Edit  Edit_Settings  Menu  Utilities  Compilers  Test  Help
-------------------------------------------------------------------------------
EDIT       SYS0.IPLPARM(LOAD01) - 01.99                   Columns 00001 00072
Command ===>                                                 Scroll ===> CSR
000024 *-----------DEFINITION FOR SC75-------------*
000025 HWNAME   ARIES
000026 LPARNAME ARIES23
000027 SYSPLEX  PLEX75   Y
000028 IODF     ** SYS9     ITSO     01 Y
000029 SYSCAT   BH5CAT123CMCAT.BH5CAT
000030 NUCLST   4A
000031 PARMLIB  SYS1.PARMLIB
000032 PARMLIB  SYS1.IBM.PARMLIB
000033 PROCVIEW CORE,CPU_OK
000034 *-----------
000035 HWNAME   PAVO
000036 LPARNAME PAVO33
000037 SYSPLEX  PLEX75   Y
000038 IODF     ** SYS9     ITSO     01 Y
000039 SYSCAT   BH5CAT123CMCAT.BH5CAT
000040 NUCLST   4A
000041 PARMLIB  SYS1.PARMLIB
000042 PARMLIB  SYS1.IBM.PARMLIB
000043 PROCVIEW CORE,CPU_OK
```

Figure 5-49 z/OS: SYS#.IPLPARM: LOADxx member

– The **HWNAME** keyword is set to `PAV0`.

– The **LPARNAME** keyword is set to `PAV033`.

– The **IODF** keyword is set to ** (where ** directs the IPL to look at what IODF / IOCP underwent a POR into the CPCs HSA, and then look on the IODF volume for that corresponding IODF). A specific IODF suffix number can be defined in the `LOADxx` member if you must override the HSA match.

– The **IODF** keyword points to the High-Level Qualifier of the IODF data set (SYS9) and the operating system configuration (OSCONFIG) that this system uses (`ITSO`). The OSCONFIG is the other part of an IODF that the IPL uses to determine which devices it can access, along with Nucleus Initialization Program Consoles and Esoterics.

– The remaining parameters are used for z/OS and not for the IODF.

5.9 Communicating information about the new CPC

Now that you made a new CPC with a new name in the configuration, you might want to communicate the new configuration specifics to the operations and support community in your organization.

6

Configuring network features

This chapter explains how to configure your network to connect to your IBM z16 A01 system.

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Preparing to define and customize Open Systems Adapter-Express
- Defining OSA-Express to your I/O configuration
- Customizing OSA-Express by using OSA Advanced Facilities
- Shared Memory Communications (SMC-R and SMC-D)
- Channel-to-channel connections

6.1 Preparing to define and customize Open Systems Adapter-Express

To define Open Systems Adapter-Express (OSA-Express) to your I/O configuration, you need the following information:

- The Open Systems Adapter (OSA) operation mode (channel path ID (CHPID) type)
- The physical channel ID (PCHID) of OSA-Express and the CHPID number that is associated with that PCHID
- The CHPID access list and the candidate list within the logical channel subsystem (LCSS)
- The CNTLINIT number and the IODEVICE number

These operations are described in detail in Chapter 13, “Adding network devices” on page 305.

Depending on your network configuration and environment, you can perform OSA-Express customization by using OSA Advanced Facilities. OSA Advanced Facilities is used for customizing the following settings:

- OSA Address Table (OAT) and the Systems Network Architecture (SNA) timer
- Physical port speed
- Media Access Control (MAC) address

These settings are described in 6.3, “Customizing OSA-Express by using OSA Advanced Facilities” on page 134.

6.2 Defining OSA-Express to your I/O configuration

Defining the OSA-Express involves these high-level steps:

- Choosing the OSA-Express CHPID type
- Defining the OSA-Express to I/O configuration
- Confirming your OSA-Express I/O definition

6.2.1 Choosing the OSA-Express CHPID type

Before using OSA-Express, you must choose the CHPID type. A summary of CHPID types that are supported in an IBM z16 A01 system is shown in Table 6-1. For more information, see the *Open Systems Adapter-Express Customer's Guide and Reference,* SA22-7935, and the *IBM Z Connectivity Handbook*, SG24-5444.

Table 6-1 Summary of OSA-Express CHPID types that are supported in an IBM z16

CHPID[a] type	OSA-Express operation mode
OSE	Non-Queued Direct Input/Output (QDIO) mode for SNA and TCP/IP networking (1000Base-T only)
OSD	QDIO mode for TCP/IP networking (1000Base-T, 1-Gigabit Ethernet (GbE), 10 GbE, and 25 GbE)
OSC	Open Systems Adapter Integrated Console Controller (OSA-ICC) (1000Base-T, 1-GbE)

a. CHPID types OSN, OSX, and OSM are not supported by IBM z16 systems.

Statements of Direction[a]:

- IBM z16 will be the last IBM Z to support the OSE CHPID type.
- IBM z16 will be the last IBM Z to support OSA Express 1000BASE-T hardware adapters.

a. Statements by IBM regarding its plans, directions, and intent are subject to change or withdrawal without notice at the sole discretion of IBM.

6.2.2 Defining the OSA-Express to I/O configuration

Define CHPID, CNTLUNIT, and IODEVICE to use OSA-Express. For more information about how to define an I/O configuration by using Hardware Configuration Definition (HCD), see Chapter 13, “Adding network devices” on page 305.

6.2.3 Confirming your OSA-Express I/O definition

You can confirm your definition by running the following z/OS command:

```
DISPLAY M=CHP(xx)
```

You can confirm the CHPID path status by running the command that is shown in Figure 6-1.

```
D M=CHP(D6)

IEE174I 07.03.26 DISPLAY M 858
CHPID D6:  TYPE=11, DESC=OSA DIRECT EXPRESS, ONLINE
DEVICE STATUS FOR CHANNEL PATH D6
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
01D6 +  +  +  +  +  +  +  +  +  +  +  +  +  +  +  +
SWITCH DEVICE NUMBER = NONE
PHYSICAL CHANNEL ID = 010C
OPERATING SPEED = 10G
PNETID 1 = PERFNET
************************ SYMBOL EXPLANATIONS ************************
+ ONLINE    @ PATH NOT VALIDATED   - OFFLINE    . DOES NOT EXIST
* PHYSICALLY ONLINE   $ PATH NOT OPERATIONAL
```

Figure 6-1 z/OS “D M=CHP” command

To confirm the channel path to a device, run the following command:

```
DISPLAY M=DEV(xxxx)
```

The node descriptor information that is returned includes the emulated control units (CUs) 1730.008 and 1732.001 that are used for the OSA-Express7S port. Also included is the 3931 machine type and serial number, as shown in Figure 6-2.

```
D M=DEV(1D60)

IEE174I 07.04.03 DISPLAY M 861
DEVICE 01D60   STATUS=ONLINE
CHP                   D6
ENTRY LINK ADDRESS    ..
DEST LINK ADDRESS     0D
PATH ONLINE           Y
CHP PHYSICALLY ONLINE Y
PATH OPERATIONAL      Y
MANAGED               N
CU NUMBER             1D60
INTERFACE ID          0C00
MAXIMUM MANAGED CHPID(S) ALLOWED:  0
DESTINATION CU LOGICAL ADDRESS = 00
SCP CU ND         = 001730.008.IBM.02.393100071A08.D600
SCP TOKEN NED     = 001730.008.IBM.02.393100071A08.D600
SCP DEVICE NED    = 001732.001.IBM.02.393100071A08.D600
```

Figure 6-2 The z/OS "D M=DEV" command

You can confirm the device number and the status by running the following command:

```
DISPLAY U
```

The device number and type of device that are defined are shown in Figure 6-3.

```
D U,,,1D60,1

IEE457I 07.05.39 UNIT STATUS 869
UNIT TYPE STATUS        VOLSER     VOLSTATE      SS
1D60 OSA  O                                       0

D U,,,1D6F,1

IEE457I 07.06.42 UNIT STATUS 873
UNIT TYPE STATUS        VOLSER     VOLSTATE      SS
1D6F OSAD O-RAL                                   0
```

Figure 6-3 The z/OS "D D U,,,device" command

6.3 Customizing OSA-Express by using OSA Advanced Facilities

OSA Advanced Facilities is a tool that is integrated into the Hardware Management Console (HMC). To start OSA Advanced Facilities, log in to the HMC with the proper authority, and select the central processor complex (CPC) that requires OSA customization. Then, select **Operational Customization** → **OSA Advanced Facilities** (Figure 6-4 on page 135).

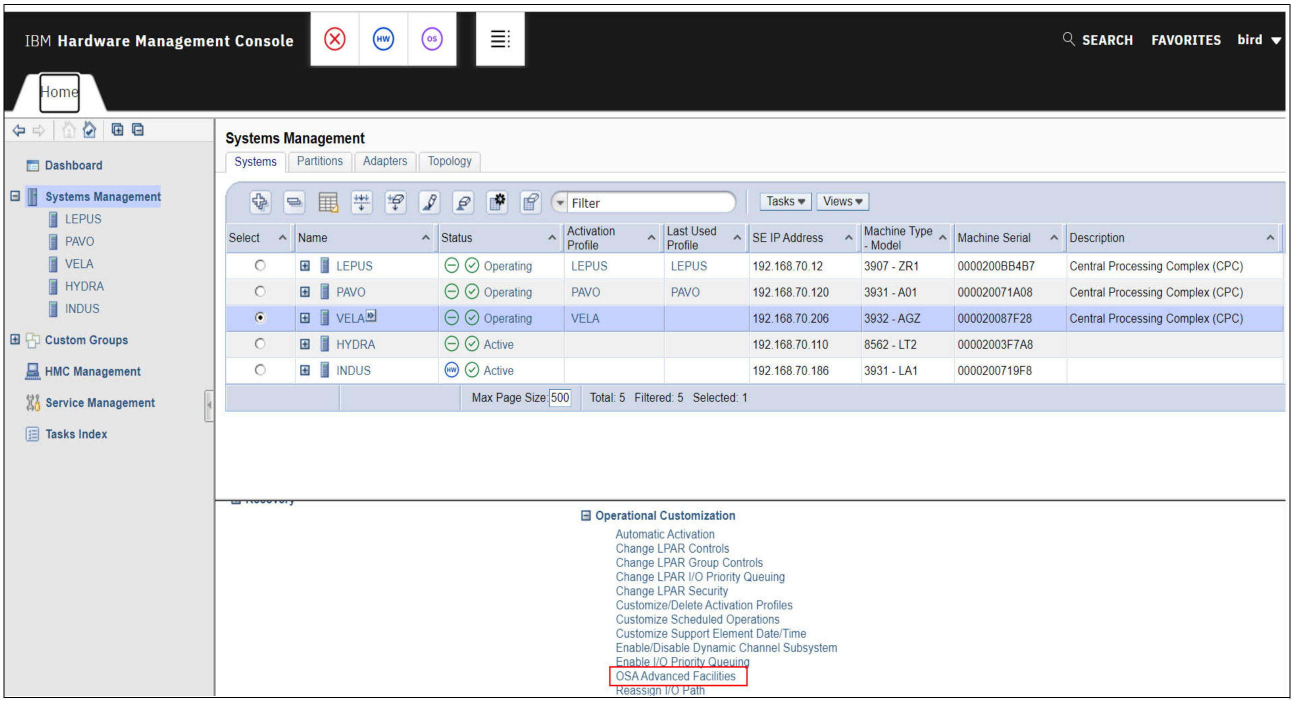


Figure 6-4 OSA/SF on the HMC: OSA Advanced Facilities selection

The OSA Advanced Facilities window that is shown in Figure 6-5 opens.

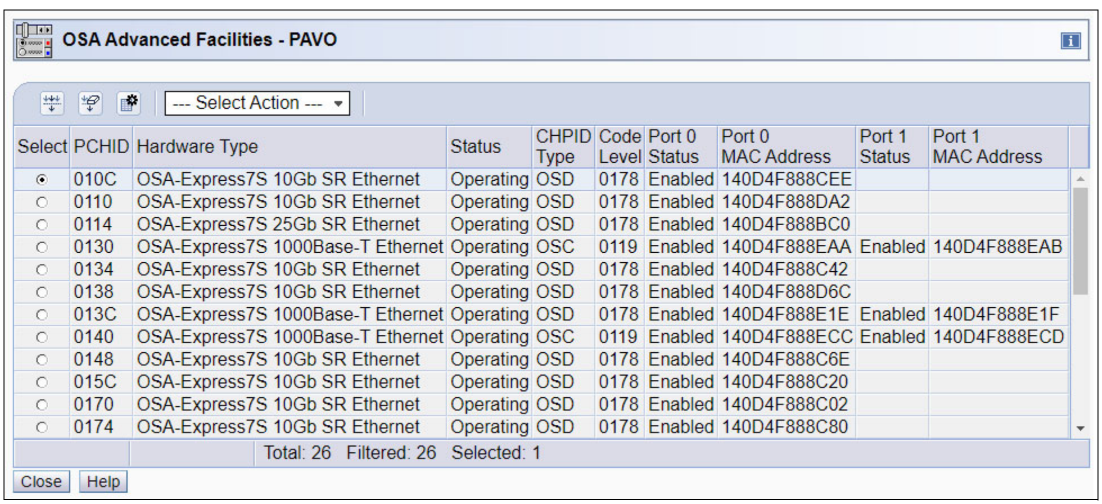


Figure 6-5 OSA/SF on the HMC: OSA Advanced Facilities initial window

6.3.1 Configuring OAT and the SNA LLC2 timer for an OSE channel

When you define OSA-Express as an OSE channel (non-QDIO mode), you must customize the OAT *except* for the following uses:

- Use *only* the default OAT and do *not* use (require) port sharing.
- OSA-Express Direct SNMP subagent.

For more information, see *Open Systems Adapter-Express Customer's Guide and Reference,* SA22-7935.

You can edit OAT by using the Open Systems Adapter/Support Facility (OSA/SF). OSA/SF is a tool for customizing OSA-Express. The OSA/SF tool is available on the HMC as a submenu of OSA Advanced Facilities.

For other CHPID types, OSA/SF is not required. If you must change the port speed or the MAC address, you can configure them from OSA Advanced Facilities. The OSA CHPID type and OSA/SF requirements are listed in Table 6-2.

Table 6-2 OSA/SF and OSA CHPID reference

OSA CHPID type	OSA/SF
OSE	Required
OSD	Not required
OSC	Not required

Note: CHPID types OSN, OSM, and OSX are not supported by IBM z16.

When you use a SNA network that uses an OSE channel and must change the SNA timer (SNA LLC2 parameter), you must customize the parameters in OSA Advanced Facilities. For more information, see *Open Systems Adapter-Express Customer's Guide and Reference,* SA22-7935.

If you are upgrading from IBM z14 or IBM z15 to IBM z16 A01, or if you are upgrading IBM z15 T02 to IBM z16 A02 or IBM z16 AGZ, and your configuration uses the OSA-Express6S or OSA-Express7S 1000Base-T feature, your OSE configuration is automatically migrated. After this process completes, check the configuration by using OSA/SF on the HMC.

Customizing the OAT and the SNA timer

Note: Before you customize OAT and the SNA timer by using OSA/AF on the HMC, see *Open Systems Adapter/Support Facility on the Hardware Management Console,* SC14-7580. You can download it from IBM Resource Link.

To customize the OAT and the SNA timer for an OSE channel, complete the following steps:

1. Start OSA Advanced Facilities.
2. The OSA Advanced Facilities window opens (Figure 6-6). Select the OSE channel PCHID that you want to customize. In this example, we select PCHID 01CC. Then, select **Card specific advanced facilities** from the **Select Action** menu, as shown in Figure 6-6.

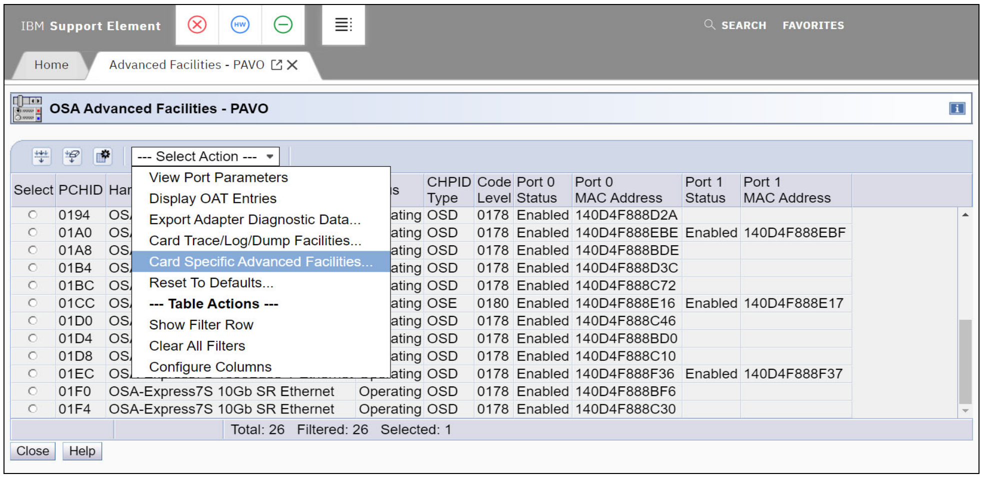


Figure 6-6 OSA/SF on the HMC: Card Specific Advanced Facilities

3. The Advanced Facilities window opens (Figure 6-7). To edit OAT and the SNA timer entries, select **Panel configuration options** and click **OK**.

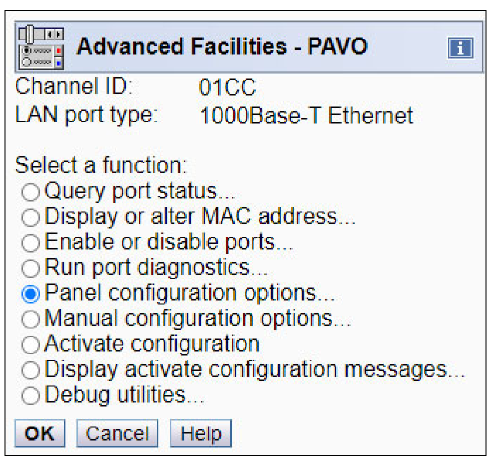


Figure 6-7 OSA/SF on the HMC: Panel configuration options

4. The Panel Configuration Options window opens (Figure 6-8). You can define these items:

Edit OAT entries By selecting this option, you can edit the OAT and SNA definition. An OAT entry defines the data path between an OSA feature port and a logical partition (LPAR) image.

Edit SNA timers By selecting this option, you can enter the SNA timer values.

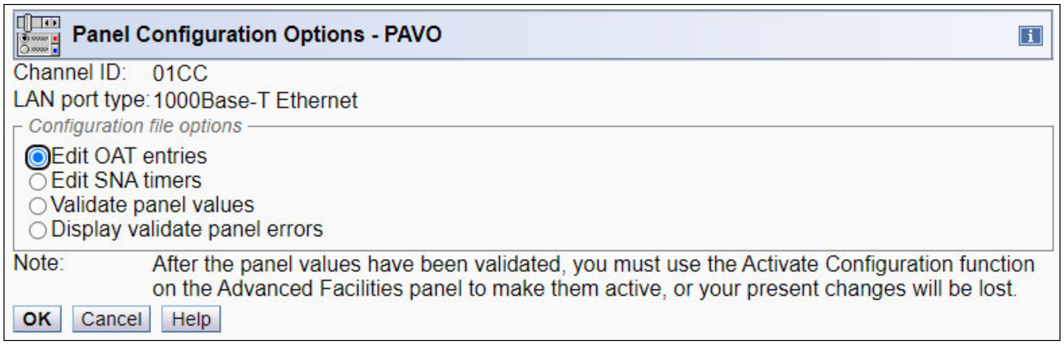
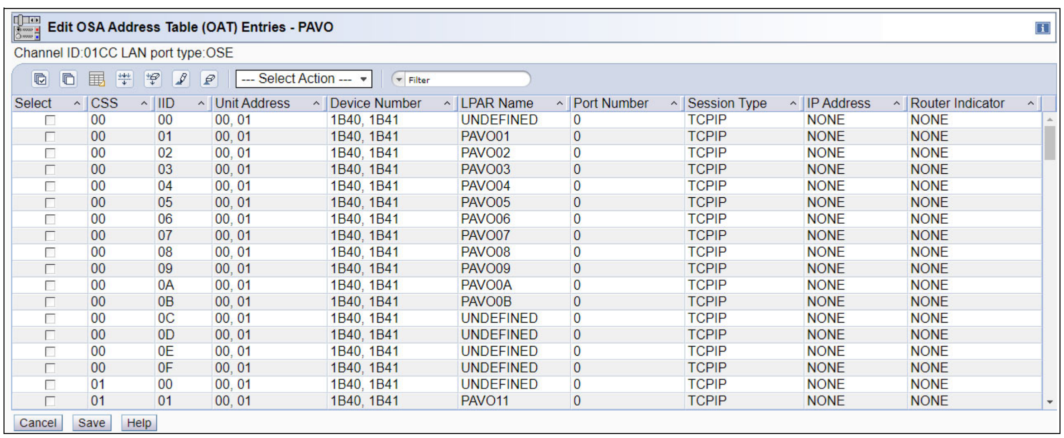


Figure 6-8 OSA/SF on the HMC: Configuration file options

5. Choose **Edit OAT entries**, and the Edit OSA Address Table (OAT) Entries window opens, as shown in Figure 6-9.



Select	CSS	IID	Unit Address	Device Number	LPAR Name	Port Number	Session Type	IP Address	Router Indicator
	00	00	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	00	01	00, 01	1B40, 1B41	PAVO01	0	TCPIP	NONE	NONE
	00	02	00, 01	1B40, 1B41	PAVO02	0	TCPIP	NONE	NONE
	00	03	00, 01	1B40, 1B41	PAVO03	0	TCPIP	NONE	NONE
	00	04	00, 01	1B40, 1B41	PAVO04	0	TCPIP	NONE	NONE
	00	05	00, 01	1B40, 1B41	PAVO05	0	TCPIP	NONE	NONE
	00	06	00, 01	1B40, 1B41	PAVO06	0	TCPIP	NONE	NONE
	00	07	00, 01	1B40, 1B41	PAVO07	0	TCPIP	NONE	NONE
	00	08	00, 01	1B40, 1B41	PAVO08	0	TCPIP	NONE	NONE
	00	09	00, 01	1B40, 1B41	PAVO09	0	TCPIP	NONE	NONE
	00	0A	00, 01	1B40, 1B41	PAVO0A	0	TCPIP	NONE	NONE
	00	0B	00, 01	1B40, 1B41	PAVO0B	0	TCPIP	NONE	NONE
	00	0C	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	00	0D	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	00	0E	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	00	0F	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	01	00	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	01	01	00, 01	1B40, 1B41	PAVO11	0	TCPIP	NONE	NONE

Figure 6-9 OSA/SF on HMC: Edit OSA Address Table (OAT) Entries window

6. To edit, select the device in the left column, as shown in Figure 6-10. Click **Select Action** and choose either **Edit as TCP/IP entry** or **Edit as SNA entry** for the selected device.

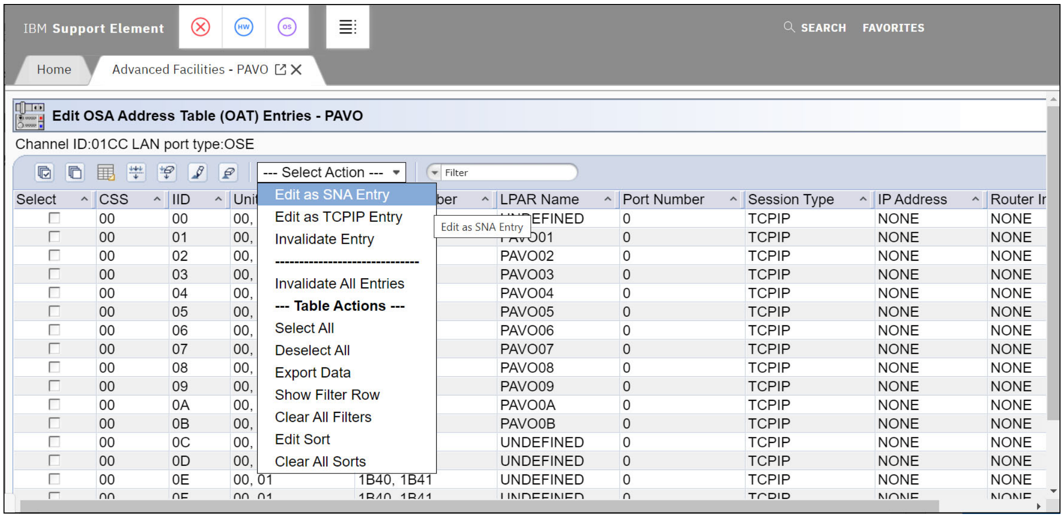


Figure 6-10 OSA/SF on the HMC: Select Action for Edit OSA Address Table (OAT) Entries window

7. Select **Edit as SNA Entry**, and the OSA Address Table (OAT) Entry window that is shown in Figure 6-11 opens. Select the appropriate SNA entry and click **OK**.

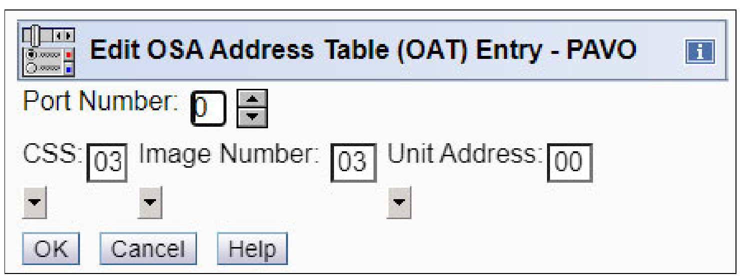


Figure 6-11 OSA/SF on the HMC: Edit SNA entry window

8. Select **Edit as TCP/IP Entry**, and the Edit OSA Address Table (OAT) Entry that is shown in Figure 6-12 opens. Enter and select the appropriate TCP/IP parameters here, and then click **OK**.

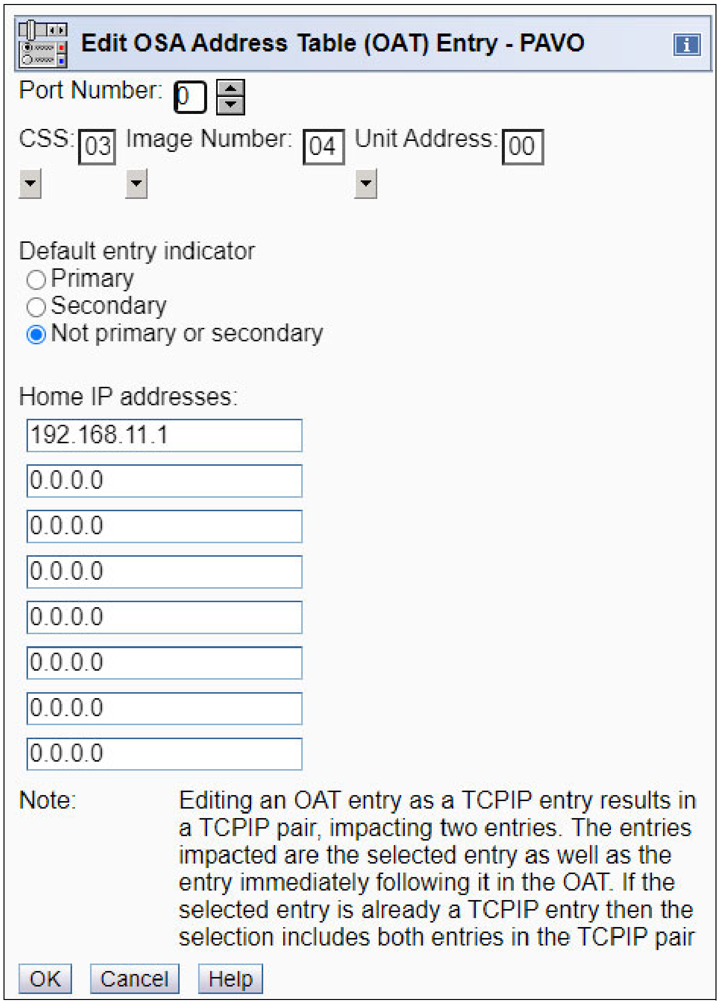
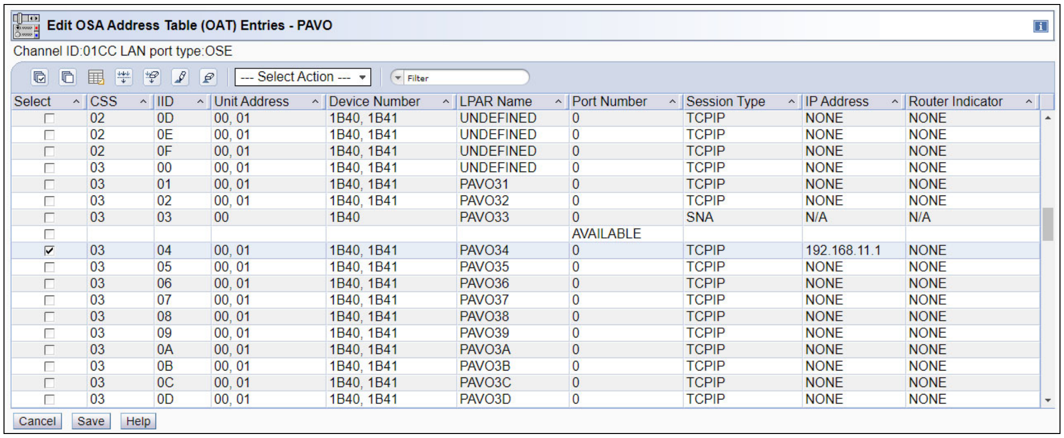


Figure 6-12 OSA/SF on the HMC: Edit TCP/IP entry window

9. After editing the TCP/IP entry or SNA entry, the Edit OSA Address Table (OAT) Entries window opens again. Confirm that your entries are displayed in this window. Figure 6-13 shows that the TCP/IP entry and SNA entry can be confirmed. Click **Save** to save the configuration.



Select	CSS	IID	Unit Address	Device Number	LPAR Name	Port Number	Session Type	IP Address	Router Indicator
	02	0D	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	02	0E	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	02	0F	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	03	00	00, 01	1B40, 1B41	UNDEFINED	0	TCPIP	NONE	NONE
	03	01	00, 01	1B40, 1B41	PAVO31	0	TCPIP	NONE	NONE
	03	02	00, 01	1B40, 1B41	PAVO32	0	TCPIP	NONE	NONE
	03	03	00	1B40	PAVO33	0	SNA	N/A	N/A
						AVAILABLE			
✓	03	04	00, 01	1B40, 1B41	PAVO34	0	TCPIP	192.168.11.1	NONE
	03	05	00, 01	1B40, 1B41	PAVO35	0	TCPIP	NONE	NONE
	03	06	00, 01	1B40, 1B41	PAVO36	0	TCPIP	NONE	NONE
	03	07	00, 01	1B40, 1B41	PAVO37	0	TCPIP	NONE	NONE
	03	08	00, 01	1B40, 1B41	PAVO38	0	TCPIP	NONE	NONE
	03	09	00, 01	1B40, 1B41	PAVO39	0	TCPIP	NONE	NONE
	03	0A	00, 01	1B40, 1B41	PAVO3A	0	TCPIP	NONE	NONE
	03	0B	00, 01	1B40, 1B41	PAVO3B	0	TCPIP	NONE	NONE
	03	0C	00, 01	1B40, 1B41	PAVO3C	0	TCPIP	NONE	NONE
	03	0D	00, 01	1B40, 1B41	PAVO3D	0	TCPIP	NONE	NONE

Figure 6-13 OSA/SF on the HMC: Edit OSA Address Table (OAT) Entries window after editing

10. Select **Edit SNA timers** in the Panel Configuration Options window to change the SNA timer setting. Figure 6-14 shows the window in which you can edit the values. You can set the parameters for ports 0 and 1 individually.

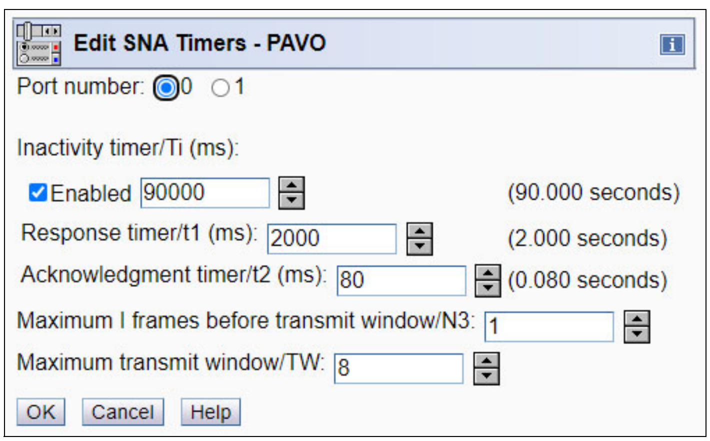


Figure 6-14 OSA/SF on the HMC: Edit SNA Timers window

11. When you complete editing the OAT entries or the SNA timer, the Panel Configuration Options window opens again. To activate the settings, you must validate them by selecting **Validate panel values**. Then, click **OK** (see Figure 6-15).

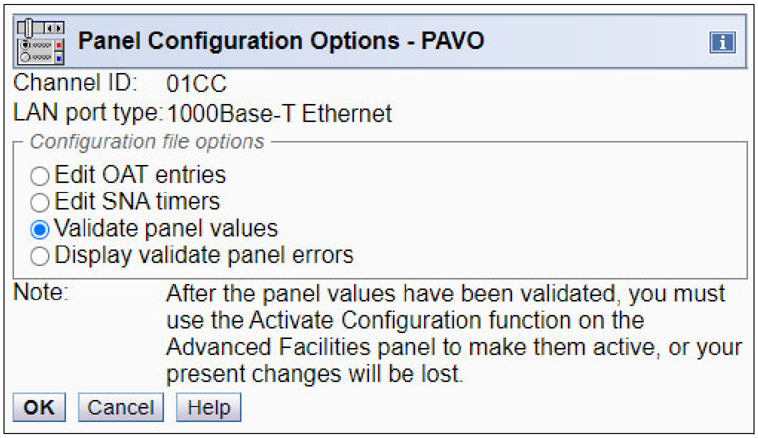


Figure 6-15 OSA/SF on the HMC: Validate panel values

12. If all parameters are entered correctly, a window like the one that is shown in Figure 6-16 opens.

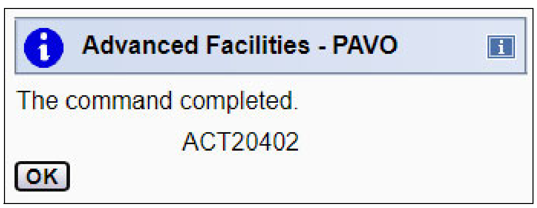


Figure 6-16 OSA/SF on HMC: Validate window value with success

If any of the parameters that were entered are wrong, a window with an ACT20425 message opens. To identify the error, select **Display validate panel errors**, and correct the error. Then, validate the panel values again until the error is fixed.

13. To activate your OSA configuration, select **Activate configuration** from the Advanced Facilities window, and click **OK** (Figure 6-17).

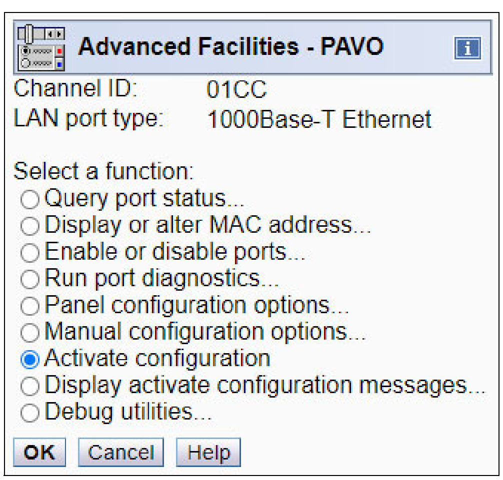


Figure 6-17 OSA/SF on the HMC: Activate configuration

14.The confirmation window that is shown in Figure 6-18 opens. Click **Yes** to continue.

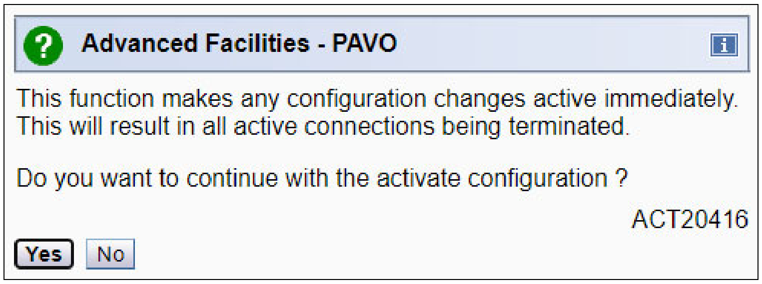


Figure 6-18 OSA/SF on the HMC: Confirm activation

15.When the activation is successful, the window that is shown in Figure 6-19 opens. Click **OK** to complete the process.

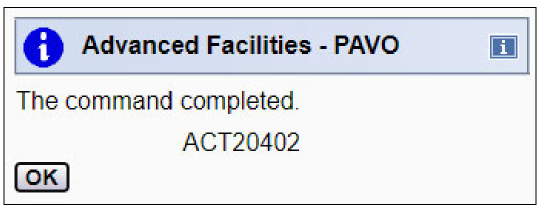


Figure 6-19 OSA/SF on the HMC: Message when activation is completed

16.To make the changes effective, you must bring the CHPID OFFLINE from all the LPARs that share the OSA CHPID, and then bring the CHIPID ONLINE.

17.If you select **Manual configuration options** (Figure 6-7 on page 137), the window that is shown in Figure 6-20 opens. In this window, you can import and export the source file of OAT through a USB device or FTP, create a configuration file on the editor on HMC, and edit the source file. For more information, see *Open Systems Adapter/Support Facility on the Hardware Management Console,* SC14-7580.

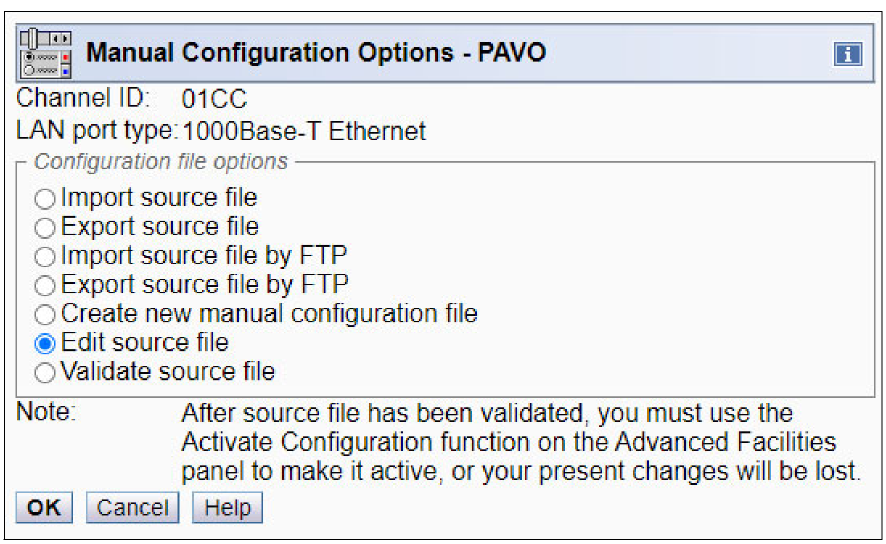


Figure 6-20 OSA/SF on the HMC: Manual Configuration Options

6.3.2 Setting OSA parameters by using OSA Advanced Facilities

If you want to change the port speed or MAC address of an OSA-Express6S/7S feature, you can use OSA Advanced Facilities. Normally, changing a MAC address is required for SNA networks.

> **Port speed:** You can set the port speed to only 100 Mbps with the OSA-Express6S 1000Base-T features. The OSA-Express7S[a] 1000Base-T feature does not have this capability.
>
> You cannot set the port speed to 1000 Mbps with the OSA-Express6S 1000Base-T features. If you want the port speed to run at 1000 Mbps, you must select **Auto Negotiate**.
>
> The screen captures regarding setting the port speed were done for an OSA Express6S card on an IBM z15 T01 system. The IBM z16 A01 system that was available had only OSA Express7S cards.

a. OSA Express7S is not supported on IBM z16 A02 and IBM z16 AGZ.

Setting the OSA port speed

To change the port speed, complete the following steps:

1. Log on to the HMC, select the CPC that you want to operate, and then click **Open OSA Advanced Facilities**.
2. Select the PCHID of the OSA channel for which you must set the card mode. Select **Card specific advanced facilities** and click **OK**.
3. Select **Set card mode** and click **OK** (Figure 6-21).

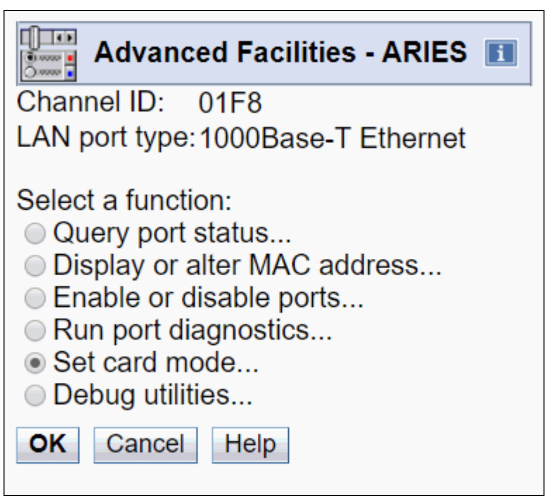


Figure 6-21 OSA/SF on the HMC: Selecting the card mode

4. The Set Card Mode or Speed window opens (Figure 6-22). Select the correct port speed from the Speed/Mode list. You can set the speed of ports 0 and 1 individually. Click **OK**.

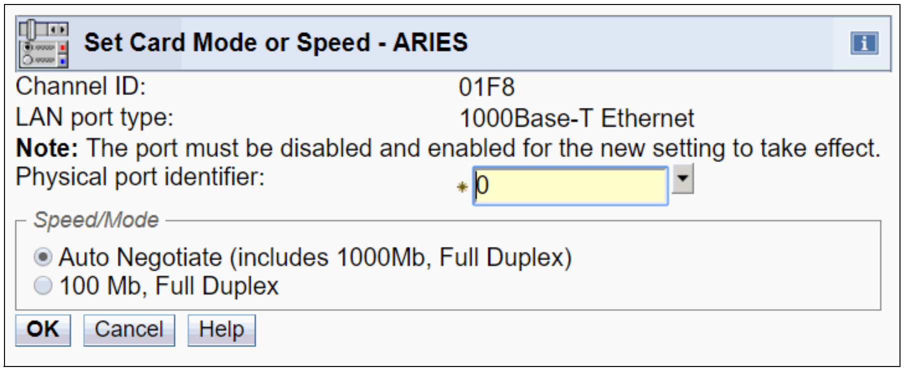


Figure 6-22 OSA/SF on the HMC: Setting the card mode or speed

5. To make the changes effective, you must configure CHPID OFFLINE and ONLINE from every LPAR where this CHPID is defined.

Changing the OSA MAC address

To change the MAC address, complete the following steps:

1. Log on to the HMC, open OSA Advanced Facilities, and select the PCHID that you want to customize.
2. The Advanced Facilities window opens (Figure 6-23). Select **Display or alter MAC address**, and then click **OK**.

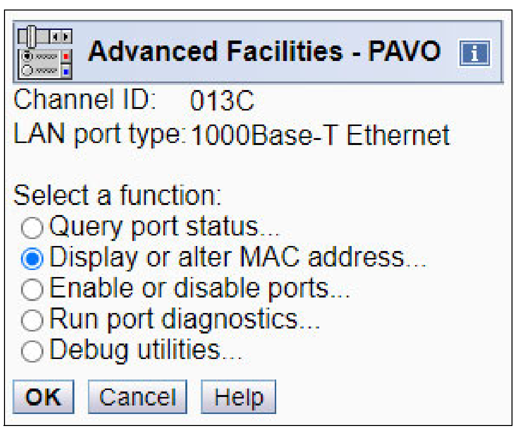


Figure 6-23 OSA/SF on the HMC: Display or alter MAC address

3. The Display or alter MAC address window opens (Figure 6-24). Set the MAC address that you want and then click **OK**.

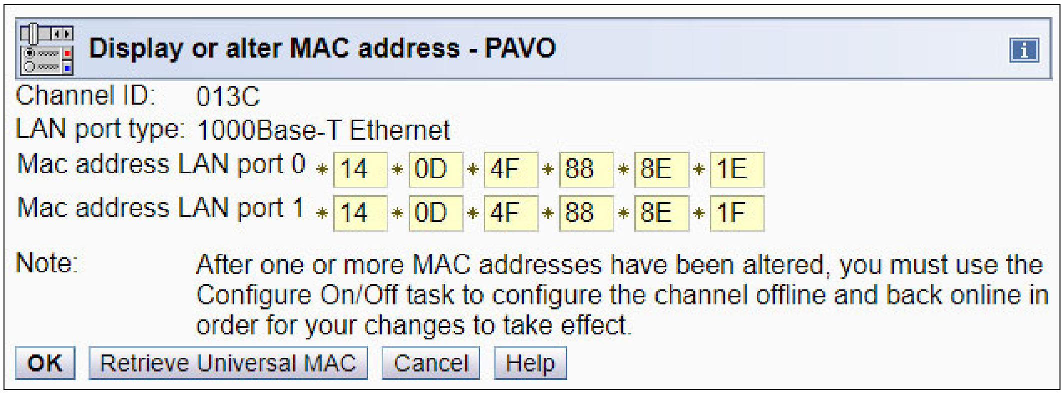


Figure 6-24 OSA/SF on the HMC: Display or alter MAC address values

4. To reflect the modification, you must configure CHPID OFFLINE and ONLINE from every LPAR where this CHPID is defined.

6.3.3 Confirming your OSA customization

To confirm your customization of OSA Advanced Facility, open OSA Advanced Facility again and confirm whether your definitions are reflected correctly. Also, check the device status from your networking software, such as TCP/IP and IBM Virtual Telecommunications Access Method (VTAM).

6.4 Shared Memory Communications (SMC-R and SMC-D)

For more information about how to plan for and configure SMC - Remote Direct Memory Access over Converged Ethernet Express (SMC-R), see 2.5.4, “Network connectivity” on page 28 and 15.2.3, “Defining a RoCE PCIe function” on page 382.

For more information about how to configure SMC - Direct Memory Access over Internal Shared Memory (SMC-D), see 15.2.2, “Defining an ISM PCIe function” on page 378.

6.5 Channel-to-channel connections

This section describes the configuration steps for channel-to-channel (CTC) connections. If your system has programs such as VTAM or global resource serialization (GRS), then you must configure Fibre Connection (FICON) channel-to-channel (FCTC) links.

6.5.1 FCTC: Preparing

FCTC does not require that you explicitly define the CTC CU function to one channel side or the other. The channel itself decides which side contains the CU function. Both sides of an FCTC connection use a Fibre Channel (FC) channel path that is defined to one or more FCTC CUs representing the target systems for the CTC connections.

A logical address is required when the FC channel path is attached to a shared FC channel path to identify the LPAR to communicate with. When attached to an unshared FC channel path, the logical address must be zero or not specified. For more information, see the CTC Definitions page.

FCTC communication within a single processor complex can be accomplished with a single FC channel path connecting to an FC switch. Both sides of the CTC connection are represented by the same single FC channel path. This configuration results in these advantages:

- Reducing the number of channels that are required
- Simplified configuration design
- Simplified configuration definition

6.5.2 FCTC: Implementation

The following considerations apply to all FCTC configurations:

- The server at each end of an FCTC connection uses a FICON native (CHPID type FC) channel.
- The FICON native channel at each end of the CTC connection has an FCTC CU that is defined.
- The FCTC devices on the FCTC CU are defined as type FCTC.
- The FCTC control function on the IBM Z platform can communicate with an FCTC CU that is defined on a FICON native channel on any server that supports FICON.
- The FICON native channel at each end of the FCTC connection supports the FCTC CUs, and also communicates with other FICON native CUs, such as disk and tape.

In an FCTC configuration, FCTC CUs are defined at each end, but only one end provides the FCTC CU function. During initialization of the logical connection between two ends of an FCTC connection, the channel that provides the FCTC CU function is determined by using an algorithm. This process results in balancing the number of FCTC CU functions that each end of the logical connection is providing. The algorithm uses the channel with the lower FC worldwide name (WWN) to provide the FCTC CU function.

FICON native channel CTC communication does *not* require a pair of channels because it can communicate with any FICON native channel that has a corresponding FCTC CU that is defined. This configuration means that FCTC communications can be provided by using only a single FICON native channel per server.

For more information about how to implement FCTC, see the following publications:

- *FICON CTC Implementation*, REDP-0158
- *FICON Planning and Implementation Guide*, SG24-6497
- *I/O Configuration Using z/OS HCD and HCM*, SG24-7804

6.5.3 FCTC: Management

After you activate the FCTC configuration and connect all the cables, verify whether the CHPIDs are online and operating by using either z/OS or the Support Element (SE):

- Checking the status by using z/OS commands.

  On our IBM z16 A01, the CHPIDs 44, 45, 54, and 55 (PCHIDs 0120, 0160, 01A4, and 01E4) are defined as FCTC by using the devices 2E20-2E23, 2E28-2E2B, 4E20-4E23, and 4E28-4E2B.

  If you are interested in checking the status of CHPIDs 44, 45, 54, and 55, run the **D M=CHP(44,45,54,55)** command, as shown in Figure 6-25.

```
D M=CHP(44,45,54,55)
IEE174I 04.47.28 DISPLAY M 150
CHPID 44:  TYPE=1B, DESC=FICON SWITCHED, ONLINE
CHPID 45:  TYPE=1B, DESC=FICON SWITCHED, ONLINE
CHPID 54:  TYPE=1B, DESC=FICON SWITCHED, ONLINE
CHPID 55:  TYPE=1B, DESC=FICON SWITCHED, ONLINE
DEVICE STATUS FOR CHANNEL PATH 44
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
04E2 +  +  +  +  .  .  .  .  .  .  .  .  .  .  .  .
SWITCH DEVICE NUMBER = NONE
ATTACHED ND = 008960.F64.IBM.CA.1000010546MH
PHYSICAL CHANNEL ID = 0120
OPERATING SPEED = 32G, GENERATION = 2E
FACILITIES SUPPORTED = ZHPF, CSEC(Encr)
DEVICE STATUS FOR CHANNEL PATH 45
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
04E2 .  .  .  .  .  .  .  .  +  +  +  +  .  .  .  .
SWITCH DEVICE NUMBER = NONE
ATTACHED ND = 008960.F64.IBM.CA.1000010546MD
PHYSICAL CHANNEL ID = 0160
OPERATING SPEED = 32G, GENERATION = 2E
FACILITIES SUPPORTED = ZHPF, CSEC(Encr)
DEVICE STATUS FOR CHANNEL PATH 54
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
02E2 +  +  +  +  .  .  .  .  .  .  .  .  .  .  .  .
SWITCH DEVICE NUMBER = NONE
ATTACHED ND = 008960.F64.IBM.CA.1000010546MH
PHYSICAL CHANNEL ID = 01A4
OPERATING SPEED = 32G, GENERATION = 2E
FACILITIES SUPPORTED = ZHPF, CSEC(Encr)
DEVICE STATUS FOR CHANNEL PATH 55
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
02E2 .  .  .  .  .  .  .  .  +  +  +  +  .  .  .  .
SWITCH DEVICE NUMBER = NONE
ATTACHED ND = 008960.F64.IBM.CA.1000010546MD
PHYSICAL CHANNEL ID = 01E4
OPERATING SPEED = 32G, GENERATION = 2E
FACILITIES SUPPORTED = ZHPF, CSEC(Encr)
************************ SYMBOL EXPLANATIONS ************************
+ ONLINE    @ PATH NOT VALIDATED   - OFFLINE    . DOES NOT EXIST
* PHYSICALLY ONLINE   $ PATH NOT OPERATIONAL
```

Figure 6-25 DISPLAY FCTC on system SC75

- Checking the status by using the SE:
  - From the HMC, select the CPC (under Systems Management) where the CHPID or PCHID that you want to verify is and click **Single Object Operations** (under the **Recovery** task options).
  - On the SE, select the same CPC and click **Channels**. Look for the PCHID that you are interested in checking the status of. The result is shown in Figure 6-26.

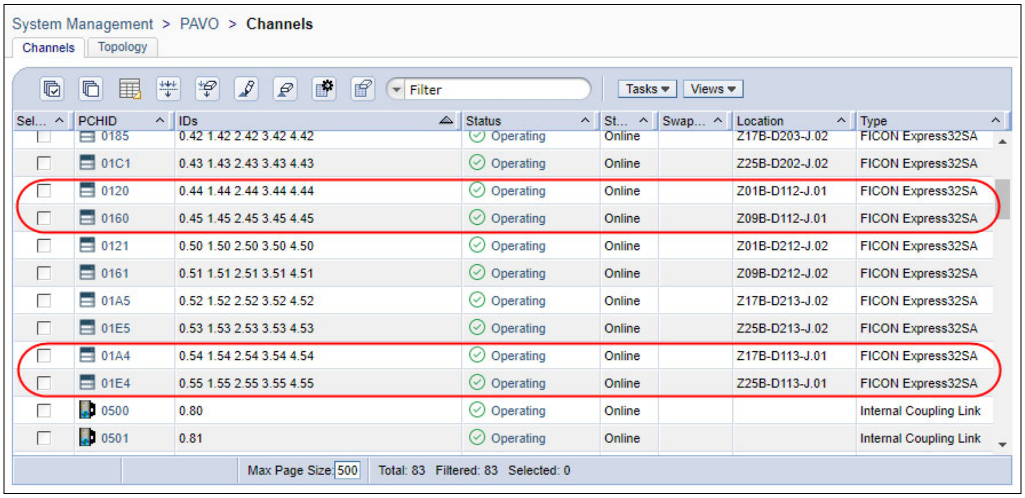


Figure 6-26 Using the SE to verify channel FCTC by using the CPC view

  - To get more details about the PCHID, click the PCHID to open the details window that is shown in Figure 6-27.

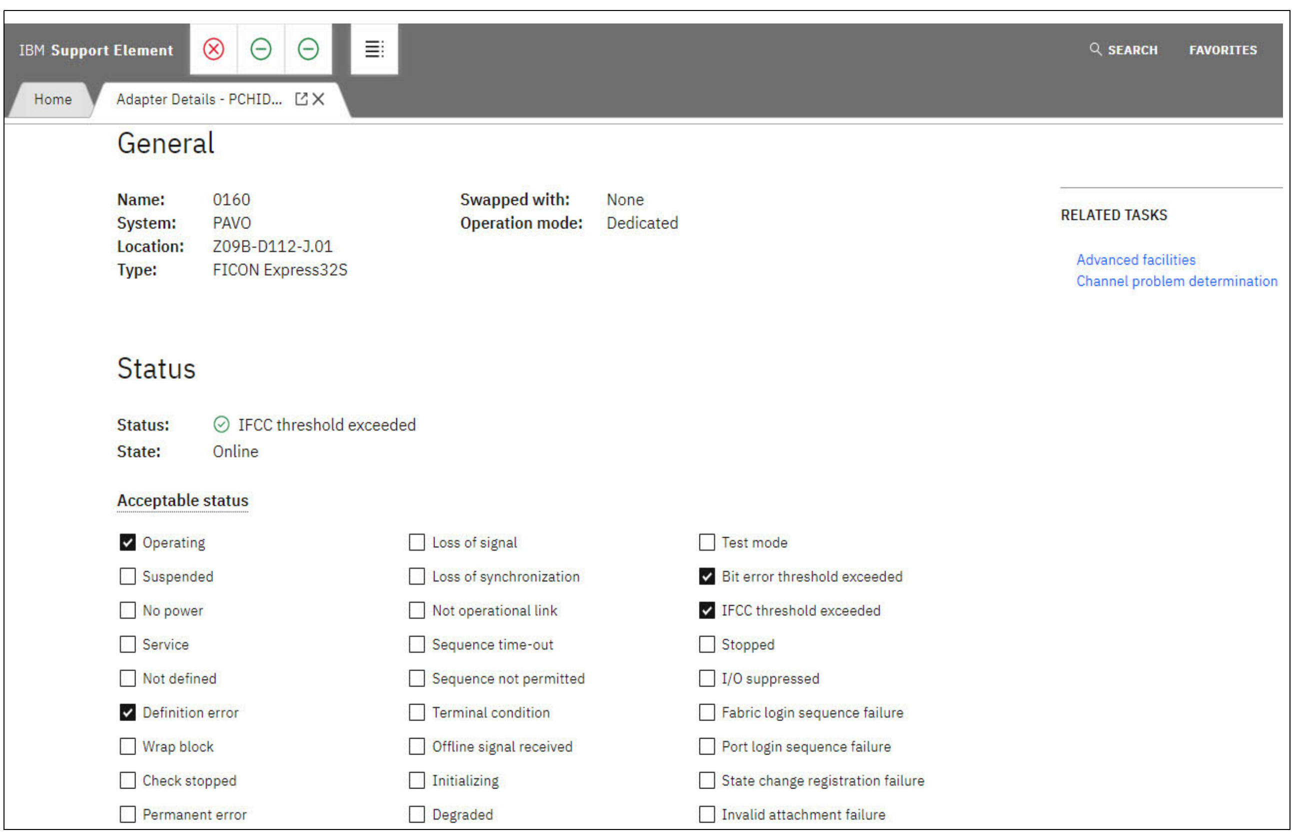
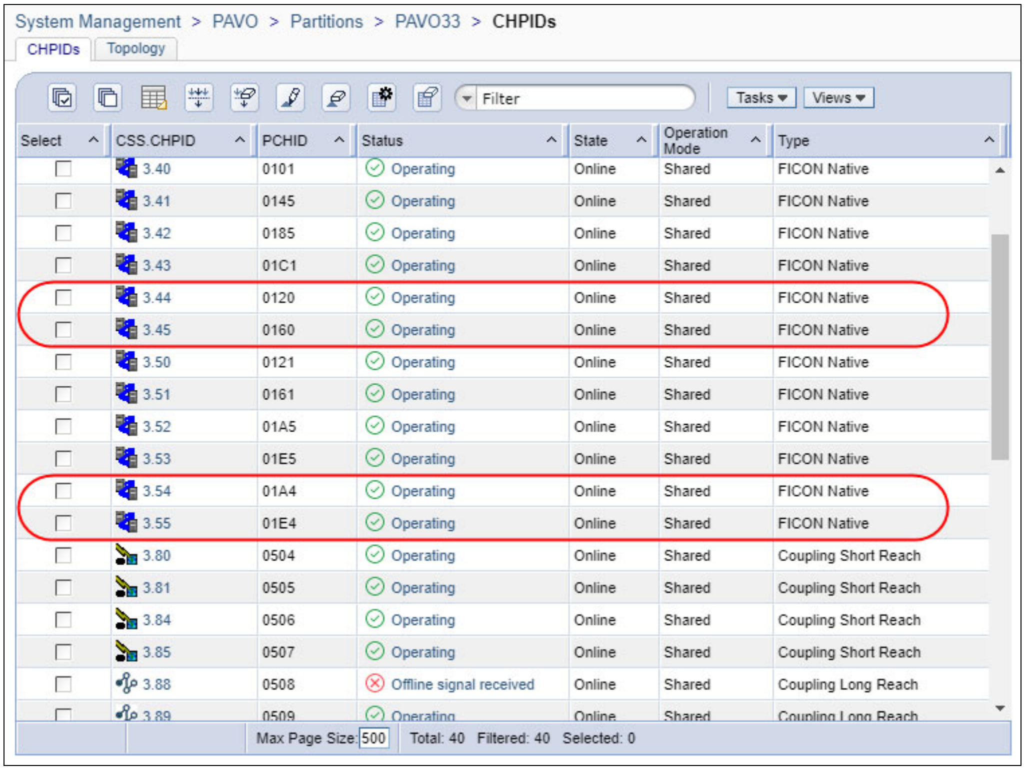


Figure 6-27 FCTC PCHID details

– Another way to check the status is from the LPAR view. Select the LPAR and then the CHPIDs option under that LPAR. You can look for the CHPID and check the status, as shown in Figure 6-28.


System Management > PAVO > Partitions > PAVO33 > CHPIDs

CHPIDs | Topology

Select	CSS.CHPID	PCHID	Status	State	Operation Mode	Type
☐	3.40	0101	Operating	Online	Shared	FICON Native
☐	3.41	0145	Operating	Online	Shared	FICON Native
☐	3.42	0185	Operating	Online	Shared	FICON Native
☐	3.43	01C1	Operating	Online	Shared	FICON Native
☐	3.44	0120	Operating	Online	Shared	FICON Native
☐	3.45	0160	Operating	Online	Shared	FICON Native
☐	3.50	0121	Operating	Online	Shared	FICON Native
☐	3.51	0161	Operating	Online	Shared	FICON Native
☐	3.52	01A5	Operating	Online	Shared	FICON Native
☐	3.53	01E5	Operating	Online	Shared	FICON Native
☐	3.54	01A4	Operating	Online	Shared	FICON Native
☐	3.55	01E4	Operating	Online	Shared	FICON Native
☐	3.80	0504	Operating	Online	Shared	Coupling Short Reach
☐	3.81	0505	Operating	Online	Shared	Coupling Short Reach
☐	3.84	0506	Operating	Online	Shared	Coupling Short Reach
☐	3.85	0507	Operating	Online	Shared	Coupling Short Reach
☐	3.88	0508	Offline signal received	Online	Shared	Coupling Long Reach
☐	3.89	0509	Operating	Online	Shared	Coupling Long Reach

Max Page Size: 500 Total: 40 Filtered: 40 Selected: 0

Figure 6-28 Verifying the channel FCTC by using the LPAR view

– For more details, click the CHPID, as shown in Figure 6-29.

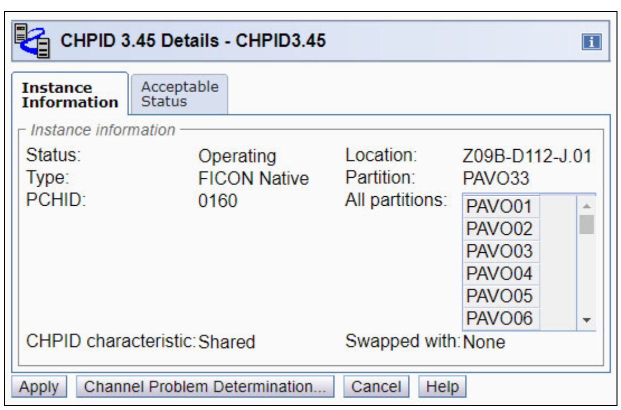


Figure 6-29 FCTC CHPID details

6.6 Validating the work input/output definition file

To validate the work input/output definition file (IODF) by using the HCD component, complete the following steps:

1. Select HCD option `2.12. Build validated work I/O definition file`. Review the message list and correct any errors.
2. Press PF3 to continue. The `Requested action successfully processed` message is displayed.
3. Select HCD option `6.4. View I/O Definition File Information`. The IODF type is now indicated as `Work - Validated` (see Figure 6-30).

```
················ View I/O Definition File Information ·················
·                                                                      ·
·                                                                      ·
· IODF name  . . . . . . : 'SYS9.IODF81.WORK'                          ·
· IODF type  . . . . . . : Work - Validated                            ·
· IODF version . . . . . : 5                                           ·
·                                                                      ·
· Creation date  . . . . : 2022-03-13                                  ·
· Last update  . . . . . : 2022-03-13  03:32                           ·
·                                                                      ·
· Volume serial number . : IODFPK                                      ·
· Allocated space  . . . : 3000    (Number of 4K blocks)               ·
· Used space . . . . . . : 1266    (Number of 4K blocks)               ·
·    thereof utilized (%)  91                                          ·
· Activity logging . . . : No                                          ·
· Multi-user access  . . : No                                          ·
· Backup IODF name . . . :                                             ·
·                                                                      ·
· Description  . . . . . :                                             ·
·                                                                      ·
·                                                                      ·
·                                                                      ·
· ENTER to continue.                                                   ·
```

Figure 6-30 View I/O Definition File Information: Validated work IODF

6.7 Creating the input/output configuration program file for the CHPID Mapping Tool

To create the input/output configuration program (IOCP) input data set for the CHPID Mapping Tool (CMT), complete the following steps:

1. Select HCD option `2.3. Build IOCP input data set`, and press Enter (see Figure 6-31).

```
······· Activate or Process Configuration Data ·······
·                                                    ·
·                                                    ·
· Select one of the following tasks.                 ·
·                                                    ·
· 3   1.  Build production I/O definition file       ·
·     2.  Build IOCDS                                ·
·     3.  Build IOCP input data set                  ·
·     4.  Create JES3 initialization stream data     ·
·     5.  View active configuration                  ·
·     6.  Activate or verify configuration           ·
·         dynamically                                ·
·     7.  Activate configuration sysplex-wide        ·
·     8.  (no longer supported)                      ·
·     9.  (no longer supported)                      ·
·     10. Build I/O configuration data               ·
·     11. Build and manage processor cluster         ·
·         IOCDSs, IPL attributes and dynamic I/O     ·
·         changes                                    ·
·     12. Build validated work I/O definition file   ·
·                                                    ·
·                                                    ·
·                                                    ·
```

Figure 6-31 Activate or Process Configuration Data: Building IOCP for PAVO

2. HCD displays the list of available processors (see Figure 6-32). Select the `PAVO` processor by entering a forward slash (/) next to it and pressing Enter.

```
··························· Available Processors ····························
·                                                                Row 1 of 4 ·
· Command ===> __________________________________________________________   ·
·                                                                           ·
· Select one.                                                               ·
·                                                                           ·
·   Processor ID  Type     Model    Mode  Description                       ·
·   ARIES         8561     T01      LPAR  Aries                             ·
·   HYDRA         8562     LT2      LPAR  Hydra                             ·
·   LEPUS         3907     ZR1      LPAR  Lepus                             ·
· / PAVO          3931     A01      LPAR  Pavo                              ·
· *************************** Bottom of data **************************** ·
·                                                                           ·
```

Figure 6-32 Available Processors: Selecting a processor for the IOCP file

3. HCD displays a panel on which you enter information about the IOCP input data set to be created (see Figure 6-33). Complete the following fields:
   - Title1: `IODF84`
   - IOCP input data set: `'SYS9.IODF84.IOCPIN.PAVO'`
   - Input to Stand-alone IOCP: `Yes`
   - Job statement information: Complete this information for your installation.

```
························ Build IOCP Input Data Set ························
·                                                                          ·
·                                                                          ·
· Specify or revise the following values.                                  ·
·                                                                          ·
· IODF name . . . . . . . . . : 'SYS9.IODF84.WORK'                         ·
· Processor ID  . . . . . . . : PAVO                                       ·
· Title1 . IODF84________________________________________________________  ·
· Title2 : SYS9.IODF84.WORK - 2022-03-13 03:32                             ·
·                                                                          ·
· IOCP input data set                                                      ·
· 'SYS9.IODF84.IOCPIN.PAVO'______________________________                  ·
· Input to Stand-alone IOCP?  Yes  (Yes or No)                             ·
·                                                                          ·
· Job statement information                                                ·
· //ZNEXT04H JOB (ACCOUNT),'ZNEXT04'                                       ·
· //*                                                                      ·
· //*                                                                      ·
· //*                                                                      ·
· //*                                                                      ·
· //*                                                                      ·
```

Figure 6-33 Build IOCP Input Data Set: Data fields to be updated

4. Press Enter. HCD submits a batch job to create the data set.
5. Using an editor or browser tool of your choice, verify that the data set that you created exists and contains IOCP statements (see Figure 6-34). In this example, we used Time Sharing Option (TSO). This data set is used as input into the CMT.

```
 ID    MSG1='IODF84',                                          *
      MSG2='SYS9.IODF84.WORK - 2022-03-13 03:32',             *
      SYSTEM=(3931,1),LSYSTEM=PAVO,                           *
      TOK=('PAVO',008003331A083931033258630122072F00000000,000*
      00000,'22-03-13','03:32:58','........','........')
RESOURCE PARTITION=((CSS(0),(PAV00A,A),(PAV00B,B),(PAV001,1),(*
      PAV002,2),(PAV003,3),(PAV004,4),(PAV005,5),(PAV006,6),(P*
      AV007,7),(PAV008,8),(PAV009,9),(*,C),(*,D),(*,E),(*,F)),*
      (CSS(1),(PAV01A,A),(PAV01B,B),(PAV01C,C),(PAV01D,D),(PAV*
      01E,E),(PAV01F,F),(PAV011,1),(PAV012,2),(PAV013,3),(PAV0*
      14,4),(PAV015,5),(PAV016,6),(PAV017,7),(PAV018,8),(PAV01*
      9,9)),(CSS(2),(PAV02A,A),(PAV02B,B),(PAV02C,C),(PAV021,1*
      ),(PAV022,2),(PAV023,3),(PAV024,4),(PAV025,5),(PAV026,6)*
      ,(PAV027,7),(PAV028,8),(PAV029,9),(*,D),(*,E),(*,F)),(CS*
      S(3),(PAV03A,A),(PAV03B,B),(PAV03C,C),(PAV03D,D),(PAV03E*
      ,E),(PAV03F,F),(PAV031,1),(PAV032,2),(PAV033,3),(PAV034,*
      4),(PAV035,5),(PAV036,6),(PAV037,7),(PAV038,8),(PAV039,9*
      )),(CSS(4),(PAV041,1),(PAV042,2),(PAV043,3),(PAV044,4),(*
```

Figure 6-34 IOCP input data set: Contents (truncated)

Part of the TOK statement is now replaced with dots (see Example 6-1).

Example 6-1 IOCP file (TOK statement)

```
TOK=('PAVO',008003331A08393103325863012207 2F00000000,000*
00000,'22-03-13','03:32:58','........','........')
```

These dots ensure that this IOCP file cannot be written to a processor and used for a Power on Reset (POR). This precaution is needed because this IOCP file was created from a validated work IODF and not a production IODF. IOCP files that can be used for a POR can be generated only from a production IODF.

Important: When an IOCP file is exported by using HCD from a validated work IODF, it must be imported back into HCD after the *channel IDs* (CHIDs) are completed by using the CMT. The IOCP file cannot be used directly by IOCP until the CHIDs are added.

6. Download this IOCP file from z/OS to the CMT workstation. Use a workstation file transfer facility such as FTP or the one in the IBM Personal Communications Workstation Program, or any equivalent 3270 emulation program. Be sure to use `TEXT` as the transfer type. In this example, the file is named ARIES`in.iocp`.

6.8 Assigning CHIDs to CHPIDs by using the CMT

In this section, you use the IOCP statements from HCD and the 3931 order process file (CFReport). Use the CMT to assign CHIDs to each of the CHPIDs for the 3931.

For this process, the CMT must be downloaded. For more information about downloading and installing the CMT, see 2.2.3, “CHPID Mapping Tool” on page 11. If CMT is already installed, verify that the latest updates are installed.

The version of CMT that is used for the following captures is Version 6.22. Check for the latest version by going to IBM Resource Link.

For more information, see the *CHPID Mapping Tool User’s Guide*, GC28-7024.

Use the CMT to complete the following steps:

1. Import the CFReport file into the CMT.
2. Import the IOCP file into the CMT.
3. Resolve the CHPIDs with a CHID conflict.
4. Process the hardware resolution.
5. Manually resolve the CL5 or CS5 CHPIDs.
6. Set the priority for single-path CUs and other CUs that override the CMT default priorities and Automatic Mapping.
7. Resolve the CHPIDs that are not connected to CUs.
8. Create the CMT reports.
9. Create an updated IOCP file for transfer back into the IODF file.

6.9 Importing the CFReport file into the CMT

To import the CFReport file into the CMT, complete the following steps:

1. Start the CMT on your workstation.
2. The CMT asks for a project name and location of the CMT work files. In our example, we used `PAVO` as the project name (Figure 6-35).

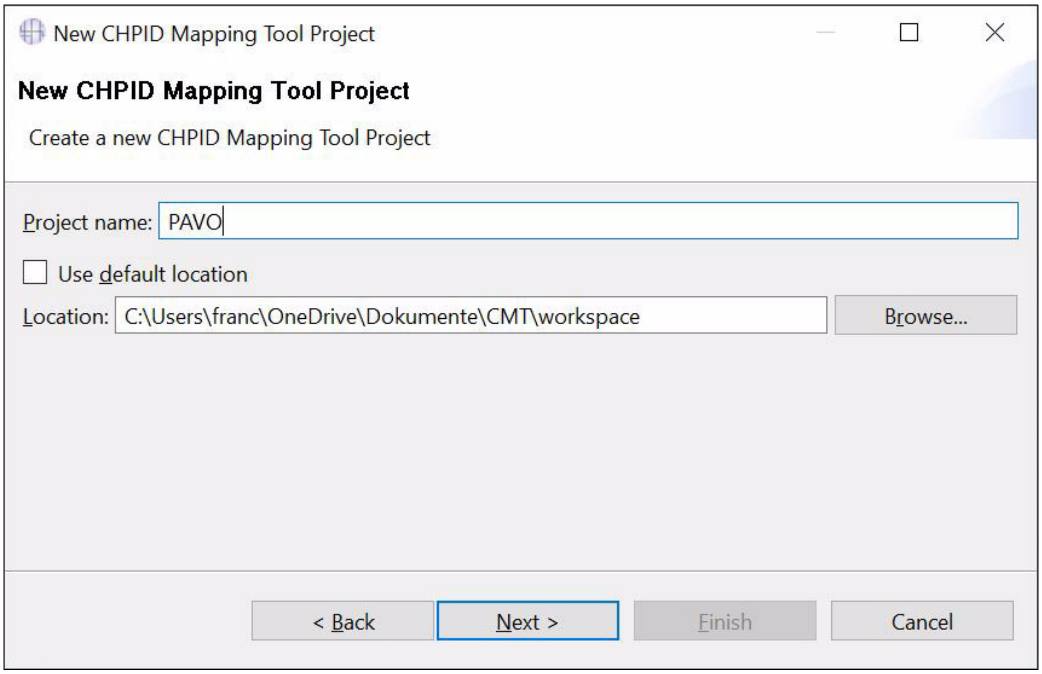


Figure 6-35 Creating a CHPID Mapping Tool Project

3. Next, specify the CFReport. The IOCP input file window opens. For this step, we input only the CFReport file.

> **Attention:** To import the CFReport file into the CMT, a Customer Number must be in the CFReport file.

4. Import the CFReport file into the CMT by specifying the name in the CFReport file field, and then click **Finish** (see Figure 6-36).

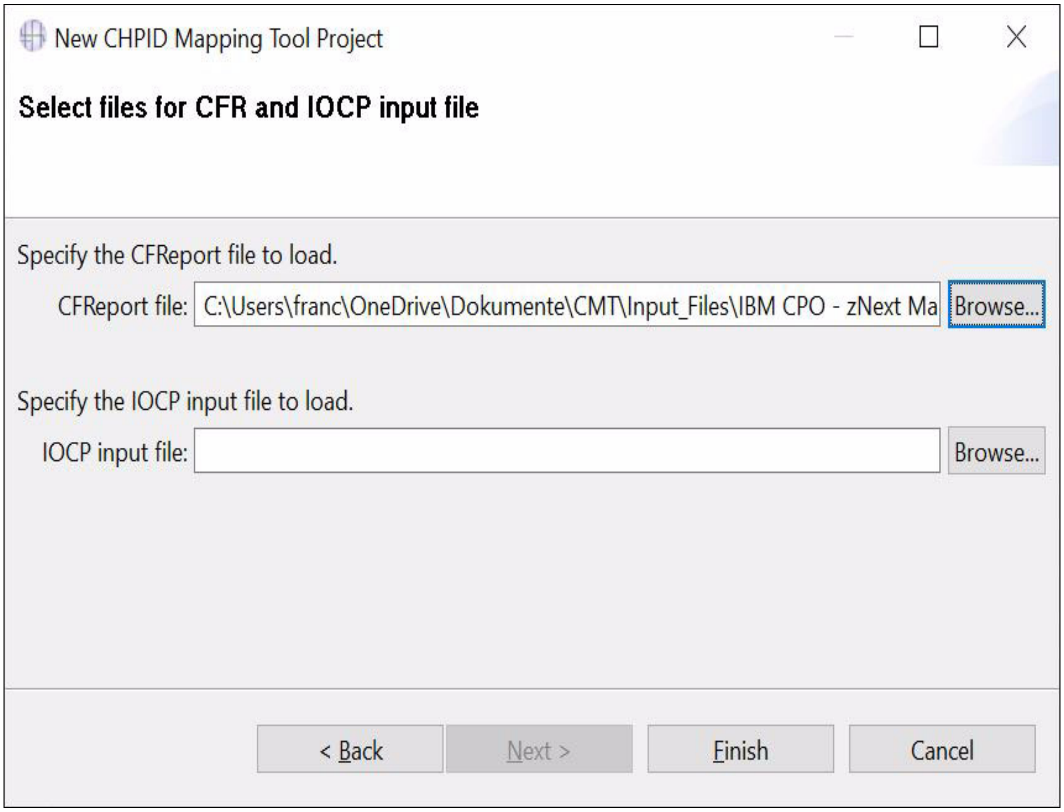


Figure 6-36 Specifying the CFReport file

If you click **Finish** but did not select an IOCP file, you receive the message that is shown in Figure 6-37. Click **OK**.

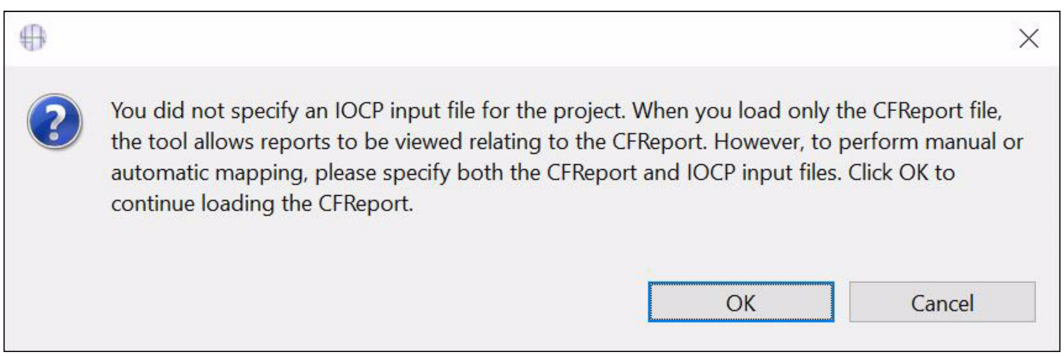


Figure 6-37 Warning message for not specifying an IOCP file

A window shows the progress of reading the CFReport file (see Figure 6-38 on page 157).

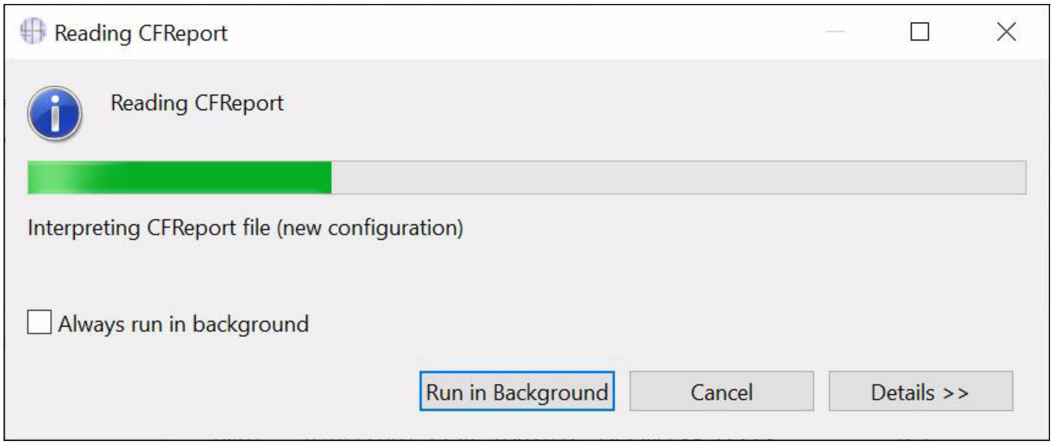


Figure 6-38 Reading the CFReport file

The information from the CFReport file is shown in the Hardware pane (see Figure 6-39).

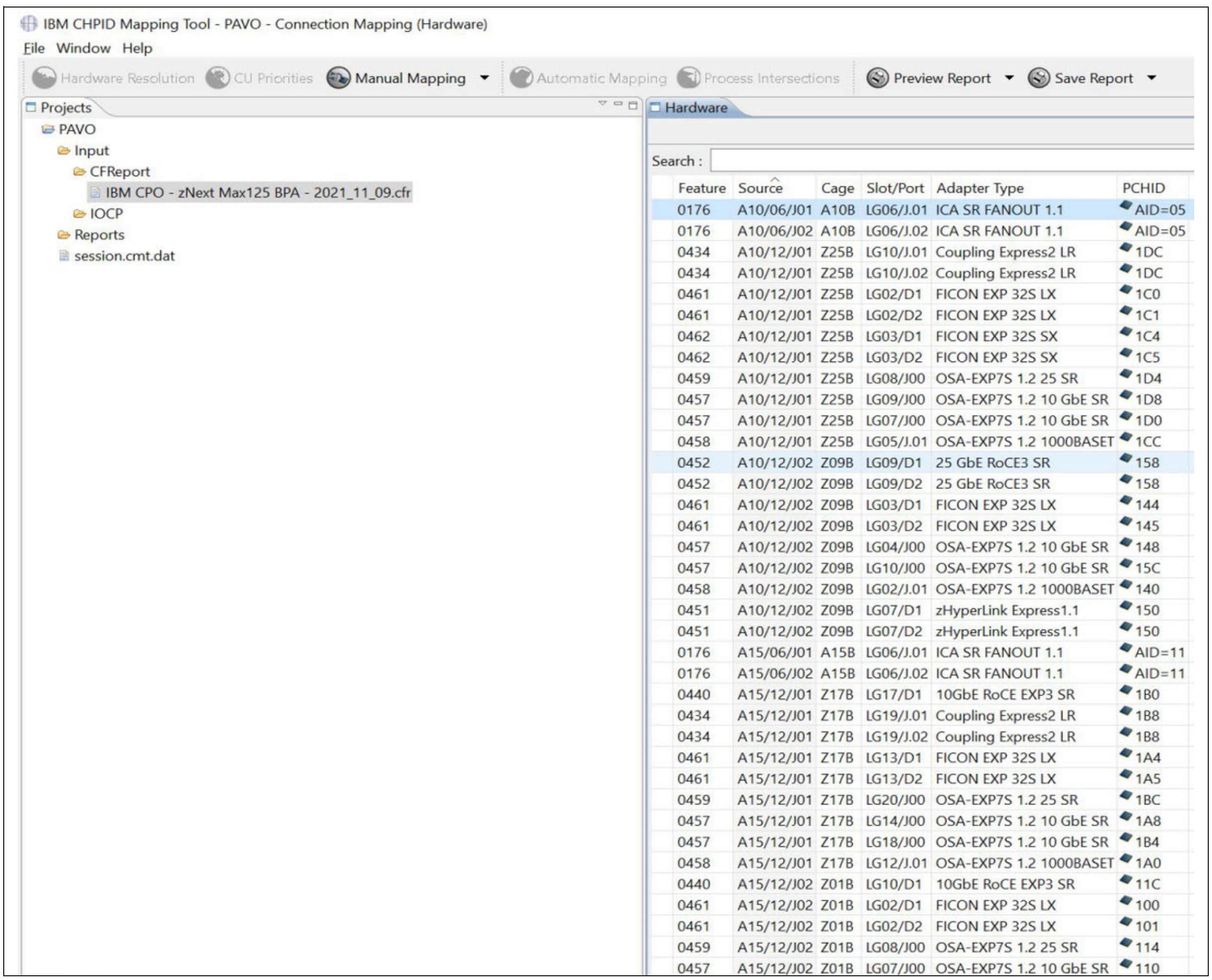


Figure 6-39 Imported CFReport file

6.10 Importing the IOCP file into the CMT

To import the validated 3931 IOCP file into the CMT, complete the following steps:

1. Right-click anywhere in the Projects window and select **Import IOCP input file** (see Figure 6-40).

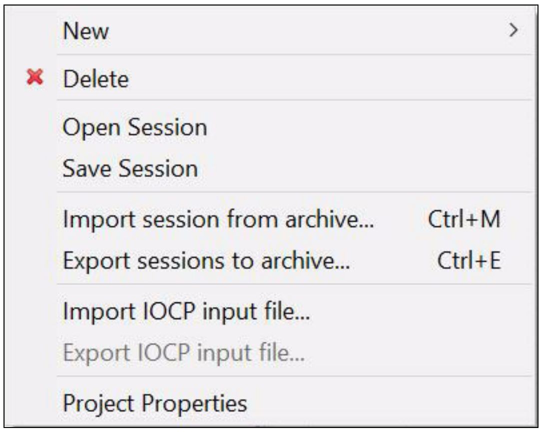


Figure 6-40 Importing the IOCP file

2. Select the IOCP file on your workstation to import into the CMT, and click **Finish** (see Figure 6-41).

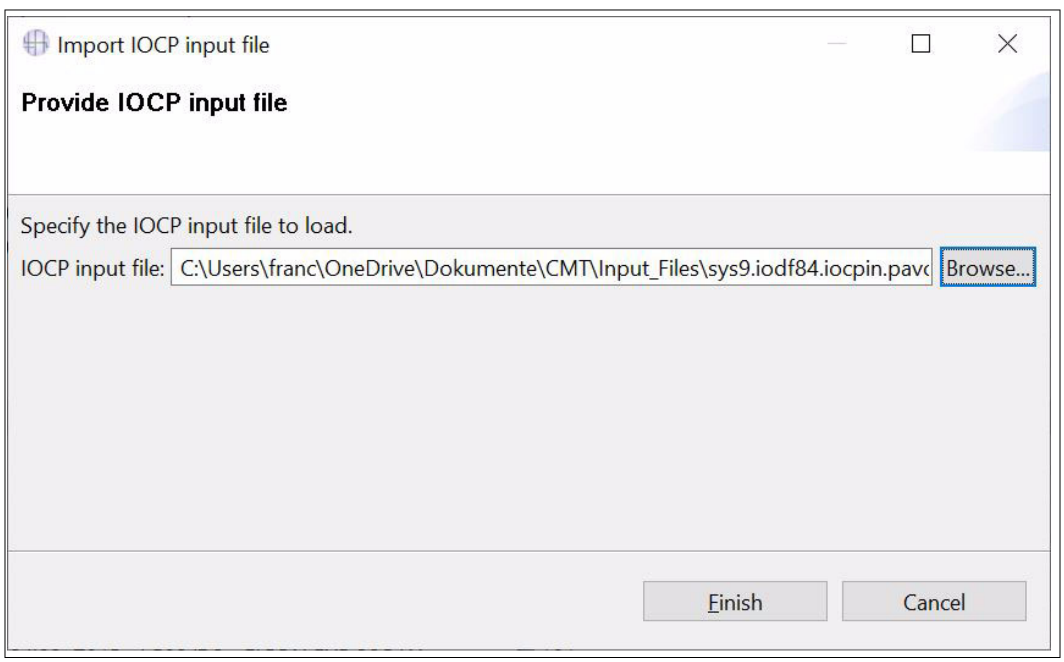


Figure 6-41 Specifying the IOCP file for import

3. In the Projects window, under the **Input** tab, expand the **IOCP** tab, right-click the IOCP file, and select **Read Selected IOCP** (see Figure 6-42).

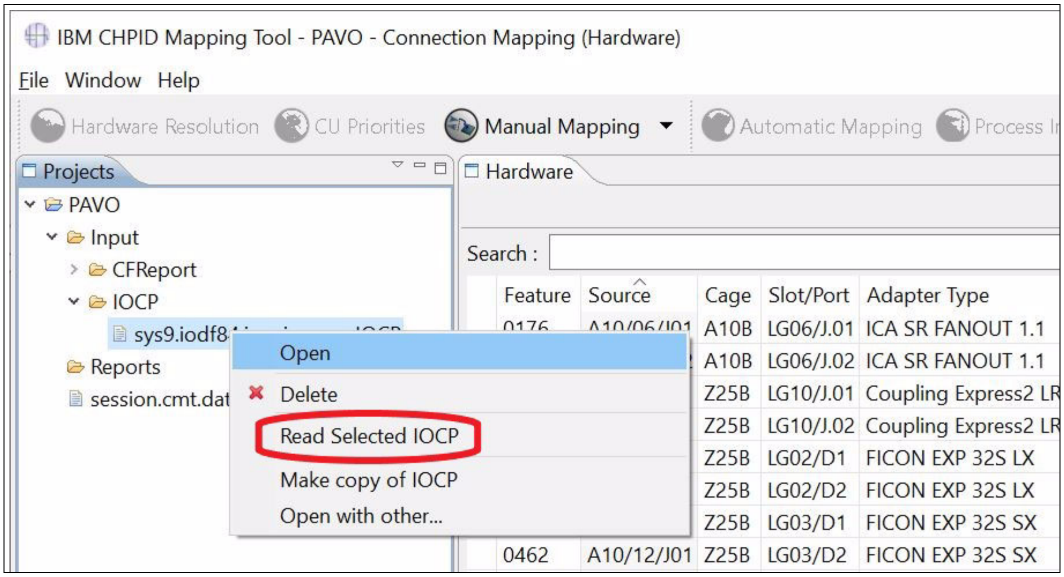


Figure 6-42 Reading the selected IOCP

A dialog box opens and shows the progress information (see Figure 6-43).

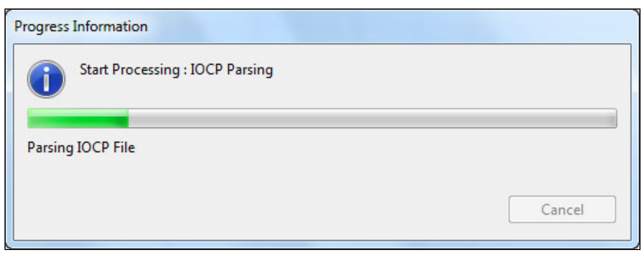


Figure 6-43 Processing the IOCP file

Another window might open and show a selection regarding what type of upgrade you are performing (Figure 6-44):

– IOCP file represents current configuration
– IOCP file represents proposed configuration

In our example, we select **IOCP file represents proposed configuration** because we added more I/O during the upgrade process from a 3906 processor to an 8561 processor. Click **OK**.

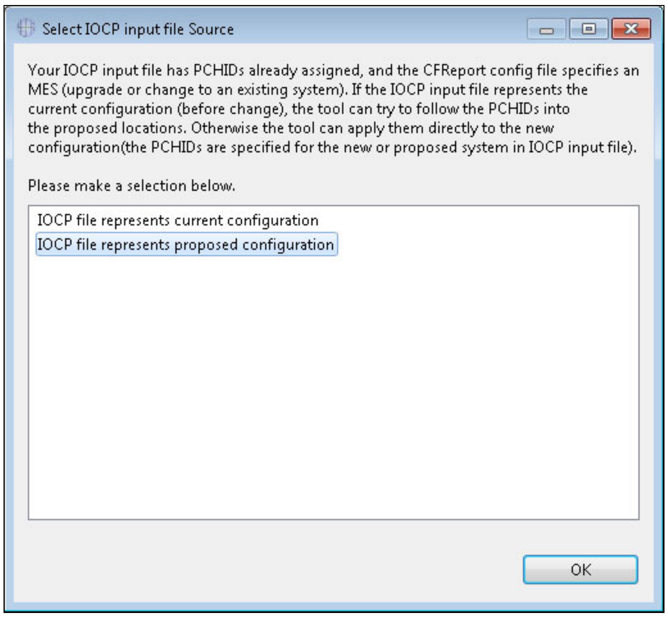


Figure 6-44 Processing the IOCP file

The CMT shows the information from the `CFReport` file and the IOCP file in the Hardware Resolution pane. By default, the Hardware Resolution view (see Figure 6-45 on page 161) includes three tabs:

- Projects
- Hardware Resolution
- Adapter Type Summary

Hardware Resolution is the middle pane and the Adapter Type Summary is on the right.

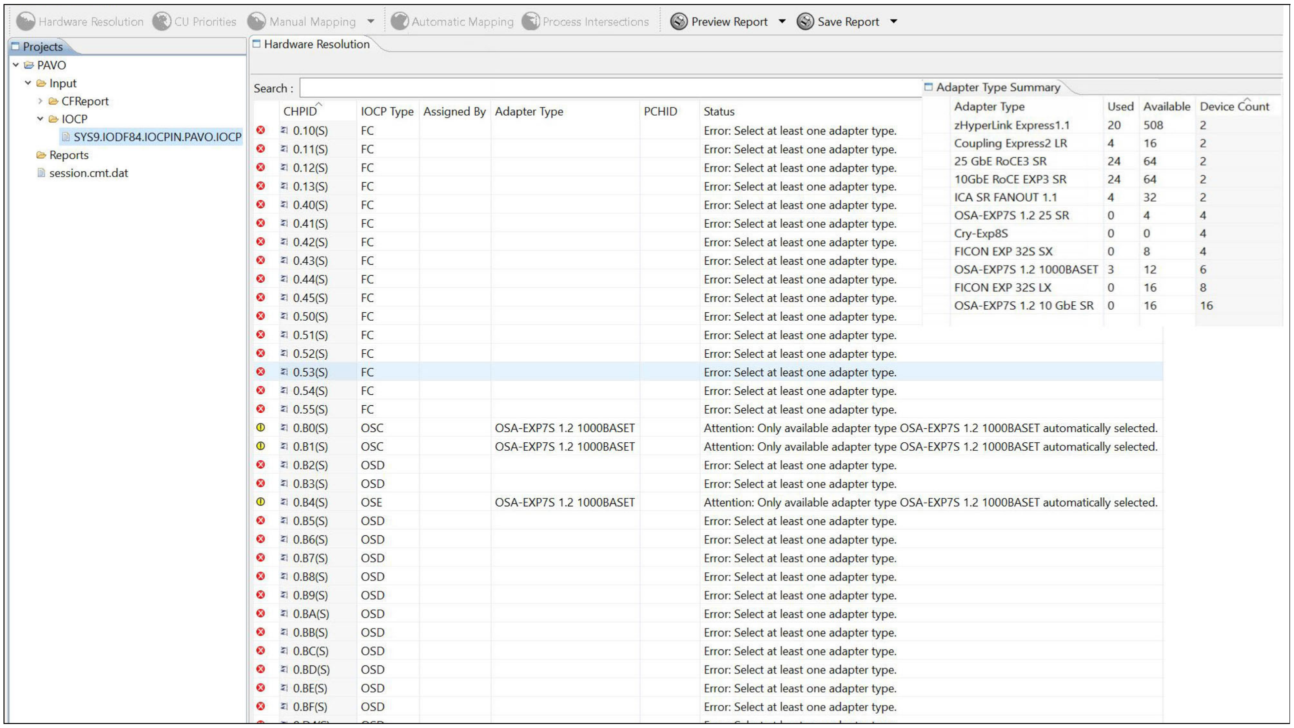


Figure 6-45 Hardware Resolution after importing the IOCP file

The Adapter Type Summary pane shows a table with helpful information. It summarizes the number of used and available channels for the hardware channel types (used, available, and device count).

In the example, the CMT might show some of the following output:

- Hardware Resolution: This window lists all CHPIDs that were found, and the Status column shows the CHPID information to be investigated. In the example, investigate the status. Table 6-3 lists status messages and possible resolutions.

Table 6-3 Status messages and possible resolutions

Status	Explanation	Resolution (if required)
No hardware found.	Adapter ID (AID) values or PCHID values are present that are not found in the hardware. This situation might occur when you replace hardware for a miscellaneous equipment specification (MES) and the IOCP file contains a CHID value for the old hardware (The IOCP file contains a CHID value for the hardware being removed).	If you have any CHPIDs of IOCP type CIB or CS5, the CMT cannot automatically assign these CHPIDs. If the AID assignment in the IOCP file is not valid, you can reset it during hardware resolution. Then, you can use manual mapping to assign the CHPIDs to AIDs. Do the following steps for CIB or CS5 CHPIDs: 1. Remove the AID values. 2. Do one of the following tasks: - Inside the CMT, perform manual mapping to associate these CHPIDs with AIDs. - Assign the AID values outside the tool, for example, by using HCD. 3. Replace the IOCP file.
Select at least one adapter type.	An adapter type is not assigned to the current row.	Assign an adapter type to the IOCP type.
Adapter_type is not compatible with *IOCP_type*.	The adapter type that is assigned to the CHPID is not compatible with the IOCP type that is specified by the IOCP file.	See Figure 6-45 on page 161.
The required hardware for type *IOCP_type* is not available. Example: Required hardware for type Fibre Channel (FC) is not available.	The CMT found no hardware for the specified IOCP type.	Change the IOCP file or obtain more hardware.
CHID_1 moved to a new CHID: *CHID_2*. Example: 520 moved to 1E2.	You are replacing hardware for an MES, and the IOCP file contains a CHID value for the old hardware, which is being removed. This CHID value moved from an old machine to the CHID value for the new hardware. *CHID_1* is the first CHID value (for example, 520) and *CHID_2* is the second CHID value (for example, 1E2).	This status is an informational message; no hardware resolution is required. The message informs you of the new location so you can change this value if you prefer a different assignment.
Only available adapter type.	Channel tape suggests one specific adapter type.	CMT assigns a new adapter.

- Process the CU Priorities and Automatic Mapping:
  - **Reset CHPIDs assigned by Automatic Mapping**: Selecting this option resets all CHPIDs that were processed by prior availability runs in this session.

    By default, this option is selected.
  - **Reset CHPIDs assigned by Manual Mapping**: Selecting this option resets CHPIDs that were assigned a CHID in the Manual window. If this option is not selected (it has no checkmark), then the available CHIDs for these CHPIDs are not reset.

    By default, this option is not selected.
  - **Reset CHPIDs assigned by IOCP (Potential re-cabling)**: If some of the CHPIDs are assigned in the IOCP Input file, selecting this option resets the CHPIDs. Selecting this option might require recabling after availability assignments.

    Generally, select this option.
  - **Reset CHPIDs assigned by CMT for config files**: The CFReport indicates that you are doing an MES or upgrade, and you have channels or CHPIDs (or both) that might have configuration files that are associated with them. The MES or upgrade might move some of those channel cards.

    Regardless of whether the channels are moving or not, the CMT either assigns CHIDs to the logical CHPID definitions to keep the CHPID definition associated with its current configuration file, or it moves the definition to the new location where the channel is moving.

    If you reset the CMT assignments, back up the configuration file data before the MES, and restore that data to the new location (the CHID where the affected CHPIDs are assigned) before you use the CHPIDs.

    By default, this option is not selected.

  If no options are selected, availability works only on CHPIDs that have no CHIDs assigned.

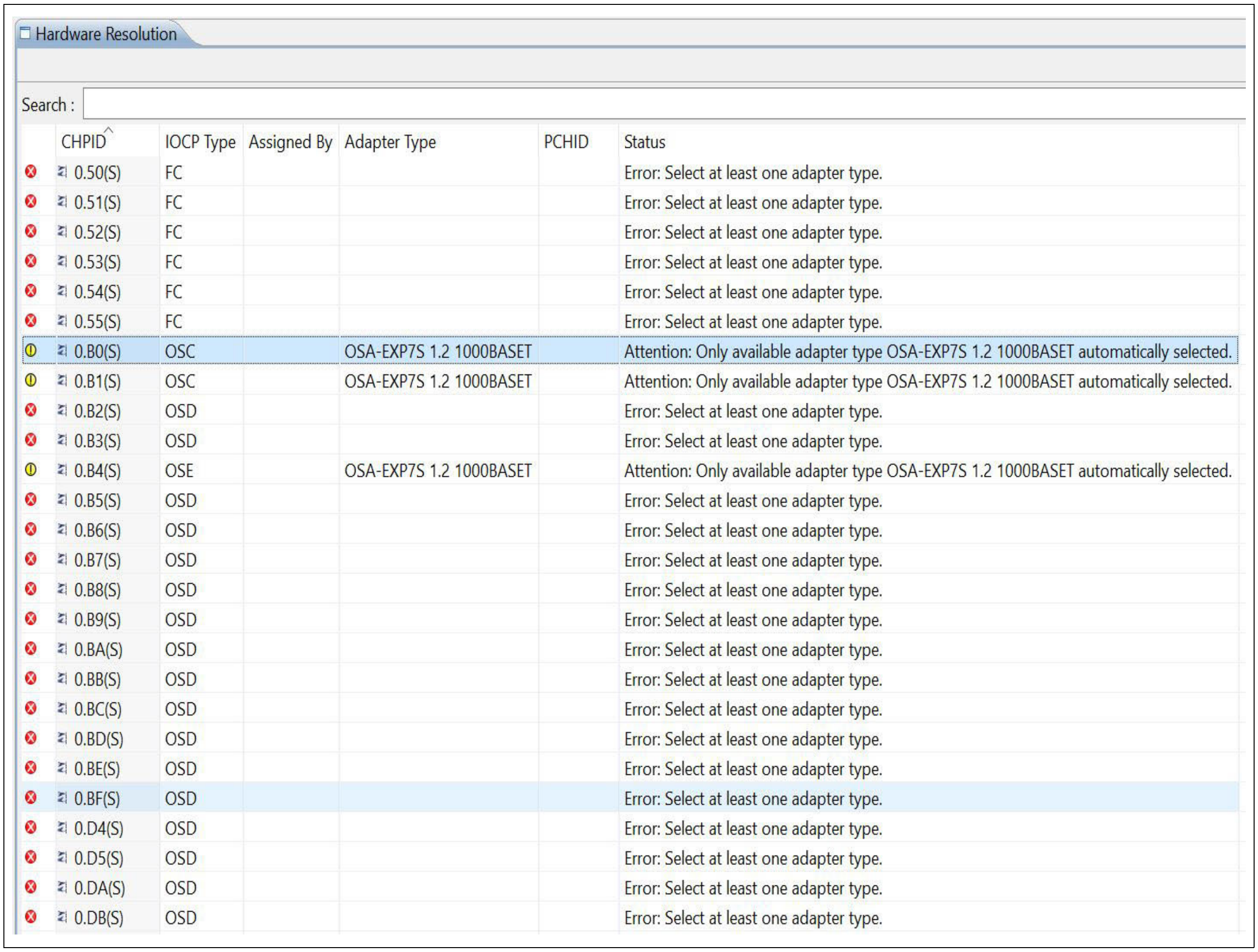
  To give the CMT the most choices when you use the availability option, select **Reset CHPIDs assigned by IOCP**.

  Attention: If you run **Reset CHPIDs assigned by IOCP**, it resets any previously mapped CHPID assignments and can result in recabling of the server.

  However, if you select **Reset CHPIDs assigned by Automatic Mapping**, review the intersects from availability processing carefully to ensure that preserving the prior CHPID-to-CHID relationship does not cause unacceptable availability.

6.11 Resolving CHPIDs with CHID conflicts

The CMT shows the CHPIDs with CHID conflicts (see Figure 6-46).



	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	0.50(S)	FC				Error: Select at least one adapter type.
	0.51(S)	FC				Error: Select at least one adapter type.
	0.52(S)	FC				Error: Select at least one adapter type.
	0.53(S)	FC				Error: Select at least one adapter type.
	0.54(S)	FC				Error: Select at least one adapter type.
	0.55(S)	FC				Error: Select at least one adapter type.
	0.B0(S)	OSC		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.
	0.B1(S)	OSC		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.
	0.B2(S)	OSD				Error: Select at least one adapter type.
	0.B3(S)	OSD				Error: Select at least one adapter type.
	0.B4(S)	OSE		OSA-EXP7S 1.2 1000BASET		Attention: Only available adapter type OSA-EXP7S 1.2 1000BASET automatically selected.
	0.B5(S)	OSD				Error: Select at least one adapter type.
	0.B6(S)	OSD				Error: Select at least one adapter type.
	0.B7(S)	OSD				Error: Select at least one adapter type.
	0.B8(S)	OSD				Error: Select at least one adapter type.
	0.B9(S)	OSD				Error: Select at least one adapter type.
	0.BA(S)	OSD				Error: Select at least one adapter type.
	0.BB(S)	OSD				Error: Select at least one adapter type.
	0.BC(S)	OSD				Error: Select at least one adapter type.
	0.BD(S)	OSD				Error: Select at least one adapter type.
	0.BE(S)	OSD				Error: Select at least one adapter type.
	0.BF(S)	OSD				Error: Select at least one adapter type.
	0.D4(S)	OSD				Error: Select at least one adapter type.
	0.D5(S)	OSD				Error: Select at least one adapter type.
	0.DA(S)	OSD				Error: Select at least one adapter type.
	0.DB(S)	OSD				Error: Select at least one adapter type.

Figure 6-46 CHPIDs with PCHID conflicts

In the first column of every row, the Hardware Resolution pane contains either of the following symbols:

- An X in a red circle: This symbol indicates an error.
- An exclamation mark in a yellow circle: This symbol indicates a warning or attention message.
- A green checkmark: This symbol indicates that the tool successfully resolved the specified Channel Type.

In this example, here are the reasons that we needed to resolve hardware resolution issues:

- The CHID channel type changed.
- The defined CHID is not compatible with the channel path at a particular location.
- Enough ports exist in the hardware.
- A type mismatch exists between a CHPID and its associated channel type.

6.12 Hardware resolution

In the example, the CMT displays an X in the first column of the Hardware Resolution panel (see Figure 6-47) that is related to these error types: `Select at least one adapter type`.

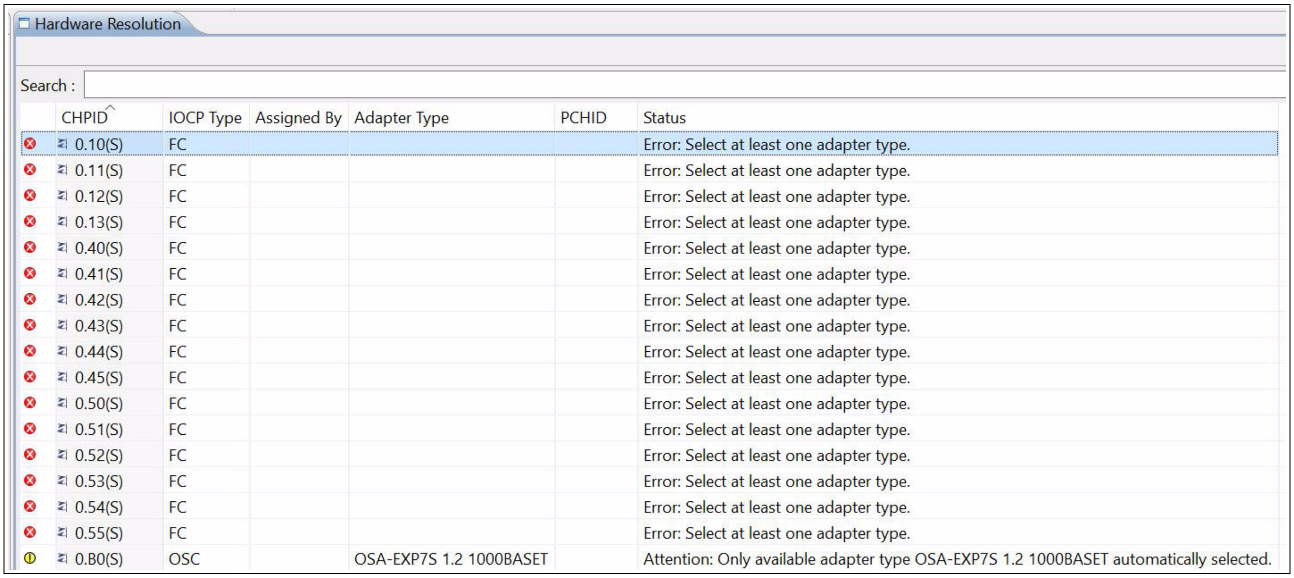


Figure 6-47 Hardware resolution status errors

More information: For more information about these error messages, see the *CHPID Mapping Tool User's Guide*, GC28-7024.

The options that must be reset are as follows:

- Resetting Incompatible (Hardware - I/O) entries: (*not* shown in example).
- Resetting "Error: No hardware found" entries: (*not* shown in example).
- Resetting "Select at least one adapter type": (shown in example).
- Resetting "Required hardware for type IOCP_type not available": (*not* shown in example).
- Resetting "CHID_1 moved to new channel ID: CHID_2": (*not* shown in example).

6.12.1 Resetting Incompatible (Hardware - I/O) entries

The channel type that is assigned for the CHPID is not compatible with the IOCP type that is specified by the IOCP file. For this mismatch, you might receive the following message:

```
Error: Channel_type is not compatible with IOCP_type.
```

You can resolve this problem by resetting the CHID. For example, if the IOCP type is OSD but the CHID is associated with a Fibre Connection (FICON) card. You cannot assign the OSD type on the FICON card.

The CMT example displays the error message in the Status column (see Figure 6-48).

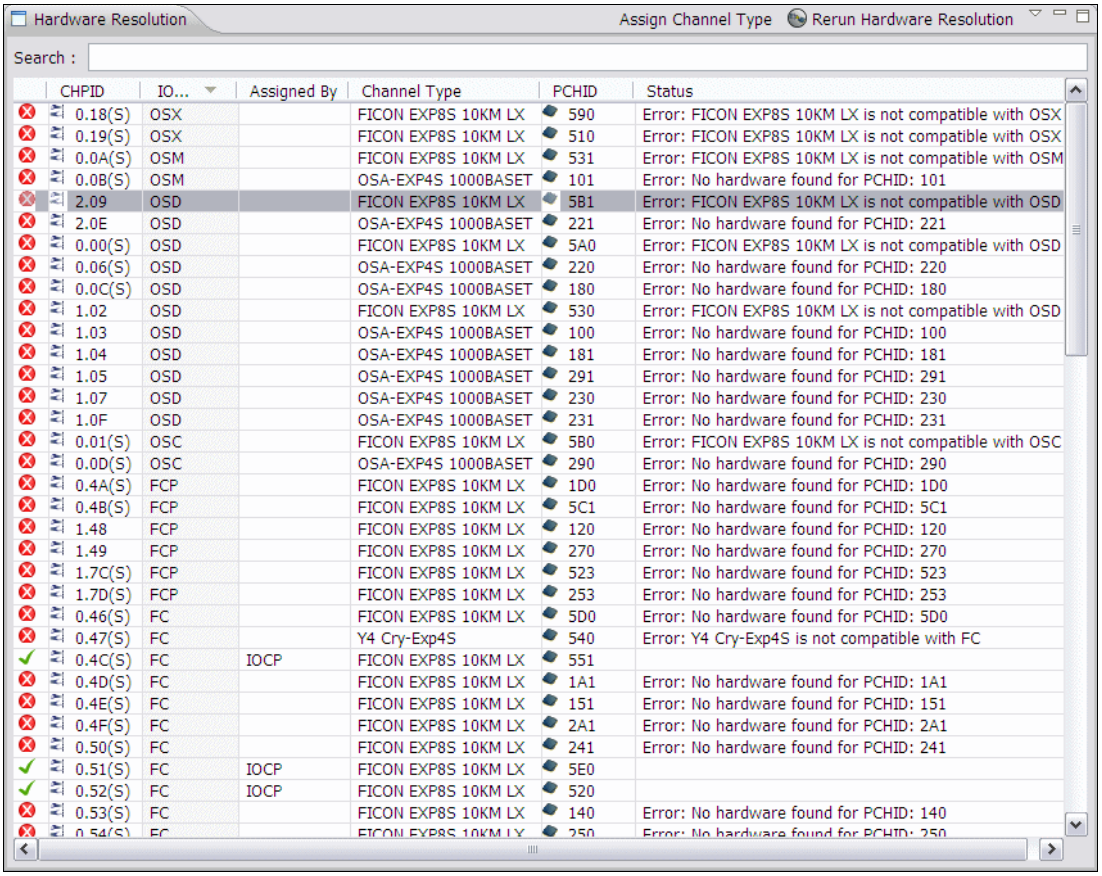


Figure 6-48 Channel_type is not compatible with IOCP_type

Complete the following steps:

1. Select the channel type **OSD**. The Status is `Error: FICON EXP8S is not compatible with OSD`. Right-click in the row and select **Reset Incompatible (Hardware - I/O) Entries** to remove the CHID values for only those rows (see Figure 6-49).

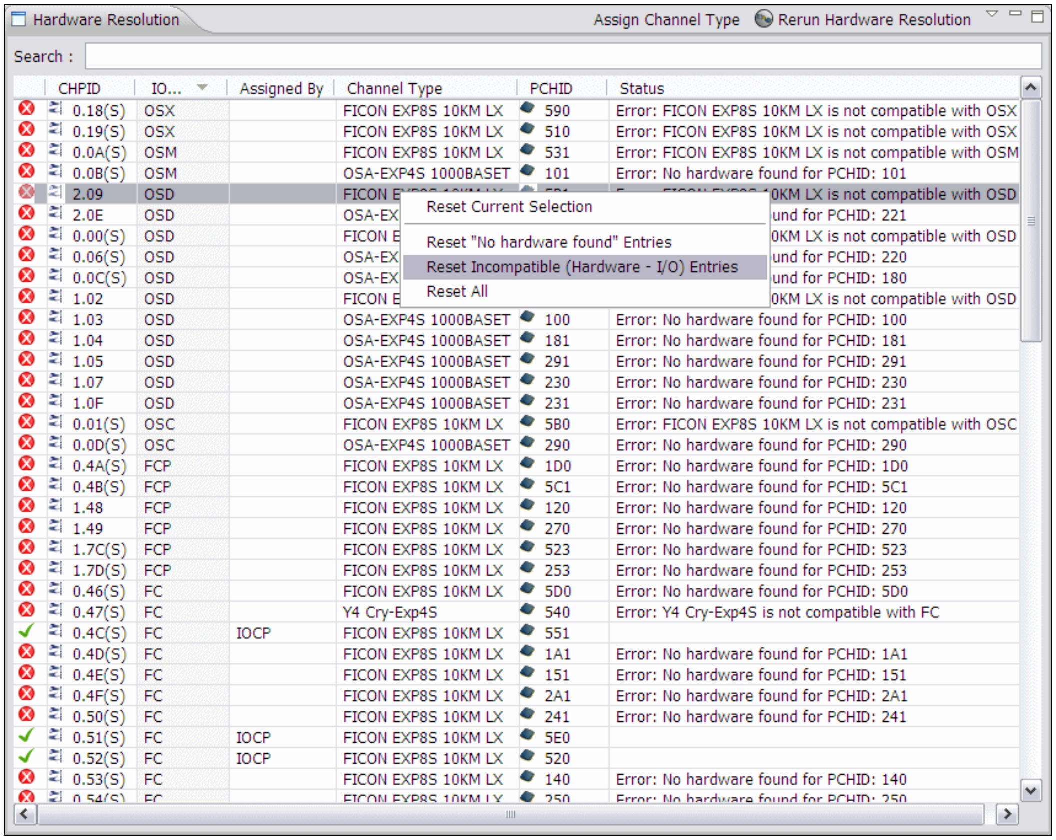
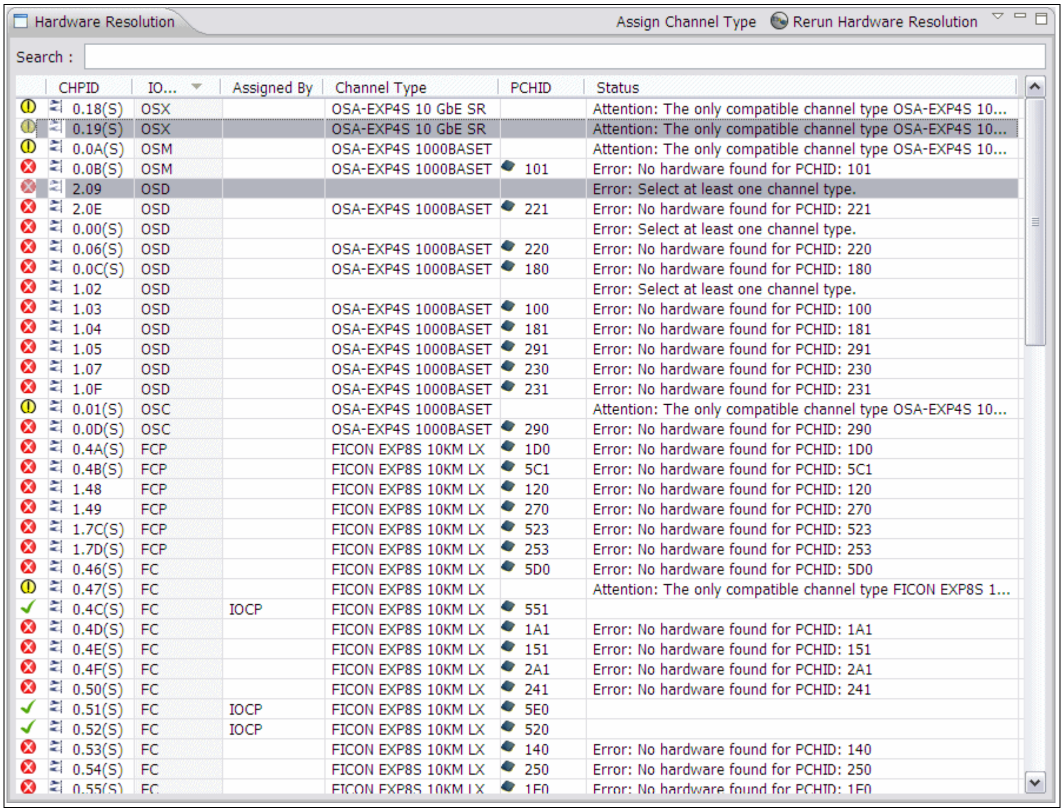


Figure 6-49 Channel_type is not compatible with IOCP_type OSD

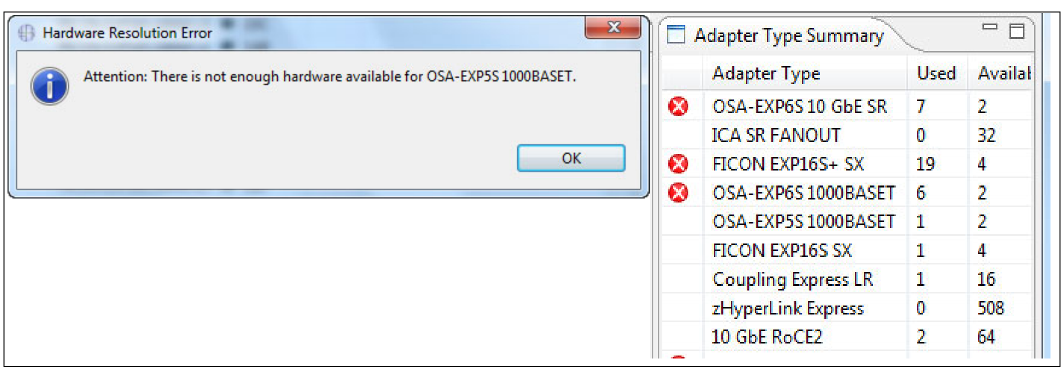
The tool replaces the X in a red circle with an Attention icon (exclamation mark in a yellow circle), changes the status message, and removes the CHID information (see Figure 6-50).



CHPID	IO...	Assigned By	Channel Type	PCHID	Status
0.18(S)	OSX		OSA-EXP4S 10 GbE SR		Attention: The only compatible channel type OSA-EXP4S 10...
0.19(S)	OSX		OSA-EXP4S 10 GbE SR		Attention: The only compatible channel type OSA-EXP4S 10...
0.0A(S)	OSM		OSA-EXP4S 1000BASET		Attention: The only compatible channel type OSA-EXP4S 10...
0.0B(S)	OSM		OSA-EXP4S 1000BASET	101	Error: No hardware found for PCHID: 101
2.09	OSD				Error: Select at least one channel type.
2.0E	OSD		OSA-EXP4S 1000BASET	221	Error: No hardware found for PCHID: 221
0.00(S)	OSD				Error: Select at least one channel type.
0.06(S)	OSD		OSA-EXP4S 1000BASET	220	Error: No hardware found for PCHID: 220
0.0C(S)	OSD		OSA-EXP4S 1000BASET	180	Error: No hardware found for PCHID: 180
1.02	OSD				Error: Select at least one channel type.
1.03	OSD		OSA-EXP4S 1000BASET	100	Error: No hardware found for PCHID: 100
1.04	OSD		OSA-EXP4S 1000BASET	181	Error: No hardware found for PCHID: 181
1.05	OSD		OSA-EXP4S 1000BASET	291	Error: No hardware found for PCHID: 291
1.07	OSD		OSA-EXP4S 1000BASET	230	Error: No hardware found for PCHID: 230
1.0F	OSD		OSA-EXP4S 1000BASET	231	Error: No hardware found for PCHID: 231
0.01(S)	OSC		OSA-EXP4S 1000BASET		Attention: The only compatible channel type OSA-EXP4S 10...
0.0D(S)	OSC		OSA-EXP4S 1000BASET	290	Error: No hardware found for PCHID: 290
0.4A(S)	FCP		FICON EXP8S 10KM LX	1D0	Error: No hardware found for PCHID: 1D0
0.4B(S)	FCP		FICON EXP8S 10KM LX	5C1	Error: No hardware found for PCHID: 5C1
1.48	FCP		FICON EXP8S 10KM LX	120	Error: No hardware found for PCHID: 120
1.49	FCP		FICON EXP8S 10KM LX	270	Error: No hardware found for PCHID: 270
1.7C(S)	FCP		FICON EXP8S 10KM LX	523	Error: No hardware found for PCHID: 523
1.7D(S)	FCP		FICON EXP8S 10KM LX	253	Error: No hardware found for PCHID: 253
0.46(S)	FC		FICON EXP8S 10KM LX	5D0	Error: No hardware found for PCHID: 5D0
0.47(S)	FC		FICON EXP8S 10KM LX		Attention: The only compatible channel type FICON EXP8S 1...
0.4C(S)	FC	IOCP	FICON EXP8S 10KM LX	551	
0.4D(S)	FC		FICON EXP8S 10KM LX	1A1	Error: No hardware found for PCHID: 1A1
0.4E(S)	FC		FICON EXP8S 10KM LX	151	Error: No hardware found for PCHID: 151
0.4F(S)	FC		FICON EXP8S 10KM LX	2A1	Error: No hardware found for PCHID: 2A1
0.50(S)	FC		FICON EXP8S 10KM LX	241	Error: No hardware found for PCHID: 241
0.51(S)	FC	IOCP	FICON EXP8S 10KM LX	5E0	
0.52(S)	FC	IOCP	FICON EXP8S 10KM LX	520	
0.53(S)	FC		FICON EXP8S 10KM LX	140	Error: No hardware found for PCHID: 140
0.54(S)	FC		FICON EXP8S 10KM LX	250	Error: No hardware found for PCHID: 250
0.55(S)	FC		FICON EXP8S 10KM LX	1E0	Error: No hardware found for PCHID: 1E0

Figure 6-50 Results of resetting the incompatible type

2. The CMT now displays messages about any CHPID types that were imported from the IODF into the CMT that do not have any associated hardware support in the CFReport file (see Figure 6-51). Click **OK**. The same figure also shows the Adapter Type Summary details.



Adapter Type	Used	Availat
OSA-EXP6S 10 GbE SR	7	2
ICA SR FANOUT	0	32
FICON EXP16S+ SX	19	4
OSA-EXP6S 1000BASET	6	2
OSA-EXP5S 1000BASET	1	2
FICON EXP16S SX	1	4
Coupling Express LR	1	16
zHyperLink Express	0	508
10 GbE RoCE2	2	64

Figure 6-51 Required hardware unavailable

There are excessive numbers of OSC CHPID types in the example IODF to show how the CMT handles this condition.

You can use the `overdefine` option to change the CHID value to an asterisk (*) in the IODF. This way, you can retain the OSD CHPID definitions in the IODF so that you can install OSD CHIDs in the processor later.

> **Tip:** Other CHPID types can also be overdefined by entering an asterisk (*) for the CHID value. Overdefining is now supported for CIB and CS5 type CHPID definitions.

Alternatively, you can remove the OSD CHPID definitions from the IODF.

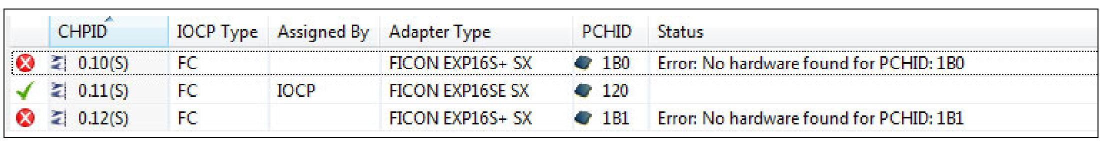
3. Return to the IODF and change the CHID values for the OSD CHPIDs (or any other CHPIDs that have no supporting hardware in the CFReport) to an asterisk (*).
4. Revalidate the IODF by using HCD option 2.12.
5. Re-create the IOCP statements file and transfer it to your workstation.
6. Import the IOCP file by right-clicking the Projects window and selecting **Import IOCP File**.

> **Tip**: If you look at the IOCP statements file now, although the OSD CHPIDs are omitted from the file, but they are still defined in the IODF.

Now, when you click **Reset "*Channel-Type* is not compatible with IOCP_*type*"**, the CMT prompts you to resolve some hardware errors.

6.12.2 Resetting "Error: No hardware found" entries

An X in a red circle in the first column indicates an error, and the Status column shows the message `Error: No hardware found` (see Figure 6-52).

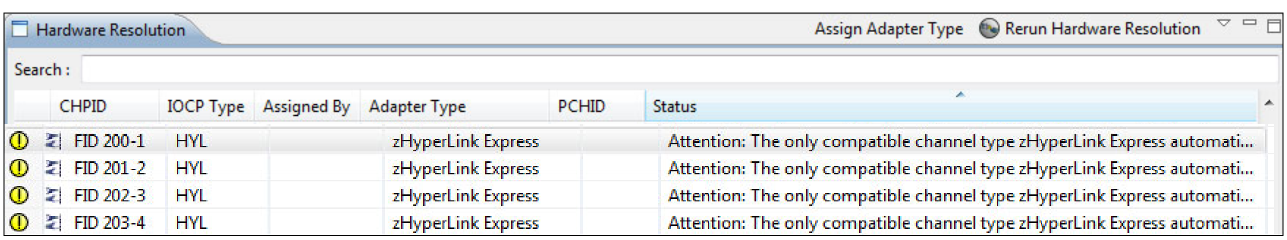


	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	0.10(S)	FC		FICON EXP16S+ SX	1B0	Error: No hardware found for PCHID: 1B0
	0.11(S)	FC	IOCP	FICON EXP16SE SX	120	
	0.12(S)	FC		FICON EXP16S+ SX	1B1	Error: No hardware found for PCHID: 1B1

Figure 6-52 Error: No Hardware found

In the example, select channel type **FC**. The status is `Error: No Hardware found`. Right-click in the row and select **Reset "No hardware found" Entries** to remove the CHID values for those rows.

The tool replaces the X with an Attention icon, changes the status message, and removes the CHID information (see Figure 6-53).



Hardware Resolution | Assign Adapter Type | Rerun Hardware Resolution

Search :

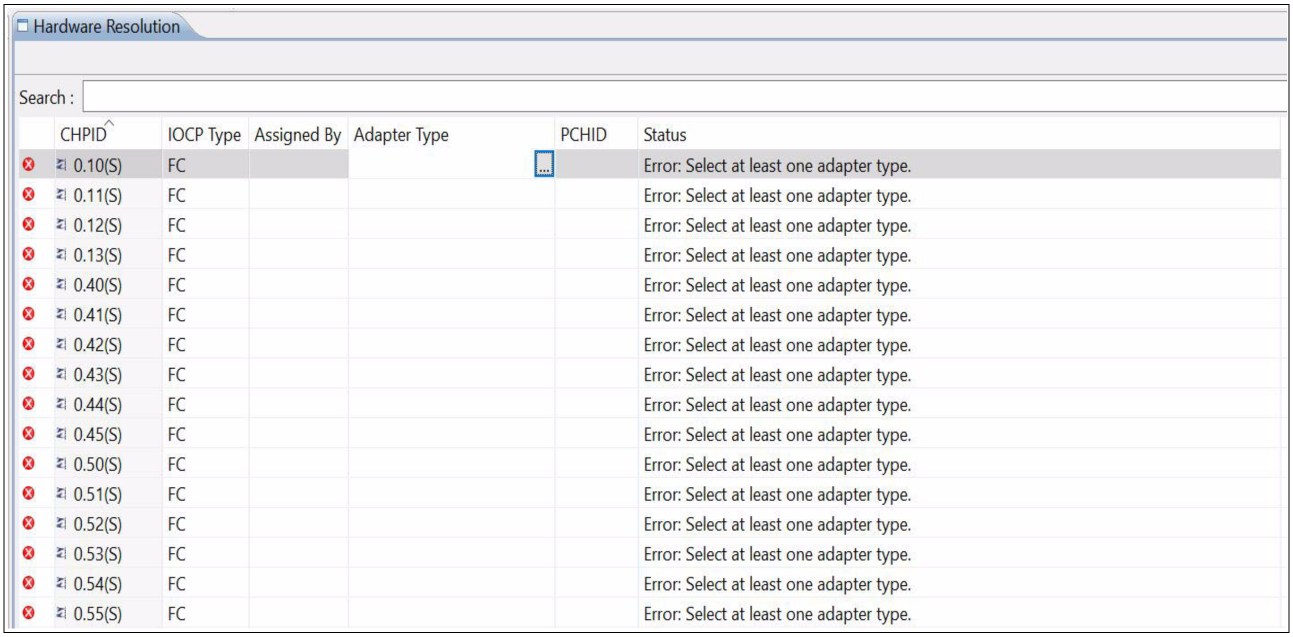
	CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
	FID 200-1	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...
	FID 201-2	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...
	FID 202-3	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...
	FID 203-4	HYL		zHyperLink Express		Attention: The only compatible channel type zHyperLink Express automati...

Figure 6-53 Results of resetting "No hardware found"

6.12.3 Resetting “Select at least one adapter type”

The adapter type is not assigned to the current row. Assign an adapter type to the IOCP type by completing the following steps:

1. Click the **Adapter Type** column in the target row. The tool displays an arrow in the Channel Type column of the target row (see Figure 6-54).



Hardware Resolution

Search :

CHPID	IOCP Type	Assigned By	Adapter Type	PCHID	Status
0.10(S)	FC		...		Error: Select at least one adapter type.
0.11(S)	FC				Error: Select at least one adapter type.
0.12(S)	FC				Error: Select at least one adapter type.
0.13(S)	FC				Error: Select at least one adapter type.
0.40(S)	FC				Error: Select at least one adapter type.
0.41(S)	FC				Error: Select at least one adapter type.
0.42(S)	FC				Error: Select at least one adapter type.
0.43(S)	FC				Error: Select at least one adapter type.
0.44(S)	FC				Error: Select at least one adapter type.
0.45(S)	FC				Error: Select at least one adapter type.
0.50(S)	FC				Error: Select at least one adapter type.
0.51(S)	FC				Error: Select at least one adapter type.
0.52(S)	FC				Error: Select at least one adapter type.
0.53(S)	FC				Error: Select at least one adapter type.
0.54(S)	FC				Error: Select at least one adapter type.
0.55(S)	FC				Error: Select at least one adapter type.

Figure 6-54 Selecting at least one adapter type

2. Click the **ellipses** (...) box.
3. The tool displays a list of available and compatible card types for the CHPID, as shown in see Figure 6-55 on page 171. Select an adapter type and click **OK**.
4. In the **Adapter Type Summary** tab, observe that the Used and Available totals change.

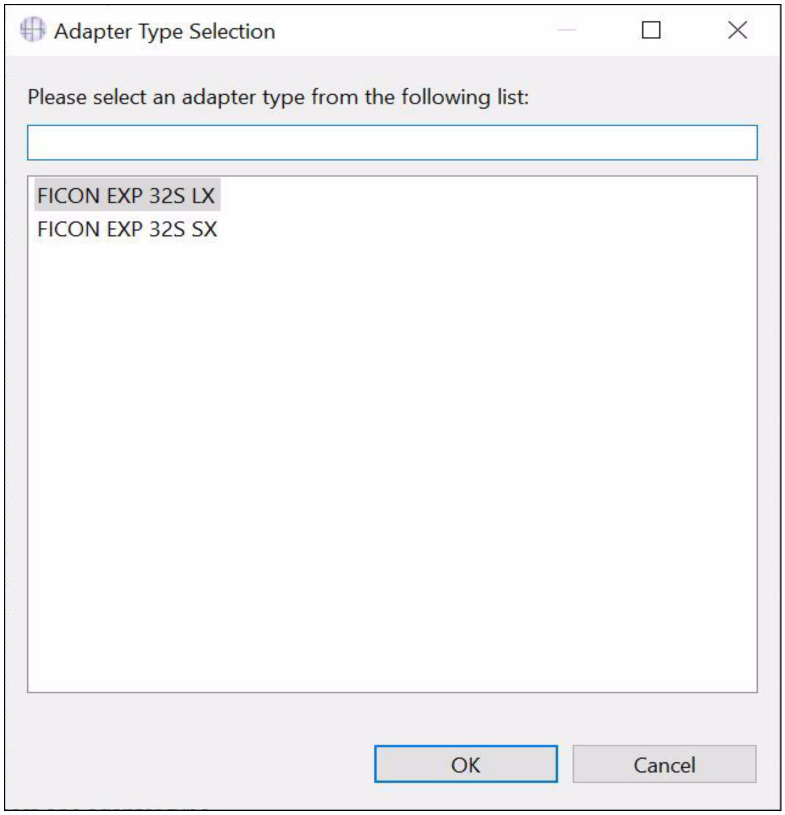


Figure 6-55 Adapter Type Selection

6.12.4 Resetting “Required hardware for type IOCP_type not available”

The CMT found no hardware for the specified IOCP type, as shown in this example message:

```
Required hardware for type CS5 not available.
```

Change the IOCP file or obtain more hardware.

6.12.5 Resetting “CHID_1 moved to new channel ID: CHID_2”

When moving from old hardware to new hardware, for example, during a MES, the CHID value that is assigned to a feature can change. This message indicates that the IOCP file contains a CHID value for the old machine that is being removed. The CHID value is changed from the old machine to the CHID value for the new machine.

For example, *CHID_1* is the first CHID value representing the old hardware (for example, 1B0) and *CHID_2* is the new value representing the new hardware (for example, 533). In essence, the feature is present in both the old and new hardware, but its location (CHID) changed.

This status is an informational message. No hardware resolution is required. The message informs you of the new location so you can change it if you prefer a different assignment.

After you assign all Adapter Types, the **Manual Mapping** button becomes available.

6.13 Manual mapping to resolve CIB CHPIDs

> **Note:** This section applies only when you upgrade from IBM z14 (3906) to IBM z16 (3931).

In some situations, the Automatic Mapping option is not available. You cannot use automatic mapping until all CIB or CS5 CHPIDs are resolved. You can use manual mapping to resolve this task.

To resolve the CIB or CS5 CHPIDs, assign the available CHPIDs by completing the following steps:

1. Click **Manual Mapping** (see Figure 6-56).

Figure 6-56 Manual Mapping

2. Ensure that the tool is set to display Manual Mapping by selecting **Hardware** → **I/O** (see Figure 6-57).

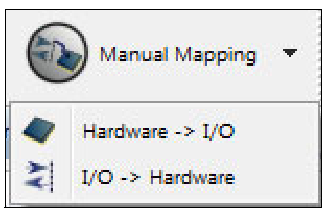


Figure 6-57 Manual Mapping of Hardware -> I/O

3. Select every row that has type Integrated Coupling Adapter Short Reach (ICA SR) in the Channel Type column. The tool displays all the available CHPIDs with the IOCP type (see Figure 6-58).

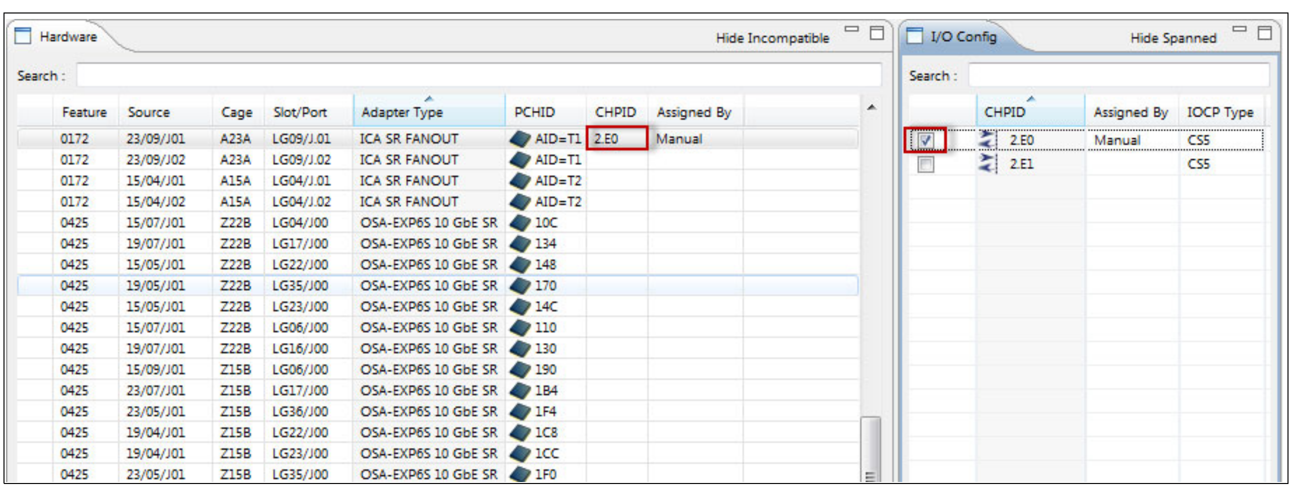


Figure 6-58 Adapter Type of HCA3 and associated CHPIDs that are assigned

4. Select one or more empty check boxes in the I/O Config pane to assign the CHPID. In the Hardware pane, the CHPID number is inserted in the CHPID column. In the Assigned By column, the value of Manual is inserted.

5. If you select more than one CHPID for an ICS SR adapter type, you see the Multiple --> value (see Figure 6-59) inserted into the CHPID and Assigned By columns.

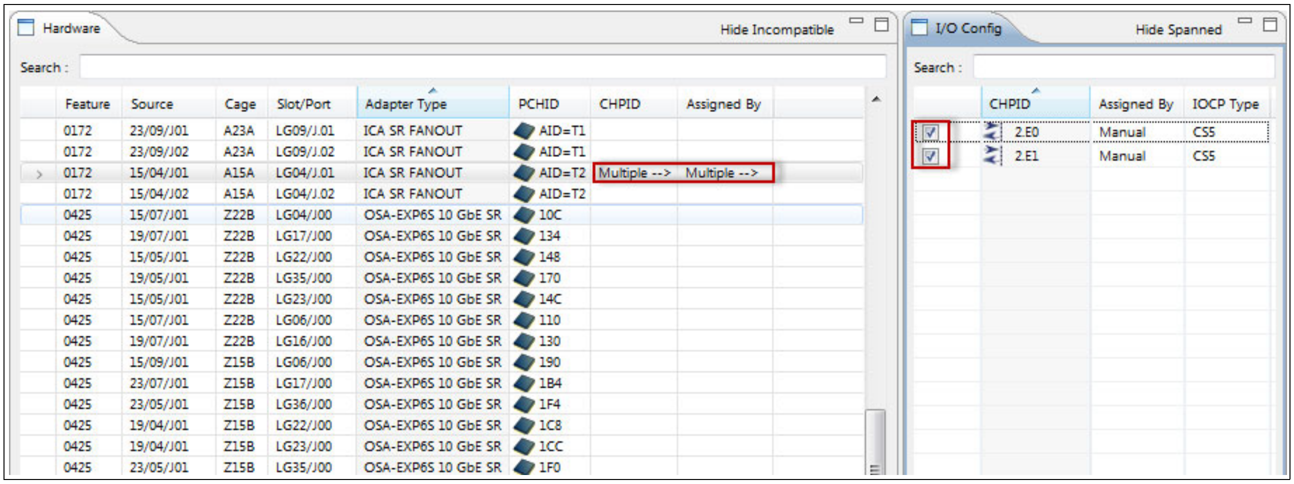


Figure 6-59 Adapter Type of HCA3 and associated multiple CHPIDs that are assigned

The **Automatic Mapping** button becomes available after you assign all the CHPIDs of IOCP type CIB or CS5.

6.14 Processing Automatic Mapping and CU Priority

If you are importing an IOCP statements file from an IBM z15 that had CU Priority values defined, review the CU Priority values first. Then, the CMT can perform the availability functions for an IBM z16.

Assign priorities if you want to make some CUs more important (in the CMT processing order) than others, or have two (or more) CUs that you want the CMT to process at the same time.

Perform the first availability function by completing these steps:

1. Click **Automatic Mapping**.
2. The Reset CHPID Assignments window opens with Reset choices (see Figure 6-60). For the example, select the following two options and then click **OK**:
   - **Reset CHPIDs assigned by Automatic Mapping**
   - **Reset CHPIDs assigned by IOCP (Potential re-cabling required!)**

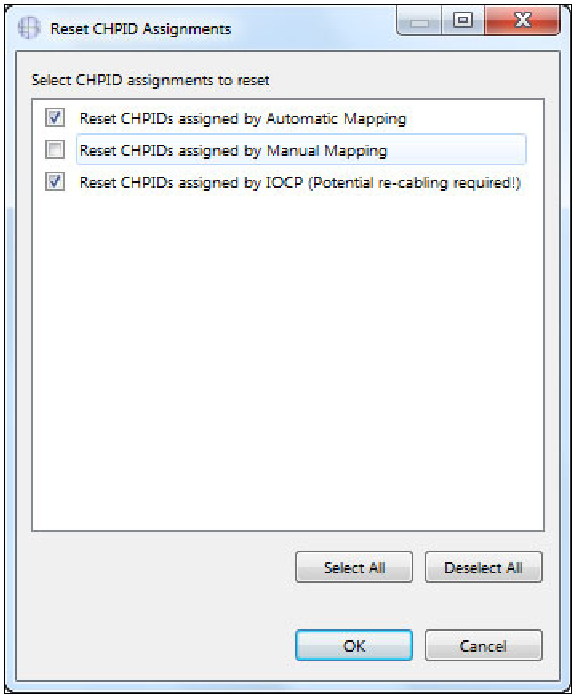


Figure 6-60 Resetting CHPID Assignments

> **Tip:** The following third choice is also available, but only for an upgrade or an MES:
>
> **Reset CHPIDs assigned by CMT for config files.**

3. Click **OK** to confirm the reset (see Figure 6-61).

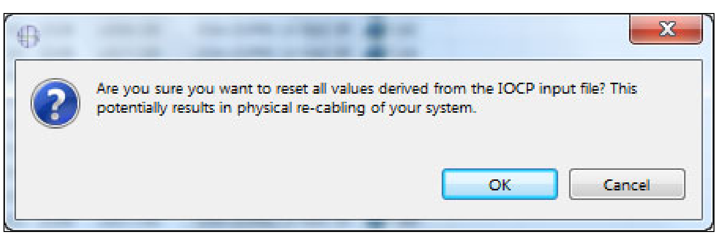


Figure 6-61 Resetting CHPID assignments warning message

4. The availability rules might differ from a previous zSystems family, so remove all CHID assignments that are still in the IOCP.
5. Click **OK**.
6. After the CMT resets the CHPIDs, it displays the result of the process (see Figure 6-62 on page 175). Click **OK**.

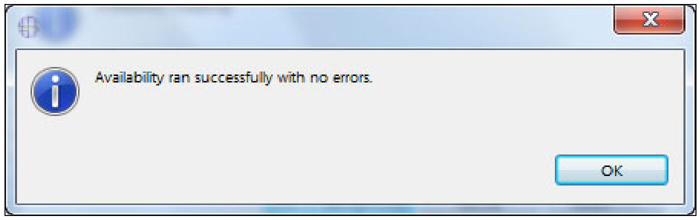


Figure 6-62 Availability ran successfully with no errors message

7. Click **OK** (see Figure 6-63).

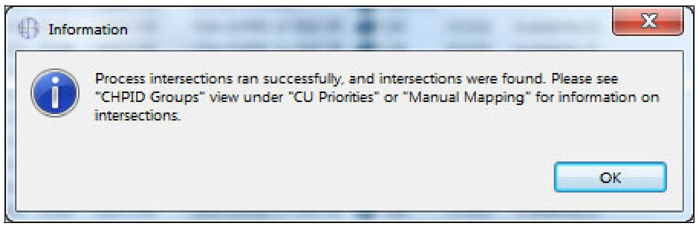


Figure 6-63 Process Intersections run successfully message

The possible intersects are as follows:

C Two or more assigned channels use the same adapter.

S Greater than half the assigned PCHIDs use the same InfiniBand or STI link.

M All assigned channels are supported by the same MBA group.

B More than half the assigned channels are supported by the same book.

D Assigned channels are on the same daughter card.

Tip: Intersect messages inform you of a potential availability problem that is detected by the CMT. However, they do not necessarily indicate an error. It is your responsibility to evaluate whether the condition must be corrected.

8. Click **Manual Mapping**. In the **CHPID Groups** tab, observe any intersect warnings that were found during automatic mapping and decide whether they are acceptable (see Figure 6-64). The example returned the “C” intersect. This warning indicates that there are multiple definitions on the same I/O card.

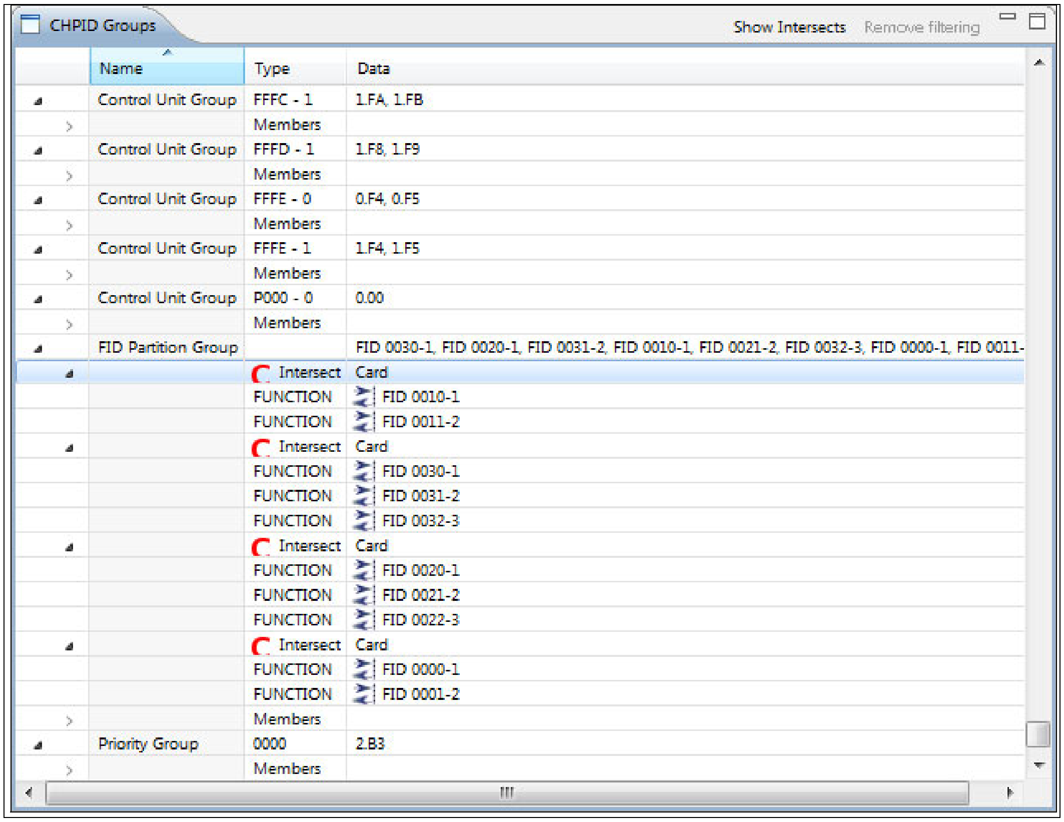


Figure 6-64 B Intersect examples

You can now display the results of the channel mapping. You can also sort the report in various ways. For example, you can see how the CMT ranked CUs.

Check and set values for items such as OSC CHPIDs and FCTC CHPIDs to ensure that the CMT allocates these CHPIDs with high CHID availability by completing the following steps:

1. Click **CU Priorities**. By default, this pane is in the center at the top.
2. In the CU Priorities pane, search in the CU Number column for the CUs that you want to set a priority for.
3. Type a priority number for the CU in the Priority column for each row. The CMT makes more related changes in the CHPID Groups panes.

6.15 CHPIDs not connected to control units

In the CU Priorities window, select the CU Number column (see Figure 6-65). The CMT shows, at the end of the list, all CHPIDs that are defined in the IOCP input that are not connected to CUs. In the list of CU numbers, the letter “S” precedes all coupling CHPIDs, and the letter “P” precedes all non-coupling CHPIDs.

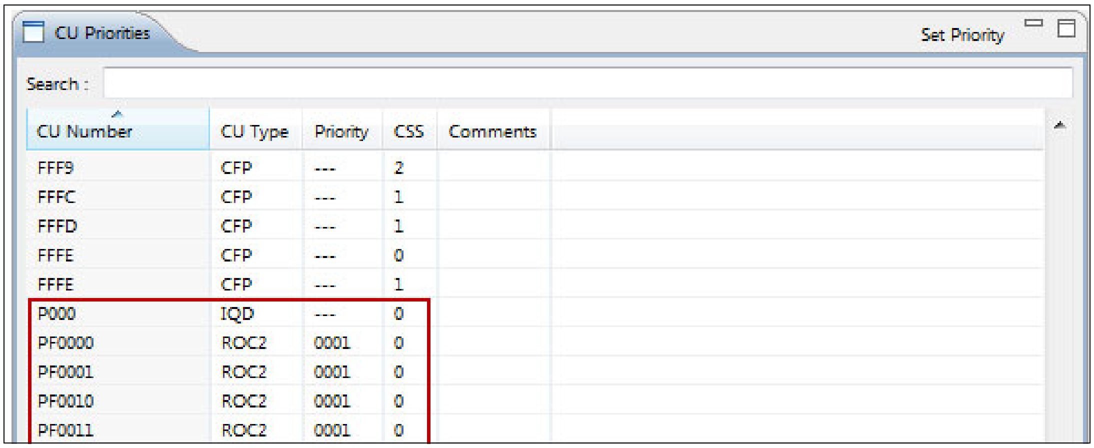


Figure 6-65 CHPIDs not connected to control units

Review the list for the following reasons:

- Perhaps you forgot to add a CHPID to a CU and must update the IOCP source before you continue in the CMT.
- The unconnected CHPIDs might be extra channels that you are ordering in anticipation of new CUs.
- The unconnected CHPIDs might be coupling links that are being used in Coupling Facility (CF) images (they do not require CUs).

If there are extra CHPIDs for anticipated new CUs, consider grouping these CHPIDs with a common priority. Having a common priority enables the availability mapping function to pick CHIDs that can afford your new CU availability.

6.16 Creating CHPID Mapping Tool reports

The CMT offers built-in reports, which are available from the top of the window. You can also print the information from the report by clicking **Print**. Figure 6-66 shows the options to create a Preview Report or Save Report.

Figure 6-66 Preview Report and Save Report buttons

Click **Preview Report** or **Save Report** to display the choices (a list of types of reports). The choices are the same except that **Save Report** lists an extra selection (see Figure 6-67

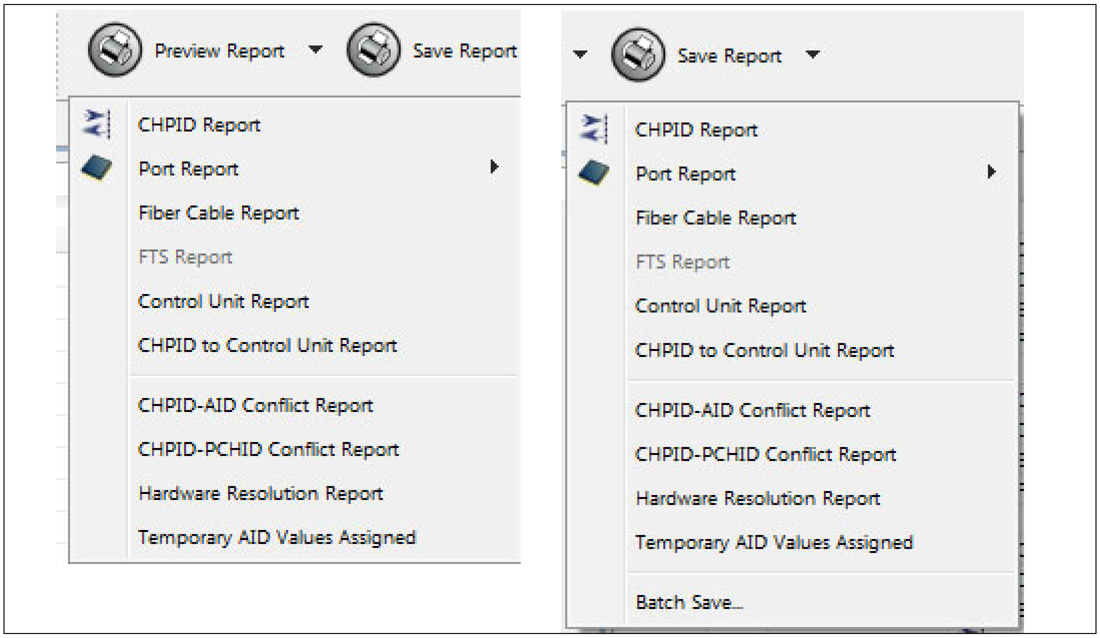


Figure 6-67 Preview Report and Save Report menus

For simplicity, only three reports are described in this example:

- The CHPID Report
- The Port Report sorted by location
- The CHPID to Control Unit Report

However, all built-in reports are printed in the same way.

The person who installs the I/O cables during system installation needs one of these reports. The Port Report sorted by location is preferable. The installer can use this report to help with labeling the cables. The labels must include the CHID or cage, slot, or port information before system delivery.

6.16.1 CHPID Report

To create the CHPID Report, complete the following steps:

1. Select **Preview Report** → **CHPID Report** (see Figure 6-68).

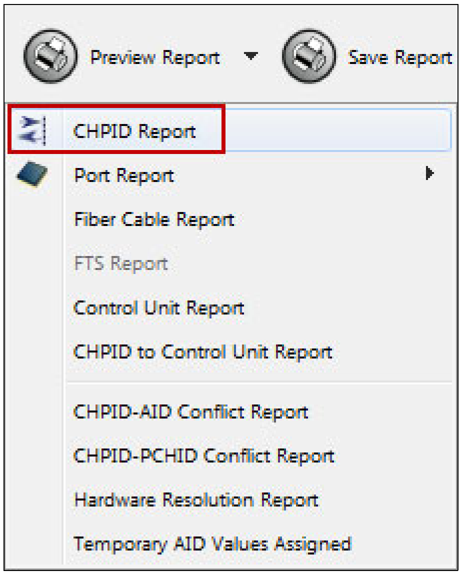
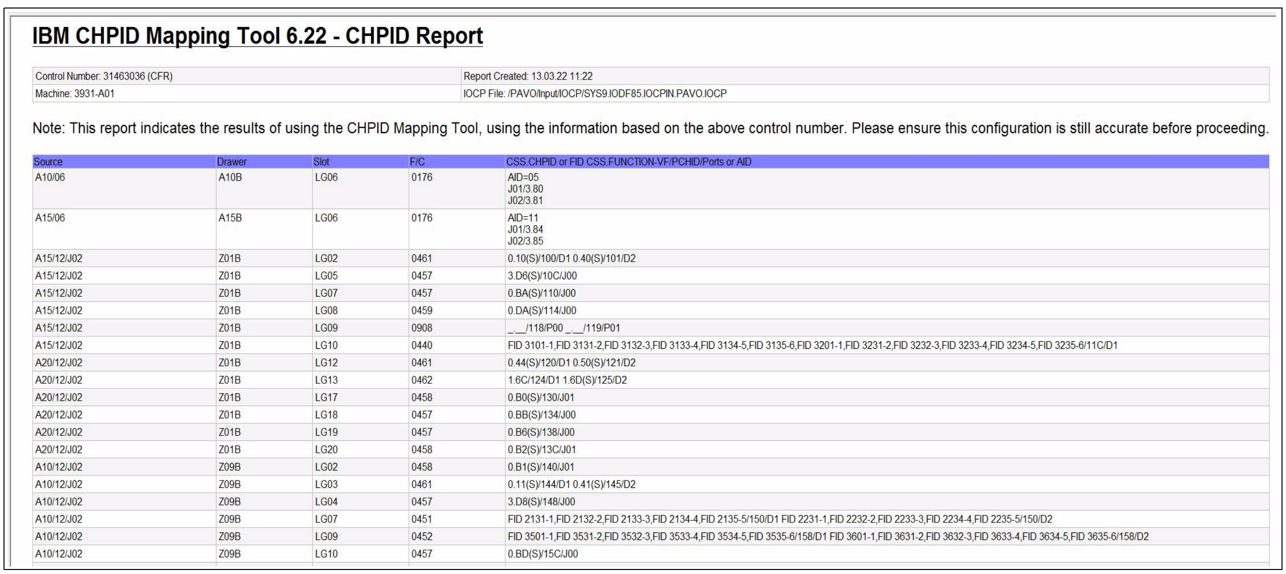


Figure 6-68 Preview report: CHPID Report

The CMT displays the CHPID Report in a **Report** tab within the CMT (see Figure 6-69).



IBM CHPID Mapping Tool 6.22 - CHPID Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:22
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before proceeding.

Source	Drawer	Slot	F/C	CSS.CHPID or FID CSS.FUNCTION-VF/PCHID/Ports or AID
A10/06	A10B	LG06	0176	AID=05 J01/3.80 J02/3.81
A15/06	A15B	LG06	0176	AID=11 J01/3.84 J02/3.85
A15/12/J02	Z01B	LG02	0461	0.10(S)/100/D1 0.40(S)/101/D2
A15/12/J02	Z01B	LG05	0457	3.D6(S)/10C/J00
A15/12/J02	Z01B	LG07	0457	0.BA(S)/110/J00
A15/12/J02	Z01B	LG08	0459	0.DA(S)/114/J00
A15/12/J02	Z01B	LG09	0908	_.__/118/P00 _.__/119/P01
A15/12/J02	Z01B	LG10	0440	FID 3101-1,FID 3131-2,FID 3132-3,FID 3133-4,FID 3134-5,FID 3135-6,FID 3201-1,FID 3231-2,FID 3232-3,FID 3233-4,FID 3234-5,FID 3235-6/11C/D1
A20/12/J02	Z01B	LG12	0461	0.44(S)/120/D1 0.50(S)/121/D2
A20/12/J02	Z01B	LG13	0462	1.6C/124/D1 1.6D(S)/125/D2
A20/12/J02	Z01B	LG17	0458	0.B0(S)/130/J01
A20/12/J02	Z01B	LG18	0457	0.BB(S)/134/J00
A20/12/J02	Z01B	LG19	0457	0.B6(S)/138/J00
A20/12/J02	Z01B	LG20	0458	0.B2(S)/13C/J01
A10/12/J02	Z09B	LG02	0458	0.B1(S)/140/J01
A10/12/J02	Z09B	LG03	0461	0.11(S)/144/D1 0.41(S)/145/D2
A10/12/J02	Z09B	LG04	0457	3.D8(S)/148/J00
A10/12/J02	Z09B	LG07	0451	FID 2131-1,FID 2132-2,FID 2133-3,FID 2134-4,FID 2135-5/150/D1 FID 2231-1,FID 2232-2,FID 2233-3,FID 2234-4,FID 2235-5/150/D2
A10/12/J02	Z09B	LG09	0452	FID 3501-1,FID 3531-2,FID 3532-3,FID 3533-4,FID 3534-5,FID 3535-6/158/D1 FID 3601-1,FID 3631-2,FID 3632-3,FID 3633-4,FID 3634-5,FID 3635-6/158/D2
A10/12/J02	Z09B	LG10	0457	0.BD(S)/15C/J00

Figure 6-69 CHPID Report

Tip: You can save individual reports as multiple reports in a batch.

2. Click **Save Report**.

In the example, when you click **CHPID Report**, an option window opens (see Figure 6-70). Specify a file name and an external path (location) of where to save the file. If you want to save the report in HTML, select **HTML**. The tool selects **PDF** by default. The window is similar for all types of reports. Click **Finish**.

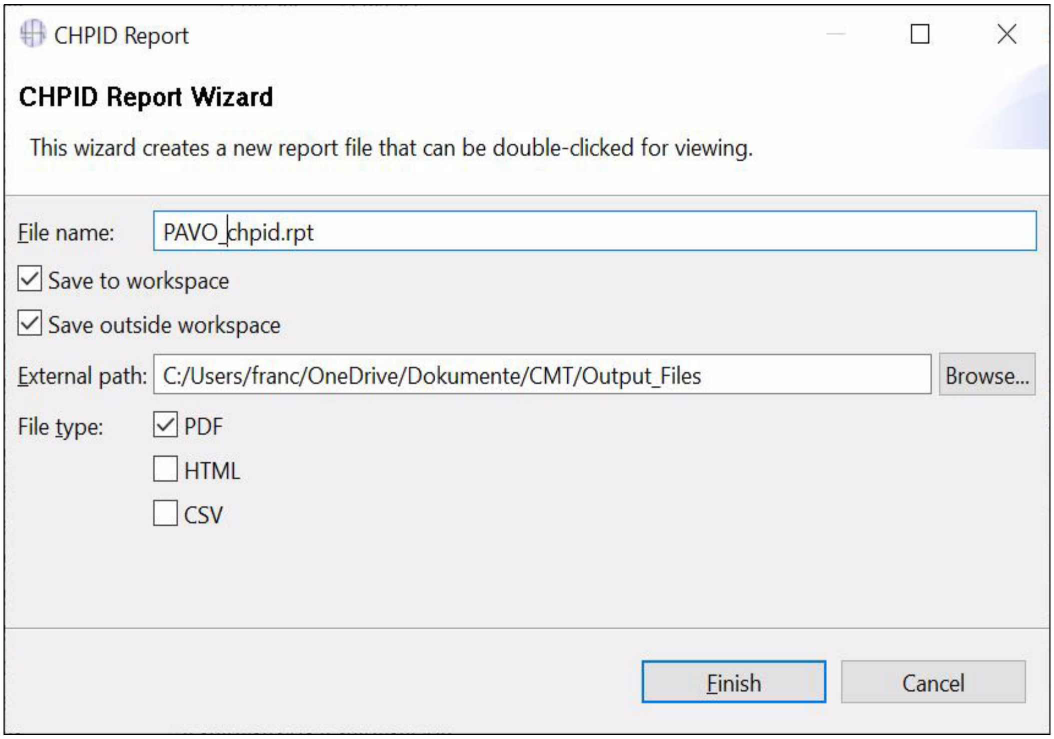
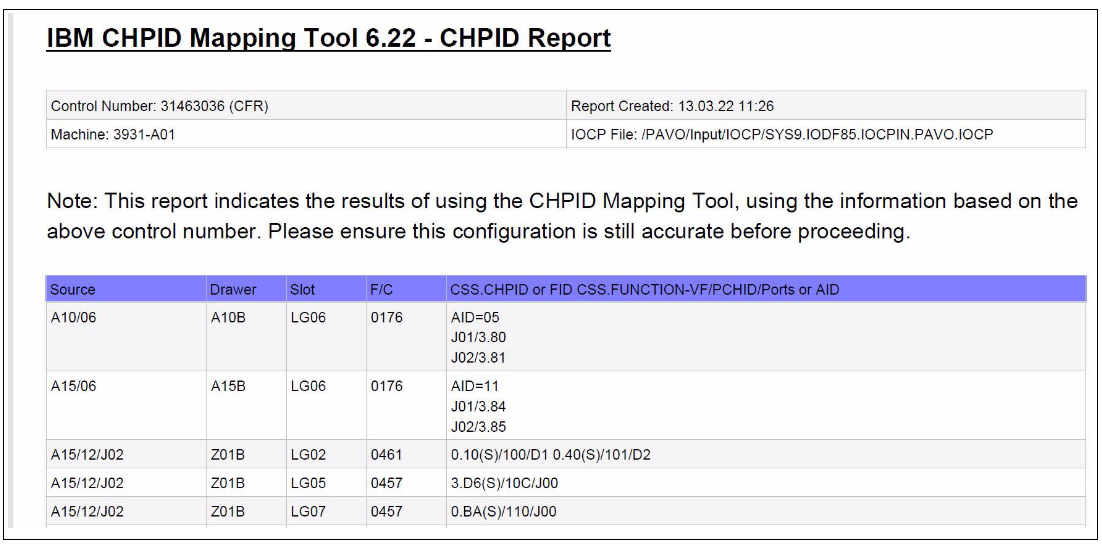


Figure 6-70 Saving the CHPID Report

The CHPID Report is created by the CMT (see Figure 6-71).



IBM CHPID Mapping Tool 6.22 - CHPID Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:26
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before proceeding.

Source	Drawer	Slot	F/C	CSS.CHPID or FID CSS.FUNCTION-VF/PCHID/Ports or AID
A10/06	A10B	LG06	0176	AID=05 J01/3.80 J02/3.81
A15/06	A15B	LG06	0176	AID=11 J01/3.84 J02/3.85
A15/12/J02	Z01B	LG02	0461	0.10(S)/100/D1 0.40(S)/101/D2
A15/12/J02	Z01B	LG05	0457	3.D6(S)/10C/J00
A15/12/J02	Z01B	LG07	0457	0.BA(S)/110/J00

Figure 6-71 CHPID Report example in PDF format

At the end of this CHPID Report is a list of CHPIDs with modified CHID or AID assignments (see Figure 6-72). This report is valuable for moving cables.

CHPIDs or FUNCTIONs	Previous PCHID/AID-Port	PCHID/AID-Port	Current Location	F/C
0.10(S)	1B0	12C	A31BLG15D1	0437
0.11(S)	120	208	Z01BLG04D1	0437
0.12(S)	1B1	1E4	B17BLG13D1	0437
0.13(S)	121	184	B25BLG03D1	0437
0.22	100	104	A31BLG03D1	0437
0.23	180	204	Z01BLG03D1	0437
0.24	101	164	B33BLG13D1	0437
0.25	181	144	B33BLG03D1	0437
0.26	12C	200	Z01BLG02D1	0437

Figure 6-72 List of CHPIDs that have modified PCHID/AID assignments

6.16.2 CHPID to Port Report sorted by location

To create the Port Report sorted by location, select **Preview Report** → **Port Report** → **Sorted by Location**. The CMT displays the CHPID to Port Report in a **Report** tab within the CMT (see Figure 6-73).

IBM CHPID Mapping Tool 6.22 - CHPID to Port Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:34
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before pro

Frame / Cage	Slot or Fanout	AID or PCHID/Port	Source	Adapter Type	Assigned CHPID or Assigned FUNCTION	CHPID Origin or Function Origin
A10B	LG06	AID=05 / J.01	A10/06/J01	ICA SR FANOUT 1.1	3.80	IOCP
A10B	LG06	AID=05 / J.02	A10/06/J02	ICA SR FANOUT 1.1	3.81	IOCP
A15B	LG06	AID=11 / J.01	A15/06/J01	ICA SR FANOUT 1.1	3.84	IOCP
A15B	LG06	AID=11 / J.02	A15/06/J02	ICA SR FANOUT 1.1	3.85	IOCP
Z01B	LG02	100 / D1	A15/12/J02	FICON EXP 32S LX	0.10(S)	IOCP(S)
Z01B	LG02	101 / D2	A15/12/J02	FICON EXP 32S LX	0.40(S)	IOCP(S)
Z01B	LG05	10C / J00	A15/12/J02	OSA-EXP7S 1.2 10 GbE SR	3.D6(S)	IOCP(S)
Z01B	LG07	110 / J00	A15/12/J02	OSA-EXP7S 1.2 10 GbE SR	0.BA(S)	IOCP(S)
Z01B	LG08	114 / J00	A15/12/J02	OSA-EXP7S 1.2 25 SR	0.DA(S)	IOCP(S)
Z01B	LG09	118 / P.00	A15/12/J02	Cry-Exp8S		
Z01B	LG09	119 / P.01	A15/12/J02	Cry-Exp8S		
Z01B	LG10	11C / D1	A15/12/J02	10GbE RoCE EXP3 SR	FID 3101-1 , FID 3131-2 , FID 3132-3 , FID 3133-4 , FID 3134-5 , FID 3135-6 , FID 3201-1 , FID 3231-2 , FID 3232-3 , FID 3233-4 , FID 3234-5 , FID 3235-6	IOCP

Figure 6-73 CHPID to Port Report sorted by location

6.16.3 CHPID to CU Report

This report is created much like a CHPID Report is. Select **Preview Report** → **CHPID to Control Unit Report**. The CMT displays the CHPID to Control Unit Report in a **Report** tab within the CMT (see Figure 6-74).

IBM CHPID Mapping Tool 6.22 - CHPID to CU Report

Control Number: 31463036 (CFR)	Report Created: 13.03.22 11:37
Machine: 3931-A01	IOCP File: /PAVO/Input/IOCP/SYS9.IODF85.IOCPIN.PAVO.IOCP

Note: This report indicates the results of using the CHPID Mapping Tool, using the information based on the above control number. Please ensure this configuration is still accurate before proceeding.

CSS	CHPID	Type	Source	Port	PCHID/AID-Port	CU Number	CU Type	Priority
0	10	FC	A15/12/J02	Z01B LG02 D1	100	3280	3490	4000
						3281	3490	4050
						3282	3490	4100
						3283	3490	4150
						3284	3490	4200
						3285	3490	4250
						3380	3490	4300
						3384	3490	4350
0	11	FC	A10/12/J02	Z09B LG03 D1	144	3280	3490	4000
						3281	3490	4050
						3282	3490	4100
						3283	3490	4150
						3284	3490	4200
						3285	3490	4250
						3380	3490	4300
						3384	3490	4350
0	12	FC	A20/09/J02	Z17B LG03 D1	184	3280	3490	4000
						3281	3490	4050
						3282	3490	4100
						3283	3490	4150
						3284	3490	4200
						3285	3490	4250
						3380	3490	4300
						3384	3490	4350

Figure 6-74 CHPID to CU Report

6.17 Creating an updated IOCP file

Now, use CMT to create an updated IOCP file that must be imported back into the IODF by using HCD. This IOCP statements file now has CHIDs that are assigned to CHPIDs.

To create the IOCP, complete the following steps:

1. Select **File** → **Export IOCP input file** (see Figure 6-75).

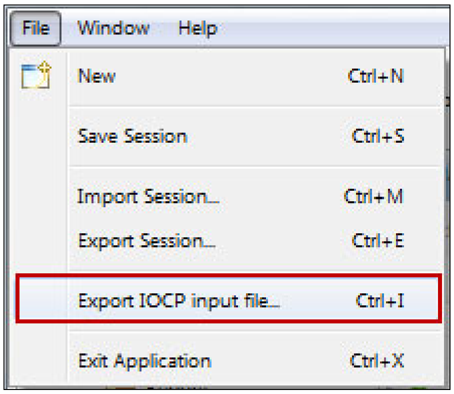


Figure 6-75 Export IOCP input file

2. Enter the Export Path and IOCP Name for the IOCP output file and click **Finish** (see Figure 6-76).

> **Requirement:** This file must be uploaded to the z/OS image on which you have the work IODF that you used previously to create the IOCP input data set.

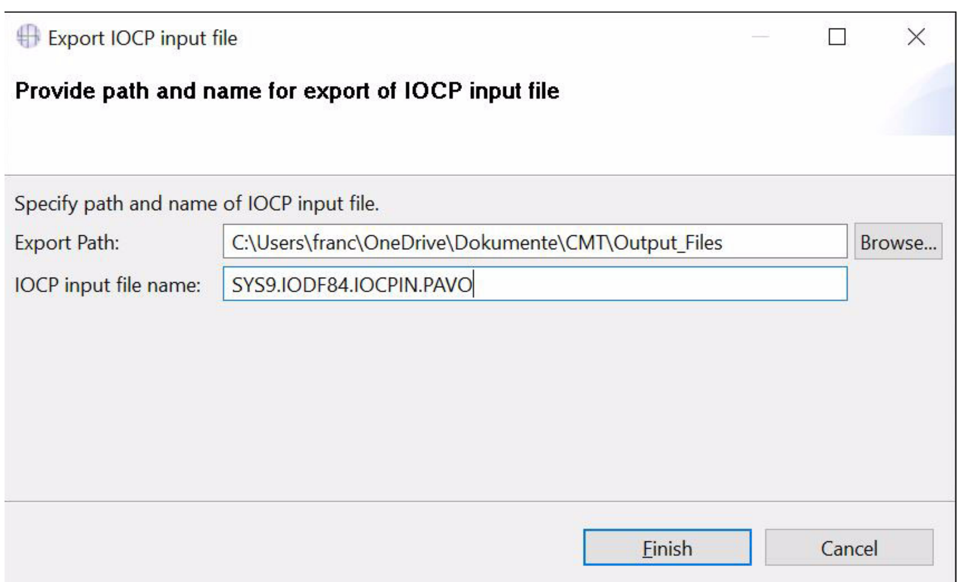


Figure 6-76 Exporting the IOCP File

3. Select **File** → **Save Session** (see Figure 6-77).

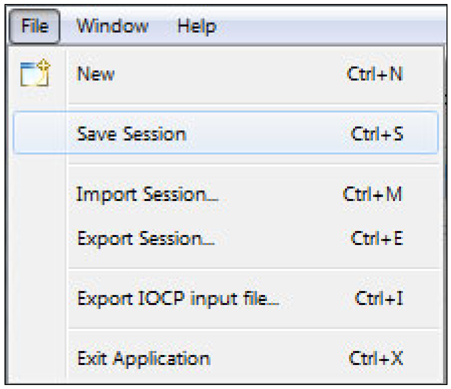


Figure 6-77 Save Session

You might want to save your project before exiting the CMT application.

6.18 Additional steps and processes

You might want to perform a PCHID migration before building a production IODF. For more information, see *CHPID Mapping Tool User's Guide,* GC28-7024.

For your next steps, go to Chapter 5, “Building the production input/output definition file and setting up the central processor complex” on page 91.

7

Defining console communication

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Preparing a console definition
- Defining the OSA-ICC
- Defining a new OSA-ICC configuration by using OSA Advanced Facilities
- Verifying the OSA-ICC definition

7.1 Preparing a console definition

A non-Systems Network Architecture (SNA) console is a console that is required for IPL, z/OS system operation, and management. Define at least one non-SNA console to your z/OS system. To define the non-SNA console, use the Open Systems Adapter-Express (OSA-Express) Integrated Console Controller (ICC) (OSA-ICC) function. For more information, see *Open Systems Adapter Integrated Console Controller User's Guide*, SC27-9003.

The following steps are required:

1. Define the OSC channel path ID (CHPID) and the CNTLUNIT.
2. Define the 3270-X IODEVICE.
3. Configure OSA-ICC by using the Open Systems Adapter (OSA) Advanced Facilities.
4. Export / import the OSA-ICC configuration (optional).
5. Activate the OSA-ICC configuration by using the OSA Advanced Facilities.
6. Set up IBM Personal Communications.

Note: Channel type OSC is supported on the OSA-Express 1000Base-T type and OSA Express Gigabit Ethernet (GbE) adapters only. The OSA-Express7S 1000Base-T Adapter supports connections at 1000 Mbps only.

Configure OSA-ICC when you upgrade to IBM z16 A01 or IBM z16 A02 or IBM z16 AGZ from an older IBM Z generation where OSA-ICC definitions exist or when installing a new IBM z16 and non-SNA consoles are required. For an upgrade from IBM z14 or IBM z15, the OSA-ICC configuration is automatically upgraded to IBM z16.

7.2 Defining the OSA-ICC

Before you perform the OSA-ICC configuration, define the OSC CHPID, CNTLUNIT, and 3270-X IODEVICE to the I/O configuration. Defining the OSC channel by using the Hardware Configuration Definition (HCD) is described in Chapter 13, “Adding network devices” on page 305 and Chapter 11, “Adding logical partitions and operating system configurations” on page 279.

7.3 Defining a new OSA-ICC configuration by using OSA Advanced Facilities

When installing a new IBM z16 A01, IBM z16 A02, or IBM z16 AGZ, configure OSA-ICC from scratch. To create an OSA-ICC configuration, complete the following steps:

1. Log on to the Hardware Management Console (HMC), select the central processor complex (CPC), and open **OSA Advanced Facilities**.
2. Select the OSC physical channel ID (PCHID) to use for the OSA-ICC configuration, and select **Card Specific Advanced Facilities** (Figure 7-1 on page 187).

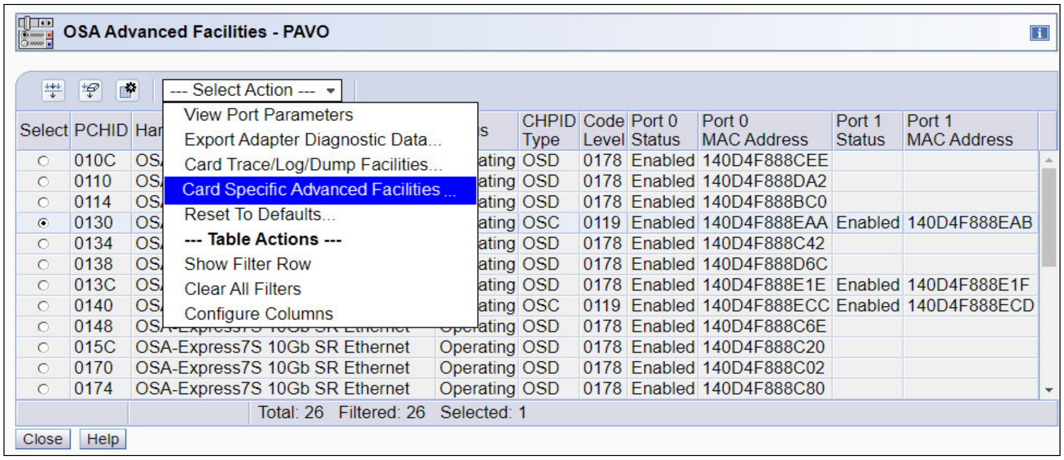


Figure 7-1 HMC: Card Specific Advanced Facilities

3. Select **Panel configuration options** and click **OK** (Figure 7-2).

Figure 7-2 HMC: Panel configuration options

4. The Panel Configuration Options window opens (Figure 7-3). Define the session and server configurations in this window, and validate those values. In this example, we define the server configuration first, and then define the session configuration. To edit the server configuration, select **Edit server configuration** and click **OK**.

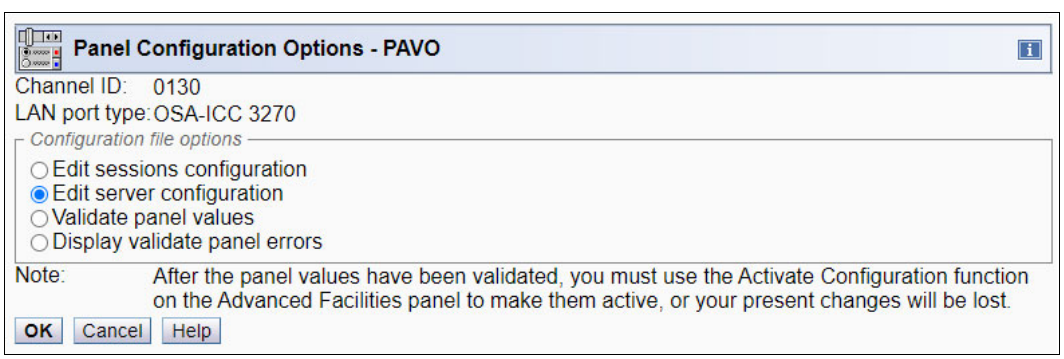


Figure 7-3 HMC: Edit server configuration

5. The Edit Server Configuration window opens. Enter the necessary values on this window. Figure 7-4 shows our sample configuration. Click **OK** to save.

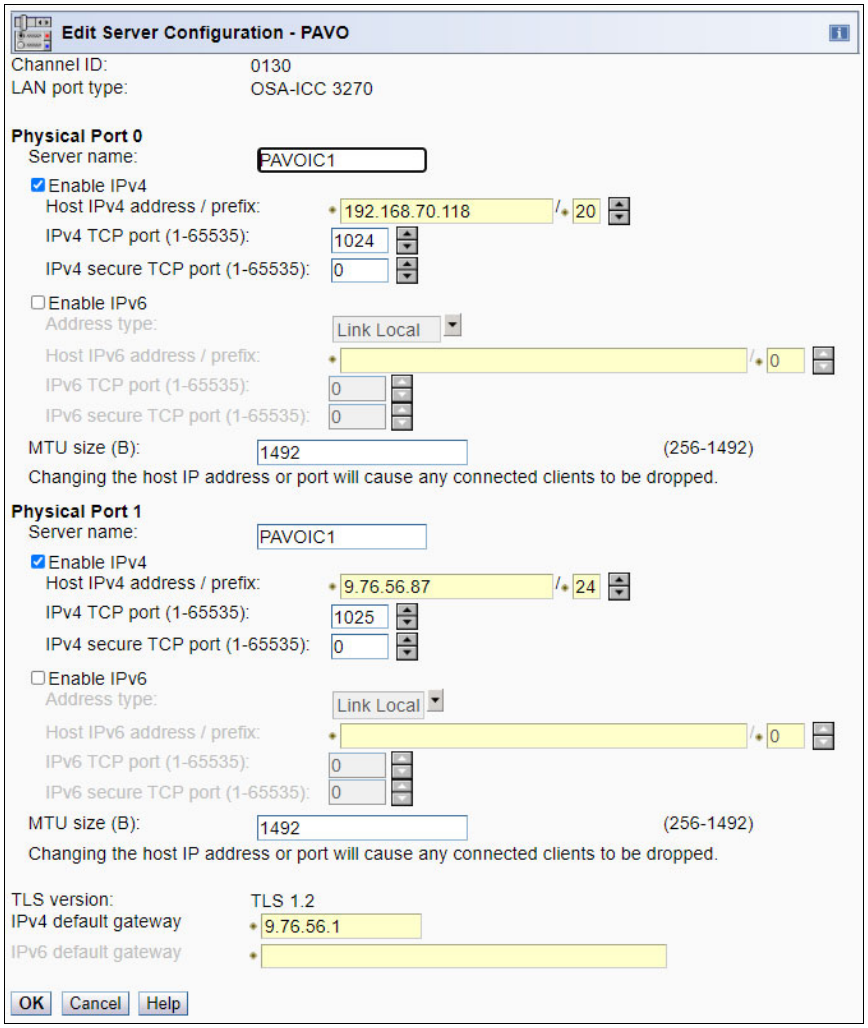


Figure 7-4 HMC: Edit Server Configuration window

6. The command is completed (ACT20402 and the window opens. Click **OK** to return to the Panel Configuration Options window.
7. Next, define the session configuration. Select **Edit sessions configuration** and click **OK**. The window that is shown in Figure 7-5 opens.

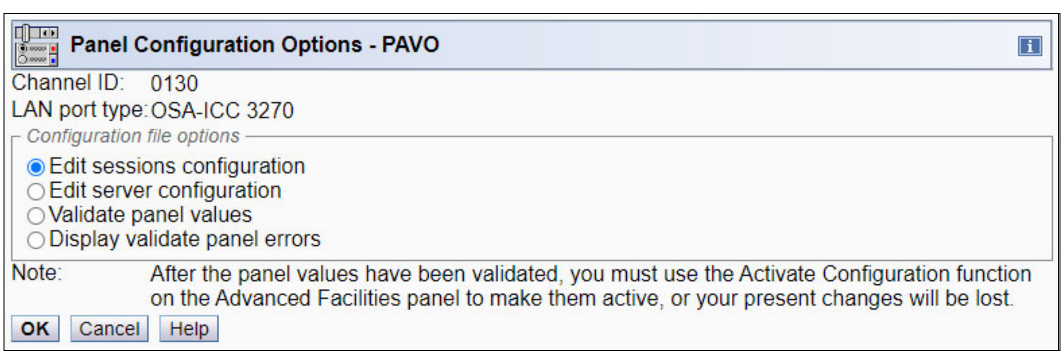
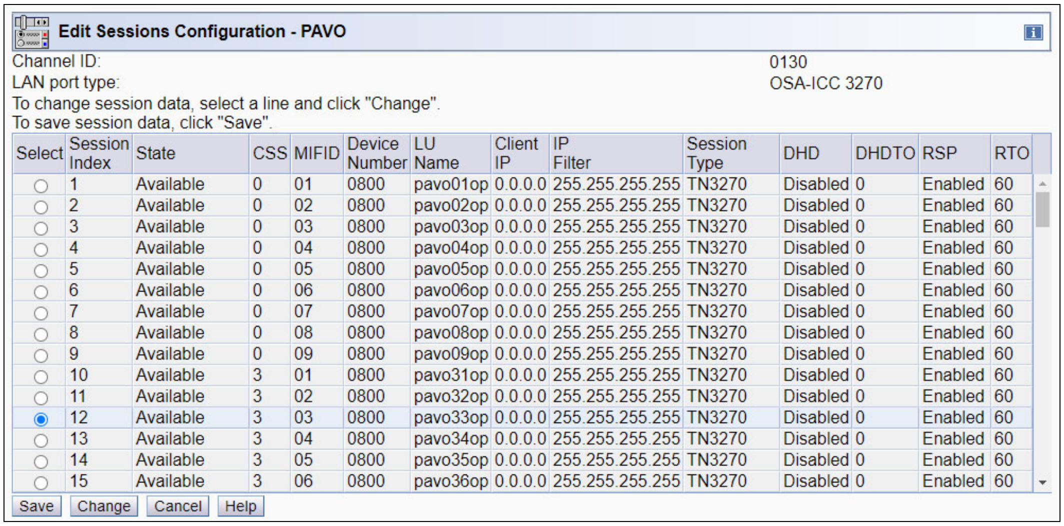


Figure 7-5 HMC: Edit sessions configuration

8. The Edit Sessions Configuration window opens (Figure 7-6). To configure a session, select a number from the Session Index column and click **Change**.



Edit Sessions Configuration - PAVO

Channel ID: 0130

LAN port type: OSA-ICC 3270

To change session data, select a line and click "Change".

To save session data, click "Save".

Select	Session Index	State	CSS	MIFID	Device Number	LU Name	Client IP	IP Filter	Session Type	DHD	DHDTO	RSP	RTO
○	1	Available	0	01	0800	pavo01op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	2	Available	0	02	0800	pavo02op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	3	Available	0	03	0800	pavo03op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	4	Available	0	04	0800	pavo04op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	5	Available	0	05	0800	pavo05op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	6	Available	0	06	0800	pavo06op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	7	Available	0	07	0800	pavo07op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	8	Available	0	08	0800	pavo08op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	9	Available	0	09	0800	pavo09op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	10	Available	3	01	0800	pavo31op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	11	Available	3	02	0800	pavo32op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
◉	12	Available	3	03	0800	pavo33op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	13	Available	3	04	0800	pavo34op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	14	Available	3	05	0800	pavo35op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	15	Available	3	06	0800	pavo36op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60

Save | Change | Cancel | Help

Figure 7-6 HMC: Edit Sessions Configuration selection

9. The Edit Session Configuration window opens. Define the session parameter here. Click **OK** to save (Figure 7-7).

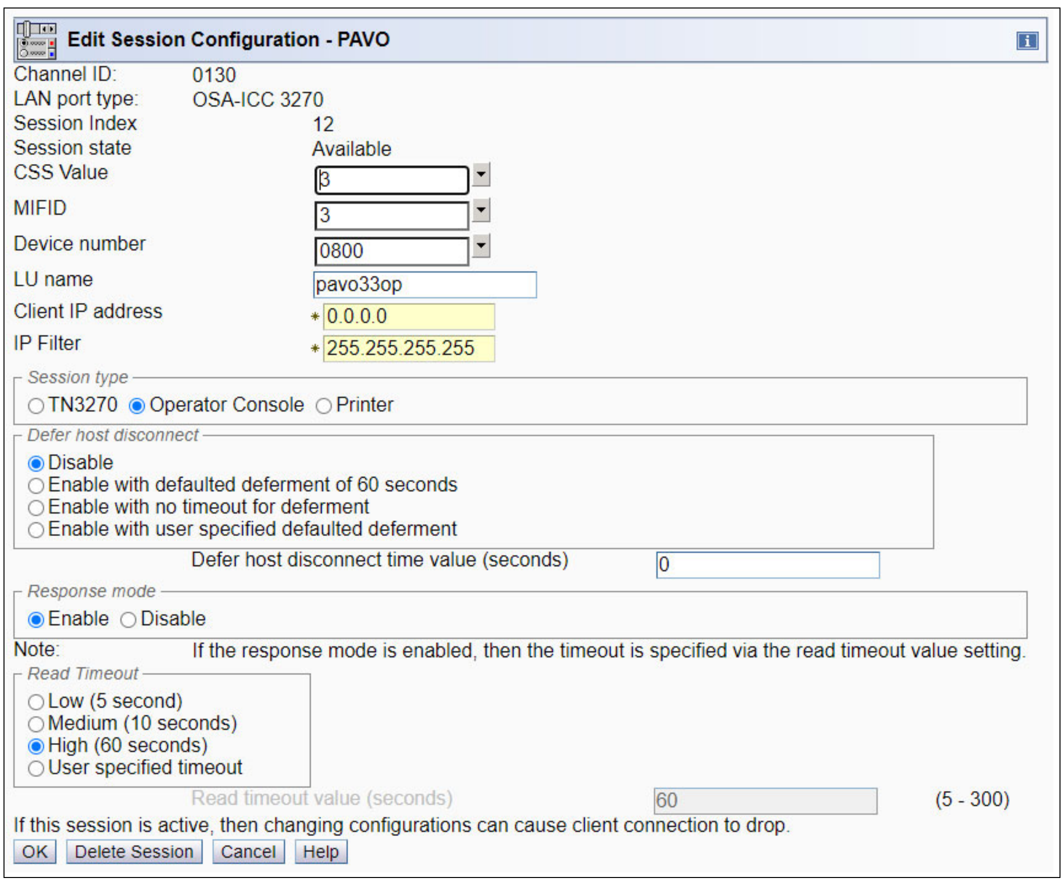
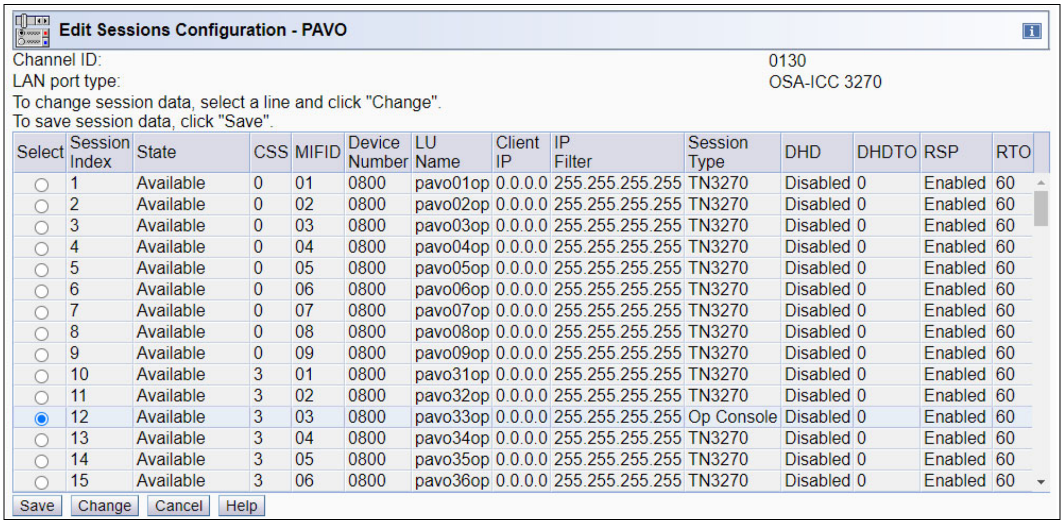


Figure 7-7 HMC: Edit Session Configuration input

10. The Edit Sessions Configuration window opens again (Figure 7-8). Be sure that your input values are displayed correctly. To save the session values, click **Save**.



Select	Session Index	State	CSS	MIFID	Device Number	LU Name	Client IP	IP Filter	Session Type	DHD	DHDTO	RSP	RTO
○	1	Available	0	01	0800	pavo01op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	2	Available	0	02	0800	pavo02op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	3	Available	0	03	0800	pavo03op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	4	Available	0	04	0800	pavo04op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	5	Available	0	05	0800	pavo05op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	6	Available	0	06	0800	pavo06op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	7	Available	0	07	0800	pavo07op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	8	Available	0	08	0800	pavo08op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	9	Available	0	09	0800	pavo09op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	10	Available	3	01	0800	pavo31op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	11	Available	3	02	0800	pavo32op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
◉	12	Available	3	03	0800	pavo33op	0.0.0.0	255.255.255.255	Op Console	Disabled	0	Enabled	60
○	13	Available	3	04	0800	pavo34op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	14	Available	3	05	0800	pavo35op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60
○	15	Available	3	06	0800	pavo36op	0.0.0.0	255.255.255.255	TN3270	Disabled	0	Enabled	60

Figure 7-8 HMC: Edit Sessions Configuration after you define the values

11. The command completed (ACT20402) window opens. Click **OK**.

12. The Panel Configuration Options window opens again (Figure 7-9). Now, you can validate the values. Select **Validate panel values** and click **OK**.

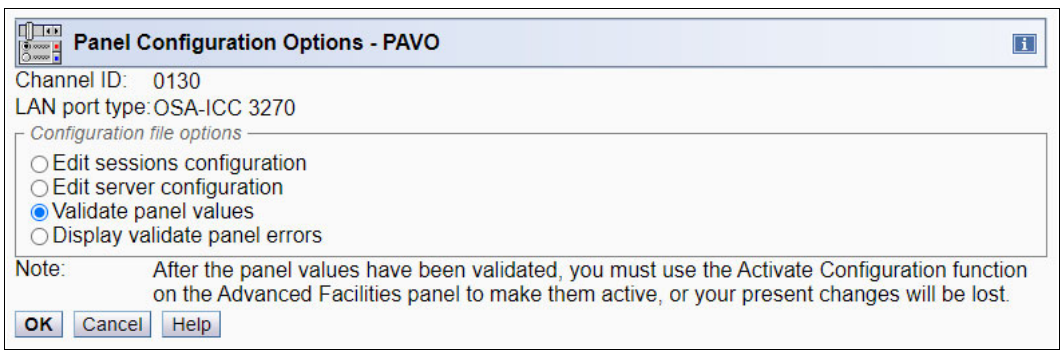


Figure 7-9 HMC: Validate panel values

13. If the configuration data is correct, the command completed (ACT20402) window opens.

If an error is encountered, a window like Figure 7-10 on page 191 opens. You can confirm the error by selecting **Display validate panel errors**, as shown in Figure 7-11 on page 191, in Panel Configuration Options (Figure 7-9). Correct the error, and select again **Validate panel values** to recheck.

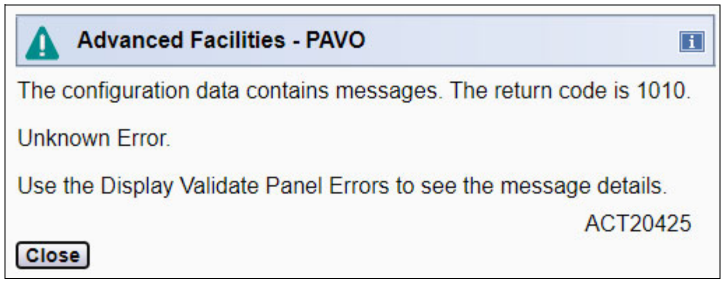


Figure 7-10 HMC: Panel Configuration Options error found

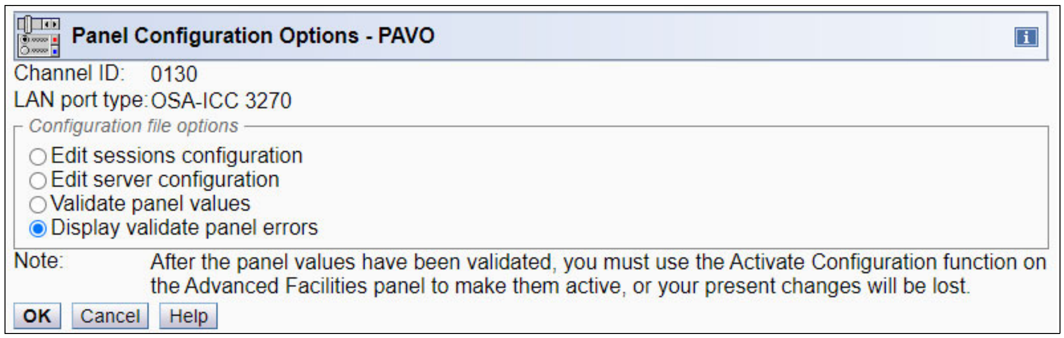


Figure 7-11 HMC: Display validate panel errors

Figure 7-12 shows the details of the error message.

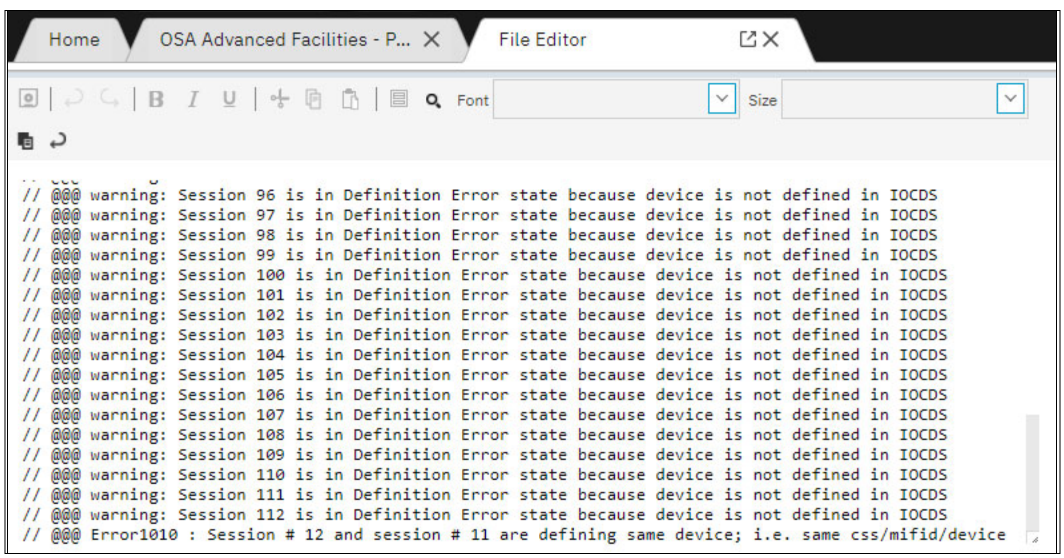


Figure 7-12 HMC: Detailed error message

14. When the validation is complete without any errors, you can activate the OSA-ICC configuration. To activate the configuration, exit the Panel Configuration Options window by clicking **Cancel**, and then select **Activate configuration** in the Advanced Facilities window (Figure 7-13).

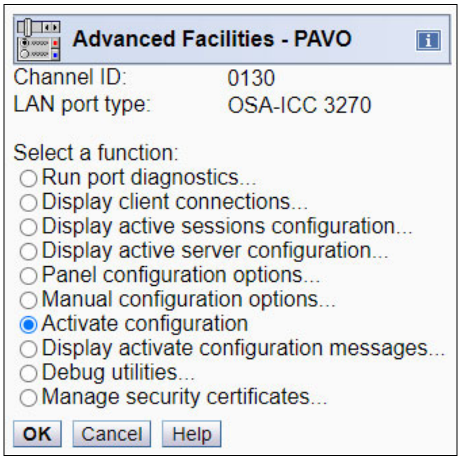


Figure 7-13 HMC: Activate configuration

15. The confirmation window opens. Click **Yes** to continue (Figure 7-14).

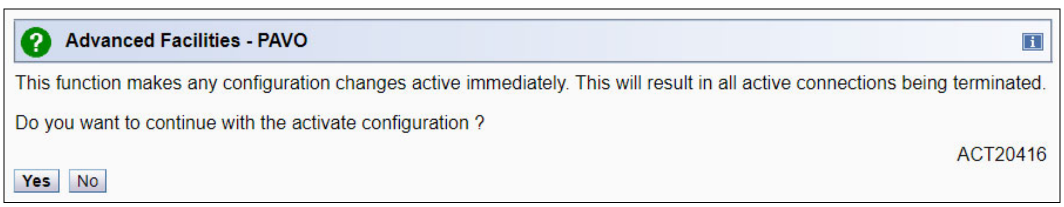


Figure 7-14 HMC: Activate configuration confirmation

16. When the activation is complete, the message that is shown in Figure 7-15 appears.

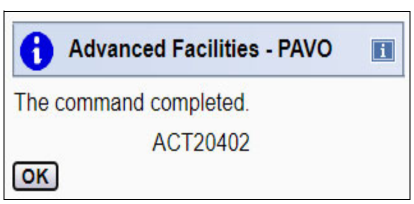


Figure 7-15 HMC: Activate configuration success

7.3.1 Saving and restoring the OSA-ICC configuration

During an upgrade, you can export an OSA-ICC configuration file from the source IBM Z CPC and import it to the IBM z16 A01. This section describes how to export and import the OSA-ICC configuration file by using HMC and an FTP server that is part of the same local area network (LAN) segment.

Exporting the OSA-ICC configuration file by using OSA Advanced Facilities

In this example, we export the OSA-ICC configuration file from an IBM z16 A01 to an FTP server and import the file to the same IBM z16 A01 from the same FTP server. You can also import or export the configuration file by using a USB Flash Drive.

To export the OSA-ICC configuration file, complete the following steps:

1. Before you try to export a source file to an FTP server, make sure the FTP server is reachable from this particular HMC:
   a. Contact your LAN administration and ask for the hostname and TCP/IP address of the FTP server that is connected to the same subnet. From the HMC Welcome window, click **HMC Management**, as shown in Figure 7-16.

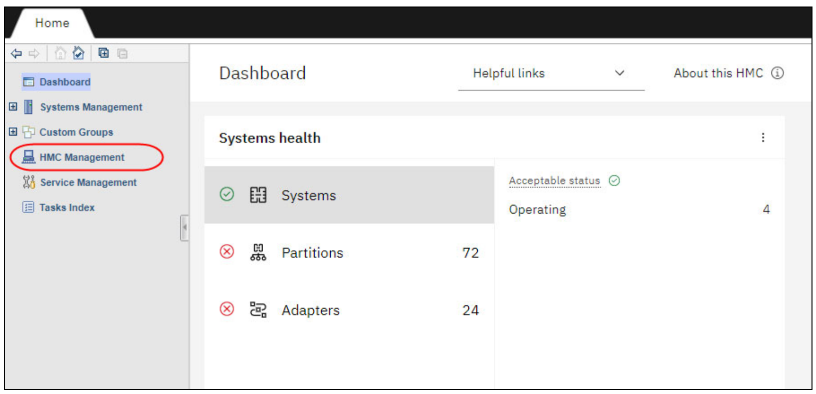


Figure 7-16 HMC: Clicking HMC Management to get to the network diagnostic information

   b. On the HMC Management window, click **Network Diagnostic Information** to get to the Network Diagnostic Information window, as shown in Figure 7-17.

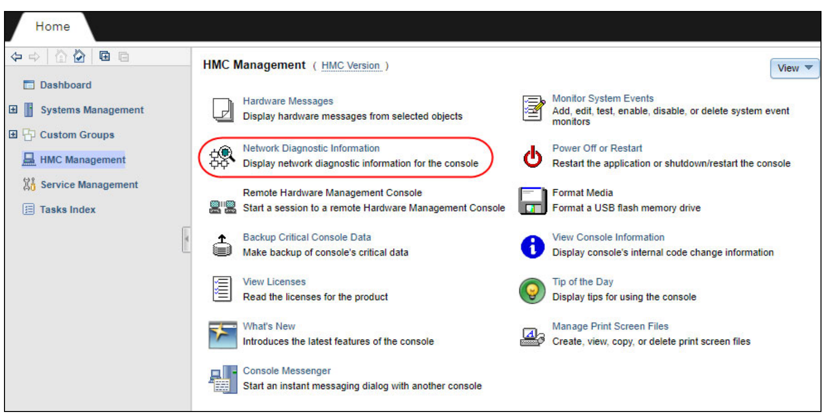


Figure 7-17 HMC: Clicking Network Diagnostic Information to ping the FTP server

c. On the **Ping** tab of the Network Diagnostic Information window, enter the TCP/IP Address of the FTP server and click **Ping**. You should see the ping statistics, which indicate that this HMC has a connection to the FTP server, as shown in Figure 7-18.

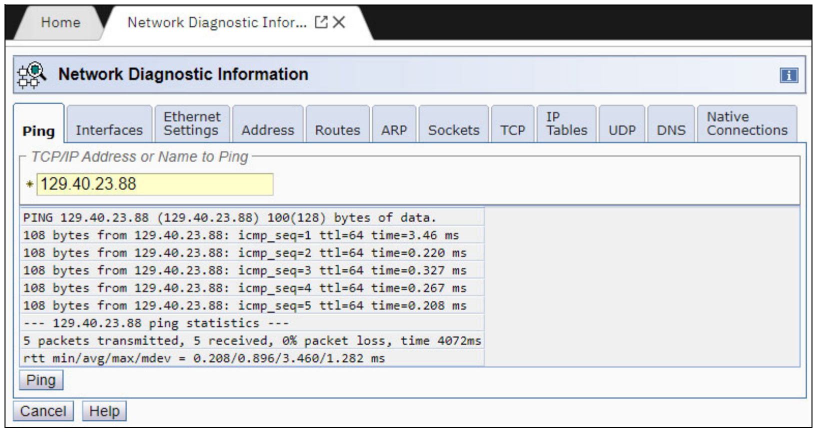


Figure 7-18 HMC - Network Diagnostic Information: Using the ping function to verify the physical connection between this HMC and the FTP server

2. Log on to the HMC, select the CPC that you want to operate, and open the OSA Advanced Facility.
3. Select the OSC CHPID to export the OSA-ICC configuration file, select **Card Specific Advanced Facilities**, and then select **Manual configuration options**. Click **OK** (Figure 7-19).

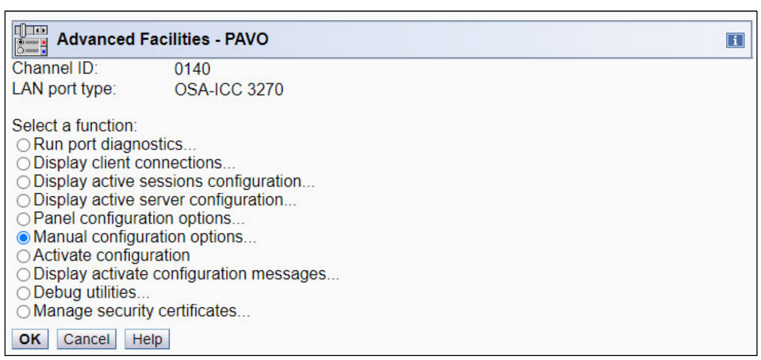


Figure 7-19 HMC: Manual configuration options

4. The Manual Configuration Options window opens (Figure 7-20). Select **Export source file by FTP** and click **OK**.

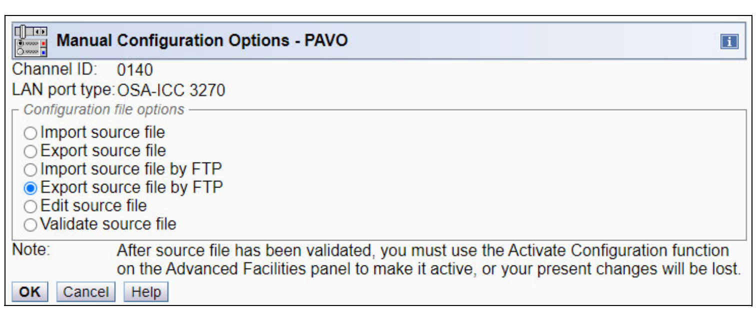


Figure 7-20 HMC: Export source file by FTP

5. The window prompts you for the FTP server information and the location of the file to export. For our example, we enter `OSC0140.txt`, as shown in Figure 7-21. Click **Export**. The HMC task writes the source file for the PCHID that was selected on to the FTP server and displays a message when it completes (Figure 7-22). Click **OK**.

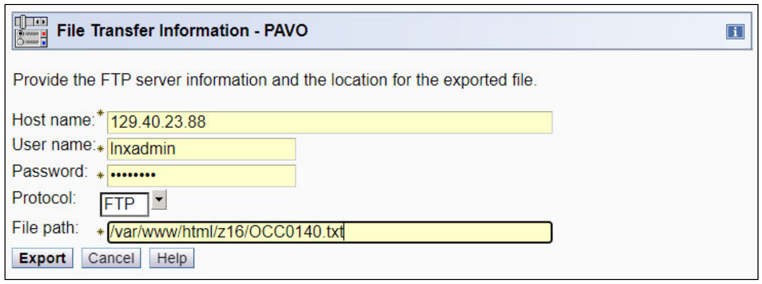


Figure 7-21 HMC - Export file: Specifying the FTP server, and file path and name

The HMC displays the ACT20402 window. Click **OK**.

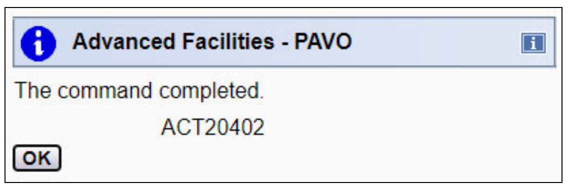


Figure 7-22 HMC: ACT20421 window display

6. Click **Cancel** to exit all OSA Advanced Facilities windows.

Example 7-1 shows an extract from the source file that we transferred to the FTP server.

Example 7-1 OSA-ICC: Sample source file

```
<OSC_SERVER>
<OSC_PHYSICAL_PORT0>
  HOST_IP= 192.168.70.119
  SUBNET_MASK= 255.255.240.0
  PORT= 1024
  SECURE_PORT= 0
  HOST_LL_ADDRESS/PREFIX=  fe80::160d:4fff:fe88:8ecc/64
  ADDR_TYPE= LINK_LOCAL
  HOST_IPV6_ADDRESS/PREFIX=  ::/0
  IPV6_PORT= 0
  IPV6_SECURE_PORT= 0
  ETHERNET_FRAME= DIX
  MTU= 1492
  NAME= PAVOIC2
</OSC_PHYSICAL_PORT0>

<OSC_PHYSICAL_PORT1>
  HOST_IP= 9.76.56.88
  SUBNET_MASK= 255.255.255.0
  PORT= 1025
  SECURE_PORT= 0
  HOST_LL_ADDRESS/PREFIX=  fe80::160d:4fff:fe88:8ecd/64
  ADDR_TYPE= LINK_LOCAL
  HOST_IPV6_ADDRESS/PREFIX=  ::/0
```

```
  IPV6_PORT= 0
  IPV6_SECURE_PORT= 0
  ETHERNET_FRAME= DIX
  MTU= 1492
  NAME= PAVOIC2
</OSC_PHYSICAL_PORT1>

  TLS_VERSION= 1.0
  DEFAULT_GATEWAY= 9.76.56.1
  IPV6_DEFAULT_GATEWAY=  ::
</OSC_SERVER>

<CONFIG_SESSION>
<SESSION1>
  CSS= 00 IID= 01 DEVICE= 0880
  GROUP=  "pavo01op"
  CONSOLE_TYPE= 1    RESPONSE= ON    READ_TIMEOUT= 60
</SESSION1>

<SESSION2>
...
...
</CONFIG_SESSION>
```

Editing the source file for OSA-ICC

When your OSA-ICC configuration for IBM z16 (such as the IODEVICE, CSSID, and MIFID of logical partitions (LPARs)) is changed, you must edit the OSA-ICC source file to match the new configuration. For more information about editing the source file, see *Open Systems Adapter Integrated Console Controller User's Guide,* SC27-9003.

Importing the OSA-ICC source file to IBM z16

To import the source file and activate the configuration of the OSA-ICC on the new IBM z16 A01, complete the following steps:

1. Before you import the source file from the FTP server, make sure that the FTP server is reachable from this particular HMC. For more information about how to make sure that the FTP server is reachable, see step 1 on page 193.
2. Log on to the HMC, select the CPC that you want to operate, and open OSA Advanced Facility.
3. Select OSC CHPID to import the OSA-ICC configuration file. Then, select **Card specific advanced facilities**.
4. Select **Manual configuration options** and click **OK**.
5. The Manual Configuration Options window opens. Select **Import source file by FTP** and click **OK** (Figure 7-23 on page 197).

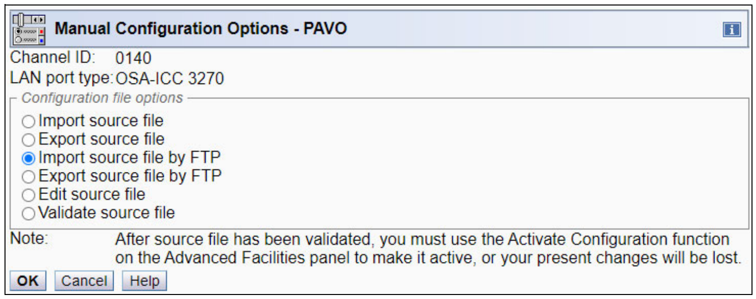


Figure 7-23 HMC: Importing a source file

6. You are prompted to provide the FTP server and file location information (Figure 7-24). Click **Import**.

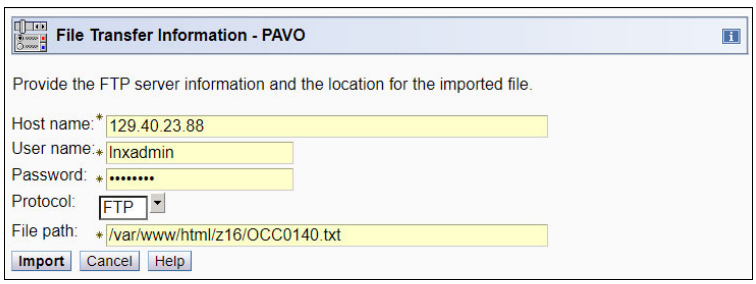


Figure 7-24 HMC: Importing a file

7. Figure 7-25 indicates that the source file import is complete. Click **OK** to continue.

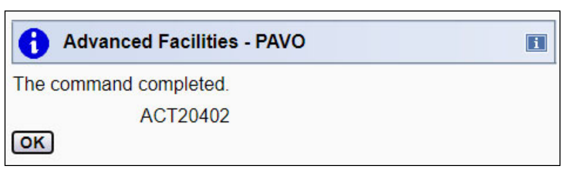


Figure 7-25 HMC: Importing file successful

8. After importing the source file, you must validate it and activate the configuration.

7.4 Verifying the OSA-ICC definition

This section presents some tools that you can use to verify the OSA-ICC configuration.

7.4.1 z/OS commands

You can check your definition by using the following z/OS commands:

- **DISPLAY M=CHP(xx)**

  Check whether the CHPID DESC is displayed as OSA CONSOLE (Figure 7-26).

```
D M=CHP(B1)
IEE174I 12.56.00 DISPLAY M 520
CHPID B1:  TYPE=14, DESC=OSA CONSOLE, ONLINE
DEVICE STATUS FOR CHANNEL PATH B1
     0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F
0088 +  +  $@ $@ $@ $@ $@ $@ $@ $@ $@ $@ $@ $@ $@ $@
SWITCH DEVICE NUMBER = NONE
PHYSICAL CHANNEL ID = 0140
************************ SYMBOL EXPLANATIONS ************************
+ ONLINE    @ PATH NOT VALIDATED   - OFFLINE    . DOES NOT EXIST
* PHYSICALLY ONLINE   $ PATH NOT OPERATIONAL
```

Figure 7-26 OSC D M=CHP

- **DISPLAY M=DEV(xxxx)**

  Using this command, you can confirm the channel path to a device. The node descriptor information that is returned includes the emulated control unit (CU) 2074. Also included is the 3931 machine type and serial number, as shown in Figure 7-27.

```
D M=DEV(880)
IEE174I 12.59.12 DISPLAY M 525
DEVICE 00880   STATUS=ONLINE
CHP                   B1
ENTRY LINK ADDRESS    ..
DEST LINK ADDRESS     0D
PATH ONLINE           Y
CHP PHYSICALLY ONLINE Y
PATH OPERATIONAL      Y
MANAGED               N
CU NUMBER             1C60
INTERFACE ID          4000
MAXIMUM MANAGED CHPID(S) ALLOWED:  0
DESTINATION CU LOGICAL ADDRESS = 00
SCP CU ND         = NOT AVAILABLE
SCP TOKEN NED     = 002074.   .IBM.02.393100071A08.B100
SCP DEVICE NED    = 002074.002.IBM.02.393100071A08.B100
```

Figure 7-27 OSC D M=DEV(xxx)

- **DISPLAY U**

  Using this command, you can confirm the device number and the status. Check whether the device number and type are defined correctly (Figure 7-28).

```
D U,,,880,1
IEE457I 13.01.02 UNIT STATUS 527
UNIT TYPE STATUS       VOLSER     VOLSTATE      SS
0880 3270 O                                      0
```

Figure 7-28 OSC D U,,,device

7.4.2 OSA-ICC console initial window

When you complete setting up IBM Personal Communications, you see the OSA-ICC initial window, as shown in Figure 7-29. Check whether the OSA-ICC definitions are reflected correctly.

If you do not see the initial window, check your definition in the OSA-ICC or IBM Personal Communications session setup.

```
 **      OSC Index 01 connected to PAVOIC2 via IP Addr 9.76.56.88:1025       **
 **       LT Index=00 CSSID=00 MIFID=01 CU=0  UA=00  LUName=pavo01op         **
 **       Type=3931-A01 Mfg=IBM SN=000000071A08 CHPID=C0 Status=Active       **


9.57.247.177:58297
```

Figure 7-29 OSA-ICC initial window

8

Preparing for IBM Parallel Sysplex and Server Time Protocol

This chapter describes the preparation tasks for IBM Parallel Sysplex and how to configure time synchronization with Server Time Protocol (STP).

> **Naming:** The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.
>
> **Note:** The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Preparing for Parallel Sysplex
- Preparing for non-sysplex system time synchronization
- Server Time Protocol overview
- Configuring the HMC as an NTP server
- HMC 2.16.0 (Manage System Time task)

8.1 Preparing for Parallel Sysplex

If your IBM z16 is a member of a Parallel Sysplex or if you create a Parallel Sysplex that involves an IBM z16, time synchronization among central processor complexes (CPCs) is required. For time synchronization, use the STP or Precision Time Protocol (PTP) feature (Feature Code 1021). In addition to the time synchronization, the following tasks are required to create a Parallel Sysplex:

1. Define Coupling Facility (CF) links.
2. Define Fibre Connection (FICON) channel-to-channel (FCTC) connections (optional).
3. Define the CF logical partition (LPAR).
4. Define the CF LPAR image profile in Hardware Management Console (HMC).
5. Configure STP or PTP.

Defining CF (coupling) links is described in Chapter 9, “Defining Coupling Facility links” on page 213. Defining the image profile is described in 5.4, “Creating an image profile on the Support Element” on page 107.

8.2 Preparing for non-sysplex system time synchronization

If your IBM z16 is not part of a Parallel Sysplex but you want to synchronize the time among multiple CPCs, you need the STP function and timing-only links. These configuration steps are required:

1. Define timing-only links.
2. Configure STP.

Defining timing-only links is described in 9.4, “Defining an STP timing-only link by using ICA SR” on page 224.

8.3 Server Time Protocol overview

STP provides time synchronization among multiple CPCs in a Coordinated Timing Network (CTN). A CTN is a collection of servers that are synchronized to a time protocol that is called Coordinated Server Time (CST). The STP function (feature) is implemented in the Licensed Internal Code (LIC) as a chargeable feature. You must order STP enablement Feature Code 1021 to use STP.

For more information about STP concepts and planning information, see *Server Time Protocol Planning Guide*, SG24-7280 and *IBM Z Server Time Protocol Guide*, SG24-8480.

Beginning with IBM z15, STP stratum level 4[1] is supported. Timekeeping information is transmitted over coupling links.

Figure 8-1 on page 203 shows a diagram of a CTN.

[1] Stratum 4 is a temporary status to allow more options to move and replace machines and reconfigure CTN. Although STP stratum level 4 is supported, it should not be used for permanent configurations. Stratum 4 should be used for transitional configurations during CTN maintenance.

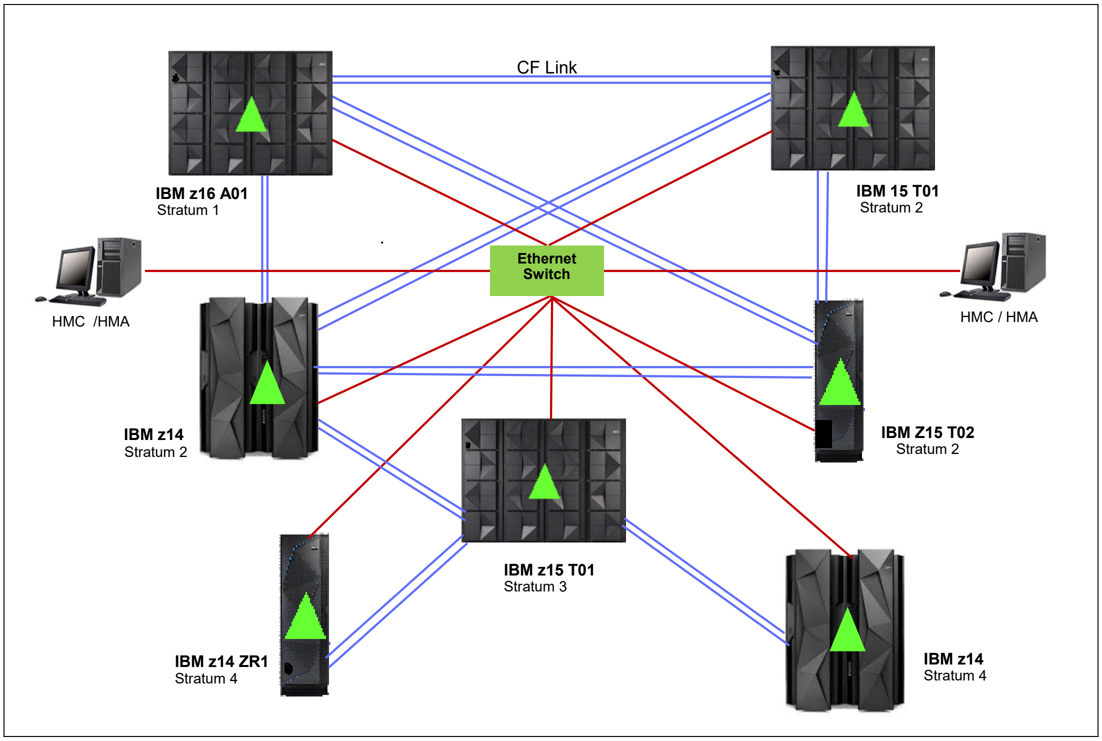


Figure 8-1 STP only CTN connectivity

> **Note:** IBM z16 supports STP timing mode only (can be part of an STP-only CTN). IBM z16 cannot be in the same sysplex or CTN with any IBM Z earlier than the IBM z14.

8.3.1 External Time Source

For IBM Z machines before IBM z15, the external time reference would typically be Network Time Protocol (NTP). Starting with IBM z15, support for IEEE 1588 (PTP) was added. Before IBM z16, the external time reference network connectivity occurred through the internal Support Element (SE) Management network Interface.

IBM z16 introduces a new, enhanced method for accessing the External Time Source (ETS) by connecting the IBM z16 CPC directly to the client network, which provides access to the PTP or NTP time reference, thus bypassing the SE and the internal network. PTP or NTP traffic is provided to the CPC through Ethernet connectivity to a new adapter that is connected directly to the IBM z16 oscillators. This new adapter features hardware timestamping capabilities so that IBM z16 leverages the accuracy of PTP. In IBM z16, a new container firmware partition provides time protocol support for both NTP and PTP.

For clients requiring a Coordinated Universal Time lower than 100 milliseconds, Pulse Per Second (PPS) connectivity is also available. To provide NTP or PTP data, the NTP or PTP servers are directly connected to the CPC.

Note: On IBM z16, a new adapter that carries the PPS connector and the Oscillators is installed. The new adapter provides two I350 (Ethernet) ports:

- One port is dedicated to the SE interface.
- One port is dedicated specifically to time synchronization (PTP or NTP).

There is also one coaxial cable connector for PPS.

Figure 8-2 shows a sample PTP ETS configuration for the STP.

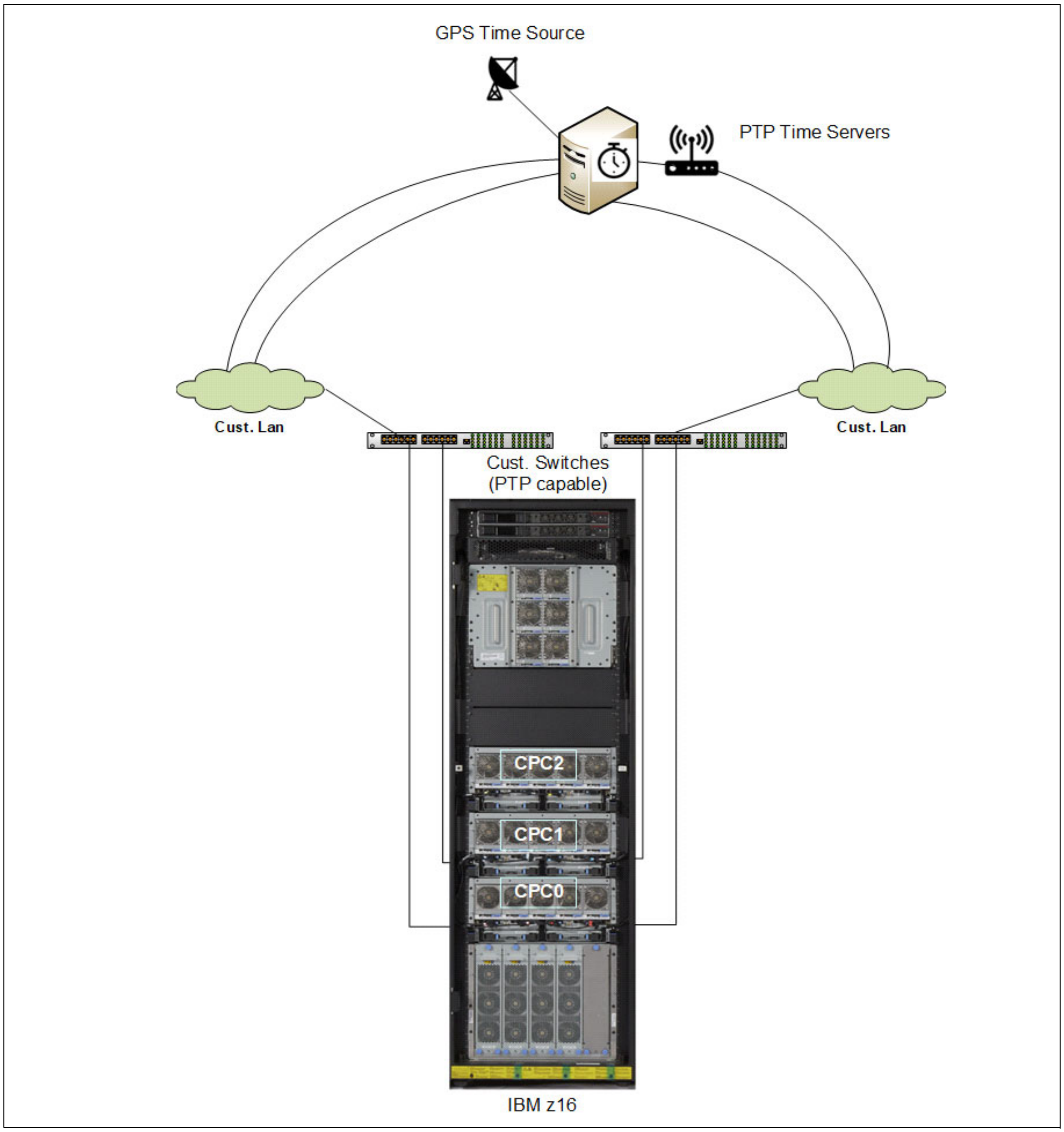


Figure 8-2 Example configuration: PTP time server configuration

Especially for the financial markets, tight time accuracy is demanded by the authorities of various countries. The US Financial Industry Regulatory Authority (FINRA) announced that computer clocks that are used to record events in national market system (NMS) securities and over-the-counter (OTC) equity securities must be synchronized to within a 50-millisecond drift tolerance of the National Institute of Standards and Technology (NIST) atomic clock. Also, the European Union demands in their Markets in Financial Instruments Directive (MIFID II) regulation that the maximum divergence from Coordinated Universal Time is 100 microseconds.

Unfortunately, the accuracy of the interface with an NTP server to maintain the CST accuracy that is provided by STP is 100 milliseconds to the time that is provided by the NTP server. To meet the clock synchronization requirements of FINRA and MIFID II, the NTP server must have a PPS output signal that can achieve time accuracy within 10 microseconds. If your configuration requires the NTP server with PPS capability, the NTP server that is configured as the ETS must be attached directly to the SE network, and the PPS cable must be attached directly to the PPS port on the CPCs that have the Preferred Time Server (PTS) and Backup Time Server (BTS) roles.

For more information about this topic, see *STP recommendations for the FINRA clock synchronization requirements*.

For more information, see *IBM Z Server Time Protocol Guide*, SG24-8480.

8.4 Configuring the HMC as an NTP server

The NTP server that is configured as the ETS must be attached directly to the IBM z15 and IBM z14 families SE local area network (LAN). The SE LAN is considered in many configurations to be a private (dedicated) LAN and should be kept as isolated as possible. On IBM z16, the NTP server connects directly to the CPC BMC card.

Defining an NTP server on the HMC addresses potential security concerns because the HMC is normally attached directly to the SE LAN. The HMC has two LAN ports that are physically isolated, one port for the connection to the HMC/SE LAN that is used by NTP client code, and the second port for the LAN that is used by HMC to access an NTP time server to set its time.

So, the NTP server on the HMC can access another NTP server through a separate LAN connection to obtain its time reference (see Figure 8-3). The NTP server function on the HMC does not provide a PPS output.

Note: As a best practice for security reasons, connect the ETS ports to a protected network (through a firewall) to access the external time servers (PTP or NTP). This best practice also applies for the ETS connectivity direct to the CPC.

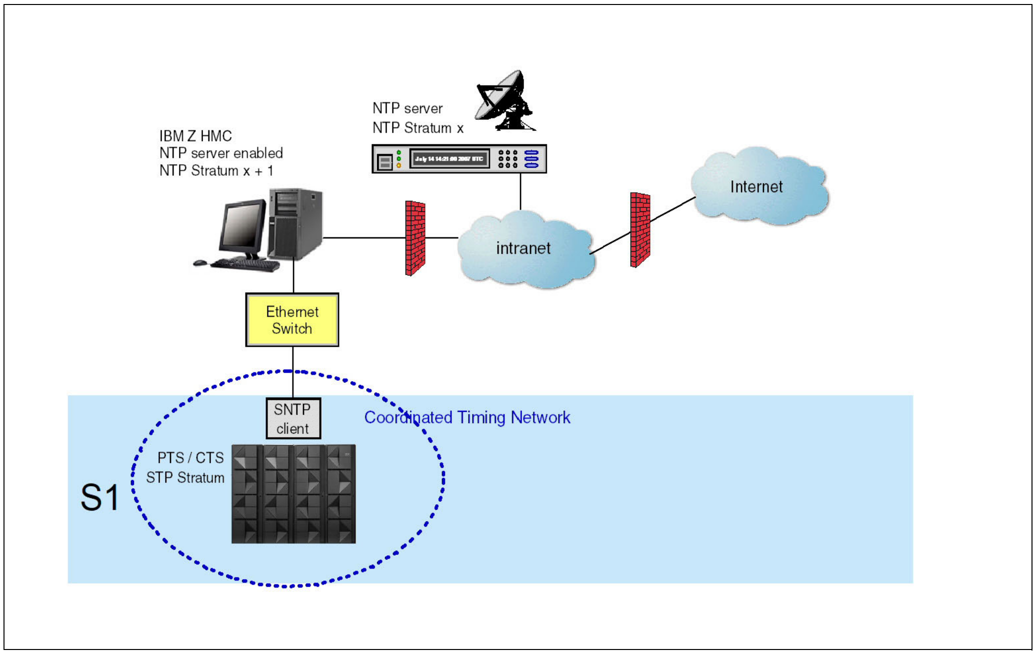


Figure 8-3 HMC configured as an NTP server

For more information, see *IBM Z Server Time Protocol Guide*, SG24-8480.

8.5 HMC 2.16.0 (Manage System Time task)

You can set up STP by using the HMC Manage System Time task. Figure 8-4 on page 207 shows the Manage System Time task initial window on the HMC. The CTN configuration for any CPC object that is managed by this HMC can be displayed. You can display any CTN by clicking the down arrow icon next to the CTN ID name. You can enter the configuration wizard by using menu below the STP ACTIONS.

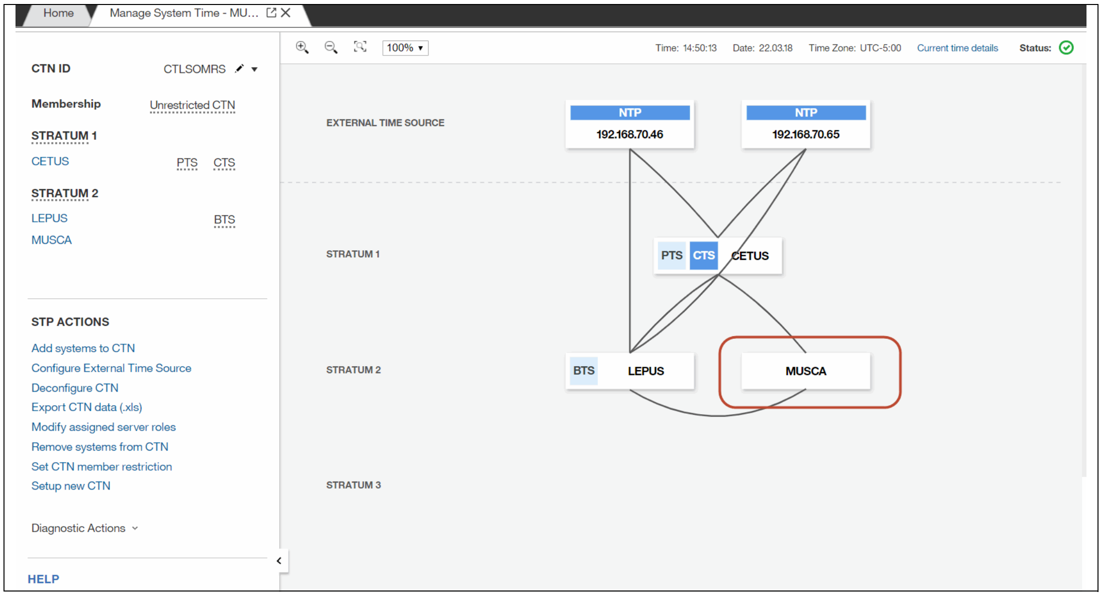


Figure 8-4 Manage System Time initial window

Figure 8-5 displays the Manage System Time task initial window on the HMC if there is a PTP server that is configured.

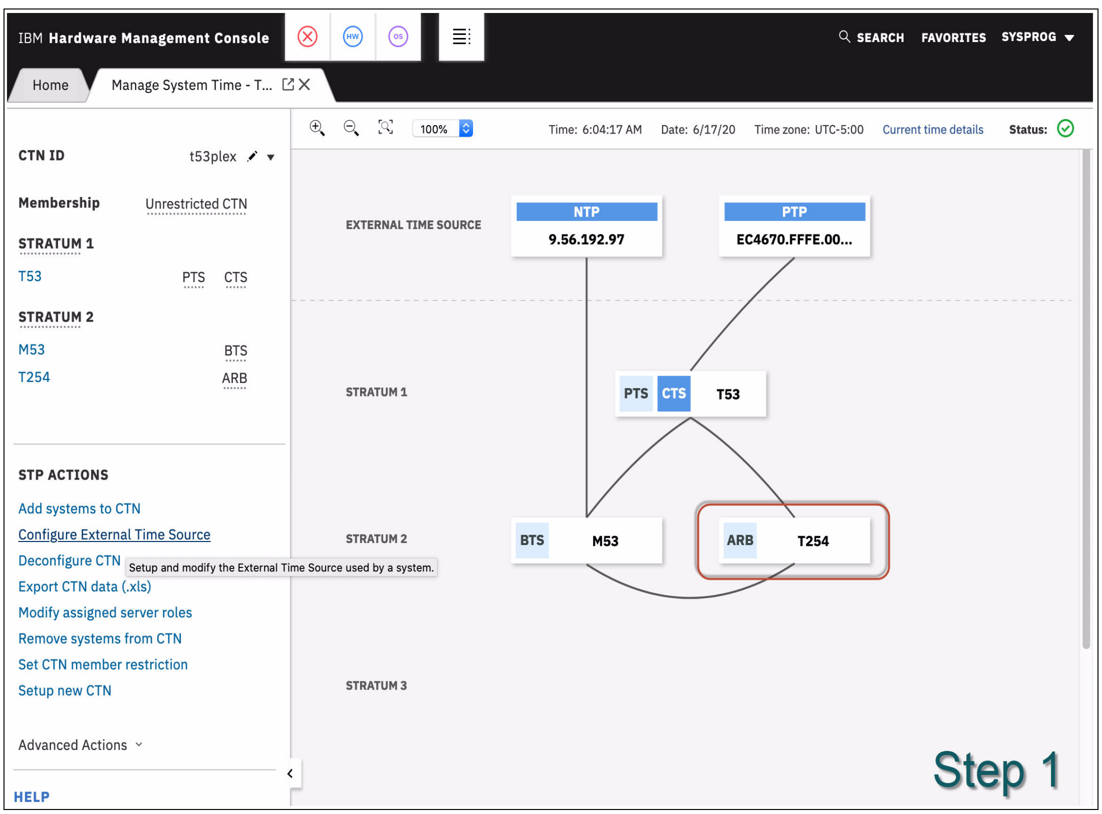


Figure 8-5 Manage System Time initial window with mixed NTP and PTP server

Note: When a PTP server is configured as an ETS, the Server name is displayed instead of the IP address.

In the Manage System Time initial window, the CTN topology appears as a graph. You can identify the stratum level and the role of the CPC. You can also identify the status of each CTN component, such as CPC, CF LINK, and ETS, by clicking the respective objects.

Figure 8-6 shows the details of a CPC in the CTN.

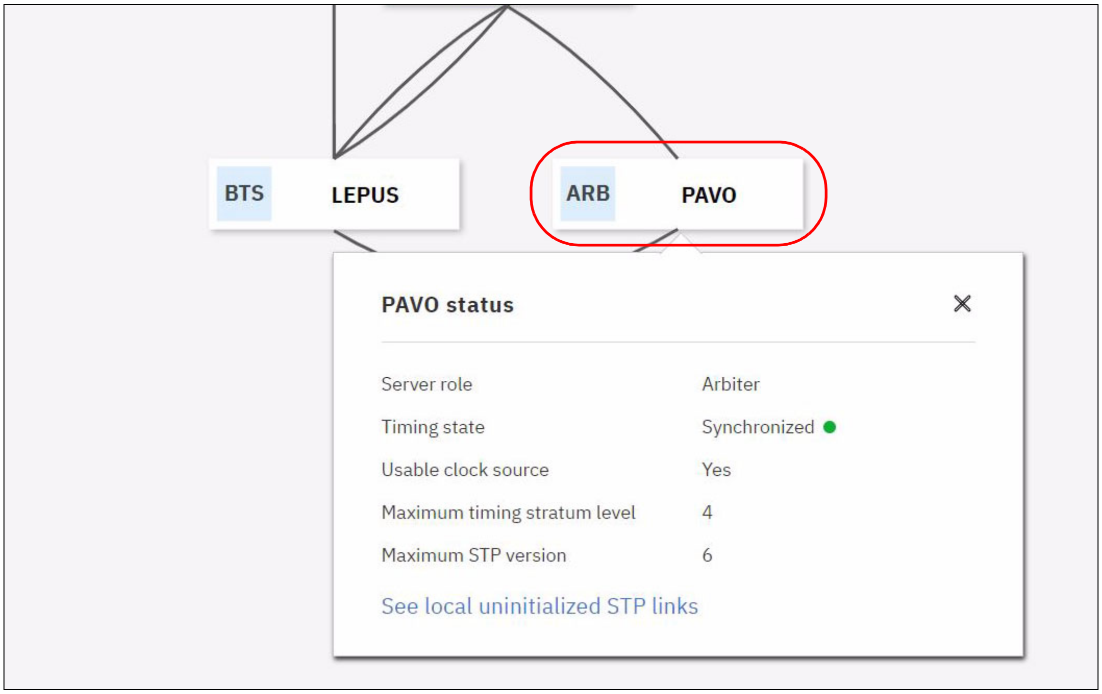


Figure 8-6 CPC status display

Figure 8-7 shows the details of a coupling link.

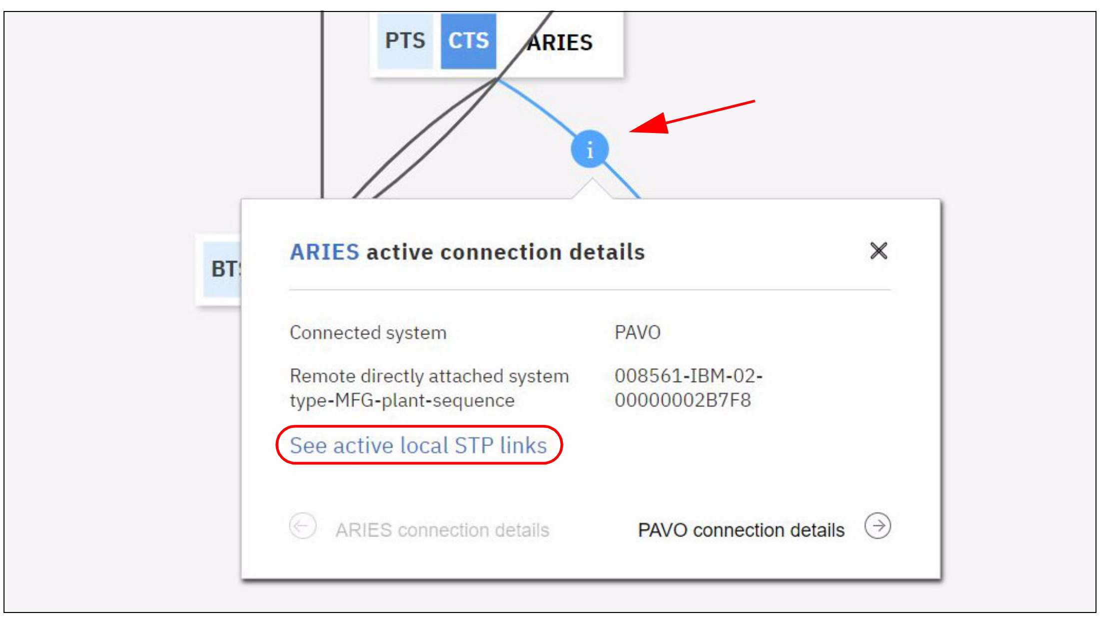


Figure 8-7 Coupling/timing link status display

8.5.1 Setting CTN member restrictions

For a single-server CTN or a dual-server CTN, you can restrict the CTN membership by selecting **Only allow the server(s) specified above to be in the CTN** in this menu. This configuration saves the configuration across Power on Resets (PORs) for STP-only CTNs with one or two servers (also known as *bounded CTN*).

8.5.2 HMC operations to add the CPC to the CTN

To add a CPC to an existing STP-only CTC, complete the following steps:

1. Open the **Manage System Time** task from the HMC, and select **Add systems to CTN** from **STP ACTIONS** (Figure 8-8).

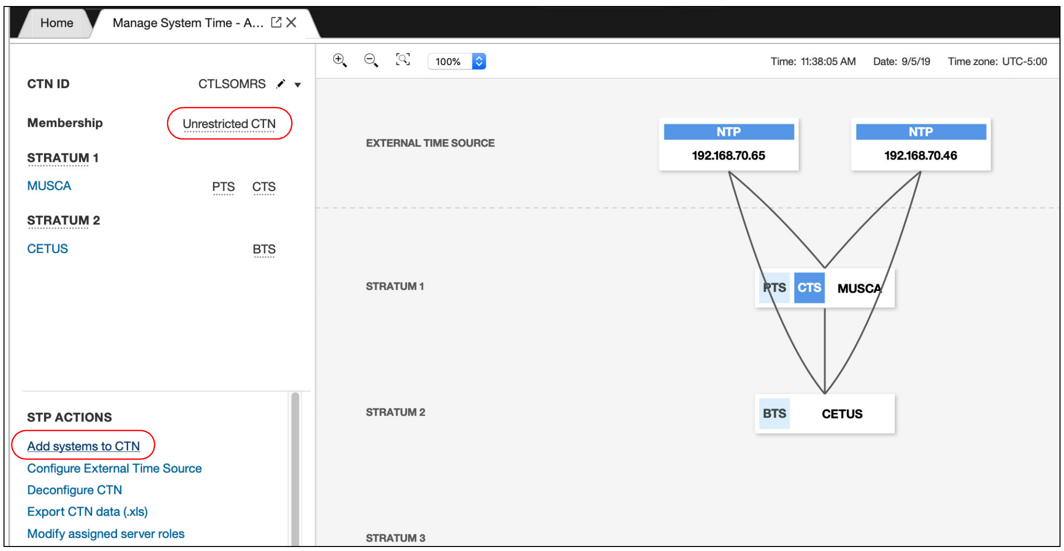


Figure 8-8 Add systems to CTN

Note: Before adding a CPC to an existing CTN, ensure that **Allow any server to be a member of the CTN** is selected in the **Coordinated Timing Network (CTN) member restriction preferences**.

2. The Specify Coordinated Timing Network (CTN) Members window opens. In this window, select the CPC name that does not belong to any CTN (**ARIES**). Click **NEXT** to continue (Figure 8-9).

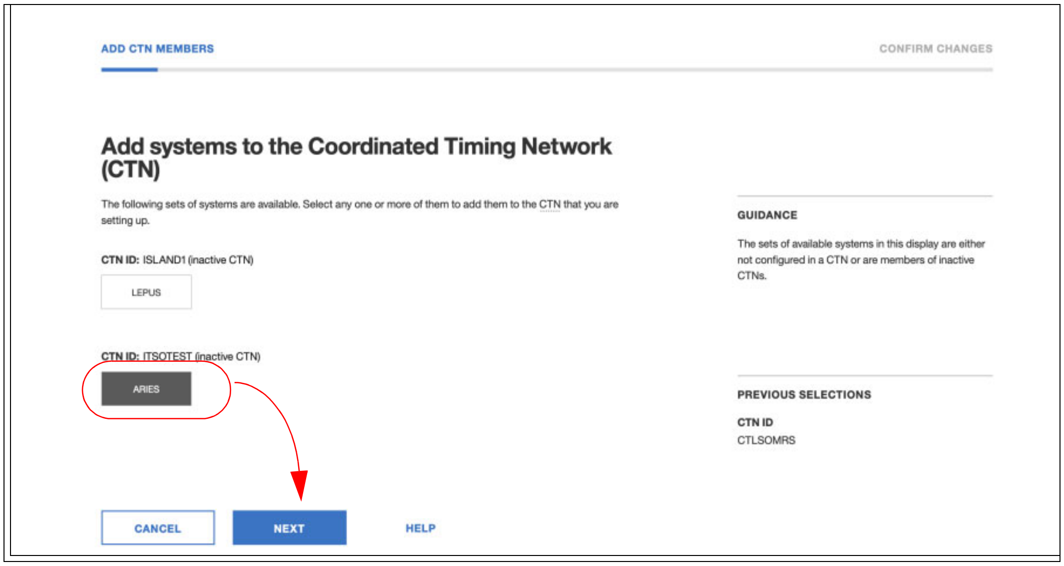


Figure 8-9 Specify Coordinated Timing Network (CTN) Members window

3. The Confirm Changes window opens. In this case, ARIES is added as a Stratum 2 server. Click **APPLY** to continue (Figure 8-10).

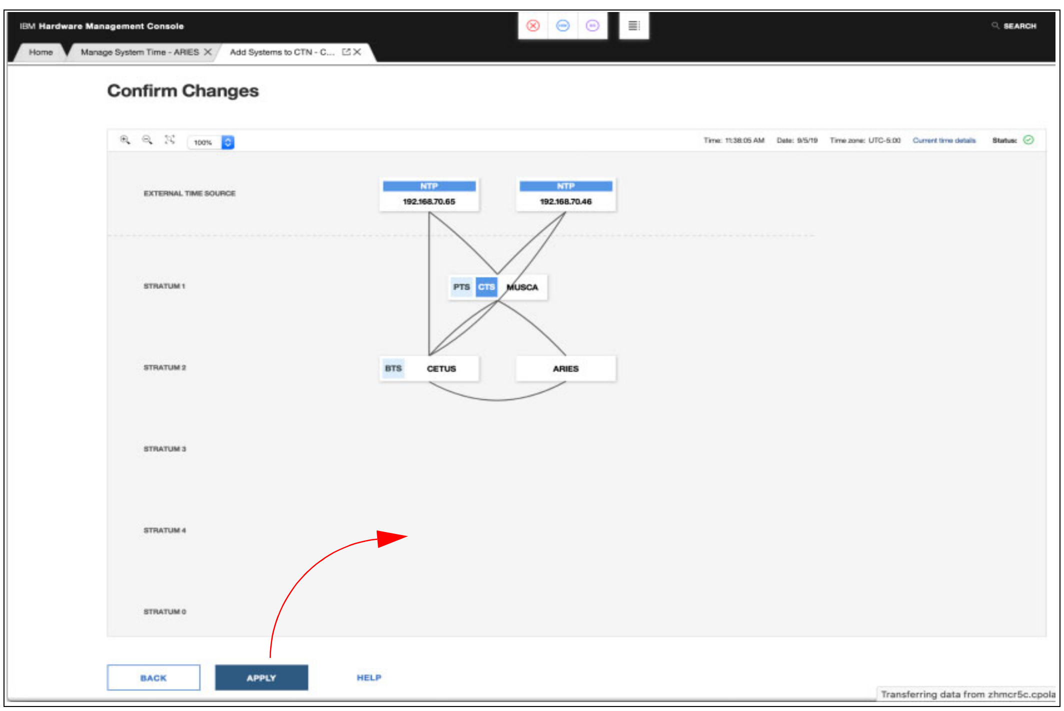


Figure 8-10 Confirm Changes window

4. You see the Local CTN ID change confirmation for ARIES (Figure 8-11 on page 211). After you select **APPLY**, the Complete message window opens. Click **Close** to complete the operation (Figure 8-11 on page 211).

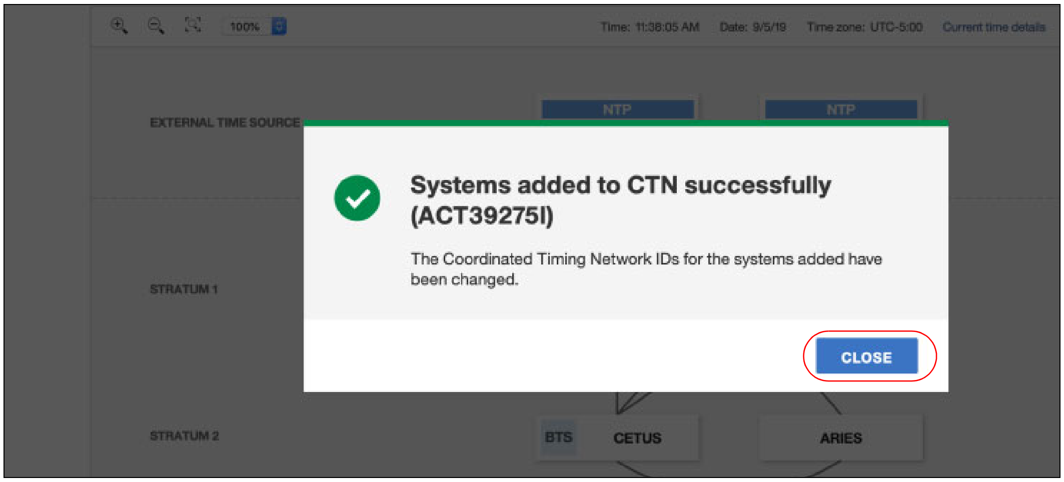


Figure 8-11   Local CTN ID change confirmation (ACT37363)

8.5.3 Verifying the new CTN configuration

When the new CTN configuration completes, the Manage System Time initial window opens (see Figure 8-12).

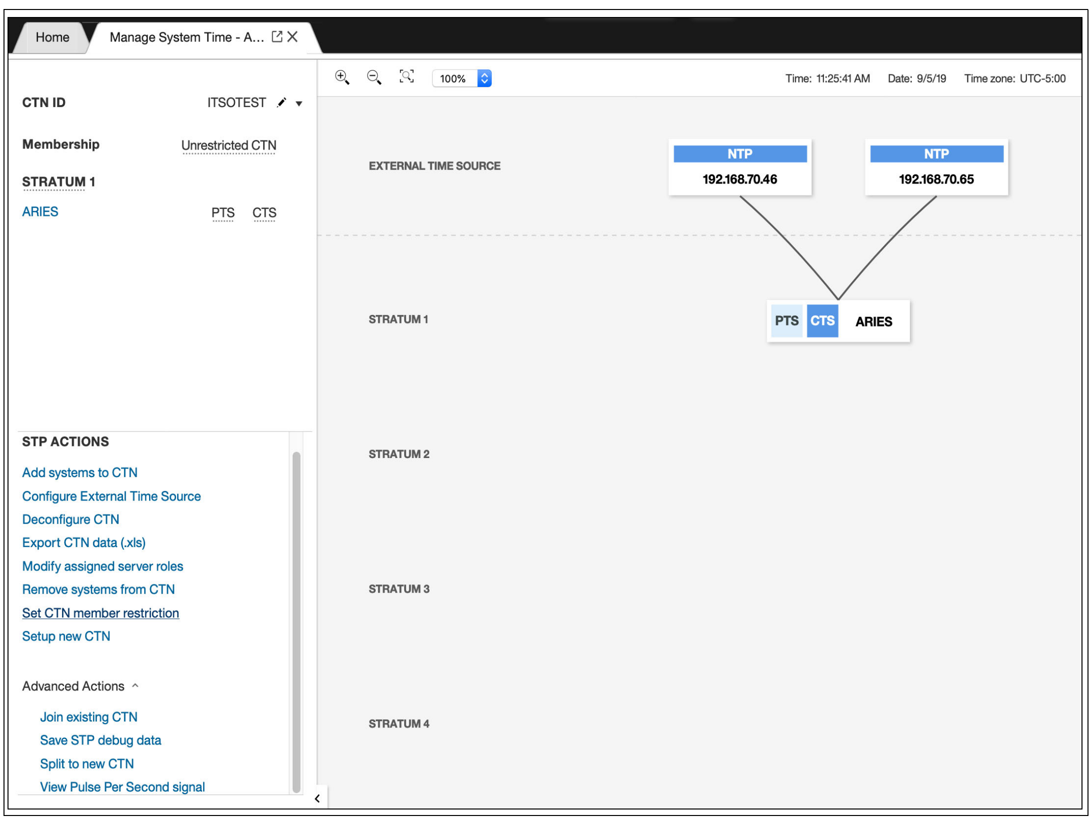


Figure 8-12   Manage System Time Window

Check that the following items are defined correctly in the window:

- Status
- CTN ID
- Time / Date / Time zone
- Stratum Level
- STP Role

You can also check the status of STP by running the z/OS **D ETR** command (Example 8-1).

Example 8-1 D ETR display command

```
D ETR
IEA386I 13.15.59 TIMING STATUS 951
SYNCHRONIZATION MODE = STP
  THIS SERVER IS A STRATUM 1
  CTN ID = ITSOTEST
  THE STRATUM 1 NODE ID = 008561.T01.IBM.02.000000007A88
  THIS IS THE PREFERRED TIME SERVER
```

For more information, see *IBM Z Server Time Protocol Guide*, SG24-8480.

9

Defining Coupling Facility links

This chapter describes the coupling connectivity options and the Parallel Sysplex clustering enhancements that are available on IBM z16 systems. Coupling link configuration examples for Parallel Sysplex and Server Time Protocol (STP) are also shown.

For more information about the enhancements that were made in Coupling Facility (CF) level 25, see *IBM z16 (3931) Technical Guide*, SG24-8951 or *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Coupling connectivity options for Parallel Sysplex on IBM z16
- Defining Coupling Express2 Long Reach
- Defining Integrated Coupling Adapter Short Reach
- Defining an STP timing-only link by using ICA SR
- CF LPAR setup and Coupling Facility Control Code Level 25

9.1 Coupling connectivity options for Parallel Sysplex on IBM z16

Coupling connectivity for Parallel Sysplex on IBM z16 can use Coupling Express2 Long Reach (CE LR) and Integrated Coupling Adapter Short Reach (ICA SR). The ICA SR feature is designed to support distances of up to 150 m. The CE2-LR feature supports distances up to 10 km unrepeated between systems, and up to 100 km with qualified Dense Wavelength Division Multiplexer. The available options for coupling links on IBM z16 are shown in Figure 9-1.

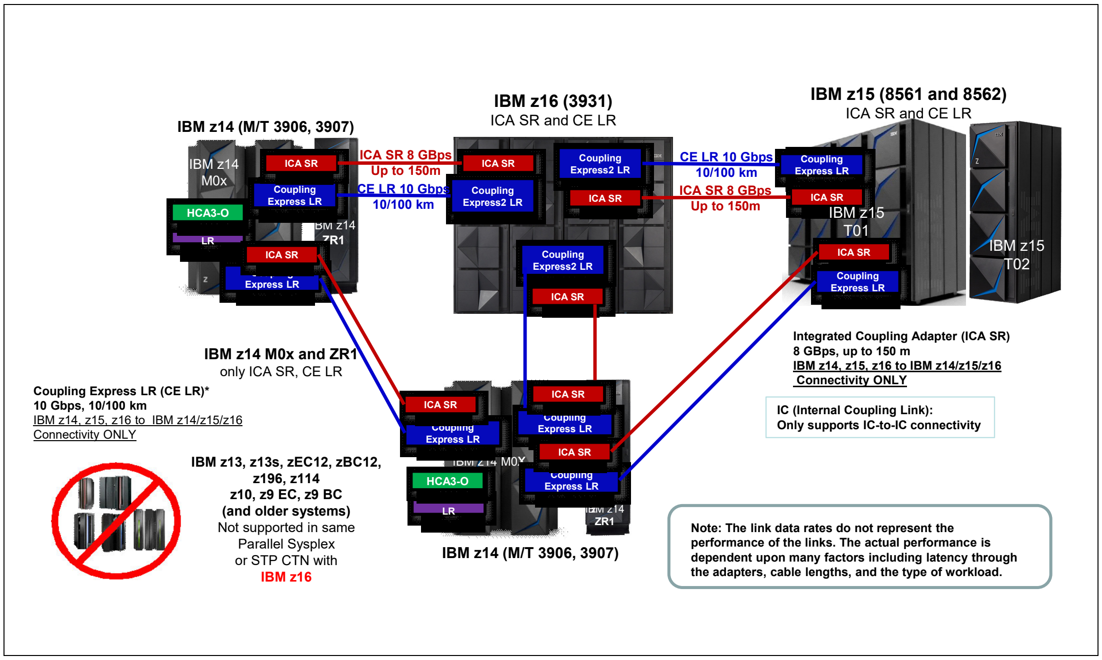


Figure 9-1 IBM z16 coupling connectivity

Internal Coupling (IC) links are supported and used for internal communication between logical partitions (LPARs) on the same central processor complex (CPC) running Coupling Facilities (CFs) and z/OS images. The connection is emulated in the Licensed Internal Code (LIC) and provides fast and secure memory-to-memory communications between LPARs within a single system. No physical cabling is required. For IC, an ICP type channel path ID (CHPID) is used.

> **Note:** IBM z16 do not support InfiniBand coupling links; only ICA SR and CE2-LR external coupling links are supported.

9.1.1 Preparing to define Coupling Facility links

A good starting point for implementing coupling links is accurate and current documentation that clearly illustrates all connections that are needed for the new or upgraded CPC.

When installing coupling links, ensure that you ordered enough ports to support your configuration with physical feature redundancy. Your Parallel Sysplex should be configured for the highest possible availability.

Parallel Sysplex failure independence is a function of a z/OS to CF relationship and the removal of single points of failure. For example, all connections to a structure on a Stand-alone Coupling Facility (SACF) are failure-independent. With an Internal Coupling Facility (ICF), all connections from z/OS images on the same footprint are failure-dependent.

For more information, see *Coupling Facility Configuration Options*, ZSW01971, which can be found at the IBM downloads website.

Evaluate whether the configuration includes any channel features that are not supported on IBM z16. The configuration should be reviewed for any channel types that cannot be carried forward or connected to the IBM z16.

Another important point is to ensure that all CPCs are connected to the IBM z16 by using coupling links as follows: Only N, N-1, and N-2 IBM Z generations can coexist in the same Parallel Sysplex or Coordinated Timing Network (CTN). For example, IBM z16 provides coupling connectivity back to IBM z14 M0x, IBM z14 ZR1, IBM z15 T01, and IBM z15 T02 systems only through ICA SR and CE2-LR features.

Note: Deactivate any coupling links on other connected systems before an upgrade, or you might experience configuration errors.

If an IBM z16 plays a CTN role (Preferred Time Server (PTS), Backup Time Server (BTS), or Arbiter), then the other CTN role-playing CPCs must have coupling connectivity to the IBM z16 (N, N-1, and N-2).

If coupling links are connected across sites by using Dense Wavelength Division Multiplexing (DWDM), verify whether the DWDM equipment that you plan to use supports the respective coupling link technology and is qualified for the STP.

Note: Do not use DWDM equipment that is not qualified by IBM to transport STP information.

For more information about the supported coupling link features, see *IBM Z Connectivity Handbook*, SG24-5444.

9.2 Defining Coupling Express2 Long Reach

This section describes the implementation of the CE2-LR feature. The definition of this CF link is part of the activity that is called *Define CF/STP link*, which is shown in Figure 1-3 on page 5.

Coupling Express2 LR (CE LR) coexistence/migration is critical:

- IBM z16 CE2-LR links connect to existing CE LR links on IBM z14 and IBM z15 by using the same LR cabling.
- Compatibility patches were delivered to IBM z14 and IBM z15 in 2020 (Protocol updates for scalability).
- CE LR hardware cannot be used on IBM z16 for new-build or carry-forward systems.

In this example, we show how to define a coupling link between an IBM z16 and an IBM z15 by using CHPID type CL5 (see Figure 9-2).

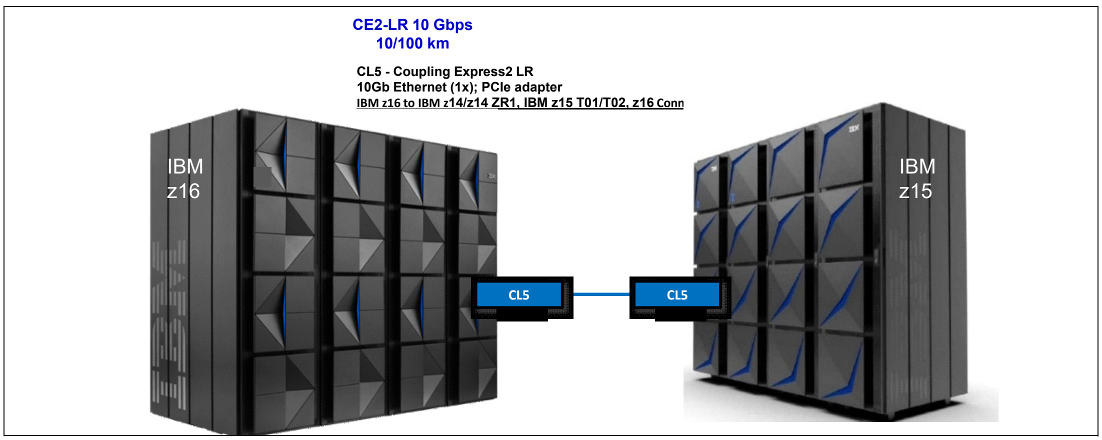


Figure 9-2 CF link connection that uses CL5

CE2-LR is defined in an input/output configuration data set (IOCDS) like PSIFB. Even though this feature is a Peripheral Component Interconnect Express (PCIe) feature, a physical channel ID (PCHID) is used instead of an adapter ID (AID) to identify the physical card.

Example 9-1 shows a sample extract of the input/output configuration program (IOCP) to define the new CHPID Type CL5 on the IBM z15 that connects to an IBM z16.

Example 9-1 IOCP definitions for CHPID Type CL5 on an IBM z15

```
ID     ..                                                   *
       ..                                                   *
       SYSTEM=(8561,1),LSYSTEM=ARIES,                       *
       TOK=('ARIES',008001117A883906095804670118074F00000000,00*
       000000,'22-02-08','14:15:57','........','........')
RESOURCE PARTITION=((CSS(0),(ARIES0A,A),..                  *
       ),(ARIES0D,D),(ARIES0E,E),(ARIES0F,F),(ARIES01,1),(ARIES*
       ..                                                   *
       (CSS(2),(ARIES2A,A),(ARIES2B,B),(ARIES2C,C),(ARIES2D,D),*
       (ARIES2E,E),..                                       *
CHPID PATH=(CSS(2),E9),SHARED,PARTITION=((ARIES2E),(=)),    *
       CPATH=(CSS(1),E9),CSYSTEM=PAVO,PORT=2,PCHID=13C,      *
       TYPE=CL5
```

Example 9-2 shows a sample extract of the corresponding IOCP definition for a connecting CHPID Type CL5 on an IBM z16.

Example 9-2 IOCP definitions for CHPID Type CL5 on an IBM z16 system

```
ID    ..                                                      *
      ..                                                      *
      SYSTEM=(3931,1),LSYSTEM=PAVO,                           *
      TOK=('PAVO',008001117A8885610958046701180 74F00000000,00*
      000000,'22-02-08','14:15:57','........','........')
RESOURCE PARTITION=((CSS(0),(PAVO0A,A),..                     *
      PAVO07,7),(PAVO08,8),(PAVO09,9)),(CSS(1),(PAVO1A,A),(PA*
      VO1B,B),(PAVO1C,C),(PAVO1D,D),(PAVO1E,E),(PAVO1F,F),(PA*
      VO11,1),..                                              *
CHPID PATH=(CSS(1),E9),SHARED,PARTITION=((PAVO11),(=)),      *
      CPATH=(CSS(2),E9),CSYSTEM=ARIES,PORT=2,PCHID=124,      *
      TYPE=CL5
```

Note: When you connect CF sender and receiver channel paths, or CF peer channel paths, the Hardware Configuration Definition (HCD) proposes a CF control unit (CU), and device numbers that must be defined for a CF sender channel (CF receiver channels do not require CUs and devices to be defined).

For more information about how to define CHPID Type CL5 in HCD, see 14.2.4, “Defining CL5 CHPIDs” on page 362.

9.2.1 CE2-LR: Verifying the configuration

After you activate the new configuration with the new CE2-LR CF links and all the cables are connected, verify whether the CHPIDs are online and operating by using z/OS or the Support Element (SE) windows:

- Checking the status by using z/OS commands.

  For example, if you are interested in checking the status of CHPID 8C, run the **D M=CHP(8C)** command, as shown in Example 9-3.

Example 9-3 Displaying the status of CHPID 8C

```
D M=CHP(8C)
IEE174I 12.02.20 DISPLAY M 507
CHPID 8C:  TYPE=34, DESC=COUPLING OVER ROCE, ONLINE
Coupling Facility 003931.IBM.02.000000071A08
                  PARTITION: 3E  CPCID: 00
NAMED CF78        CONTROL UNIT ID: FFEC

PATH        PHYSICAL              LOGICAL  CHANNEL TYPE      CAID PORT
8C / 050A   ONLINE                ONLINE   CL5 10GbE-RoCE    01DC  01

Coupling Facility SUBCHANNEL STATUS
 TOTAL:   46   IN USE:   46   NOT USING:    0   NOT USABLE:    0
 OPERATIONAL DEVICES / SUBCHANNELS:
     FBFD / 0FCA     FBFE / 0FCB     FBFF / 0FCC     FC00 / 0FCD
     FC01 / 0FCE     FC02 / 0FCF     FC03 / 0FD0     FC0B / 0FD1
     FC0C / 0FD2     FC0D / 0FD3     FC0E / 0FD4     FC0F / 0FD5
     FC10 / 0FD6     FC11 / 0FD7     FFC0 / 0FD8     FFC1 / 0FD9
```

```
FFC2 / 0FDA     FFC3 / 0FDB     FFC4 / 0FDC     FFC5 / 0FDD
FFC6 / 0FDE     FFC7 / 0FDF     FFC8 / 0FE0     FFC9 / 0FE1
FFCA / 0FE2     FFCB / 0FE3     FFCC / 0FE4     FFCD / 0FE5
FFCE / 0FE6     FFCF / 0FE7     FFD0 / 0FE8     FFD1 / 0FE9
FFD2 / 0FEA     FFD3 / 0FEB     FFD4 / 0FEC     FFD5 / 0FED
FFD6 / 0FEE     FFD7 / 0FEF     FFD8 / 0FF0     FFD9 / 0FF1
FFDA / 0FF2     FFDB / 0FF3     FFDC / 0FF4     FFDD / 0FF5
FFDE / 0FF6     FFDF / 0FF7
```

- Checking the status by using the SE windows by completing the following steps:

  a. From the Hardware Management Console (HMC), select the CPC (under Systems Management) where the CHPID/PCHID that you want to verify is, and click **Single Object Operations** (under Recovery task options).

  b. On the SE, select the same CPC and click **Channels**, as shown in Figure 9-3.

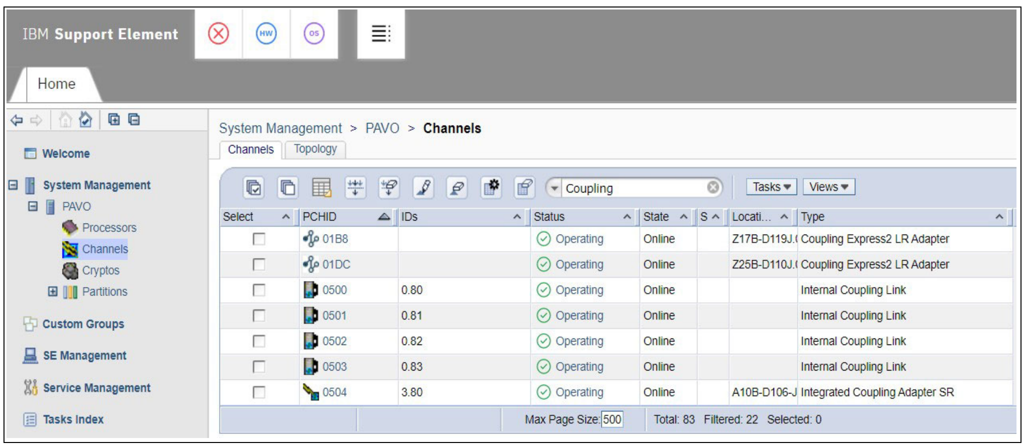


Figure 9-3 SE Systems Management and channels

  c. Look for the PCHID that you are interested in checking the status of. The result looks like what is shown in Figure 9-4.

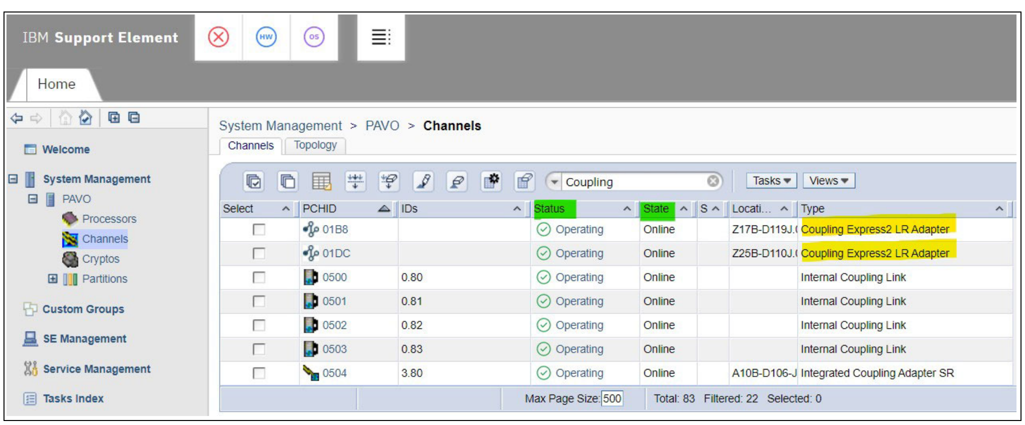


Figure 9-4 Verifying channel CL5 by using the CPC view

  d. For more information about the PCHID, click the PCHID to show its details, as shown in Figure 9-5 on page 219.

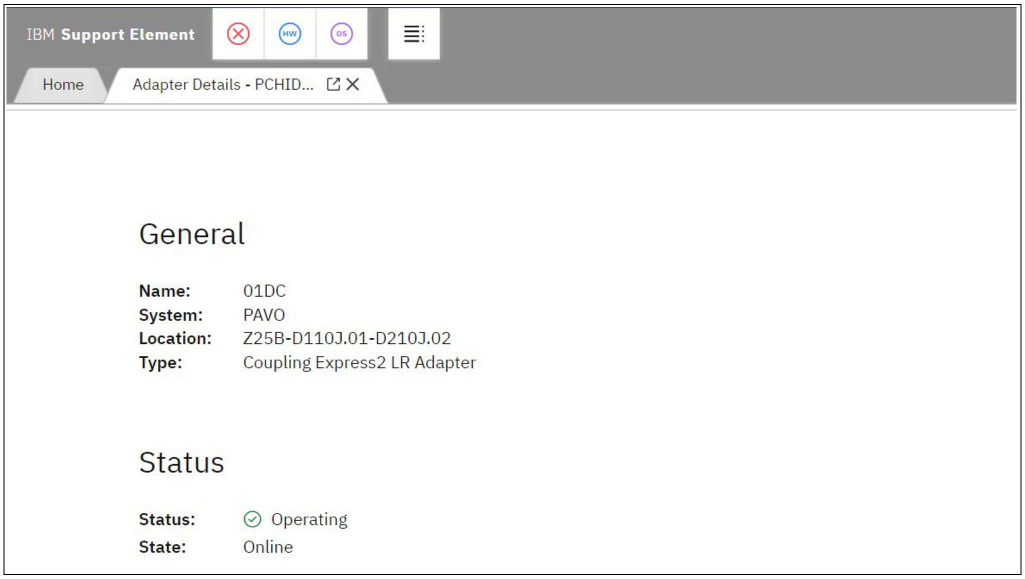


Figure 9-5 CL5 PCHID details

You can also check the status from the LPAR view. Select the LPAR that you want to check the CHPID status of, and select the channels option under that LPAR. Now, you can look for the CHPID and check the status, as shown in Figure 9-6.

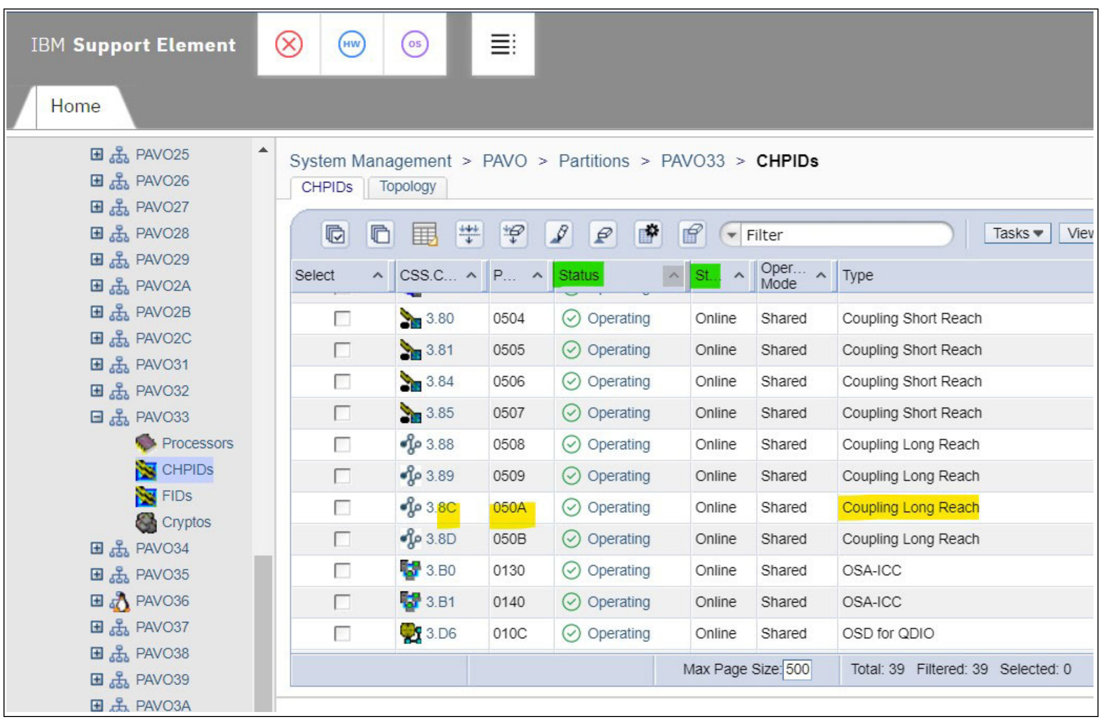


Figure 9-6 SE Verify channel LPAR view

9.3 Defining Integrated Coupling Adapter Short Reach

This section describes the implementation of coupling links by using the ICA-SR 1.1 feature. The definition of this CF link is part of the activity that is called *Define CF/STP link*, which is shown in Figure 1-3 on page 5.

The ICA-SR 1.1 IBM z16 has the following improvements.

Note: The ICA-SR 1.1 carries forward from IBM z15 and IBM z14. What is unique for IBM z16 is the protocol that is used for the ICA SR links, which reduces the link latency and service times.

- Refactored ICA-SR protocol engine for the IBM z16:
  - Push Message Command Block (MCB) and Message Response Block (MRB) (versus pull) removes a memory round trip to retrieve an MCB.
  - The Direct Memory Access request (DREQ)-less write data protocol removes the cross-fiber handshake to send data for a CF write command.
  - HW Offload engines for processing async SMSG MRB & Secondary MCB arrival Vector setting by central processor (CP) instead of SAP remove SAPs from the processing path for these messages.

There is a complete coexistence with legacy ICA SR connections (CS5 channel type), and the expected result is improved CPU-synchronous CF service times.

In this example, we show how to define a coupling link between an IBM z16 system and an IBM z15 system by using CHPID type CS5 (see Figure 9-7).

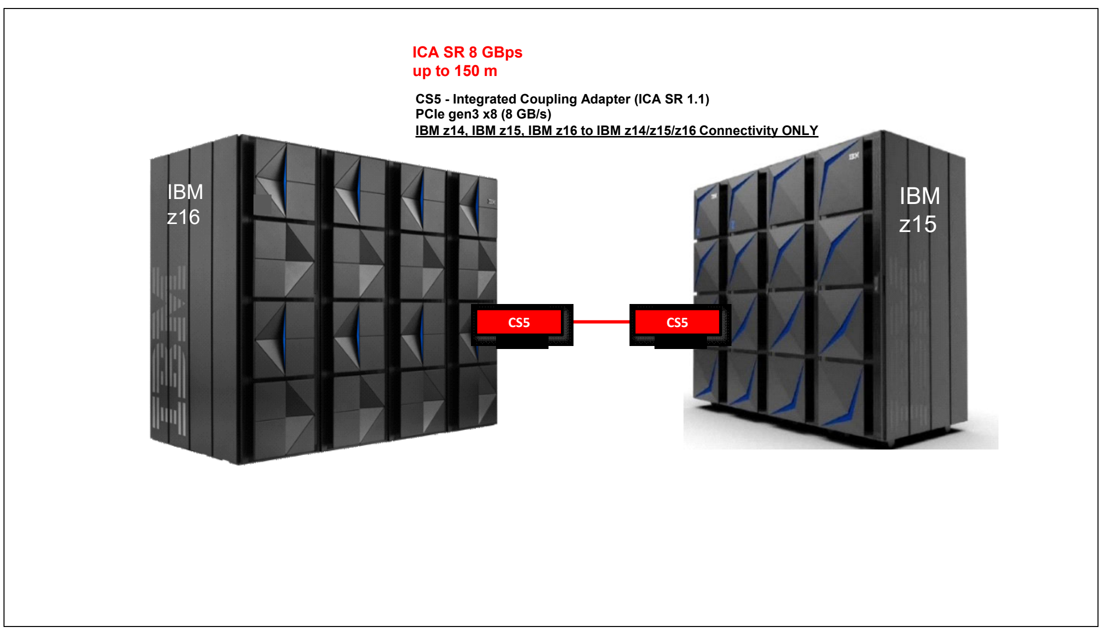


Figure 9-7 CF link CS5 connection from an IBM z16 to an IBM z15

The ICA SR is defined in an IOCDS-like PSIFB by using an AID to identify the physical card. Example 9-4 on page 221 shows a sample of the IOCP defining the CS5 CHPID.

Example 9-4 IOCP definitions for CHPID Type CS5 on an IBM z15 system

```
ID    ..                                                    *
      ..                                                    *
      SYSTEM=(8561,1),LSYSTEM=ARIES,                        *
      TOK=('ARIES',008001117A88390609580467O118074F00000000,00*
      000000,'22-02-08','14:15:57','........','........')
RESOURCE PARTITION=((CSS(0),(ARIES0A,A),..                  *
      (CSS(2),(ARIES2A,A),(ARIES2B,B),(ARIES2C,C),(ARIES2D,D),*
      (ARIES2E,E),..                                        *
CHPID PATH=(CSS(2),E0),SHARED,PARTITION=((ARIES2E),(=)),    *
      CPATH=(CSS(1),E5),CSYSTEM=PAVO,AID=20,PORT=1,TYPE=CS5
```

Example 9-5 shows a sample extract of the corresponding IOCP definition for a connecting CHPID Type CS5 on an IBM z16.

Example 9-5 IOCP definitions for CHPID Type CS5 on an IBM z16

```
ID    ..                                                    *
      ..                                                    *
      SYSTEM=(3931,1),LSYSTEM=PAVO,                         *
      TOK=('PAVO',008001117A88390609580467O118074F00000000,000*
      00000,'22-02-08','14:15:57','........','........')
RESOURCE PARTITION=((CSS(0),(PAVO0A,A),..                   *
      ),(PAVO0D,D),(PAVO0E,E),(PAVO0F,F),(PAVO01,1),(PAVO..  *
      (CSS(2),(PAVO2A,A),(PAVO2B,B),(PAVO2C,C),(PAVO2D,D),(PAV*
      02E,E),..                                             *
CHPID PATH=(CSS(2),E9),SHARED,PARTITION=((PAVO2E),(=)),     *
      CPATH=(CSS(1),E9),CSYSTEM=ARIES,PORT=2,AID=20,        *
      TYPE=CS5
```

For more information about how to define CHPID Type CS5 in the HCD, see 14.2.3, “Defining a Coupling Facility link with CS5 CHPIDs” on page 359.

9.3.1 ICA SR: Verifying the configuration

After activating the new configuration with the ICA SR CF links and all cables are connected, verify whether the CHPIDs are online and operating by using a z/OS command or the SE windows:

- Checking the status by using the z/OS command.

  For example, if you are interested in checking the status of CHPID 80, run a **D M=CHP(80)** command, as shown in Example 9-6.

  Example 9-6 Displaying the status of CHPID 80

```
D M=CHP(80)
IEE174I 07.38.20 DISPLAY M 048
CHPID 80:  TYPE=33, DESC=COUPLING OVER PCIE, ONLINE
Coupling Facility 003931.IBM.02.000000071A08
                  PARTITION: 3F  CPCID: 00
NAMED CF79        CONTROL UNIT ID: FFEE

PATH        PHYSICAL             LOGICAL  CHANNEL TYPE      CAID PORT
80 / 0504   ONLINE               ONLINE   CS5 8X-PCIE3      0005  01
```

```
Coupling Facility SUBCHANNEL STATUS
 TOTAL:    64    IN USE:    64    NOT USING:     0    NOT USABLE:     0
 OPERATIONAL DEVICES / SUBCHANNELS:
     FE52 / 10A6     FE53 / 10A7     FE54 / 10A8     FE55 / 10A9
     FE56 / 10AA     FE57 / 10AB     FE58 / 10AC     FE59 / 10AD
     FE5A / 10AE     FE5B / 10AF     FE5C / 10B0     FE5D / 10B1
     FE5E / 10B2     FE5F / 10B3     FE60 / 10B4     FE61 / 10B5
     FE62 / 10B6     FE63 / 10B7     FE64 / 10B8     FE65 / 10B9
     FE66 / 10BA     FE67 / 10BB     FE68 / 10BC     FE69 / 10BD
     FE6A / 10BE     FE6B / 10BF     FE6C / 10C0     FE6D / 10C1
     FE6E / 10C2     FE6F / 10C3     FE70 / 10C4     FE71 / 10C5
     FFA0 / 10C6     FFA1 / 10C7     FFA2 / 10C8     FFA3 / 10C9
     FFA4 / 10CA     FFA5 / 10CB     FFA6 / 10CC     FFA7 / 10CD
     FFA8 / 10CE     FFA9 / 10CF     FFAA / 10D0     FFAB / 10D1
     FFAC / 10D2     FFAD / 10D3     FFAE / 10D4     FFAF / 10D5
     FFB0 / 10D6     FFB1 / 10D7     FFB2 / 10D8     FFB3 / 10D9
     FFB4 / 10DA     FFB5 / 10DB     FFB6 / 10DC     FFB7 / 10DD
     FFB8 / 10DE     FFB9 / 10DF     FFBA / 10E0     FFBB / 10E1
     FFBC / 10E2     FFBD / 10E3     FFBE / 10E4     FFBF / 10E5
```

- Checking the status by using SE windows by completing the following steps:

  a. From the HMC, select the CPC (under Systems Management) where the CHPID or PCHID that you want to verify is, and click **Single Object Operations** (under Recovery task options).

  b. On the SE, select the same CPC and click **Channels**, as shown in Figure 9-8.

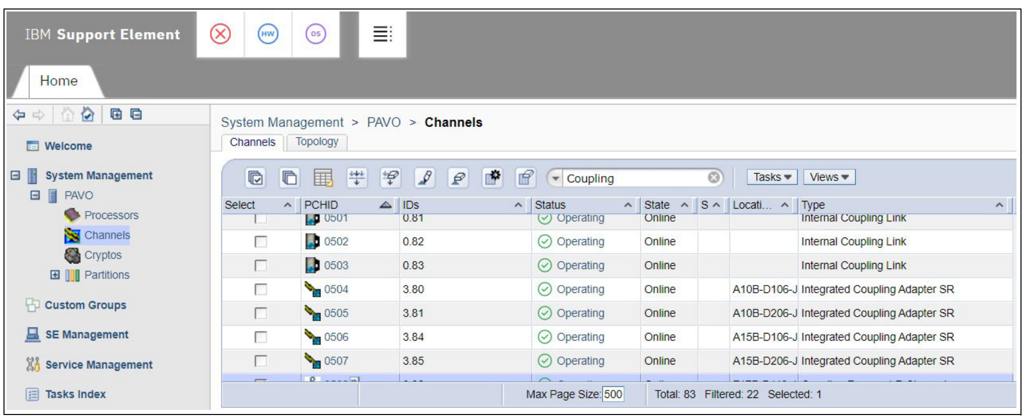


Figure 9-8 SE Systems Management and channels

  c. Look for the PCHID that you are interested in checking the status for. The result looks similar to what is shown in Figure 9-9 on page 223.

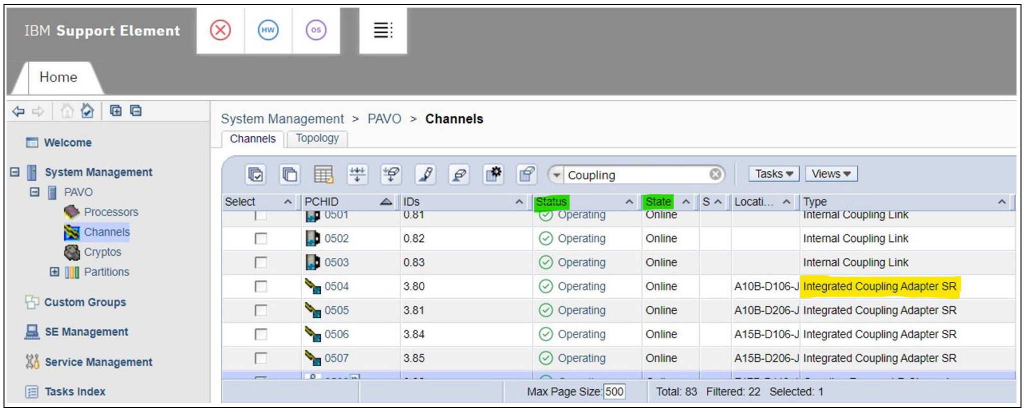


Figure 9-9 Verifying channel CS5 by using the CPC view

d. For more information about the PCHID, click the PCHID to show a result like what is shown in Figure 9-10.

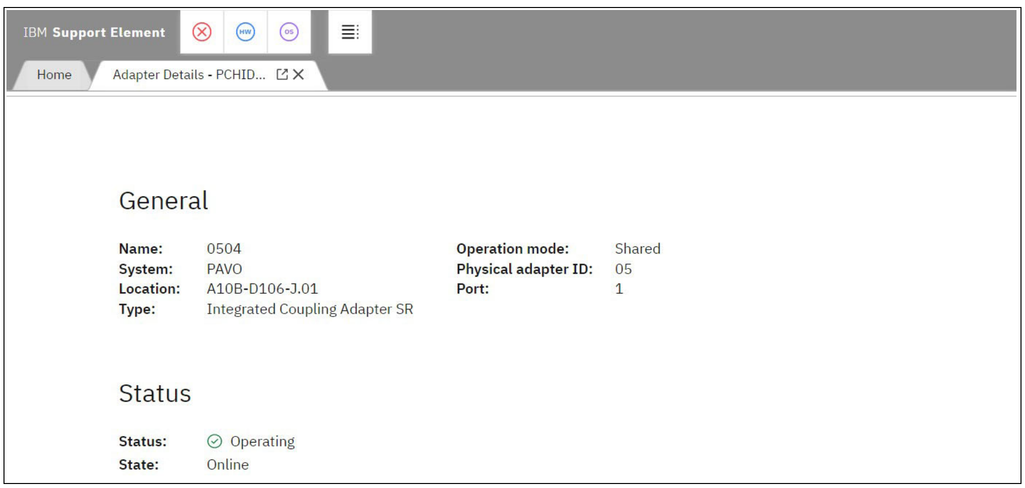


Figure 9-10 CS5 PCHID details

Another option is to check the status from the LPAR view. Select the LPAR that you are interested in checking the CHPID status of, and select the **Channels** option under that LPAR. Now, you can look for the CHPID and check the status, as shown in Figure 9-11.

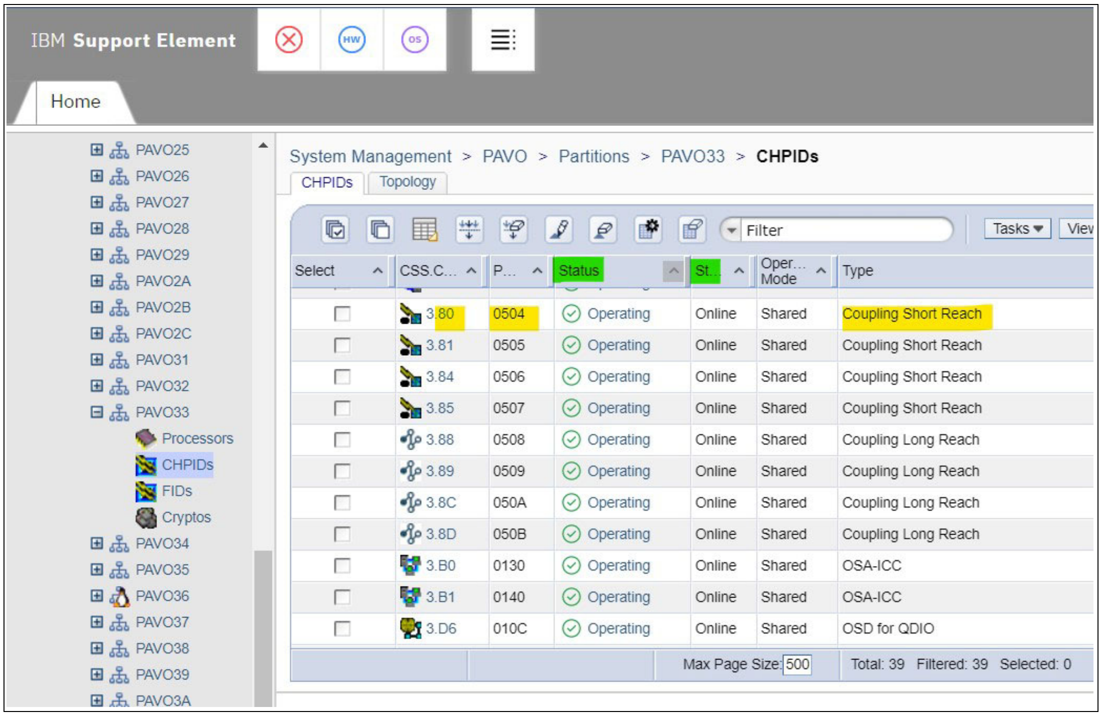


Figure 9-11 SE Verify channel LPAR view

9.4 Defining an STP timing-only link by using ICA SR

This section describes how to configure a timing-only link (for STP messages) over ICA SR connectivity.

9.4.1 STP timing-only link: Implementation

In this section, a CHPID type (CS5) connection is used to show an example of an STP timing-only link definition. The definition of the STP timing-only link is part of the *Define CF/STP link* activity that is shown in Figure 1-3 on page 5.

A coupling link connection between an IBM z16 and an IBM z15 by using CS5 CHPIDs is used as an example of how to define an STP timing-only link (see Figure 9-12).

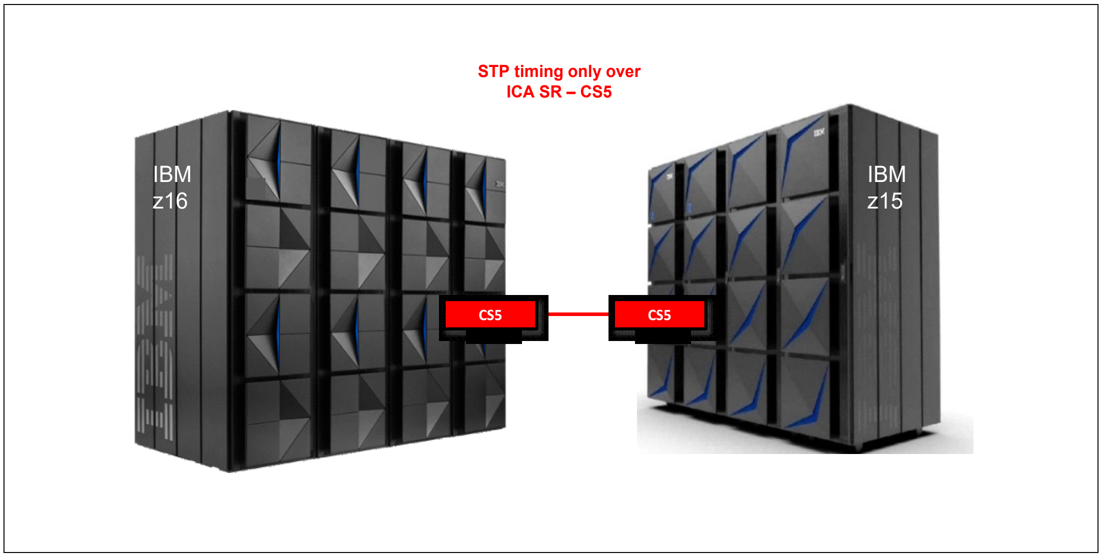


Figure 9-12 STP timing-only link connection from an IBM z16 to an IBM z15 (over CS5)

A timing-only link ICA SR is defined in the IOCDS like an ICA SR. The only difference is the CU type, which is STP in this case. Example 9-7 shows a sample IOCP defining the CS5 CHPID for timing-only links on the IBM z15 side.

Example 9-7 IOCP defining STP timing-only link on an IBM z15 by using CS5

```
ID    ..                                                    *
      ..                                                    *
      SYSTEM=(8561,1),LSYSTEM=ARIES,                        *
      TOK=('ARIES',00800112E0F7390609470424011806 1F00000000,00*
      000000,'22-02-08','14:15:57','SYS9','IODF78')
RESOURCE PARTITION=((CSS(0),(ARIES0A,A),..                  *
      (CSS(2),(ARIES2A,A),(ARIES2B,B),(ARIES2C,C),(ARIES2D,D),*
      (ARIES2E,E),(ARIES2F,F),(ARIES21,1),..                *
CHPID PATH=(CSS(2),E0),SHARED,PARTITION=((ARIES21),(=)),    *
      CPATH=(CSS(1),E5),CSYSTEM=PAVO,AID=20,PORT=1,TYPE=CS5
CHPID PATH=(CSS(2),E1),SHARED,PARTITION=((ARIES21),(=)),    *
      CPATH=(CSS(1),E0),CSYSTEM=PAVO,AID=20,PORT=2,TYPE=CS5
CNTLUNIT CUNUMBR=FFFD,PATH=((CSS(2),E9,ED,E1,E4,E5,E0)),    *
      UNIT=STP
```

Example 9-8 shows a sample IOCP defining the CS5 CHPID for timing-only links on the IBM z16 side.

Example 9-8 IOCP defining STP timing-only link on an IBM z16 by using CS5

```
ID    ..                                                    *
      ..                                                    *
      SYSTEM=(3931,1),LSYSTEM=PAVO,                         *
      TOK=('PAVO',00800112E0F7856109470424011806 1F00000000,000*
      00000,'22-02-08','14:15:57','SYS9','IODF78')
RESOURCE PARTITION=((CSS(0),(PAVO0A,A),..                   *
      USCA07,7),(PAVO08,8),(PAVO09,9)),(CSS(1),(PAVO1A,A),(PAV*
      O1B,B),(PAVO1C,C),(PAVO1D,D),(PAVO1E,E),(PAVO1F,F),(PAVO*
```

```
      11,1),..                                             *
CHPID PATH=(CSS(1),E4),SHARED,PARTITION=((PAVO11),(=)),    *
      CPATH=(CSS(2),E5),CSYSTEM=ARIES,AID=16,PORT=1,TYPE=CS5
CHPID PATH=(CSS(1),E5),SHARED,PARTITION=((PAVO11),(=)),    *
      CPATH=(CSS(2),E0),CSYSTEM=ARIES,AID=16,PORT=2,TYPE=CS5
CNTLUNIT CUNUMBR=FFFC,PATH=((CSS(1),E9,EC,E0,E1,E4,E5)),
      UNIT=STP
```

The sequence of steps to define the STP timing-only link connection between an IBM z16 and an IBM z15 by using CS5 CHPIDs through HCD is the same as for defining the CF links to a connection.

For more information about how to define CHPID Type CS5 in HCD, see 14.2.3, "Defining a Coupling Facility link with CS5 CHPIDs" on page 359.

Complete the following steps:

1. On the CF links connection step, after including the data that is related to the CPC ARIES side of the connection, type `YES` on the `Timing-only link` option of the Connect to CF Channel Path panel (Figure 9-13), and press Enter.

```
Goto  Filter  Backup  Query  Help
+---------------- Connect to CF Channel Path -----------------+ ---------
|                                                             |
|                                                             | ==> PAGE
| Specify the following values.                               |
|                                                             |
| Source processor ID  . . . . . : PAVO                       |
| Source channel subsystem ID  . : 2                          |
| Source channel path ID . . . . : 80                         |
| Source channel path type . . . : CS5                        |
|                                                             |
| Destination processor ID . . . . . . ARIES     +            |  -CU-  -#-
| Destination channel subsystem ID . . 2   +                  |  Type  Dev
| Destination channel path ID  . . . . E4  +                  |
|                                                             |  CFP   8
| Timing-only link . . . . . . . . . . YES                    |  CFP   32
|                                                             |  CFP   8
|                                                             |  STP
|  F1=Help     F2=Split    F3=Exit     F4=Prompt   F5=Reset   |  CFP   32
|  F9=Swap    F12=Cancel                                      |  STP
+-------------------------------------------------------------+  CFP   32
F8       Y  ICP  SHR  N     PAVO.2    F9       Y  ICP  SHR     CFP   7
```

Figure 9-13 STP timing-only link from an IBM z16 system to an IBM z15 system by using CS5

2. After accepting or overriding the CU and Device numbers for both processors, HCD returns to the CF Channel Path Connectivity List panel (Figure 9-14 on page 227). You can see that the STP timing-only links are now connected.

```
---------------------------------------------------------------------------
                     CF Channel Path Connectivity List             Row 5 of
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . : PAVO     Pavo
Source channel subsystem ID . : 2
Source partition name . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  De
_ 80  1DC/1 Y  CS5  SHR  N     ARIES.2    E4  104/1 N  CS5  SHR    STP
```

Figure 9-14 STP timing-only links connected

9.4.2 STP timing-only links: Verifying the configuration

After activating the new configuration with the ICA SR links defined as STP timing-only links and all cables are connected, verify whether the CHPIDs are online and operating by using z/OS or the SE windows.

The same process that you used for ICA SR links should be followed to check the status (online and operating) of the CS5 CHPIDs that were defined to work as STP timing-only links.

Complete the steps that are described in 9.3.1, “ICA SR: Verifying the configuration” on page 221 by using the respective CHPID/PCHID of the links for which you are interested in checking the status.

9.5 CF LPAR setup and Coupling Facility Control Code Level 25

The intention of this section is to remind you of the configuration aspects that are related to a CF LPAR, such as the possible sysplex configuration with an IBM z16, memory considerations due to the new CF Level, and the changes in Coupling Facility Control Code (CFCC) Level 25.

As shown in Figure 1-3 on page 5, the following aspects must be considered for the activity *Setup CF LPAR*:

- IBM z16 servers support active participation in the same Parallel Sysplex, and connection with, these servers:
  - IBM z15 T01 (M/T 8561) and IBM z15 T02 (M/T 8562).
  - IBM z14 (M/T 3906) and IBM z14 ZR1 (M/T 3907).
  - This is both a direct CPC-CPC connectivity requirement and anywhere in the sysplex regardless of direct or indirect connectivity.
  - Configurations with z/OS on one of these servers can add an IBM z16 server to their sysplex for either a z/OS or a CF image.

   - Configurations with a CF on one of these servers can add an IBM z16 to their sysplex for either a z/OS or a CF image.
   - Usage of Integrated Coupling Adapter Short Reach (ICA SR) or CE LR coupling links is required.

   > **Note:** IBM z14 servers were the last generation servers to support HCA3-O and HCA3-O LR (InfiniBand coupling links). These HCA3-O and HCA3-O LR links are *not* supported on IBM z14 ZR1, IBM z15, or IBM z16.

- Memory considerations:
   - Memory planning must consider the CFCC memory and structure size increases that are associated with a new level of the CFCC.
   - LPARS running the CFCC code might increase storage requirements when moving from CF Level 24 (or earlier) to CF Level 25. In fact, structure size increases because of CF Level 25 might be more noticeable than in earlier CFLEVELs, specifically for structures that are smaller (perhaps, 100 MB or less).
   - As a best practice, use the Coupling Facility Structure Sizer (CFSizer) Tool or the batch SIZER utility.
   - For resizing your CF structures as needed, make the corresponding changes to your CFRM policy INITSIZE and SIZE values.
   - Also, as in earlier CF Levels, ensure that the CF LPAR has at least 512 MB storage for the CFCC microcode.

9.5.1 Coupling Facility Control Code Level 25

The new CFCC Level 25 introduces changes and improvements in the following areas:

- New capability: Cache residency time metrics for directory/data entries.
- Resiliency/Serviceability:
   - Cache retry buffer support for IFCC retry idempotency
   - Lock record data reserved entries for structure full recovery
- Simplification: Deprecate DYNDISP OFF/ON, keep only the THIN option for shared-engine CF images.
- Parallel Sysplex scalability, virtualization, consolidation, and density: CF Image scalability improvements.
- New ICA-SR 1.1 link protocol for the IBM z16: The ICA-SR 1.1 enhanced link protocol reduces the link latency and service times.

For more information about the enhancements that were made in CF level 25, see *IBM z16 (3931) Technical Guide*, SG24-8951 or *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

9.6 Dynamic I/O for Stand-alone Coupling Facility

Before IBM z14 GA2 (Driver 36), a SACF could not change the I/O configuration dynamically because of a missing HCD running in the IBM Z server. Changing the I/O configuration for such a server is cumbersome, error-prone, and requires a Power on Reset (POR).

Dynamic configuration capabilities for SACFs were introduced on IBM z14 GA2, and they are enabled by default on IBM z15 and IBM z16.

SACFs have no co-resident z/OS (with HCD) images that can make hardware dynamic I/O configuration changes on behalf of the CF partitions. Therefore, these I/O changes require disruptive Initial Microcode Loads (IMLs) of the SACF CPC, which cause sysplex availability and complexity issues.

With new support, an activation service (firmware function) is started on the SACF CPC to perform this role, which provides simple dynamically activated I/O changes with no IML requirement.

There are new firmware communication pathways from the “driving” HCD managing the input/output definition file (IODF) changes through the HMC/SE to the SACF CPC, and ultimately the Master Control Service (MCS) activation service (firmware function):

- For passing the modified target configuration
- For driving the Dynamic I/O activate and associated recovery/management functions

For more information, see *IBM z16 (3931) Technical Guide*, SG24-8951 or *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

> **Note:** For remote dynamic I/O activation to run on an IBM z14 system, Driver Level 36 or later is required.

9.6.1 Preparation steps on IBM z14 only

If you are not using an IBM z15 or IBM z16, plan and perform a firmware update to Driver Level 36 and HMC 2.14.1 on your earlier IBM Z generation.

Complete the following steps:

1. Install the program temporary fixes (PTFs) for APARs for z/OS (OA54912) and Hardware Configuration Manager (HCM) (IO25603). Make sure that the servers in the same Parallel Sysplex are running on Driver Level 36 or later, and then select the processor to update the definitions on the appropriate server, as shown in Figure 9-15.

```
+-------------------------- Supported Processors
|                                                    R
| Command ===> ___________________________________
|
| Select one to view more details.
|
|   Processor
|   Type-Model Support Level
|   3906-M03   3906 support
|   3906-M03   3906 GA2 support        <===
+--------------------------------------------------
```

Figure 9-15 Update 3906 processor definition to new support level

2. Define Partition B in the `highest*` channel subsystem (CSS) with the name `MCS_1` for the CF processor.

> **Note:** The `highest` CSS is CSS ID 5 for the IBM z14 (M0x), IBM z15 T01 and IBM z16 A01, and CSS ID 2 for the IBM z16 A02 and IBM z16 AGZ, IBM z15 T02, and IBM z14 ZR1 systems.

Using the HCD, you see the panel that is shown in Figure 9-16 on page 231.

```
+---------------------------- Partition List --------------------------
|   Goto  Backup  Query  Help
| ------------------------------------------------------------------------
|
| Command ===> ________________________________________ Scroll ===> PAGE
|
| Select one or more partitions, then press Enter. To add, use F11.
|
| Processor ID  . . . . : CETUS     Cetus
| Configuration mode  . : LPAR
| Channel S +---------- Change Internal Partition Definition ----------+
|           |                                                          |
| / Partiti |                                                          |
| _ *       | Specify or revise the following values.                  |
| _ *       |                                                          |
| C *       | Partition name . . . MCS_1                               |
| _ *       | Partition number . : B      (same as MIF image ID)       |
| _ *       | Partition usage  . : FW                                  |
| _ *       | UID uniqueness . . : N        (Y/N)                      |
| _ *       |                                                          |
|  F1=Help  | Description  . . . . Master Control Service FW lpar__    |
|  F7=Backw |                                                          |
| F12=Cance |                                                          |
+---------- |  F1=Help    F2=Split   F3=Exit    F4=Prompt  F5=Reset    |
            |  F9=Swap   F12=Cancel                                  |
            +----------------------------------------------------------+
```

Figure 9-16 HCD change to the internal partition definition

Using the HCM, you see the window that shown in Figure 9-17.

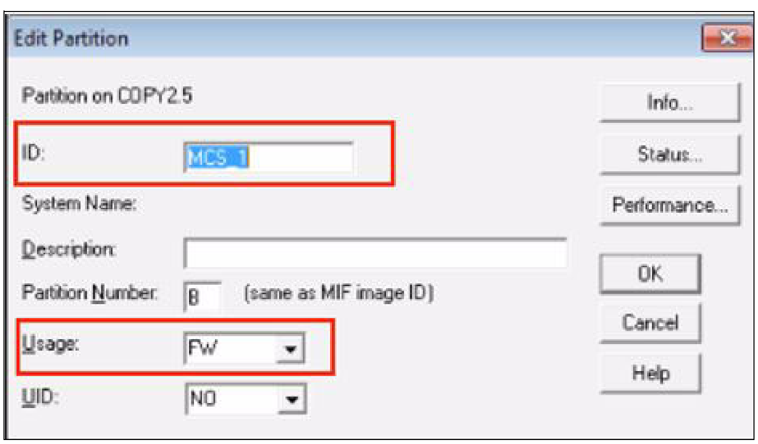


Figure 9-17 HCM edit partition definition

3. To do the activation, update the IOCDS with the updated configuration to the CF processor, and then perform a POR.

   After this “last” POR is done on the SACF CPC, then all later dynamic I/O changes can be done dynamically.

The dynamic activation is like the existing remote dynamic activation on a server that supports z/OS LPARs, but for hardware only changes.

For more information about how to implement this new support, see 5.5.2, “Dynamic I/O configuration for a Stand-Alone Coupling Facility” on page 119.

9.6.2 IBM Processor Resource/System Manager solution

With IBM z14 GA2, IBM z15, and IBM z16, dynamic activation of a new or changed IODF on a SACF CPC is supported:

- Without requiring a POR/IML
- Without requiring the presence (on the same CPC) of any z/OS or z/VM image running an HCD instance

This is a base IBM Processor Resource/System Manager (PR/SM) solution; it does not require the usage of Dynamic Partition Manager (DPM) mode:

- A firmware function is used, which is a firmware-based appliance version of the HCD instance.
- The solution is fully managed by the IBM Z firmware.
- The solution is included with the base firmware (no need to order a feature code).

For IBM z14 only, the activation of the firmware function requires a POR with an IOCDS that includes and establishes the activation service on the SACF CPC before this new capability can be used.

The firmware LPAR is activated by default on IBM z15 and IBM z16.

When this “last” POR is done on the SACF CPC (IBM z14 only), then all later dynamic I/O changes can be done dynamically.

The firmware appliance LPAR on a supported system is driven by an updated HCD running in z/OS LPAR on a remote IBM Z (Driver Level 36 or newer), as shown on Figure 9-18.

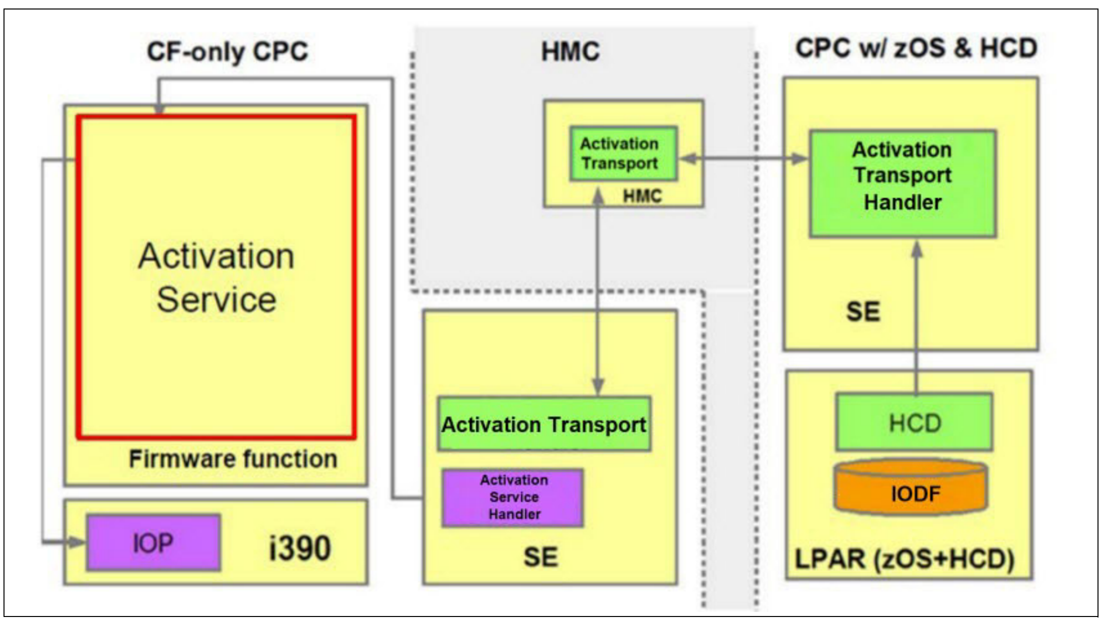


Figure 9-18 Dynamic I/O for a Stand-alone Coupling Facility

10

Specialized features

This chapter covers the configuration of all specialized features that are available for IBM z16 systems.

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

This chapter includes the following topics:

- Crypto Express8S
- Virtual Flash Memory

10.1 Crypto Express8S

This section provides information about the configuration of the Crypto Express8S feature on IBM z16. It covers cryptographic domains, configuration rules, and what to consider when you are planning for a nondisruptive installation of cryptographic features.

The chapter includes the steps for defining and configuring the Crypto Express8S feature to a logical partition (LPAR).

This section includes the following topics:

- Crypto Express8S overview
- Planning for a Crypto Express8S configuration
- Configuring Crypto Express8S
- Handling cryptographic coprocessors by using ICSF

10.1.1 Crypto Express8S overview

There are three generations of cryptographic coprocessors[1] that are supported for IBM z16:

- Crypto Express6S (Feature Code 0893) carry forward only (miscellaneous equipment specification (MES) from IBM z14, IBM z14 ZR1, or IBM z15)
- Crypto Express7S (Feature Code 0899 (one adapter on card) and Feature Code 0898 (two adapters on card)), carry forward only (MES from IBM z15)
- Crypto Express8S (Feature Code 0909 (one adapter on card) and Feature Code 0908 (two adapters on card))

This section describes the Crypto Express8S features for the IBM z16 system.

Each cryptographic coprocessor of an IBM z16 A01 has 85 physical sets of registers, which correspond to the maximum number of LPARs running on an IBM z16 A01. The IBM z16 A02 and IBM z16 AGZ have 40 sets. Each of these sets belongs to a domain as follows:

- A cryptographic domain index, in the range of 0 - 84 (0 - 39 on an IBM z16 A02 and IBM z16 AGZ) is allocated to an LPAR by the definition of the partition in its image profile. The same domain must also be allocated to the Integrated Cryptographic Service Facility (ICSF) instance running in the LPAR that uses the Options data set.
- Each ICSF instance accesses only the master keys that correspond to the domain number that is specified in the LPAR image profile at the Support Element (SE) and in its Options data set. Each ICSF instance sees a logical cryptographic coprocessor that consists of the physical cryptographic engine and the unique set of registers (the domain) that is allocated to this LPAR.

1 Regional Crypto Enablement (RCE) is also supported, but it is not covered here.

The installation of CP Assist for Cryptographic Functions (CPACF) Data Encryption Standard (DES) / Triple Data Encryption Standard (TDES) Enablement (Feature Code 3863) is one of the prerequisites for using the special hardware cryptographic feature in an IBM z16. Feature Code 3863 enables the following functions:

- For data privacy and confidentiality: DES, TDES, and Advanced Encryption Standard (AES) for 128-bit, 192-bit, and 256-bit keys. Also with Feature Code 3863, the Modulo arithmetic unit is enabled, which supports Elliptic Curve Cryptography for verification and signing by using NIST P256, P384, and P521 curves; Brainpool Curves P256, P384, and P512; and Edward curves Ed25519 and Ed448 with clear keys.
- For data integrity: Secure Hash Algorithm-1 (SHA-1) 160-bit, and SHA-2 for 224-, 256-, 384-, and 512-bit support. SHA-3 for 224-, 256- 384-, and 512-bit support, and SHAKE for 128- and 256-bit support. SHA-1, SHA-2, and SHA3 are enabled on all IBM z16 A01 systems, and they do not require the no-charge enablement Feature Code 3863.
- For Key Generation: Pseudo-Random Number Generation (PRNG), Deterministic Random Number Generation (DRNG), and True Random Number Generation (TRNG).
- For message authentication code: Single-key message authentication code and double-key message authentication code.

The total number of cryptographic Peripheral Component Interconnect Express (PCIe) adapters (combined Crypto Express8S, Crypto Express7S, or Crypto Express6S features) cannot exceed 60 per IBM z16. Up to 16 cards with one PCIe adapter can be used (Crypto Express6S or Crypto Express7S 1 port carried forward, or Crypto Express8S 1 port), or up to 30 cards with two PCIe adapters (Crypto Express7S 2 port carried forward, or Crypto Express8S 2 port) resulting in 60 PCIe adapters.

IBM z16 A02 and IBM z16 AGZ support up to 20 cards with two PCIe adapters (Crypto Express7S 2 port carried forward or Crypto Express8S 2 port resulting in 40 PCIe adapters.

The initial order for Crypto Express8S is two features (two PCIe adapters for Feature Code 0909, and four PCIe adapters for Feature Code 0908). After the initial order, the minimum order is one feature.

Each Crypto Express8S (Feature Code 0909) contains one PCIe adapter, and each Crypto Express8S (Feature Code 0908) contains one PCIe adapter. The adapter can be in the following configurations:

- Common Cryptographic Architecture (CCA) Coprocessor (CEX8C)
- Public Key Cryptography Standards (PKCS) #11 (EP11) Coprocessor (CEX8P)
- Accelerator (CEX8A)

During the feature installation, the PCIe adapter is configured by default as the CCA coprocessor.

The configuration of the Crypto Express8S adapter as an EP11 coprocessor requires a Trusted Key Entry (TKE) workstation Hardware 10.0 (Feature Code 0057 for the rack-mounted workstation, and Feature Code 0058 for the tower workstation) with TKE 10.0 Licensed Internal Code (LIC) (Feature Code 0882).

The Crypto Express8S feature does not use channel path IDs (CHPIDs) from the channel subsystem (CSS) pool. However, the Crypto Express8S feature requires one slot in a PCIe I/O drawer, and one physical channel ID (PCHID) for each PCIe cryptographic adapter.

Table 10-1 summarizes the cryptographic feature codes for IBM z16.[2]

Table 10-1 Cryptographic feature codes

Feature Code	Description
3863	CPACF enablement This feature is a prerequisite to use CPACF (except for SHA-1, SHA-2, and SHA-3) and cryptographic coprocessor hardware.
0908	Crypto Express8S (2-port) card A maximum of 30 features for an IBM z16 A01 and a maximum of 20 features for an IBM z16 A02 and IBM z16 AGZ can be ordered (a minimum of two adapters). This feature is optional, and each feature contains two PCIe cryptographic adapters (an adjunct processor). This feature is supported by only IBM z16.
0909	Crypto Express8S (1-port) card A maximum of 16 features can be ordered (a minimum of two adapters). This feature is optional, and each feature contains one PCIe cryptographic adapter (an adjunct processor). This feature is supported by only IBM z16.
0898	Crypto Express7S (2-port) card This feature cannot be ordered for a new IBM z16 system, but only on a carry-forward MES from a IBM z15 system. A maximum of 30 features can be ordered for an IBM z16 A01 and a maximum of 20 features can be ordered for an IBM z16 A02 and IBM z16 AGZ (a minimum of two adapters for all models). This feature is optional, and each feature contains two PCIe cryptographic adapters (an adjunct processor). This feature is supported by only IBM z16 and IBM z15.
0899	Crypto Express7S (1-port) card This feature cannot be ordered for a new IBM z16 A01 system, but only on a carry-forward MES from an IBM z15 system. A maximum of 16 features can be ordered (a minimum of two adapters). This feature is optional, and each feature contains one PCIe cryptographic adapter (an adjunct processor). This feature is supported by only IBM z16 and IBM z15.
0893	Crypto Express6S card This feature cannot be ordered for a new IBM z16 system, but only on a carry-forward MES from an IBM z14 or IBM z15. A maximum of 16 features can be ordered (a minimum of two adapters). This feature is optional, and each feature contains one PCIe cryptographic adapter (an adjunct processor). This feature is supported by IBM z16, IBM z15, IBM z14, and IBM z14 ZR1.
0058 and 0088	TKE tower workstations A TKE provides basic key management (key identification, exchange, separation, updates, and backup) and security administration. It is optional for running a Crypto Express feature in CCA mode in a non-PCI-compliant environment. It is required for running in EP11 mode and CCA mode with full PCI compliance. The TKE workstation has one Ethernet port, and supports connectivity to an Ethernet local area network (LAN) operating at 10, 100, or 1000 Mbps. It also requires Feature Code 0157. Up to 10 features that are combined with Feature Code 0057 per IBM z16 can be ordered.
0157	TKE Table Top Keyboard/Monitor/Mouse A tabletop monitor with a US English language keyboard. There is a touchpad for pointing, and a country-specific power cord.

[2] Other IBM Z servers are also listed where applicable.

Feature Code	Description
0057	TKE rack-mounted workstation The rack-mounted version of the TKE, which needs a customer-provided standard 19-inch rack. It also requires Feature Code 0156. When using smart card readers, an extra customer-provided tray is needed. Up to 10 features combined with Feature Code 0058 per IBM z16 can be ordered.
0156	TKE Rack Keyboard/Monitor/Mouse A 1U rack-mounted display and keyboard with a built-in pointing device. The keyboard comes in the English language.
0882	TKE 10.0 LIC Included with the TKE tower workstation Feature Code 0058 and the TKE rack-mounted workstation Feature Code 0057 for IBM z16. Earlier versions of TKE features (Feature Codes 0085, 0086, 0087, and 0088) can also be upgraded to the TKE 10.0 LIC if the TKE is assigned to a IBM z14 or later system.
0891	TKE Smart Card Reader Access to information in the smart card is protected by a PIN. One Feature Code includes two smart card readers, two cables to connect to the TKE workstation, and 20 smart cards.
0900	TKE extra smart cards When one Feature Code is ordered, 10 smart cards are included. The order increment is 1 - 99 (990 blank smart cards).

Note: You might need the TKE workstation including TKE Smart Card Reader while you run CEX in CCA mode to meet certain security standards requirements.

For more information about the Crypto Express8S feature and the corresponding crypto features, see *IBM z16 (3931) Technical Guide*, SG24-8951 or *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

10.1.2 Planning for a Crypto Express8S configuration

Note: New ICSF support is required to administer a Crypto Express8S coprocessor that uses a TKE workstation, due to leveraging quantum algorithms. Otherwise, existing workloads run on IBM z16 A01 without requiring ICSF support.

Leveraging of the new function is supplied in ICSF program temporary fixes (PTFs) on z/OS 2.2 - 2.4 (Web deliverable HCR77D1, which can be downloaded from the z/OS downloads website) or 2.5 (base, which is HCR77D2). When leveraging new quantum-safe algorithms and sharing a KDS in a sysplex, ensure that all ICSF PTFs are installed on all systems.

All supported levels of ICSF automatically detect what hardware cryptographic capabilities are available where it is running, then enables functions as needed. No toleration of new hardware is necessary. If you want to leverage new capabilities, then ICSF support is necessary.

For the latest MCL bundle requirements, see the *Driver Level 51 Exception Letter*.

IBM z16 always operates in LPAR mode. The concept of *dedicated coprocessor* does not apply to the PCIe adapter. A PCIe adapter, whether configured as a coprocessor or accelerator, is made available to LPARs as directed by the domain assignment and the candidate list. This process occurs regardless of the shared or dedicated status that is given to the central processors (CPs) in the partition.

IBM z16 A01 enables up to 85 LPARs to be active concurrently. IBM z16 A02 and IBM z16 AGZ enable up to 40 LPARs to be active concurrently. Each PCIe adapter on a Crypto Express8S feature supports 85 domains on IBM z16 A01 and 40 domains on IBM z16 A02 and IBM z16 AGZ, whether it is configured as a Crypto Express8S coprocessor or a Crypto Express8S accelerator.

For availability reasons, the minimum configuration consists of two Crypto Express8S features so that every potential LPAR can have access to two cryptographic adapters on two different cards.

More Crypto Express8S features might be needed to satisfy application performance and availability requirements:

- For availability, spread the assignment of multiple PCIe adapters of the same type (accelerator or coprocessor) to one LPAR across features in multiple I/O domains.
- Using retained private keys on a PCIe adapter that is configured as a Crypto Express8S coprocessor creates an application single point of failure. This point of failure exists because RSA-retained private keys are not copied or backed up.
- There is an intrusion latch within the PCIe adapter logic that is set when the feature is removed from the system. If the feature is reinstalled and power is applied, the coprocessor keys and secrets are zeroed and the intrusion latch is reset.

  If a TKE workstation is available, disable the PCIe adapter before you remove the feature from the system. When the feature is reinstalled, the coprocessor keys and secrets are not zeroed. The intrusion latch is reset, and the coprocessor remains in the disabled state. Then, the PCIe adapter can be enabled from the TKE and normal operations can resume.

  Plan the definition of domain indexes and cryptographic coprocessor numbers in the candidate list for each LPAR to prepare the cryptographic configuration. You can also define or change that cryptographic definition dynamically to an active LPAR with a running system. For more information, see “Change LPAR Cryptographic Controls function” on page 246.
- Crypto Express8S features can be installed concurrently when all physical requirements are fulfilled. Dynamically enabling a new PCIe adapter to a partition requires these configurations:
  - At least one usage domain index must be defined to the LPAR.
  - The cryptographic coprocessor numbers must be defined in the partition candidate list.
- The same usage domain index can be defined more than once across multiple LPARs. However, the cryptographic coprocessor number that is coupled with the usage domain index that is specified must be unique across all *active* LPARs.

  The same cryptographic coprocessor number and usage domain index combination can be defined for more than one LPAR. This feature can be used, for example, to define a configuration for backup situations. In this case, only one of the LPARs can be active at any one time.

- Newly installed Crypto Express8S features are assigned coprocessor numbers sequentially during the Power on Reset (POR) that follows the installation.

  However, when a Crypto Express8S feature is installed concurrently by using the Nondisruptive Hardware Change task, the installation might select an out-of-sequence coprocessor number from the unused range. In this case, communicate the cryptographic coprocessor numbers that you want to use to the IBM installation team.

  When the task is used to concurrently remove a PCI cryptographic feature, the coprocessor number is automatically freed.

Table 10-2 is a simplified configuration map for IBM z16 A01. For IBM z16 A02 and IBM z16 AGZ, the last column should be for Domain Index 39. Each row identifies a PCIe adapter, and each column identifies a domain index number. Each cell entry indicates the LPAR to be assigned to the cryptographic coprocessor number that is coupled with the usage domain index.

Table 10-2 Planning for logical partitions, domains, and PCIe adapter numbers

PCIe adapter	**Domain index 0**	**Domain index 1**	**Domain index 2**	**.../...**	**Domain index 84**
PCIe adapter 0	LP00 LP02	LP04	LP05		
PCIe adapter 1	LP01 LP02				
PCIe adapter 2					
…					
…					
PCIe adapter 37					
PCIe adapter 38					
PCIe adapter 39					

Table 10-2 illustrates these characteristics:

- LPARs LP00 and LP01 use domain 0 (zero), but are assigned different PCIe adapters. There is no conflict. They can be concurrently active.
- LPAR LP02 uses domain 0 (zero) on the set of cryptographic adapters that are already defined to LP00 and LP01. Therefore, LP02 cannot be active concurrently with either LP00 or LP01. However, the definition might be valid for backup situations.
- LPARs LP04 and LP05 use different domain numbers for PCIe cryptographic adapter 0 (zero), so there is no conflict. The combination of domain number and cryptographic coprocessor number is unique across partitions.

> **Important:** Any combination of PCIe adapter and domain index should contain only one active LPAR. The combination of cryptographic coprocessor number and usage domain index must be unique across all *active* LPARs.

For more information about the Crypto Express8S feature for IBM Z, see *IBM z16 (3931) Technical Guide*, SG24-8951 and *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

10.1.3 Configuring Crypto Express8S

This section provides steps for configuring Crypto Express8S for IBM z16 A01.

> **Note:** The same steps can be used for configuring Crypto Express8S for IBM z16 A02 and IBM z16 AGZ.

The IBM z16 operates only in LPAR mode. For each LPAR that requires access to a PCIe adapter, which is configured as either an accelerator or a coprocessor, the required information must be defined in the partition image profile. This technique ensures the correct usage of the cryptographic features when the associated partition is activated.

Concurrent changes to the Crypto Express8S features and controls when the partition is already activated are provided by special functions on the SE.

Checking whether the CPACF DES / TDES Enablement feature is installed

Feature Code 3863 enables the DES and TDES algorithms on the CPACF. It is one of the prerequisites for using the Crypto Express8S feature. Verify whether the CPACF feature is correctly installed on the processor before you configure cryptographic functions. This information is displayed in the SE and can be verified by completing the following steps:

1. Log on to the SE directly or click **Single Object Operations** from the Hardware Management Console (HMC).
2. Open the **System details** menu of the central processor complex (CPC) at the SE workplace. The system details window opens (Figure 10-1).

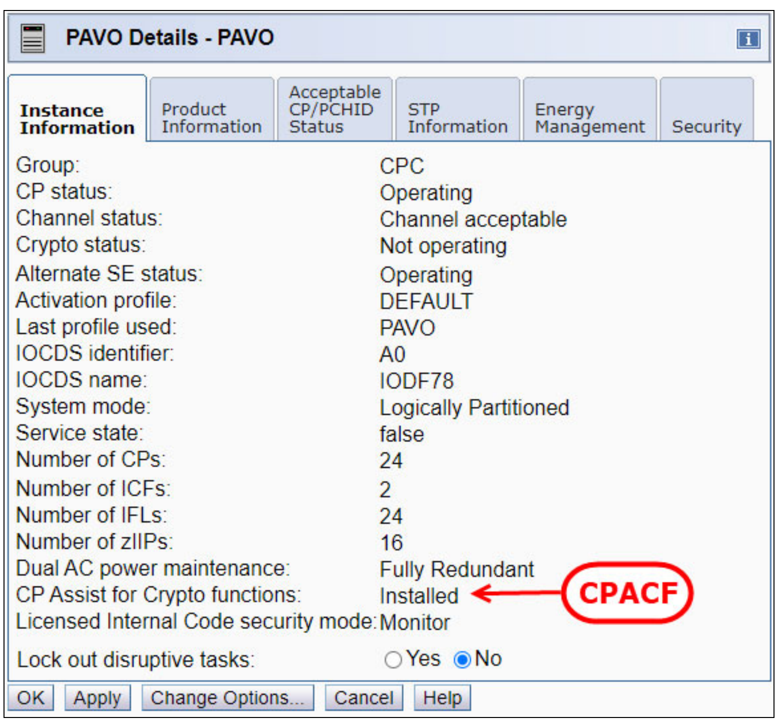


Figure 10-1 System details: CPACF installed

3. Click the **Instance Information** tab, and verify that the CPACF DES/TDES Enablement Feature Code 3863 is installed:
   - If the window shows the message “CP Assist for Crypto Functions: Installed”, the CPACF enablement Feature Code 3863 is enabled.
   - If the window shows the message “CP Assist for Crypto Functions: Not installed”, Feature Code 3863 is not installed. You can still customize the partition image profiles, but the cryptographic functions do not operate.

Logical partition cryptographic definition

The next step is to define the following cryptographic resources in the image profile for each LPAR:

- Usage domain index
- Control domain index
- PCI Cryptographic Coprocessor Candidate List
- PCI Cryptographic Coprocessor Online List

This task is accomplished by using the Customize/Delete Activation Profile task, which is in the Operational Customization Group, either from the HMC or from the SE. Modify the cryptographic initial definition from the Crypto option in the image profile, as shown in Figure 10-2. After this definition is modified, any change to the image profile requires you to DEACTIVATE and ACTIVATE the LPAR for the change to take effect. Therefore, this cryptographic definition is disruptive to a running system.

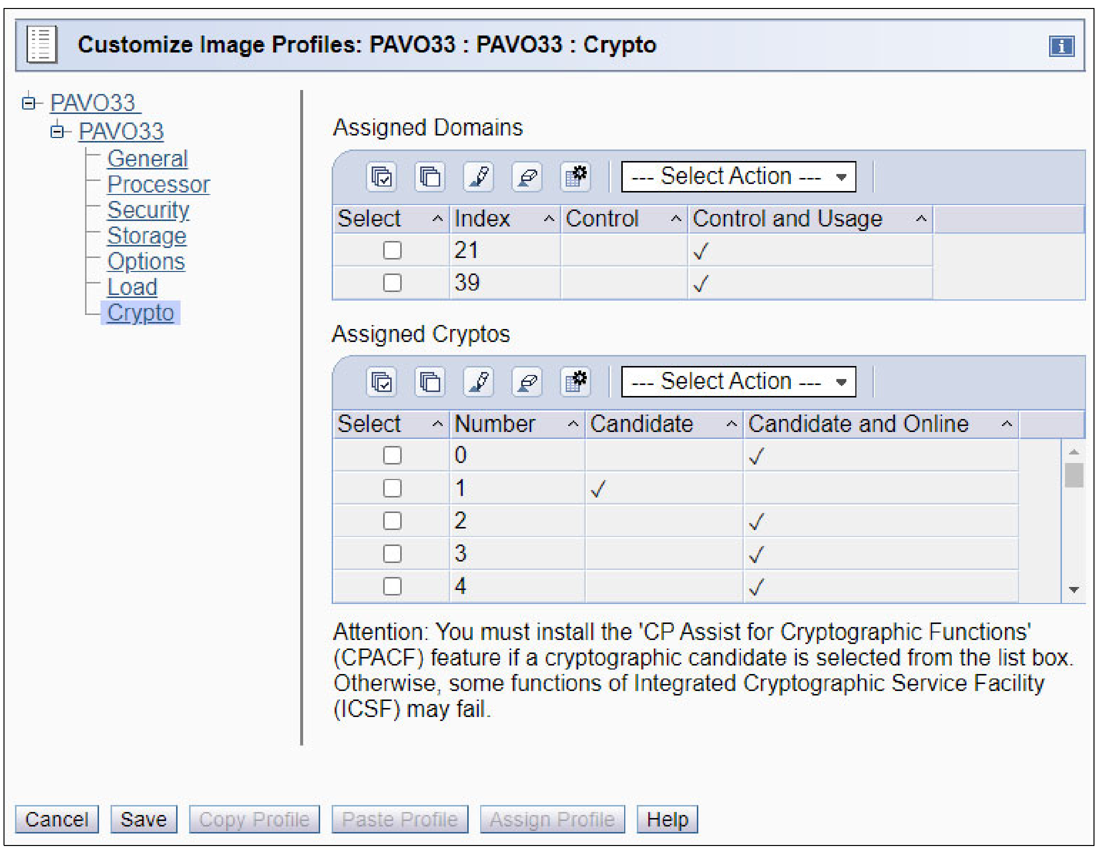


Figure 10-2 Customize Image Profiles: Crypto

Tip: Operational changes can be made by using the Change LPAR Cryptographic Controls task from the SE, which reflects the cryptographic definitions in the image profile for the partition. With this function, you can dynamically add and remove the cryptographic feature without stopping a running operating system (OS). For more information about using this function, see "Change LPAR Cryptographic Controls function" on page 246.

The cryptographic resource definitions have the following meanings:

- Control Domain

  Identifies the cryptographic coprocessor domains that can be administered from this LPAR if it is being set up as the TCP/IP host for the TKE.

  If you are setting up the host TCP/IP in this LPAR to communicate with the TKE, the partition is used as a path to other domains' Master Keys. Indicate all the control domains that you want to access (including this partition's own control domain) from this partition.

- Control and Usage Domain

  Identifies the cryptographic coprocessor domains that are assigned to the partition for all cryptographic coprocessors that are configured on the partition. The usage domains cannot be removed if they are online.

  The numbers that are selected must match the domain numbers that are entered in the Options data set when you start this partition instance of ICSF.

  The same usage domain index can be used by multiple partitions regardless to which CSS they are defined. However, the combination of PCIe adapter number and usage domain index number must be unique across all active partitions.

- Cryptographic Candidate list

  Identifies the cryptographic coprocessor numbers that are eligible to be accessed by this LPAR. From the list, select the coprocessor numbers 0 - 15 that identify the PCIe adapters to be accessed by this partition.

  No error condition is reported when a cryptographic coprocessor number, which is selected in the partition candidate list, is available to the partition when the partition is activated, either because it is configured off or not installed. The cryptographic coprocessor number is ignored and the activation process continues.

  If the cryptographic coprocessor number and usage domain index combination for the coprocessor that is selected is already in use by another active LPAR, the activation of the LPAR fails (see Figure 10-3 on page 243). In this conflicting case, you must review the cryptographic information for all active LPARs from the **Summary** tab of the View LPAR Cryptographic Controls task (see Figure 10-5 on page 245). Resolve the error based on the collected data by assigning a unique combination of PCIe adapter number and usage domain index number.

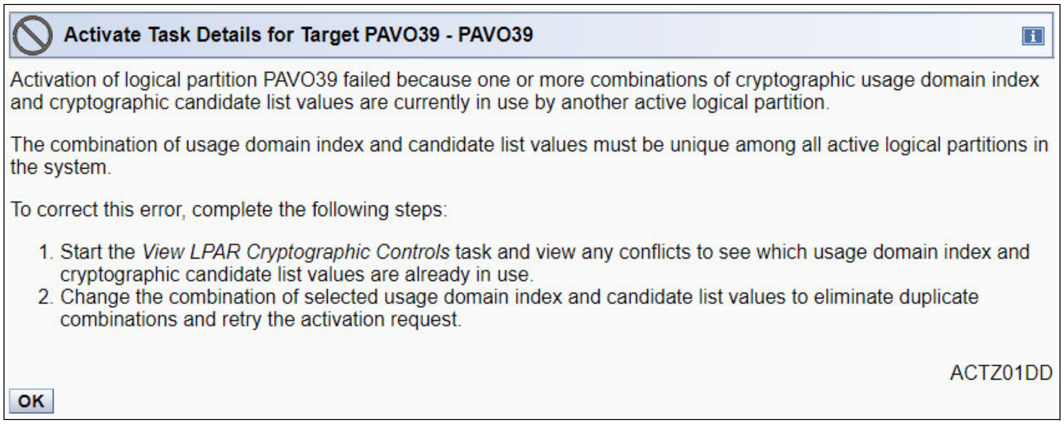


Figure 10-3 Activation of LPAR failed: ACTZ01DD

- Cryptographic Online list

  Identifies the cryptographic coprocessor numbers that are automatically brought online during LPAR activation. The numbers that are selected in the online list must also be part of the candidate list.

  After the next partition activation, installed PCI Cryptographic Coprocessors that are in the partition's PCI Cryptographic Coprocessor Candidate list but not on the PCI Cryptographic Coprocessor Online list are in a *configured off* state (Standby). They can later be configured online to the partition by selecting **Configure On/Off** from the SE. For more information, see "Configuring a Crypto Express8S online or offline on a logical partition" on page 256.

  When the partition is activated, no error condition is reported if a cryptographic coprocessor number that is selected in the partition's online list is not installed. The cryptographic coprocessor is ignored and the activation process continues.

  When a cryptographic coprocessor number that is selected in the partition's online list was previously configured to an *off* state to the partition, it is automatically configured back to an *on* state when the partition is activated. The cryptographic online list is always selected from the image profile for each LPAR.

Cryptographic configuration by using the Support Element

From the SE, you can do these tasks:

- Display PCI Cryptographic Configuration.
- Display LPAR cryptographic controls (domain index and candidate/online lists for activated partitions).
- Reconfigure the coprocessor from and to the accelerator.
- Configure a cryptographic coprocessor and accelerator on or off to an LPAR.
- Change LPAR cryptographic controls to an LPAR.

These tasks require you to work from the SE. To get to the appropriate SE task, log on to the SE directly or click **Single Object Operations** from the HMC.

Cryptographic management

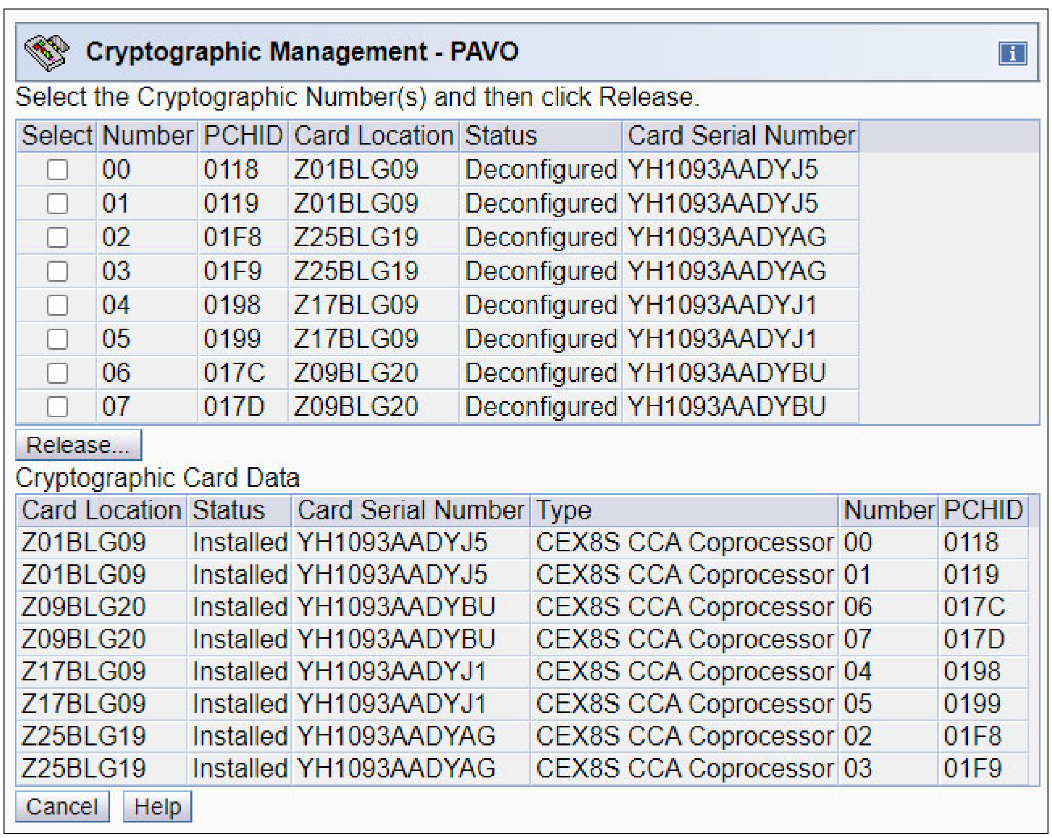
After you select the CPCs, click **Cryptographic Management** in the Configuration section.

Figure 10-4 shows the Cryptographic Management window. Use this window to obtain the installed cryptographic configuration (the association of the cryptographic number and the card serial number).

- View installed cryptographic features, including their statuses and assigned PCHIDs and coprocessor numbers. Each PCIe adapter is assigned to a coprocessor number in the range 0 - 59 as part of the configuration process. The assignment is made when the feature is installed.
- View coprocessor numbers that are still assigned to removed cryptographic features.
- Initiate the release of coprocessor numbers. Remove the relationship only when a Crypto Express8S feature is permanently removed from the CPC.

  The release option removes the relationship between a PCI cryptographic feature serial number and the assigned coprocessor numbers. Removing the relationship frees the coprocessor numbers, making them available to be assigned to a new feature serial number.

> **Important:** The coprocessor numbers are assigned to the feature serial number, *not* to the installed location. If a feature is removed from one location to be reinstalled in another location, the coprocessor number assignment remains.



Select	Number	PCHID	Card Location	Status	Card Serial Number
☐	00	0118	Z01BLG09	Deconfigured	YH1093AADYJ5
☐	01	0119	Z01BLG09	Deconfigured	YH1093AADYJ5
☐	02	01F8	Z25BLG19	Deconfigured	YH1093AADYAG
☐	03	01F9	Z25BLG19	Deconfigured	YH1093AADYAG
☐	04	0198	Z17BLG09	Deconfigured	YH1093AADYJ1
☐	05	0199	Z17BLG09	Deconfigured	YH1093AADYJ1
☐	06	017C	Z09BLG20	Deconfigured	YH1093AADYBU
☐	07	017D	Z09BLG20	Deconfigured	YH1093AADYBU

Card Location	Status	Card Serial Number	Type	Number	PCHID
Z01BLG09	Installed	YH1093AADYJ5	CEX8S CCA Coprocessor	00	0118
Z01BLG09	Installed	YH1093AADYJ5	CEX8S CCA Coprocessor	01	0119
Z09BLG20	Installed	YH1093AADYBU	CEX8S CCA Coprocessor	06	017C
Z09BLG20	Installed	YH1093AADYBU	CEX8S CCA Coprocessor	07	017D
Z17BLG09	Installed	YH1093AADYJ1	CEX8S CCA Coprocessor	04	0198
Z17BLG09	Installed	YH1093AADYJ1	CEX8S CCA Coprocessor	05	0199
Z25BLG19	Installed	YH1093AADYAG	CEX8S CCA Coprocessor	02	01F8
Z25BLG19	Installed	YH1093AADYAG	CEX8S CCA Coprocessor	03	01F9

Figure 10-4 SE Cryptographic Management

View LPAR Cryptographic Controls task

You can view active partition cryptographic definitions from the SE by selecting the CPCs and clicking **View LPAR Cryptographic Controls** in the Operational Customization pane.

The window that opens shows the definition of Usage and Control domain indexes, and PCI Cryptographic candidate and online lists. The information is provided only for active LPARs.

> **Tip:** You can review the PCI Cryptographic candidate lists and usage domain indexes that are assigned for all active LPAR from the **Summary** tab (see Figure 10-5 on page 245). The usage domain index, with the cryptographic number that is selected in the candidate list, must be unique across all partitions that are defined to the CPC. Therefore, this new tab is useful when you define or change the usage domain index for an LPAR.

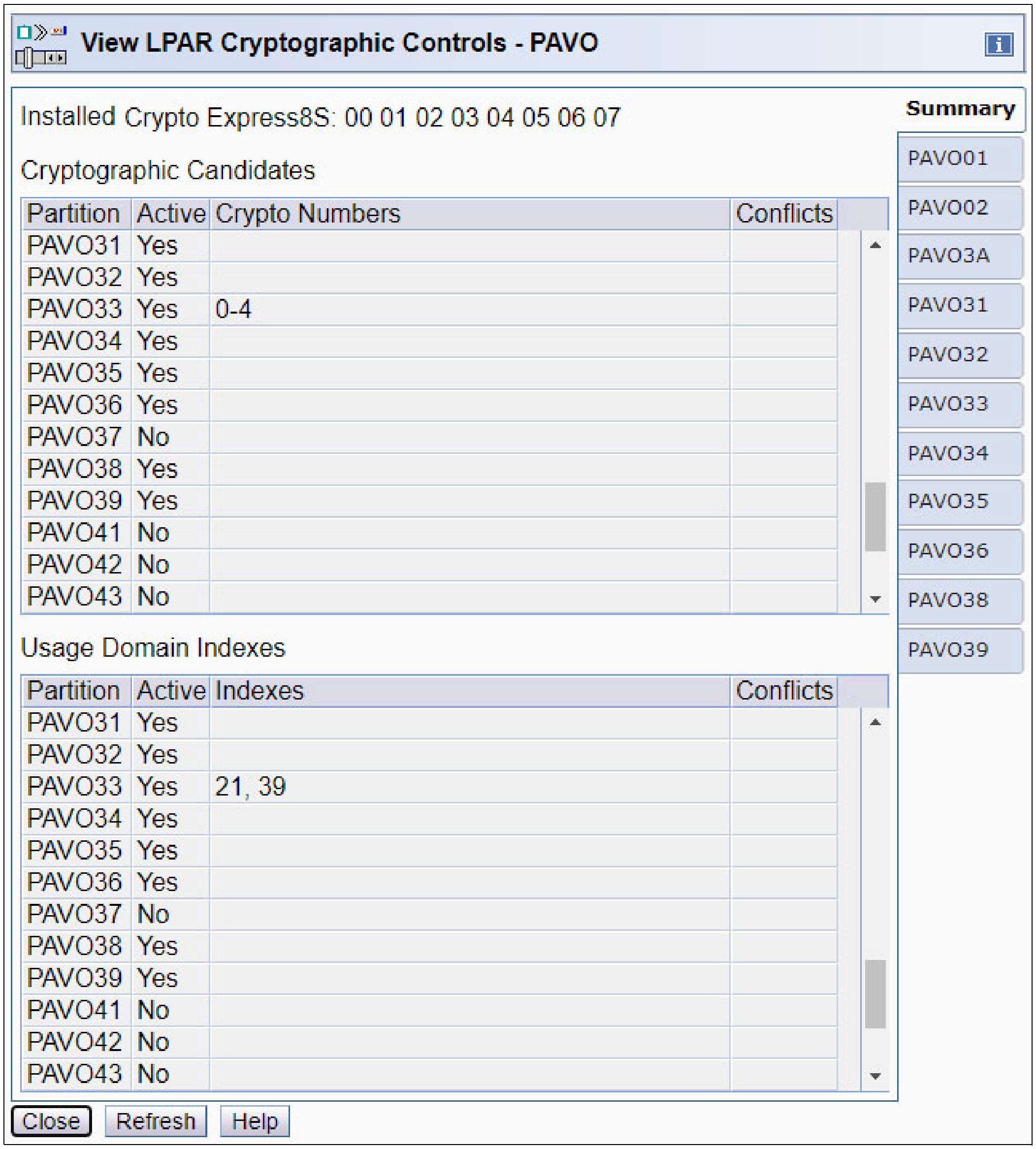


Figure 10-5 View LPAR Cryptographic Controls

This window is for informational purposes only. You can see the definitions, but you cannot change them by using this window. Modifying the cryptographic coprocessor on/off status requires the Configure On/Off task, which is described in "Configuring a Crypto Express8S online or offline on a logical partition" on page 256.

Change LPAR Cryptographic Controls function

For each LPAR, you can define these attributes:

- Usage domain index
- Control domain index
- Cryptographic Coprocessor Candidate list
- Cryptographic Coprocessor Online list

By using the Change LPAR Cryptographic Controls function, which is included in the SE for IBM z16 A01, you can do these tasks:

- Add a cryptographic coprocessor to an LPAR for the first time.
- Add a cryptographic coprocessor to an LPAR that uses a cryptographic coprocessor.
- Remove a cryptographic coprocessor from an LPAR.
- Zeroize or clear the cryptographic secure keys for a usage domain.

Dynamic assignment of the cryptographic definition to the partition

All the cryptographic functions that are defined in the image profile can be dynamically changed by using the Change LPAR Cryptographic Controls task at the SE. For more information about defining functions in the image profile, see “Logical partition cryptographic definition” on page 241.

Select **Control** and **Usage** for each domain and **Candidate** and **Online** for each crypto (see Figure 10-6).

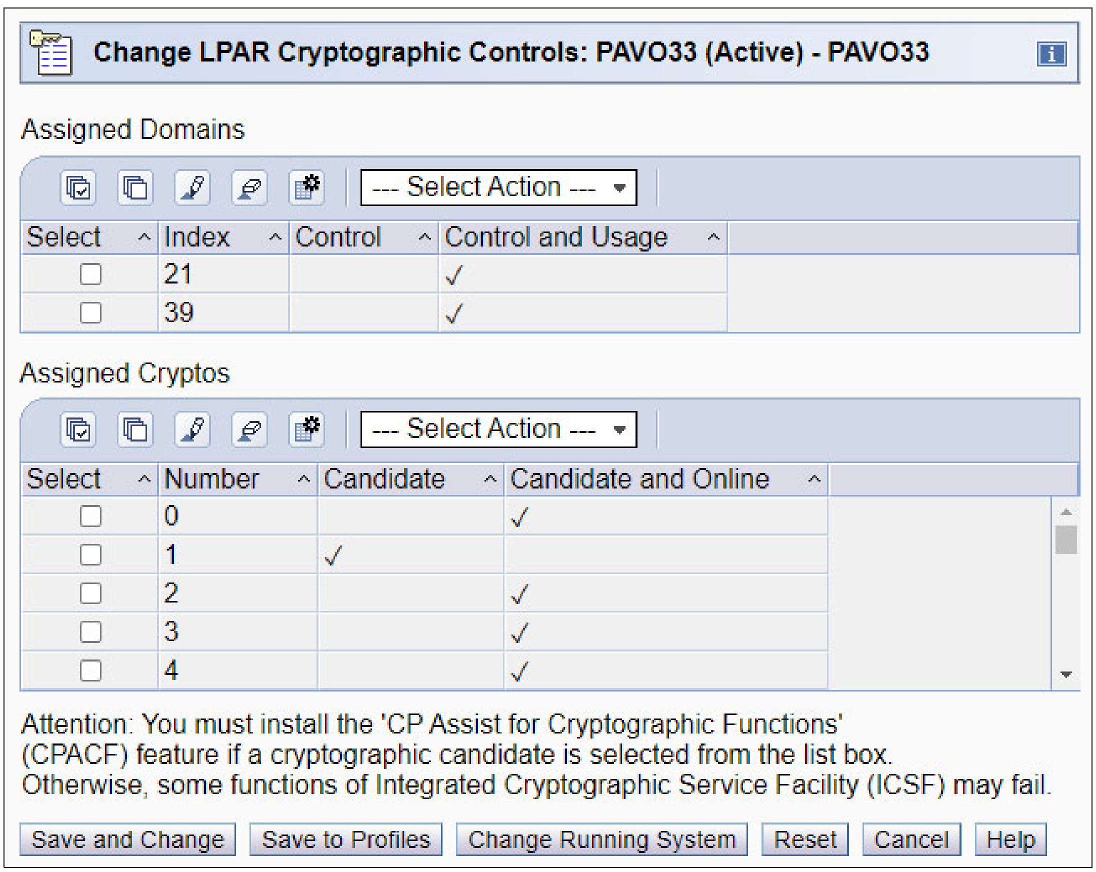


Figure 10-6 Change LPAR Cryptographic Controls: Change Running System

After selecting the appropriate boxes, you can do these tasks:

- Save these settings to the image profile without changing the running system.
- Change the running system without saving the definition to the image profile, which means after a reactivation of the partition your changes are lost.

> **Remember:** Changes to the Cryptographic Coprocessor Online List are ignored when this option is selected.

- Save the definitions to the image profile and activate the changes immediately to the partition.

When you add or change the control or usage domain index and cryptographic coprocessor number dynamically for a running system, a confirmation message appears. After processing, a status window opens and indicates the result of a dynamic addition or change of a cryptographic definition to an LPAR (see Figure 10-7).

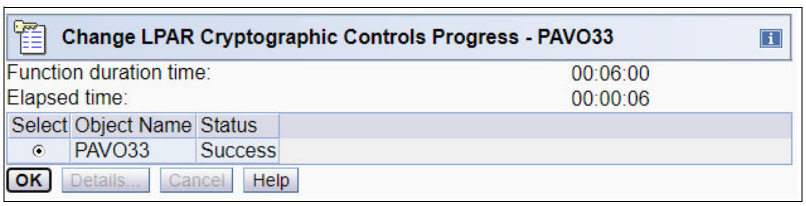


Figure 10-7 SE: Change LPAR Cryptographic Controls

Dynamic removal of the cryptographic definition

You can remove the cryptographic definition from an LPAR dynamically by using the Change LPAR Cryptographic Controls task. This section addresses the related issues and describes the procedure.

Complete the following steps:

1. Before you change the cryptographic settings by using the Change LPAR Cryptographic Controls task, verify that the cryptographic lists that you want to remove from an LPAR are offline (Standby). For more information about setting the cryptographic channel status, see "Configuring a Crypto Express8S online or offline on a logical partition" on page 256. If you try to remove the lists dynamically while they are online, the change fails and you receive the message that is shown in Figure 10-8.

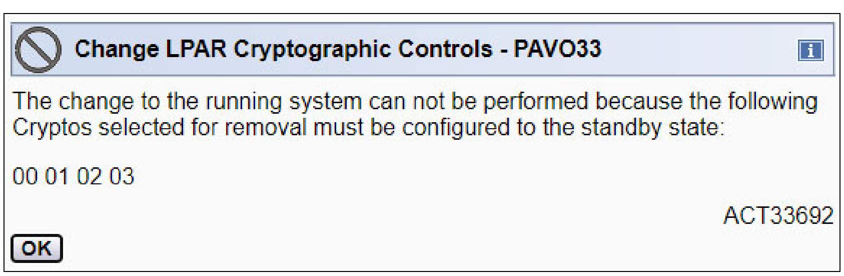


Figure 10-8 SE: Change LPAR Cryptographic Controls - ACT33692

Besides adding or changing cryptographic settings for an LPAR, you can remove the Control and Usage domains or Cryptographic Candidate lists for an LPAR from the Change LPAR Cryptographic Controls window (see Figure 10-6 on page 246).

After clearing the definitions for an LPAR, remove a definition dynamically by clicking **Change Running System**. To save the new configuration to the image profile without changing the running system, select **Save to Profiles**. With **Save and Change**, the removal becomes concurrently active, and the removed cryptographic coprocessor is also not used for the next image activation.

2. When you remove the only definition of the cryptographic lists, the zeroize window opens (see Figure 10-9).

> **Consideration:** Because you cannot see all cryptographic information, including the usage domains for other LPARs, check the information in the **View LPAR Cryptographic Controls** window before you continue. For more information about zeroize, see “Reconfiguring the PCIe adapter type” on page 249.

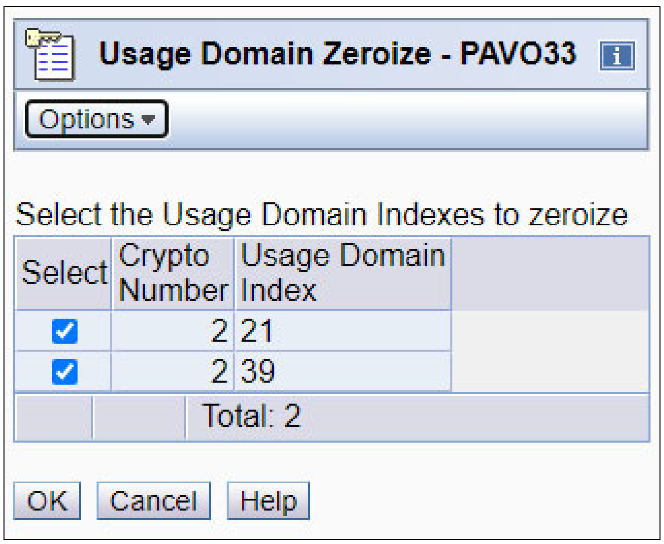


Figure 10-9 SE: Change LPAR Cryptographic Controls - Zeroize

3. In the confirmation window (see Figure 10-10), click **OK** to dynamically change the cryptographic settings. You must also enter your user password to confirm this change. After processing, a status window indicates the result of the dynamic change of cryptographic definition to an LPAR.

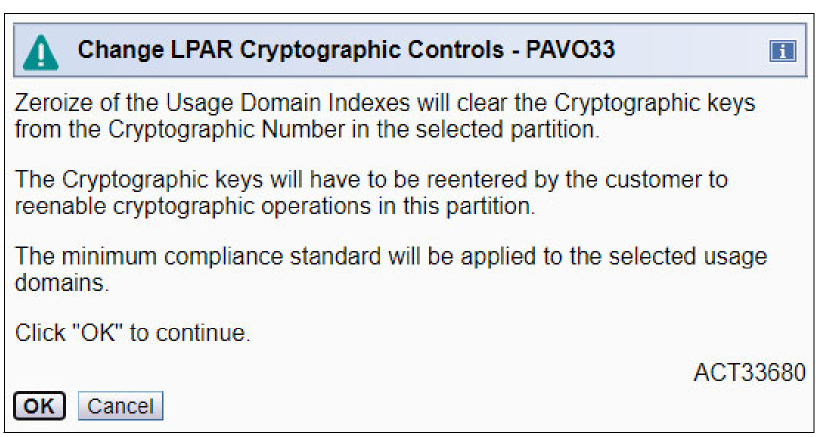


Figure 10-10 SE: Change LPAR Cryptographic Controls - ACT33680

Reconfiguring the PCIe adapter type

Each PCIe Crypto Express8S feature can be configured either as a coprocessor or as an accelerator. Each Crypto Express8S feature can be set in these configurations:

- CCA Coprocessor (CEX8C)
- PKCS #11 (EP11) Coprocessor (CEX8P)
- Accelerator (CEX8A)

Whether it is configured as a coprocessor or an accelerator, each PCIe Cryptographic adapter can be shared among 85 LPARs.

To reconfigure the cryptographic coprocessor, it must be offline to all LPARs. To put a cryptographic coprocessor online or offline on an LPAR requires using the Configure On/Off task, which is described in “Configuring a Crypto Express8S online or offline on a logical partition” on page 256. In the following example, we reconfigure the cryptographic coprocessor number 05, which is set offline to all LPARs.

Configuring a CCA coprocessor as an accelerator

During the installation of a Crypto Express8S feature, the PCIe Cryptographic adapter is configured by default as a CCA coprocessor. The reconfiguration is fully supported in LIC.

When a PCIe adapter is configured as a CCA coprocessor, it can still run accelerator functions, although slower than when configured as an accelerator. When it is configured as an accelerator, it cannot run coprocessor functions.

When a PCIe adapter is configured as an EP11 coprocessor, a TKE workstation is required for the management of the Crypto Express8S. For more information about configuring an EP11 coprocessor, see “Configuring a CCA coprocessor as an EP11 coprocessor” on page 253.

To reconfigure the PCIe adapter from coprocessor to accelerator, complete the following steps:

1. Select the CPC that has cryptographic coprocessor adapters that you want to reconfigure, and then click the **Cryptographic Configuration** task in the Configuration Group.
2. The reconfiguration is enabled only for PCIe adapters that are off. Therefore, be sure that the PCIe Cryptographic adapter status for that cryptographic coprocessor channel is unconfigured. If necessary, set the PCIe Cryptographic adapter to **Off** for all partitions that have it in their candidate list. To set the PCIe Cryptographic adapter to **Off**, use the procedure that is described in “Configuring a Crypto Express8S online or offline on a logical partition” on page 256.

3. Select the number of the cryptographic coprocessor channel (see Figure 10-11) and click **Crypto Type Configuration**.

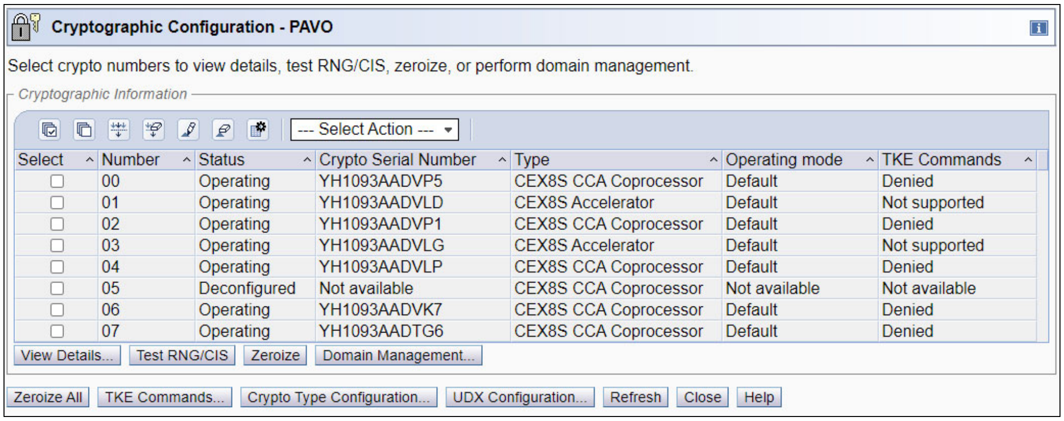


Figure 10-11 Cryptographic Configuration task (unconfigured)

4. Change the configuration for the cryptographic coprocessor adapter. The selected cryptographic coprocessor channel is configured as a coprocessor (see Figure 10-12). Select **Accelerator**.

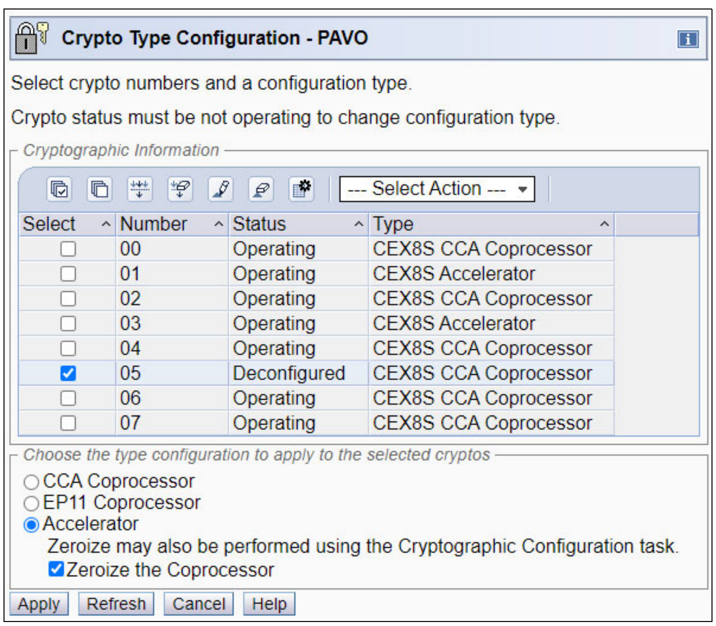


Figure 10-12 Crypto Type Configuration (CCA coprocessor to accelerator)

By selecting **Accelerator**, you can zeroize the selected coprocessor by also selecting **Zeroize the Coprocessor** on the Crypto Type Configuration window. Clear the **Zeroize the Coprocessor** checkbox and click **Apply**.

> **Important:** Zeroizing one or all cryptographic coprocessors clear their configuration data and all cryptographic keys. Zeroizing also erases configuration data from the SE hard disk drive (HDD) (for example, UDX files). Zeroize cryptographic coprocessors manually only when necessary, typically when the cryptographic coprocessor configuration data must be erased completely. In normal cases, be sure to clear the checkbox for each cryptographic channel.

5. Click **Yes** (see Figure 10-13).

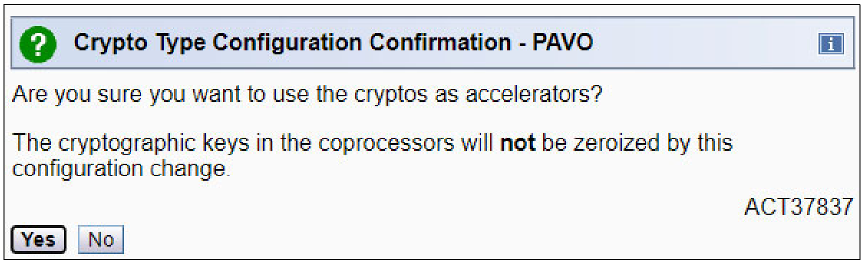


Figure 10-13 Crypto Type Configuration Confirmation for accelerator

6. Verify that your request was completed successfully. Click **OK**.
7. You are returned to the Crypto Type Configuration window. Click **Cancel**. You are returned to the Cryptographic Configuration window. Confirm that the target cryptographic channel changed to the cryptographic accelerator type. The Crypto Serial Number, Operating Mode, and TKE Commands should be "Not available" until the cryptography is set to Online again, as described in "Configuring a Crypto Express8S online or offline on a logical partition" on page 256.

   After you perform this task and go back to the Cryptographic Configuration window, where the information in Figure 10-14 appears.

> **Note:** UDX support is *not* available for a Crypto Express8S that is defined as an EP11 coprocessor and accelerator.

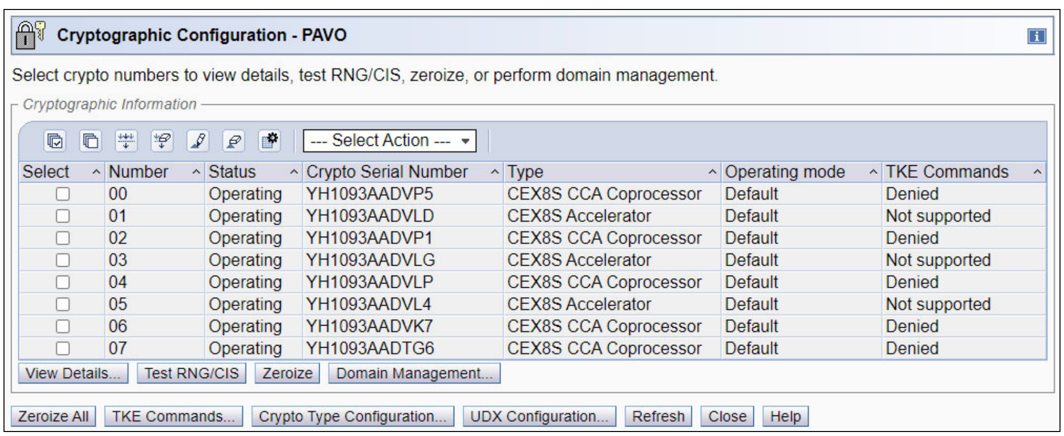


Figure 10-14 Cryptographic Configuration (Accelerator online)

8. For more information, click **View Details** (see Figure 10-15).

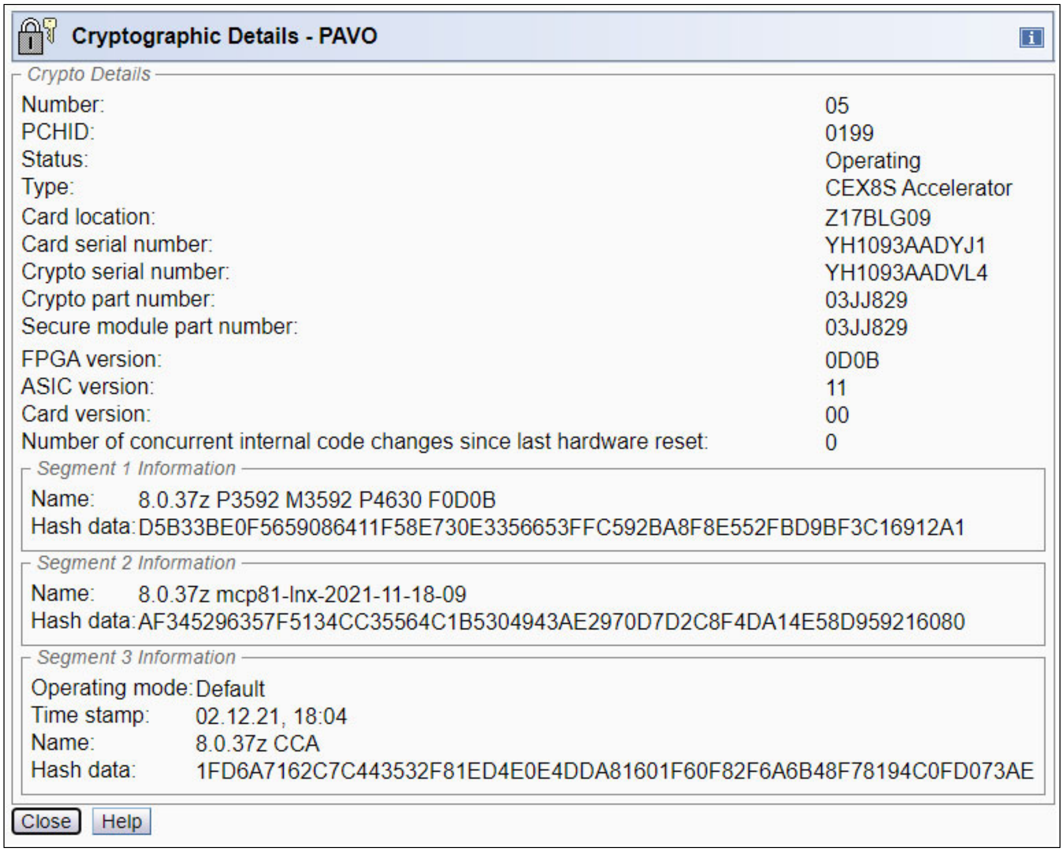


Figure 10-15 Cryptographic Details (Accelerator)

The Cryptographic Type is now a Crypto Express8S Accelerator. The adapter was not zeroized during the type-changing procedure.

The procedure for changing the type of the cryptographic configuration from a coprocessor to an accelerator is complete. To change the accelerator back to a coprocessor, the same procedure can be used, but select **Coprocessor** instead of **Accelerator**, as shown in Figure 10-12 on page 250.

The result of this change is shown in Figure 10-16 on page 253.

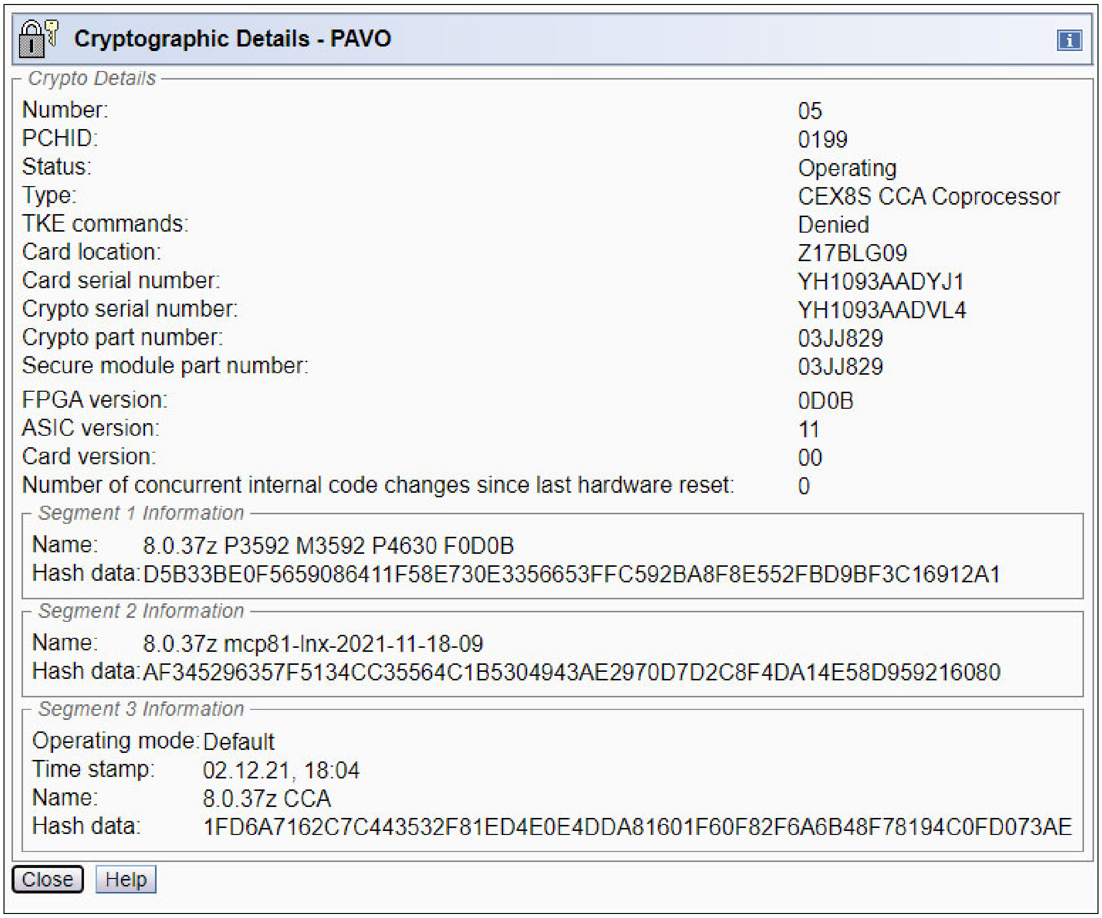


Figure 10-16 Cryptographic Details (CCA Coprocessor)

Configuring a CCA coprocessor as an EP11 coprocessor

To configure a CCA coprocessor as an EP11 coprocessor, complete the following steps:

1. Select the CPC that has cryptographic coprocessor adapters that you want to reconfigure and click **Cryptographic Configuration** in the CPC Configuration Group.
2. The reconfiguration is enabled only for PCIe adapters that are set to **Off**, so be sure the PCIe Cryptographic adapter status for that cryptographic coprocessor channel is unconfigured (Figure 10-11 on page 250). If necessary, set the PCIe Cryptographic adapter to **Off** for all partitions that have it in their candidate list. To set the PCIe Cryptographic adapter to **Off**, use the procedure that is described in “Configuring a Crypto Express8S online or offline on a logical partition” on page 256.
3. Select the number of the cryptographic coprocessor channel and click **Crypto Type Configuration**.

4. Change the configuration for the cryptographic coprocessor adapter. Select **EP11 Coprocessor** (see Figure 10-17), which by default automatically selects the **Zeroize the coprocessor** option. Click **Apply**.

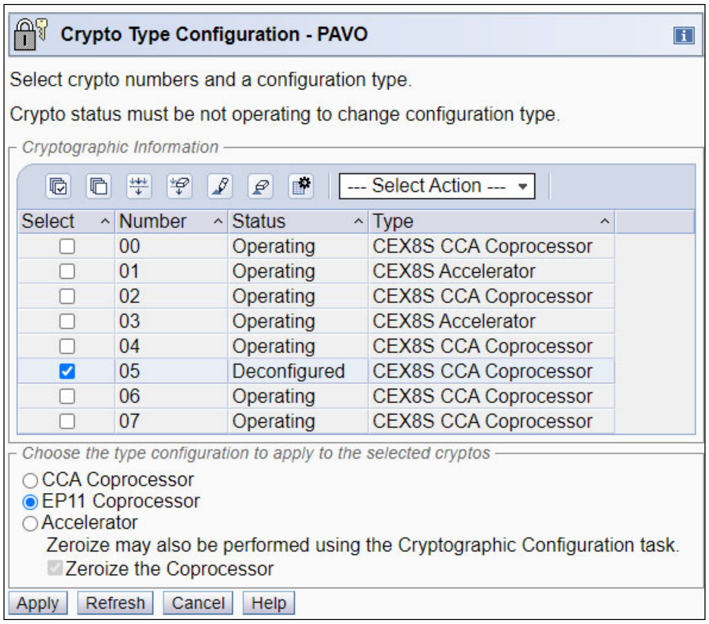


Figure 10-17 Crypto Type Configuration (CCA Coprocessor to EP11 Coprocessor)

5. Confirm your selection by clicking **Yes** (see Figure 10-18).

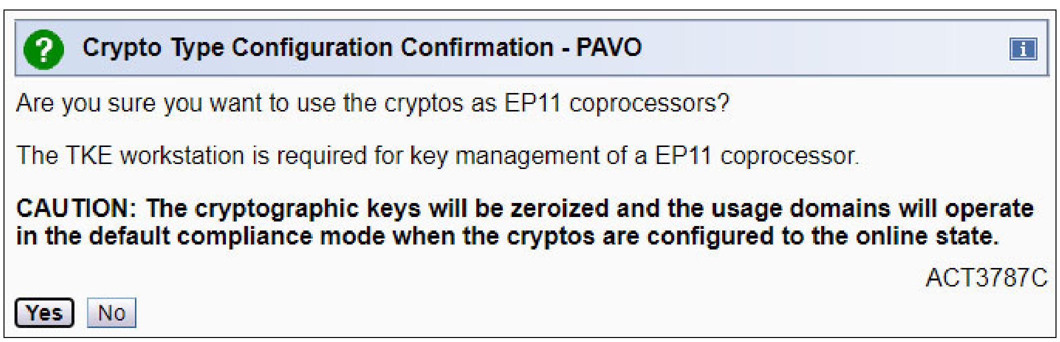


Figure 10-18 Crypto Type Configuration Confirmation for EP11 Coprocessor

6. Check that your request was completed successfully. Click **OK** to return to the Crypto Type Configuration window.
7. Click **Cancel** on the Crypto Type Configuration window to return to the Cryptographic Configuration window. Confirm that the target cryptographic channel changed to the EP11 Coprocessor type in the Cryptographic Configuration task window. The Crypto Serial Number, Operating Mode, and TKE Commands should be “Not available” until the cryptography is set to Online again, as described in “Configuring a Crypto Express8S online or offline on a logical partition” on page 256.

After you complete this task and return to the Cryptographic Configuration window, the information in Figure 10-19 appears.

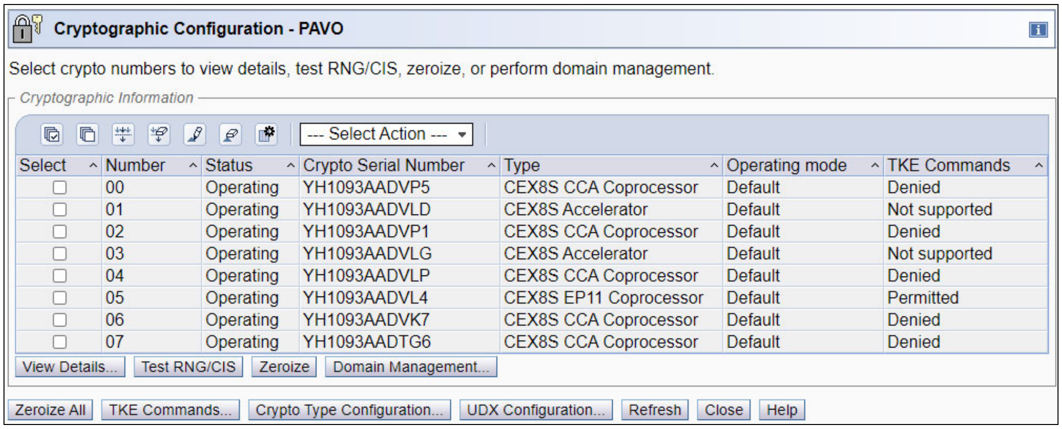


Figure 10-19 Cryptographic Configuration (EP11 Coprocessor online)

8. Click **View Details** to display the detailed information, as shown in Figure 10-20.

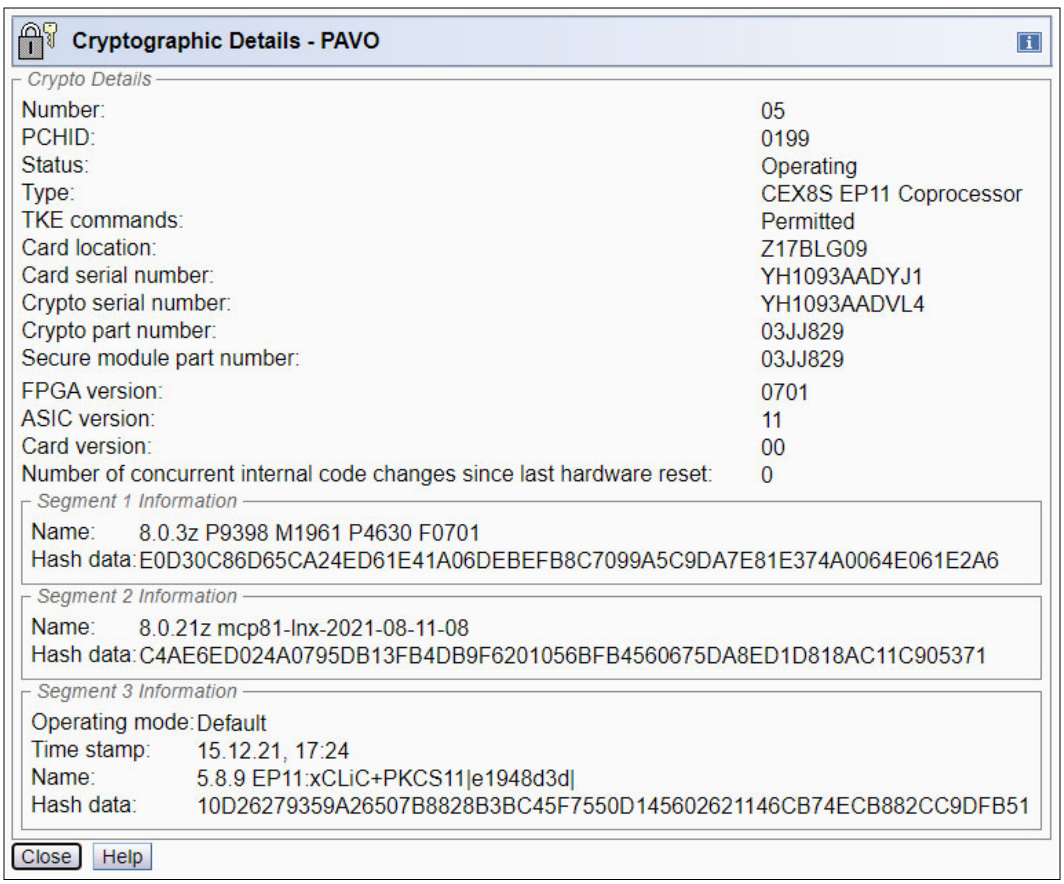


Figure 10-20 Cryptographic details (EP11 Coprocessor)

The Cryptographic Type is now a Crypto Express8S EP11 Coprocessor.

This step completes changing the type of the cryptographic configuration from a CCA Coprocessor to an EP11 coprocessor. To change the configuration back to a CCA Coprocessor, the same procedure can be used, but select **CCA Coprocessor** instead of **EP11 Coprocessor**.

You can also switch the configuration mode from Accelerator to EP11 Coprocessor and from EP11 to Accelerator by using the same process, but selecting **Accelerator** or **EP11 Coprocessor** as required.

> **Requirement:** To manage a Crypto Express8S feature that is configured as an EP11 coprocessor, the TKE workstation is required.

Configuring a Crypto Express8S online or offline on a logical partition

For some changes to the cryptographic settings to the LPAR, you must configure the Crypto Express8S online or offline. If you can reactivate (DEACTIVATE and ACTIVATE) the image for the LPARs whose cryptographic online lists were updated, this dynamic operation is not needed.

Setting a Crypto Express8S to an online state

To set a Crypto Express8S online, complete the following steps:

1. From the SE, select the **System Management** function.
2. Select the server, click **Partitions**, and then select the LPAR.
3. Click the **Cryptos** selection for the target LPAR.
4. In the Cryptos page, select the Crypto IDs to be changed. Figure 10-21 shows that on server PAVO to LPAR PAVO33, eight cryptographic coprocessors are defined: Six CCA coprocessors (ID 00, 02, 04, 05, 06, and 07, PCHID 0118, 017C, 0198, 0199, 01F8, and 01F9), and two accelerators (IDs 01 and 03, PCHIDs 0119 and 017D). The IDs 00, 02, 03, 04, 05, 06, and 07 are online, and the Accelerator ID 01 is offline. We also want to set up this accelerator online.

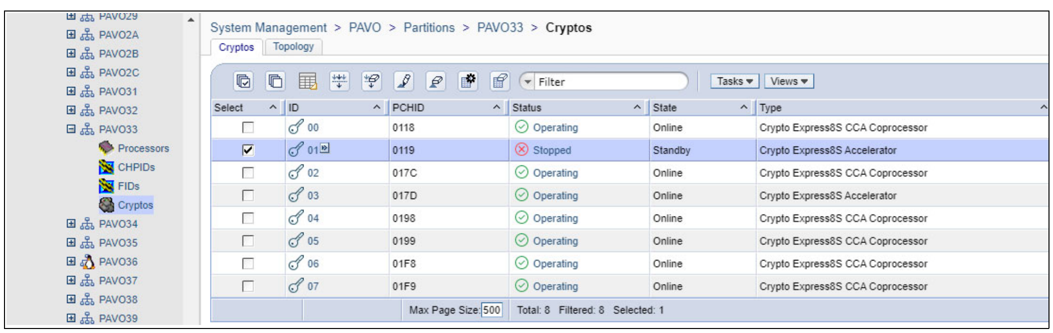


Figure 10-21 System Management: LPAR Crypto Selection Standby

5. Select the cryptographic coprocessor, and then select **Tasks** → **Crypto Service Operations** → **Configure On/Off task** (see Figure 10-22 on page 257). This task controls the online or offline (standby) state of a cryptographic processor for LPARs that are defined in the cryptographic processor's candidate list.

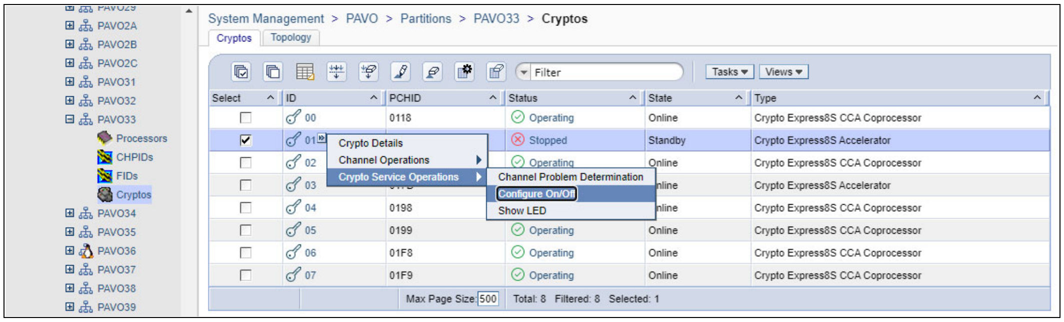


Figure 10-22 Crypto Service Operations: LPAR Crypto Selection Configure Online

6. Select the cryptographic coprocessor channel number that you want, and then select **Select Action** → **Toggle** to switch from Standby to Online (see Figure 10-23). If you want multiple cryptographic channels concurrently, select **Toggle All On**.

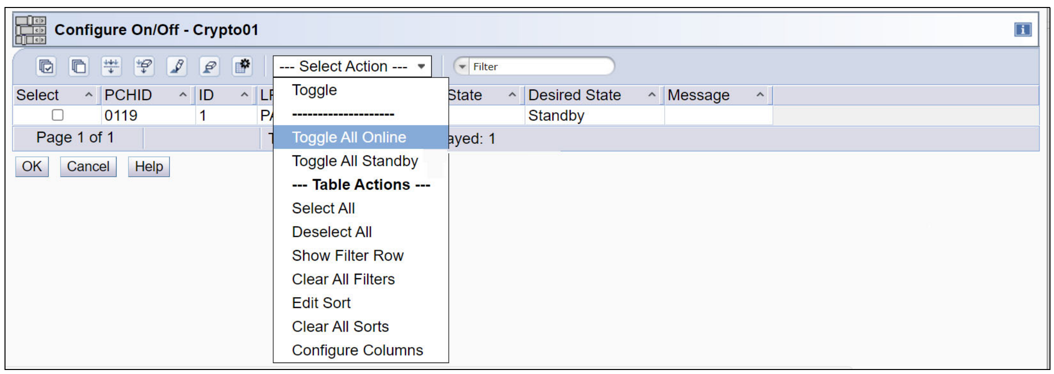


Figure 10-23 Configure On/Off (Standby)

7. After confirming that your requested cryptographic coprocessor channel is set to the state of Online, click **OK** (see Figure 10-24).

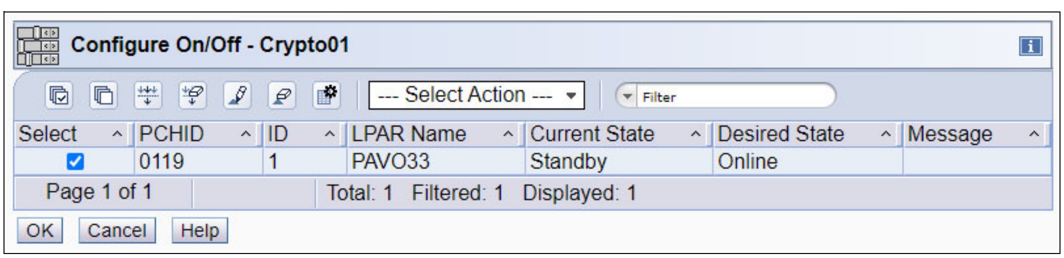


Figure 10-24 Configure On/Off (Standby to Online)

8. Confirm that your request is completed (see Figure 10-25). Click **OK**.

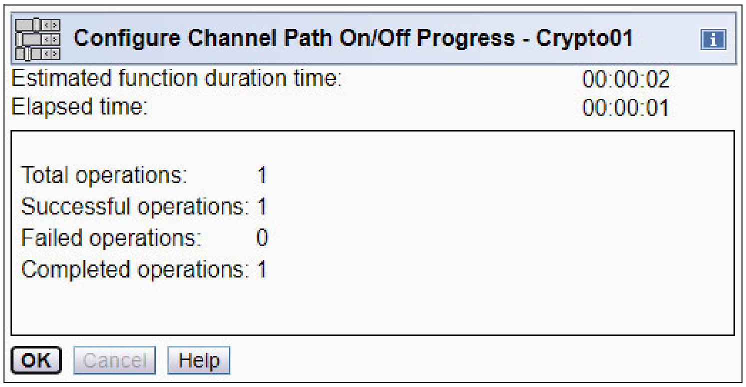


Figure 10-25 Configure On/Off (Standby to Online) completed

9. You can now view the contents of the Cryptos window of the LPAR to confirm that the cryptographic channels are now in the Operating status (see Figure 10-26).

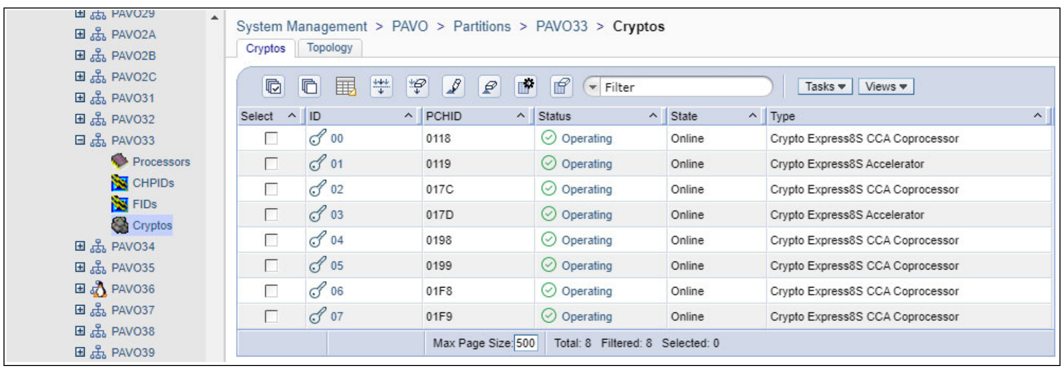


Figure 10-26 System Management: LPAR Crypto Selection Online

Changing a cryptographic channel to standby (offline) status

To change the cryptographic channel status, complete the following steps:

1. Select the LPAR whose Crypto IDs you want to change to Standby. For example, select the accelerator (03) that is in an online state. Select **Tasks** → **Crypto Service Operations** → **Configure On/Off task** (see Figure 10-27).

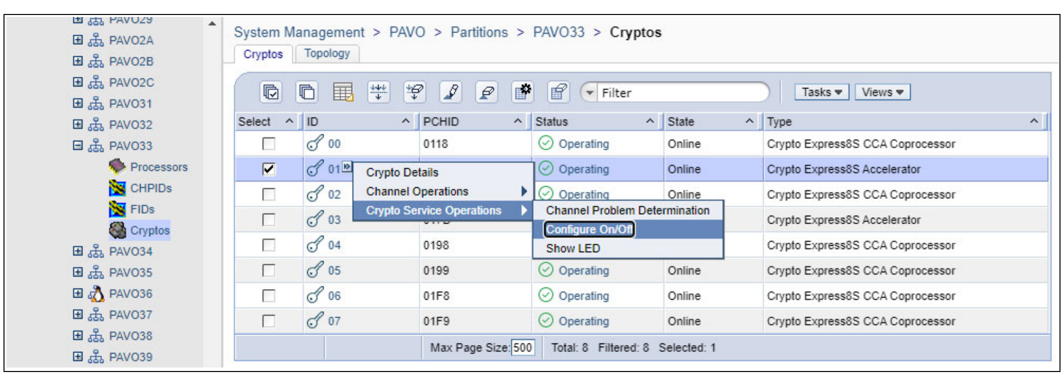


Figure 10-27 Crypto Service Operations: LPAR Crypto Selection, Configure Offline

2. Select the cryptographic coprocessor channel number that you want, and select **Select Action** → **Toggle All Standby** to switch from Online to Standby (see Figure 10-28).

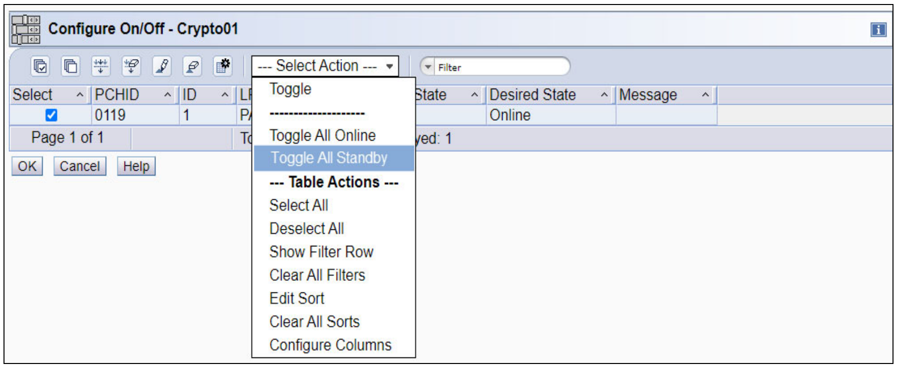


Figure 10-28 Configure On/Off (Online)

3. After you confirm that the state for your requested cryptographic channel is Standby, click **OK** (see Figure 10-29).

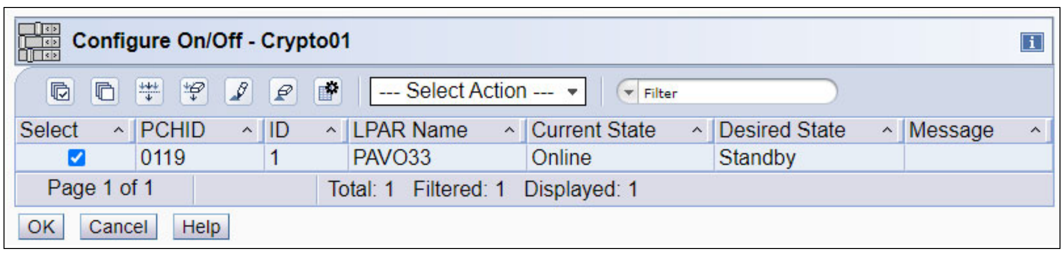


Figure 10-29 Configure On/Off (Online to Standby)

4. Because taking a cryptographic coprocessor offline can be disruptive to your application, a confirmation is required. The task must be confirmed by entering the user password (see Figure 10-30).

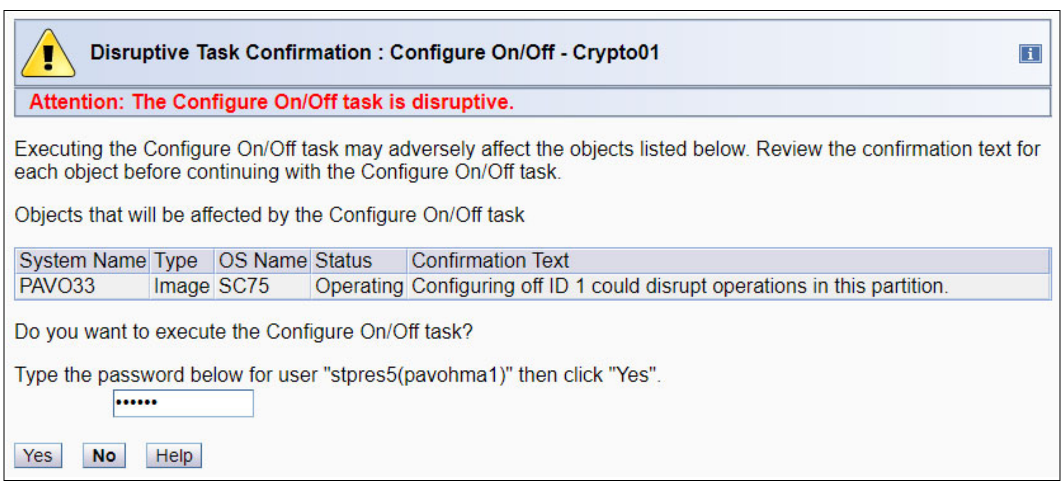


Figure 10-30 Configure On/Off (Online to Standby): Confirmation

5. Confirm that your request is completed (see Figure 10-31). Click **OK**.

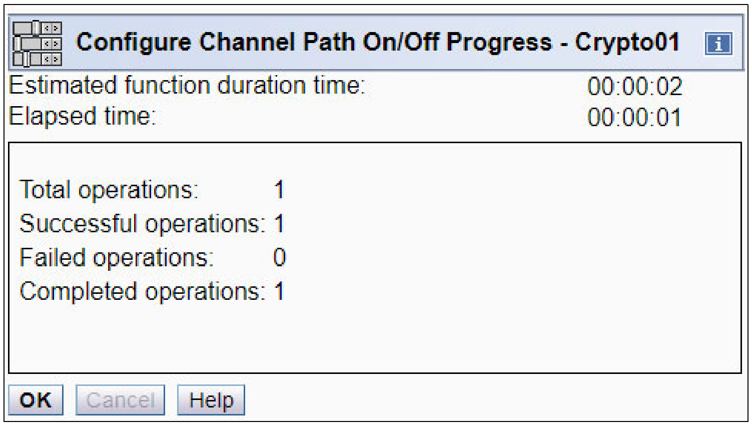


Figure 10-31 Config On/Off (Online to Standby) completed

10.1.4 Handling cryptographic coprocessors by using ICSF

ICSF provides an Interactive System Productivity Facility (ISPF) Coprocessor Management panel where you can display or change the status (Active or Deactivate) of cryptographic coprocessors. This action affects only the coprocessor status of ICSF, and has no effect on the Online/Standby hardware status that is displayed on the IBM z16 A01 SE.

It is not the purpose of this section to show how to create, load, and manage keys in the cryptographic adapters. For more information, see the ICSF literature. This section shows only how to activate and deactivate a cryptographic coprocessor and display the hardware status.

Complete the following steps:

1. From the ICSF main panel (see Figure 10-32 on page 261), select option 1 to open the ICSF Coprocessor Management panel.

```
HCR77D2  -------------- Integrated Cryptographic Service Facility -------------
OPTION ===> 1
System Name:  SC75                            Crypto Domain: 39
Enter the number of the wanted option.

  1  COPROCESSOR MGMT -  Management of Cryptographic Coprocessors
  2  KDS MANAGEMENT   -  Master key set or change, KDS Processing
  3  OPSTAT           -  Installation options
  4  ADMINCNTL        -  Administrative Control Functions
  5  UTILITY          -  ICSF Utilities
  6  PPINIT           -  Pass Phrase Master Key/KDS Initialization
  7  TKE              -  TKE PKA Direct Key Load
  8  KGUP             -  Key Generator Utility processes
  9  UDX MGMT         -  Management of User-Defined Extensions

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     US Government Users Restricted Rights - Use, duplication or
     disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Press ENTER to go to the selected option.
Press END   to exit to the previous menu.
```

Figure 10-32 Integrated Cryptographic Support Facility main panel

Cryptographic coprocessors that are configured on the partition are listed in the ICSF Coprocessor Management panel (see Figure 10-33).

```
------------------------- ICSF Coprocessor Management -------- Row 1 to 8 of 8
COMMAND ===>                                                SCROLL ===> PAGE

 Select the cryptographic features to be processed and press ENTER.
 Action characters are: A, D, E, K, R, S, and V. See the help panel for details.

  CRYPTO    SERIAL
  FEATURE   NUMBER    STATUS                AES   DES   ECC   RSA   P11
  -------   --------  --------------------  ---   ---   ---   ---   ---
_   8C00    93AADVP5  Active                 A     I     I     I
_   8A01    N/A       Active
_   8C02    93AADVP1  Active                 A     I     I     I
_   8A03    N/A       Active
_   8C04    93AADVLP  Active                 A     I     I     I
_   8C05    93AADVL4  Active                 A     I     I     I
_   8C06    93AADVK7  Active                 A     I     I     I
_   8C07    93AADTG6  Active                 A     I     I     I
****************************** Bottom of data ********************************
```

Figure 10-33 ICSF Coprocessor Management

When a coprocessor is configured offline to the LPAR from the SE (Standby status), it is shown as `Offline` in the ICSF Coprocessor Management panel (see Figure 10-34).

```
------------------------- ICSF Coprocessor Management -------- Row 1 to 8 of 8
COMMAND ===>                                                SCROLL ===> PAGE

 Select the cryptographic features to be processed and press ENTER.
 Action characters are: A, D, E, K, R, S and V. See the help panel for details.

  CRYPTO    SERIAL
  FEATURE   NUMBER    STATUS               AES   DES   ECC   RSA   P11
  -------   --------  -------------------- ---   ---   ---   ---   ---
_   8C00    93AADVP5  Active                A     I     I     I
_   8A01    N/A       Active
_   8C02    93AADVP1  Active                A     I     I     I
_   8A03    N/A       Offline
_   8C04    93AADVLP  Active                A     I     I     I
_   8C05    93AADVL4  Active                A     I     I     I
_   8C06    93AADVK7  Active                A     I     I     I
_   8C07    93AADTG6  Active                A     I     I     I
******************************* Bottom of data ********************************
```

Figure 10-34 ICSF Coprocessor Management (Candidate only - Standby)

A cryptographic coprocessor becomes visible to ICSF Coprocessor Management when the coprocessor number is part of the partition candidate list and the coprocessor is first brought online to the partition in either of these ways:

– At the time the partition is activated, if the coprocessor is installed and the coprocessor number is part of the partition Online list.

– When the coprocessor is first configured online to the partition by using the Config On/Off task from the SE Workplace.

2. In the list (see Figure 10-35), enter `A` or `D` to switch a coprocessor status to `Active` or `Deactivated`.

```
------------------------- ICSF Coprocessor Management -------- Row 1 to 8 of 8
COMMAND ===>                                                SCROLL ===> PAGE

 Select the cryptographic features to be processed and press ENTER.
 Action characters are: A, D, E, K, R, S and V. See the help panel for details.

  CRYPTO    SERIAL
  FEATURE   NUMBER    STATUS               AES   DES   ECC   RSA   P11
  -------   --------  -------------------- ---   ---   ---   ---   ---
_   8C00    93AADVP5  Active                A     I     I     I
_   8A01    N/A       Active
_   8C02    93AADVP1  Active                A     I     I     I
d   8A03    N/A       Active
_   8C04    93AADVLP  Active                A     I     I     I
_   8C05    93AADVL4  Active                A     I     I     I
_   8C06    93AADVK7  Active                A     I     I     I
_   8C07    93AADTG6  Active                A     I     I     I
******************************* Bottom of data ********************************
```

Figure 10-35 ICSF Coprocessor Management (Online)

When a coprocessor is deactivated through ICSF (see Figure 10-36), it cannot be used by applications that run in that system image. The EP11 coprocessor configuration requires a TKE workstation.

Generally, deactivate an active coprocessor from the ICSF Coprocessor Management panel before it is configured off from the SE.

> **Note:** If you do not deactivate the coprocessor first, some jobs might not be rerouted correctly.

```
------------------------- ICSF Coprocessor Management -------- Row 1 to 8 of 8
COMMAND ===>                                                  SCROLL ===> PAGE

 Select the cryptographic features to be processed and press ENTER.
 Action characters are: A, D, E, K, R, S and V. See the help panel for details.

  CRYPTO    SERIAL
  FEATURE   NUMBER    STATUS               AES   DES   ECC   RSA   P11
  -------   --------  -------------------- ---   ---   ---   ---   ---
_   8C00    93AADVP5  Active                A     I     I     I
_   8A01    N/A       Active
_   8C02    93AADVP1  Active                A     I     I     I
_   8A03    N/A       Deactivated
_   8C04    93AADVLP  Active                A     I     I     I
_   8C05    93AADVL4  Active                A     I     I     I
_   8C06    93AADVK7  Active                A     I     I     I
_   8C07    93AADTG6  Active                A     I     I     I
******************************* Bottom of data ********************************
```

Figure 10-36 SF Coprocessor Management (Deactivated)

The Active/Deactivated status that is viewed from ICSF Coprocessor Management does not change the Online/Standby status that is set from the IBM z16 SE.

Figure 10-37 shows ICSF Coprocessor Hardware Status panel for adapters 8C00 and 8C02.

```
---------------------- ICSF - Coprocessor Hardware Status ---------------------
COMMAND ===>                                                   SCROLL ===>
                                                              CRYPTO DOMAIN: 39

REGISTER STATUS                  COPROCESSOR 8C00        COPROCESSOR 8C02
                                                                   More:     +
 Crypto Serial Number          : 93AADVP5                93AADVP1
 Status                        : ACTIVE                  ACTIVE
 PCI-HSM Compliance Mode       : INACTIVE                INACTIVE
 Compliance Migration Mode     : INACTIVE                INACTIVE
 AES Master Key
   New Master Key register     : FULL                    FULL
     Verification pattern      : 1300CF50ECF4DEA6        1300CF50ECF4DEA6
   Old Master Key register     : VALID                   EMPTY
     Verification pattern      : 1A7DFDEAFFEEDAC4
   Current Master Key register : VALID                   VALID
     Verification pattern      : 1300CF50ECF4DEA6        1300CF50ECF4DEA6
 DES Master Key
   New Master Key register     : FULL                    FULL
     Verification pattern      : 29069A18A233405A        29069A18A233405A
     Hash pattern              : 5F3E03EC3E4CC653        5F3E03EC3E4CC653
                               : E3717DBBD26D1555        E3717DBBD26D1555
   Old Master Key register     : EMPTY                   EMPTY
     Verification pattern      :
     Hash pattern              :
                               :
   Current Master Key register : VALID                   VALID
     Verification pattern      : 29069A18A233405A        29069A18A233405A
     Hash pattern              : 5F3E03EC3E4CC653        5F3E03EC3E4CC653
                               : E3717DBBD26D1555        E3717DBBD26D1555
 ECC Master Key
   New Master Key register     : EMPTY                   EMPTY
     Verification pattern      :
   Old Master Key register     : EMPTY                   EMPTY
     Verification pattern      :
   Current Master Key register : EMPTY                   EMPTY
     Verification pattern      :
 RSA Master Key
   New Master Key register     : EMPTY                   EMPTY
     Verification pattern      :
                               :
   Old Master Key register     : EMPTY                   EMPTY
     Verification pattern      :
                               :
   Current Master Key register : EMPTY                   EMPTY
     Verification pattern      :
                               :

Press ENTER to refresh the hardware status display.
```

Figure 10-37 ICSF Coprocessor Hardware Status

Help information from the ICSF Coprocessor Management panel (see Figure 10-38 and Figure 10-39 on page 266) describes valid actions and status information for each type of cryptographic coprocessor.

```
----------------------- Help for Coprocessor Management -----------------------
COMMAND ===>
Press enter to page through this help.
                                                                    More:     +
The Coprocessor Management panel displays the status of all cryptographic
coprocessors installed.  Select the coprocessors to be processed.

Prefix     Type of cryptographic coprocessor        Valid action characters
------     ---------------------------------        -----------------------
  5A        Crypto Express5 Accelerator              a, d
  5C        Crypto Express5 CCA coprocessor          a, d, e, k, r, s, v
  5P        Crypto Express5 PKCS #11 coprocessor     a, d, r, s, v
  6A        Crypto Express6 Accelerator              a, d
  6C        Crypto Express6 CCA coprocessor          a, d, e, k, r, s, v
  6P        Crypto Express6 PKCS #11 coprocessor     a, d, r, s, v
  7A        Crypto Express7 Accelerator              a, d
  7C        Crypto Express7 CCA coprocessor          a, d, e, k, r, s, v
  7P        Crypto Express7 PKCS #11 coprocessor     a, d, r, s, v
  8A        Crypto Express8 Accelerator              a, d
  8C        Crypto Express8 CCA coprocessor          a, d, e, k, r, s, v
  8P        Crypto Express8 PKCS #11 coprocessor     a, d, r, s, v

Action characters:  (entered on the left of the coprocessor number)
 'a'      Makes available a coprocessor previously deactivated by a 'd'.
 'd'      Makes a coprocessor unavailable.
 'e'      Selects the coprocessor for master key entry.
 'k'      Selects the coprocessor for operational key load.
 'r'      Causes the coprocessor domain role to be displayed.
 's'      Causes complete hardware status to be displayed.
 'v'      Causes the coprocessor default role to be displayed with offsets.
The action character 'e' cannot be combined with any other action characters.
The action character 'k' may be specified on only one coprocessor.
The action characters' may not be specified for both CCA and
  PKCS #11 coprocessors at the same time.

Status:
  - Active:                The feature is available for work.
  - Offline:               The feature is installed but not available to ICSF.
  - Deactivated:           The feature has been deactivated (see action
                             characters)
  - Busy:                  The feature is temporarily busy.
  - Hardware error:        The feature has been stopped.
  - Disabled by TKE:       The feature has been removed from service by a TKE
                             workstation.
  - Master key incorrect: At least one master key is incorrect.
  - Being reconfigured:   An error has been detected and being checked by the
                             configuration task
```

Figure 10-38   Help for Coprocessor Management (part 1 of 2)

```
  - Initializing stage 1: The feature has been detected by the configuration
                            task. No status is available.
  - Initializing stage 2: The feature is being reset by the configuration
                            task. No status is available.
  - Initializing stage 3: The feature is being readied by configuration
                            task. No status is available.
  - Unknown response:     The feature has returned a return/reason code
                            combination that ICSF does not recognize.
  - Hung User on Feature: The feature is not responding. One or more users
                            hold the feature latch. If this problem persists
                            please dump and contact IBM service.
                            You will need to recycle ICSF to reclaim use of
                            the feature.
  - Bad feature response: An unexpected response was received from a feature.
  - Retry limit reached:  Initialization of the feature failed.
  - Unknown feature type: A feature has a type that is not recognized by ICSF.
  - Repeat failures:      A feature has experienced repeated failures
                            and recovered.  The feature is made inactive and
                            will require manual intervention to cause ICSF
                            to attempt to use it again.

Cryptographic Coprocessor Master Key State:
    A:  Master key Verification Pattern matches the keystore (CKDS, PKDS, or
        TKDS) and the master key is available for use
    C:  Master key Verification Pattern matches the keystore, but the master
        key is not available for use
    E:  Master key Verification Pattern mismatch for keystore or for P11, no
        TKDS was specified in the options data set
    I:  The Master key Verification Pattern in the keystore is not set,
        so the contents of the Master key are Ignored
    U:  Master key is not initialized
    -:  Not supported
     :  Not applicable

    F3 = END HELP
```

Figure 10-39 Help for Coprocessor Management (part 2 of 2)

10.2 Virtual Flash Memory

This section provides information about the configuration of the Virtual Flash Memory (VFM) feature on the IBM z16 A01. It covers the following topics:

- VFM overview
- Planning for VFM configuration
- Configuring VFM
- VFM management

10.2.1 VFM overview

VFM is the replacement for the Flash Express features that were available on the zEC12, zBC12, z13, and z13s systems. VFM offers up to 6.0 TB on IBM z16 A01 and 2.0 TB on IBM z16 A02 and IBM z16 AGZ, in 512 GB increments. No application changes are required to change from Flash Express to VFM.

VFM is designed to help improve the availability and handling of paging workload spikes when running z/OS 2.1 or later. With this support, z/OS helps to improve system availability and responsiveness by using VFM across transitional workload events, such as market openings and diagnostic data collection. z/OS is also designed to help improve processor performance by supporting middleware exploitation of pageable large (1 MB) pages.

Using VFM can help availability by reducing latency from paging delays that can occur at the start of the workday or during other transitional periods. It also helps to eliminate delays that can occur when collecting diagnostic data during failures. VFM can also be used in Coupling Facility (CF) images to provide extended capacity and availability for workloads by using IBM WebSphere® MQ Shared Queues structures.

VFM can help organizations meet their most demanding service-level agreements and compete more effectively. VFM is simple to configure to provide rapid time to value.

For more information about the VFM feature, see *IBM z16 (3931) Technical Guide*, SG24-8951 and *IBM z16 A02 and IBM z16 AGZ Technical Guide*, SG24-8952.

10.2.2 Planning for VFM configuration

For planning considerations, see “Planning considerations for Virtual Flash Memory” on page 24.

10.2.3 Configuring VFM

> **Note:** The screen captures in this section were taken on a IBM z15 T01, but all steps and screens are basically the same for all IBM z16 models.

The assignment of VFM to LPARs is exclusively done with the definitions in the image activation profiles.

> **Note:** Unlike the Flash Express cards, the allocation of VFM to LPARs cannot be altered on an activated LPAR. So, the **Manage Flash Allocation** selection on the HMC is not supported for IBM z14, IBM z14 ZR1, IBM z15 T01, IBM z15 T02, IBM z16 A01, IBM z16 A02, and IBM z16 AGZ systems.

Consider the following items when you allocate VFM to a partition:

- When an allocation is first defined, you must set the initial and maximum allocation in 16 GB increments.
- A storage-class memory (SCM) allocation is put online to the z/OS image that is assigned to the partition at IPL time unless the z/OS image is configured not to do so.
- z/OS enables more memory to be configured online, up to the maximum memory that is defined in this window or up to the maximum VFM that is available and not used by other LPARs.

- Minimum amounts are allocated from the available pool, so they cannot be overallocated.
- Maximum amounts can be overallocated up to the VFM LICCC value of the IBM z16 A01.
- Maximum amounts must be greater than or equal to the initial amounts.

To allocate VFM to a partition, select the LPAR on the HMC and select **Operational Customization** → **Customize/Delete Activation Profiles**. Then, select the image profile and click **Customize profile**. The Initial and the Maximum values for the VFM are specified on the **Storage** tab. This configuration is shown in Figure 10-40.

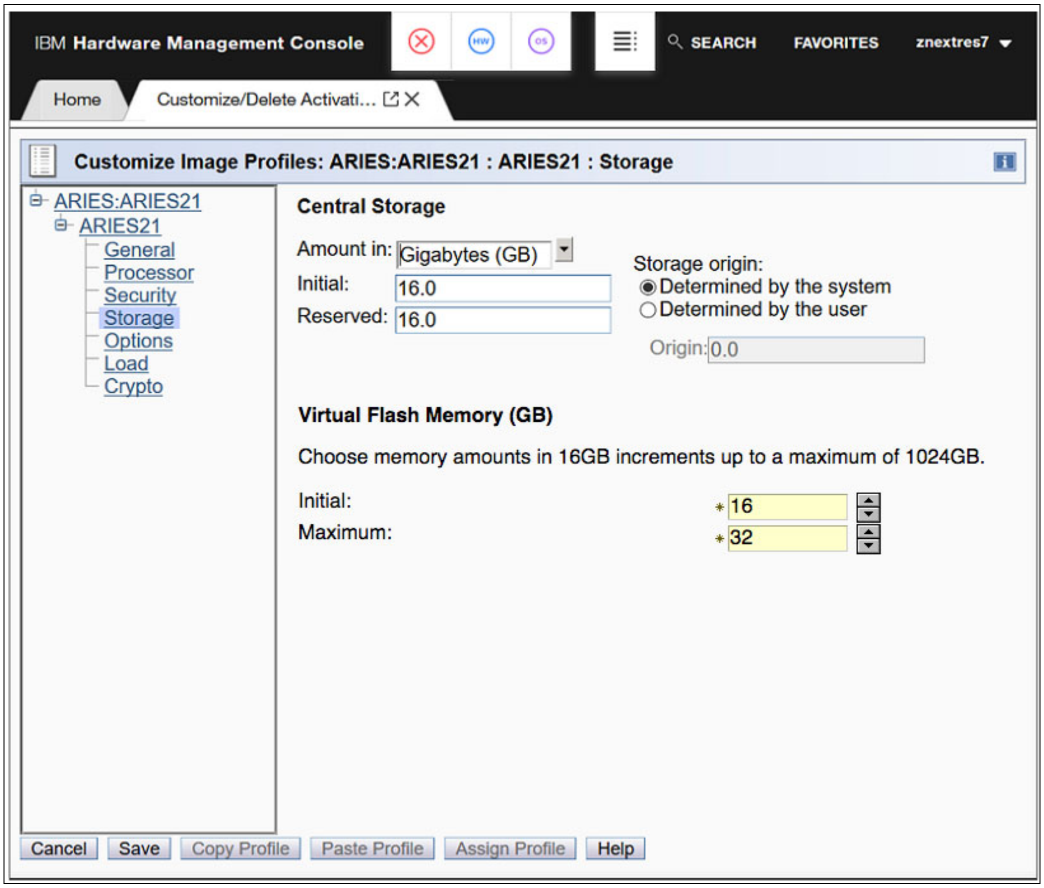

Figure 10-40 Virtual Flash Memory allocation in an image profile

In this example, the initial value is set to 16 GB, and the maximum value is set to 32 GB. The IBM z15 T01 system has two VFM features that are installed, which enables a maximum of 1024 GB that is allocated to the LPAR.

These definitions do not change the settings of a running LPAR. They are used only for the activation of the LPAR. A newly activated LPAR starts with the specified amount of initial VFM.

If in the image activation profile of an LPAR an amount of initial VFM storage greater than the available amount of deallocated VFM on the IBM z15 T01 is specified, the activation of this LPAR fails with message ACTZ01EB, as illustrated in Figure 10-41.

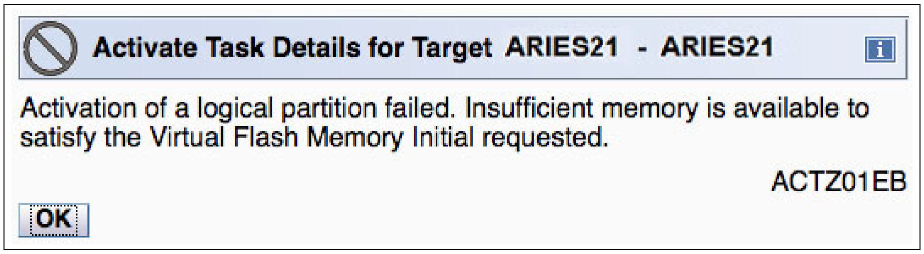

Figure 10-41 Insufficient VFM available: ACTZ01EB

Note: For a CF LPAR, it is also possible to define an initial value and a higher maximum value for VFM in the image profile. However, it does not make sense to set the maximum value higher than the initial value because the Coupling Facility Control Code (CFCC) does not support any command to set any reserved memory online.

10.2.4 VFM management

Note: The screen captures in this section are taken on a IBM z15 T01, but all steps and screens are basically the same for all IBM z16 models.

The memory allocation of an IBM z16 A01 system is shown on the SE in the Storage Information window. To view it, click the server and select **Operational Customization** → **Storage Information**. The Base System Storage Allocation window opens, as shown in Figure 10-42.

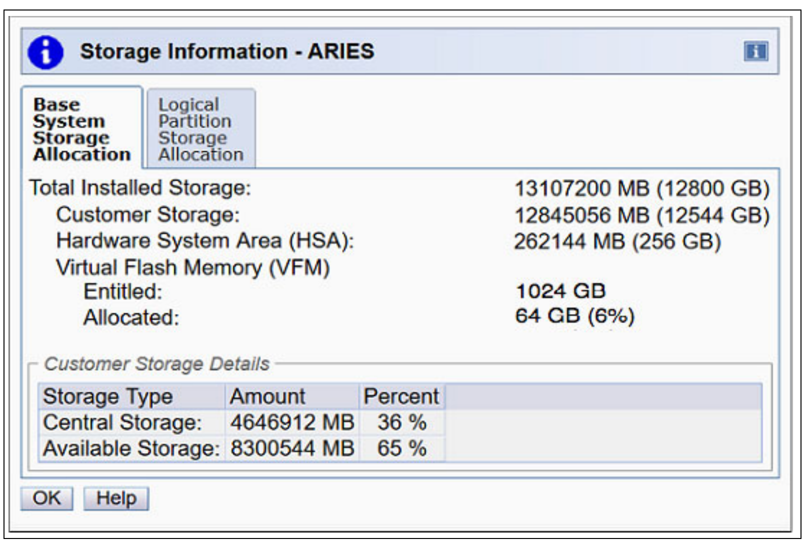

Figure 10-42 Storage Information: Base System Storage Allocation

The IBM z15 T01 in our example (ARIES) has 1024 GB installed, of which 64 GB is allocated to activated LPARs.

The Logical Partition Storage Allocation window shows the VFM allocation of the LPARs. For every LPAR, the initial and the maximum amount of VFM are listed (which were specified in the image activation profile), and the currently allocated amount, as shown in Figure 10-43.

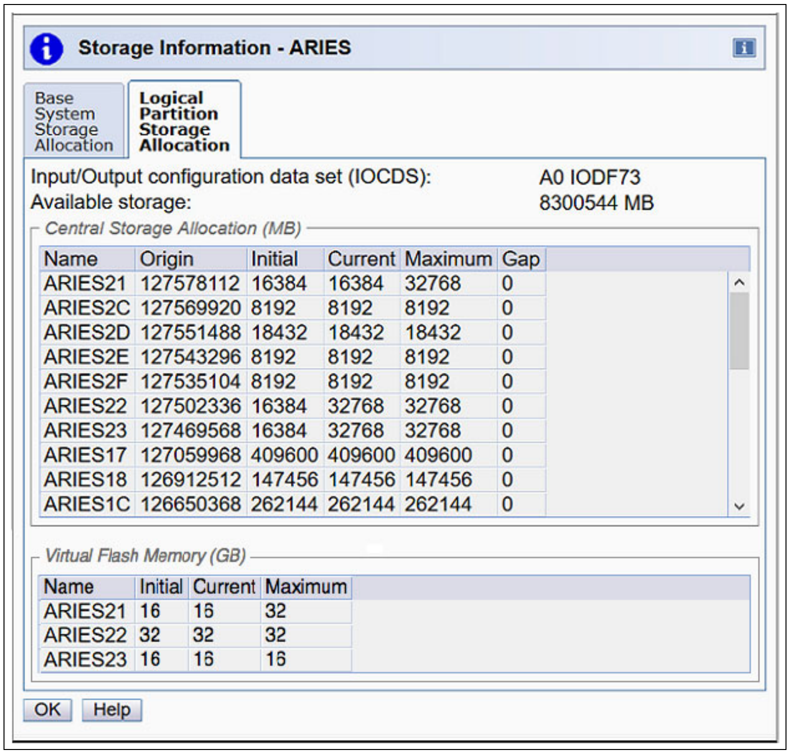

Figure 10-43 Storage Information: Logical Partition Storage Allocation

In z/OS for Flash Express and VFM, the **PAGESCM** parameter is supported in IEASYSxx. The syntax is shown in Example 10-1. This parameter determines whether and how much SCM is made available to an LPAR at IPL time.

Example 10-1 PAGESCM parameter

```
PAGESCM={xxxxxxM                    }
        {xxxxxxG                    }
        {xxT                        }
        {ALL                        }
        {NONE                       }
        {0                          }
```

This parameter specifies the minimum amount of SCM that should be made available for use as auxiliary storage. The system reserves this amount of SCM during IPL for subsequent use as auxiliary storage. Extra SCM is allocated on an as-needed basis if usage of this initial amount of SCM is exceeded.

You can specify the following value ranges for the **PAGESCM** parameter to reserve SCM for paging at IPL:

xxxxxxM Specifies the amount of SCM to reserve for paging at IPL in megabytes. This value can be 1 - 6 decimal digits.

xxxxxxG Specifies the amount of SCM to reserve for paging at IPL in gigabytes. This value can be 1 - 6 decimal digits.

xxT | Specifies the amount of SCM to reserve for paging at IPL in terabytes. This value can be 1 - 2 decimal digits. The maximum amount of SCM supported for paging is 16 TB.

xxT	Specifies the amount of SCM to reserve for paging at IPL in terabytes. This value can be 1 - 2 decimal digits. The maximum amount of SCM supported for paging is 16 TB.
ALL	Reserves all SCM for paging at IPL.
NONE	SCM is not used for paging. This parameter remains in effect until the next IPL.
0 | 0M | 0G | 0T	Indicates that no SCMs are reserved for paging at IPL. Instead, SCM is allocated as needed based on paging demand.
Default value	ALL.
Associated parmlib member:	None.

The **CONFIG SCM** command is used to set SCM online or offline to an LPAR (Example 10-2).

Example 10-2 CONFIG SCM

```
CONFIG SCM(ddddddddM|G|T),ONLINE|ON
CONFIG SCM(ddddddddM|G|T),OFFLINE|OFF
CONFIG SCM(scm_ranges),OFFLINE|OFF
```

The system reconfigures SCM both logically and physically. To bring SCM online, a number must be specified. To take SCM offline, a range of starting and ending addresses of the SCM blocks must be specified.

The command has the following values:

ddddddddM|G|T
: The amount of SCM to be reconfigured. Specify up to eight decimal digits followed by a multiplier (M = megabytes, G = gigabytes, or T = terabytes) for this amount. Check your processor configuration for the supported SCM increment sizes. The value for *dddddddd* must be a multiple of the SCM increment size (usually 2, 4, or 8), and cannot exceed 16T.

Instead of specifying a decimal amount, you can alternatively specify a hexadecimal amount, with or without a multiplier, in the following format:

X'xxxxxx'

For example:

X'123456789A00000'

X'123'M

You can use underscore characters in any hexadecimal specification for more clarity. Underscore characters in the specification are ignored during processing.

Attention: If you take SCM offline and do not specify one or more scm_ranges, the system selects which SCM increments to take offline.

`ONLINE` **or** `ON`
: The system brings the specified amount of SCM online. `ONLINE` is the default value if only `CONFIG SCM` is specified. The system rejects the command if you specify these values:
  - A value that is not a multiple of the SCM increment size.
  - A value that exceeds the total amount of SCM that is defined to this partition.
  - A value that is not a valid amount of SCM (0, for example).
  - SCM is not supported or not defined on the system.

`OFFLINE` **or** `OFF`
: The system takes the specified amount or specified ranges of SCM offline.

Attention: Taking SCM offline can affect data reliability and performance. Consider these implications before taking SCM offline:

- Your system must have enough auxiliary storage, which can include SCM and must include page data sets to back critical system data. The **`CONFIG SCM OFFLINE`** command fails if taking the specified number of SCMs offline results in leaving auxiliary storage more than 50% full.
- SCM is used for paging critical address spaces and common address spaces. An insufficient amount of SCM causes those address spaces to demote the larger pages to page-to-page data sets, which can lead to a loss of critical data during a direct access storage device (DASD) IBM HyperSwap® scenario.
- SCM is used for paging large pages. If there is an insufficient amount of SCM, 1 MB large pages are demoted to 256 4-KB pages and page-to-page data sets, which can negatively affect system performance.

`scm_ranges`
: Specifies a range of SCMs or a list of ranges that are separated by commas that are identified by *ddd{M|G|T}* - *ddd{M|G|T}*, for example, 0G - 16G or 32G - 64G. The starting and ending addresses for each range of SCMs must be multiples of the increment size.

The **`DISPLAY ASM`** and **`DISPLAY M`** commands are enhanced to display information and statuses that are related to VFM:

`DISPLAY ASM`	Lists the SCM status along with the paging data set status.
`DISPLAY ASM,SCM`	Displays a summary of SCM usage.
`DISPLAY M=SCM`	Displays SCM online or offline and increment information.
`DISPLAY M=SCM(DETAIL)`	Displays detailed increment-level information.

Tip: You might notice a difference in usage numbers between the **`DISPLAY M=SCM`** and **`DISPLAY ASM`** commands. The difference is because of how ASM perceives its usage of the cache of available SCM block IDs that ASM maintains. To ASM, some block IDs are not in use because they were not assigned to page-out requests. However, to the **`DISPLAY M=SCM`** command processor, block IDs are used because they were assigned to ASM for its use.

VFM storage can also be used by CF LPARs running CFCC Level 25 on IBM z16 A01, CFCC Level 24 on IBM z15 T01 and T02, and CFCC Level 22 or 23 on IBM z14 and IBM z14 ZR1. Systems without this support cannot connect to or rebuild a structure by using SCM storage.

In 10.2.3, “Configuring VFM” on page 267, we allocate an initial VFM of 16 GB to the LPAR ARIES21, and a maximum VFM of 32 GB, as shown in Figure 10-40 on page 268. Now, from ARIES21, which is running the z/OS image SC76, we run the IBM MVS **DISPLAY IPLINFO,PAGESCM** command. Example 10-3 shows the results.

Example 10-3 DISPLAY IPLINFO,PAGESCM

```
DISPLAY IPLINFO,PAGESCM
IEE255I SYSTEM PARAMETER 'PAGESCM': NOT_SPECIFIED
```

Because the **PAGESCM** parameter *is not* specified, the default value of ALL is used. If a VFM allocation is defined for the LPAR and PAGESCM=ALL is specified (or kept at the default), then at IPL time, the initial amount of VFM that is specified is used automatically by z/OS for paging. Likewise, if a specific amount is specified, this amount is made available for paging.

From SC76, run the enhanced **DISPLAY ASM** and **DISPLAY M** commands to display the VFM SCM-related information and status. The result for each command is shown in Example 10-4.

Example 10-4 DISPLAY commands

```
DISPLAY ASM
IEE200I 12.04.41 DISPLAY ASM 799
TYPE     FULL STAT   DEV  DATASET NAME
PLPA      28%   OK  9A0B  PAGE.SC76.PLPA
COMMON     0%   OK  9A0B  PAGE.SC76.COMMON
LOCAL      0%   OK  9A36  PAGE.SC76.LOCAL01
LOCAL      0%   OK  9AB6  PAGE.SC76.LOCAL02
LOCAL      0%   OK  9B36  PAGE.SC76.LOCAL03
SCM        0%   OK   N/A   N/A
PAGEDEL COMMAND IS NOT ACTIVE

DISPLAY ASM,SCM
IEE207I 12.05.26 DISPLAY ASM 801
STATUS      FULL              SIZE             USED         IN-ERROR
IN-USE        0%         4,194,304           20,247                0

DISPLAY M=SCM
IEE174I 12.06.04 DISPLAY M 803
STORAGE-CLASS MEMORY STATUS
32G DEFINED
ONLINE
 0G-16G
16G OFFLINE-AVAILABLE
1% IN USE
SCM INCREMENT SIZE IS 16G
DISPLAY M=SCM(DETAIL)
IEE174I 12.06.53 DISPLAY M 805
STORAGE-CLASS MEMORY STATUS - INCREMENT DETAIL
32G DEFINED
ADDRESS  IN USE  STATUS
     0G      1%  ONLINE
ONLINE: 16G  OFFLINE-AVAILABLE: 16G  PENDING OFFLINE: 0G
1% IN USE
SCM INCREMENT SIZE IS 16G
```

From these commands, you see that 32 GB of VFM is defined, but only 16 GB are online, and the other 16 GB are offline-available.

To vary an extra 16 GB VFM online to the example LPAR, run the **CONFIG SCM(xxG),ONLINE** command, as shown in Example 10-5. The amount of VFM that is configured online must be specified according to the supported increment size. From these displays, the supported increment size is 16G.

Example 10-5 CONFIG SCM(16G),ONLINE

```
CONFIG SCM(16G),ONLINE
IEE195I SCM LOCATIONS 16G TO 32G ONLINE
IEE712I CONFIG   PROCESSING COMPLETE
```

Run the **DISPLAY ASM** and **DISPLAY M** commands again to display the status of the VFM and see that the 16 GB extra value is now online and available (Example 10-6).

Example 10-6 Post-configuration displays

```
DISPLAY ASM
IEE200I 12.10.14 DISPLAY ASM 845
TYPE     FULL STAT   DEV  DATASET NAME
PLPA      28%   OK  9A0B  PAGE.SC76.PLPA
COMMON     0%   OK  9A0B  PAGE.SC76.COMMON
LOCAL      0%   OK  9A36  PAGE.SC76.LOCAL01
LOCAL      0%   OK  9AB6  PAGE.SC76.LOCAL02
LOCAL      0%   OK  9B36  PAGE.SC76.LOCAL03
SCM        0%   OK   N/A   N/A
PAGEDEL COMMAND IS NOT ACTIVE

DISPLAY ASM,SCM
IEE207I 12.10.41 DISPLAY ASM 847
STATUS      FULL              SIZE             USED         IN-ERROR
IN-USE        0%         8,388,608           20,247                0

DISPLAY M=SCM
IEE174I 12.08.47 DISPLAY M 843
STORAGE-CLASS MEMORY STATUS
32G DEFINED
ONLINE
 0G-32G
0G OFFLINE-AVAILABLE
0% IN USE
SCM INCREMENT SIZE IS 16G

DISPLAY M=SCM(DETAIL)
IEE174I 12.11.46 DISPLAY M 849
STORAGE-CLASS MEMORY STATUS - INCREMENT DETAIL
32G DEFINED
ADDRESS  IN USE  STATUS
     0G      1%  ONLINE
    16G      0%  ONLINE
ONLINE: 32G  OFFLINE-AVAILABLE: 0G  PENDING OFFLINE: 0G
0% IN USE
SCM INCREMENT SIZE IS 16G
```

When displaying the Storage Information windows on the SE again (compare to Figure 10-42 on page 269 and Figure 10-43 on page 270), this change in LPAR ARIES21 is reflected.

In Figure 10-44, the amount of allocated VFM went up to 80 GB (compared to the 64 GB in Figure 10-42 on page 269).

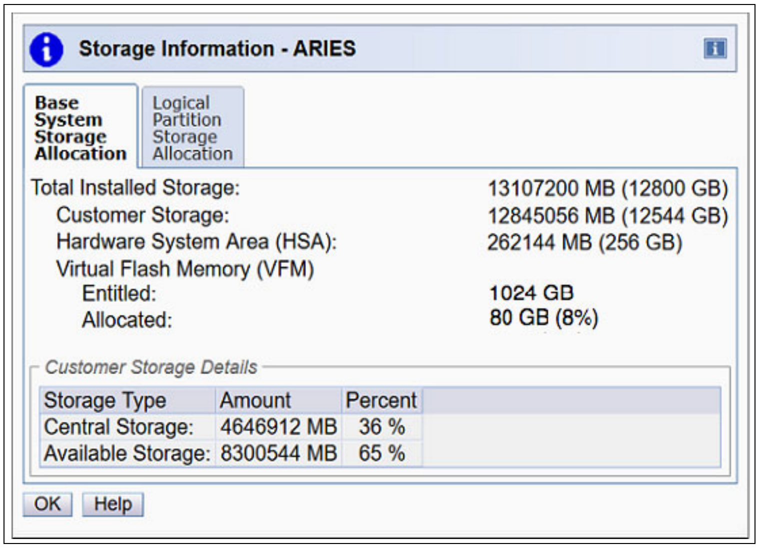

Figure 10-44 Results of CONFIG SCM(16G),ONLINE in LPAR ARIES21 - Base System Storage Allocation

In Figure 10-45, the amount of VFM allocated to LPAR ARIES21 went up to 32 GB.

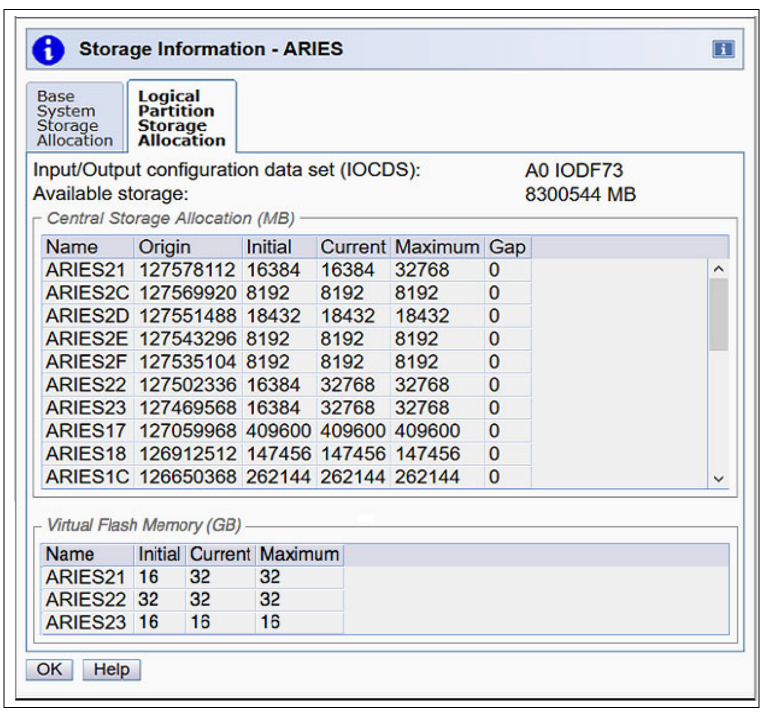

Figure 10-45 Results of CONFIG SCM(16G),ONLINE in LPAR ARIES21 - Logical Partition Storage Allocation

You can also set VFM offline, even to an amount that is lower than the initial value that is specified in the image activation profile. For LPAR ARIES21 where the amount of online VFM is reduced to 0 GB by running **CONFIG SCM(32G),OFFLINE**, you see the results in the Storage Information windows that are shown in Figure 10-46 and Figure 10-47. In Figure 10-46, the amount of allocated VFM went down to 48 GB.

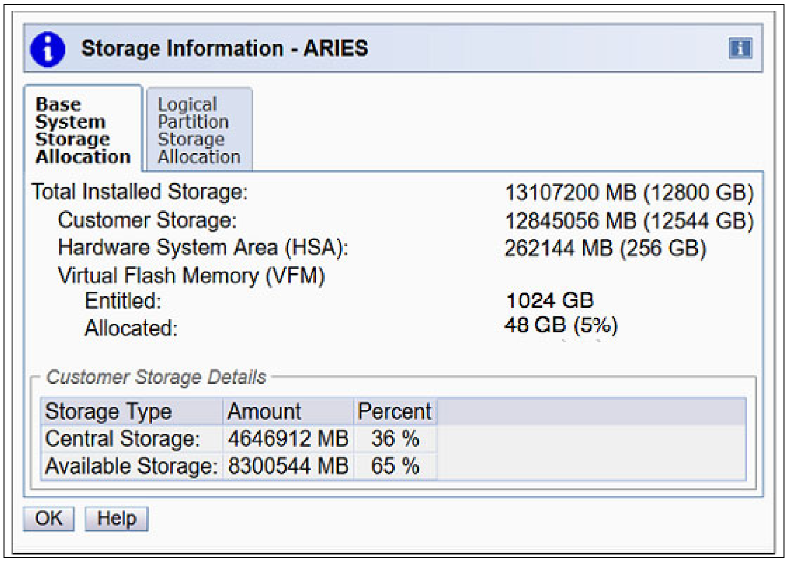

Figure 10-46 Results after CONFIG SCM(32G),OFFLINE in LPAR ARIES21 - Base System Storage Allocation

In Figure 10-47, the amount of VFM allocated to LPAR ARIES21 went down to 0 GB, which is lower than the initial 16 GB.

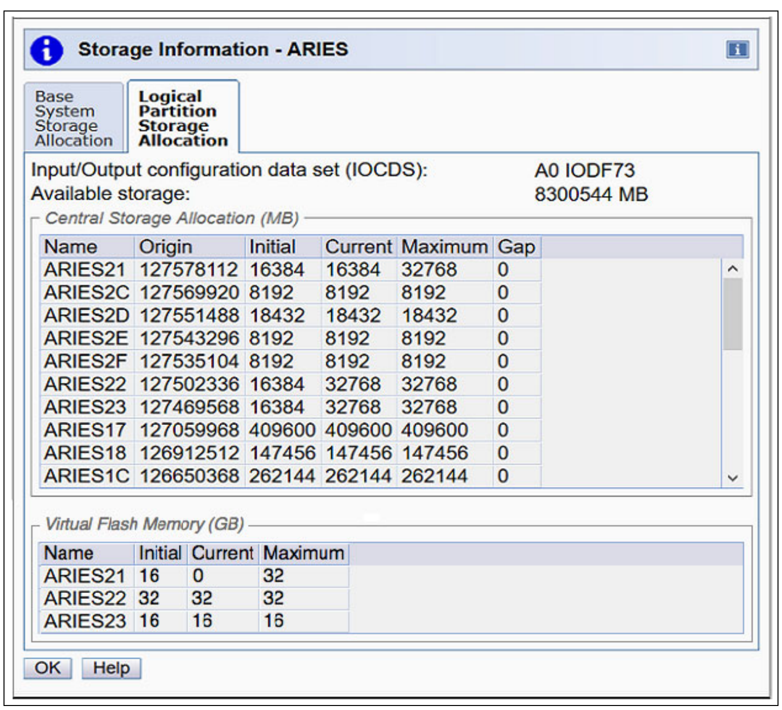

Figure 10-47 Results after CONFIG SCM(32G),OFFLINE in LPAR ARIES21 - Logical Partition Storage Allocation

Note: An LPAR uses only the amount of VFM activated for that LPAR. VFM that is set offline by the OS is returned to be used by other LPARs.

The allocation of VFM to a CF LPAR is done in the same way as for z/OS LPARs, which is described in 10.2.3, “Configuring VFM” on page 267. The amount of SCM that is allocated to a CF LPAR can be displayed in the Operating System Messages window at the HMC.

For example, LPAR ARIES2F, which allocated 32 GB of initial VFM storage, has a message that shows the amount of SCM available, as shown in Example 10-7.

Example 10-7 CFCC messages with SCM

```
CF0280I CFCC Release 24.00, Service Level 00.09
        Built on 05/16/2019 at 16:15:00
        Code Load Features:
           Facility Operational Level: 24

CF0011I Coupling Facility is active with:
           2 CPs
           5 CF Receiver Channels
           5 CF Sender Channels
           7687 MB of allocatable storage
           32768 MB of Total SCM storage
```

The CF must know the algorithm of how the structure is used by the application. Currently, this algorithm is defined only for IBM MQ shared queues. To use this function, assign flash memory to your Coupling Facilities (CFs) and update your structure definitions in your CFRM policy with the new parameters **SCMMAXSIZE** and **SCMALGORITHM**. For more information, see *z/OS MVS Setting Up a Sysplex*, SA23-1399.

IBM MQ for z/OS 7 or later enables the migration of IBM MQ shared queue objects to flash memory when the structure utilization exceeds the defined threshold. The IBM MQ objects are fetched back to real CF Storage when requested. This process provides an overflow capability for IBM MQ shared queues to handle workload peaks.

IBM Resource Measurement Facility (RMF) provides measurement data and reporting capabilities for VFM and Flash Express. The support enhances RMF Postprocessor and Monitor III reports with various new CF SCM statistics.

CF SCM statistics are provided in these reports:

- RMF Postprocessor Coupling Facility Activity (CFACT) report
- RMF Monitor III Coupling Facility Overview (CFOVER) report
- RMF Monitor III CFACT report

11

Adding logical partitions and operating system configurations

This chapter describes the steps for adding logical partitions (LPARs) and operating system configurations (OSCONFIGs) to your input/output definition file (IODF). It includes a list of these potential configuration items and a short description about how to do each of them by using a Hardware Configuration Definition (HCD).

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

Note: Not all the following configuration items are necessarily required for your installation. In addition, the examples that are presented are not exhaustive.

This chapter shows only the definition process. If you want a deeper understanding about how to use HCD and Fibre Connection (FICON), see these resources:

- *I/O Configuration Using z/OS HCD and HCM*, SG24-7804
- *FICON Planning and Implementation Guide*, SG24-6497
- Review *z/OS HCD Planning,* GA32-0907-40 in IBM Documentation

This chapter includes the following topics:

- Defining more I/O by using HCD
- OSCONFIGs and logical partition definitions

11.1 Defining more I/O by using HCD

When defining new I/O components in an IODF, certain definitions like OSCONFIGs, partitions, FICON switches, control units (CUs), and devices must be done first. After these items are defined, these connections can be made:

- Defining an extra OSCONFIG
- Defining extra operating system LPARs in a channel subsystem

The following I/O definitions use HCD to demonstrate the examples. The examples in this section continue the work example `SYS9.IODF81.WORK`.

11.2 OSCONFIGs and logical partition definitions

This section covers defining OSCONFIGs, LPARs, and FICON switches.

An OSCONFIG describes the z/OS view of devices that are attached to a partition with its operational behavior and parameters and features. An LPAR is a hardware definition of a runtime environment for an operating system (OS) and the devices that are visible from it. FICON switches describe a storage fabric, that is, the cabling and connection of your IBM Z and attached storage server.

11.2.1 Defining an extra OSCONFIG

Here are the prerequisites for a new OSCONFIG:

- OSCONFIG name:
  - Eligible Device Table ID (EDT ID): Esoterics / VIO
  - Consoles
- To add devices to Esoterics and Consoles, they first must be added to an OSCONFIG.

To add an OSCONFIG by using HCD, complete the following steps:

1. From the main HCD panel, select option `1.1. Operating system configurations`.
2. In the CLI, enter `add` (see Figure 11-1 on page 281) to add an OSCONFIG.
3. Make the following updates, and press Enter:
   - Update `OS configuration ID type to ITSOTEST`.
   - Update `Description to ITSO test OSCONFIG for IBM z16`.

```
*---------------- Add Operating System Configuration -----------------*
|                                                                      |
|                                                                      |
| Specify or revise the following values.                              |
|                                                                      |
| OS configuration ID  . . . . . ITSOTEST                              |
| Operating system type  . . . . MVS       +                           |
|                                                                      |
| Description  . . . . . . . . . ITSO test OSCONFIG for IBM z16______  |
|                                                                      |
| OS config ID for D/R site  . . ________  (generated for GDPS)        |
|                                                                      |
|                                                                      |
```

Figure 11-1 Operating System Configuration: Add OSCONFIG

4. To add an EDT ID, enter `s` next to the new OSCONFIG (see Figure 11-2).

```
                      Operating System Configuration List            Row 1 of 25
Command ===> ___________________________________________ Scroll ===> CSR

Select one or more operating system configurations, then press Enter. To
add, use F11.

/ Config. ID  Type     Gen  Description                       D/R site OS ID
_ ITSO        MVS           All ITSO devices
s ITSOTEST    MVS           ITSO test OSCONFIG for z16
_ ZOSMAINT    MVS           z/OS Central Mgmt Image
_ ZOS24BAS    MVS           z/OS 2.4 ServerPac with P1D SSs
_ ZOS24MLZ    MVS           z/OS 2.4 MLZ - clone of p1c
_ ZOS24MPL    MVS           z/OS 2.4 demo clone of p1g
```

Figure 11-2 Operating System Configuration: Add EDT

5. In the CLI, enter `add` (see Figure 11-3) to add an EDT.
6. Update `EDT identifier` to `00`, and press Enter.

```
*-------------------------------- Add EDT --------------------------------*
|                                                                          |
|                                                                          |
| Specify the following values.                                            |
|                                                                          |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16             |
|                                                                          |
| EDT identifier . . . 00                                                  |
| Description  . . . . ________________________________                    |
|                                                                          |
|                                                                          |
*--------------------------------------------------------------------------*
```

Figure 11-3 Operating System Configuration: Add EDT

7. Enter `s` (`work with esoterics`) next to `EDT 00`, and press Enter (see Figure 11-4).

```
*------------------------------- EDT List --------------------------------*
|   Goto  Backup  Query  Help                                             |
| ----------------------------------------------------------------------  |
|                                                              Row 1 of 1 |
| Command ===> _______________________________________ Scroll ===> CSR    |
|                                                                         |
| Select one or more EDTs, then press Enter. To add, use F11.             |
|                                                                         |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16            |
|                                                                         |
| / EDT Last Update By       Description                                  |
| s 00  2022-02-23  ZNEXT02  ________________________________             |
| ************************** Bottom of data *************************** |
```

Figure 11-4 Operating System Configuration: Work with Esoterics

8. In the Cli, enter `add` (see Figure 11-5) to add an Esoteric.
9. Make the following updates, and press Enter:
   – Update `Esoteric name` to `ITSOES01`.
   – Update `VIO eligible` to `Yes` (if you want to make this Esoteric VIO eligible). This setting is normally used for an Esoteric that is called VIO.
   – Update `Token` to `1`.

```
*----------------------------- Esoteric List -----------------------------
|   Goto  Filter  Backup  Query  Help
| - *--------------------- Add Esoteric ---------------------*
|   |                                                        |
| C |                                                        |
|   | Specify the following values.                          |
| S |                                                        |
|   | Esoteric name  . . . ITSOES01                          |
| C | VIO eligible . . . . Yes    (Yes or No)                |
| E | Token  . . . . . . . 1___                              |
|   |                                                        |
| / |                                                        |
| * |                                                        |
|   |                                                        |
|   *--------------------------------------------------------*
|
```

Figure 11-5 Operating System Configuration: Add Esoteric

10. After you add devices to the OSCONFIG ITSOTEST, you can add those device definitions to an Esoteric or Console if applicable.

11.2.2 Defining extra operating system LPARs in a channel subsystem

Here are considerations for a new (unreserved) partition:

- Partition name.
- Number.
- Usage.
- Description.
- To add channel path IDs (CHPIDs) to a partition, they first must be defined to the processor.
- Renaming an existing partition is a two-step process:
  a. It must be redefined as reserved (`Partition name = *`).
  a. The IODF must be activated on the processor, redefined to the new name, and then the IODF must be activated on the processor.

To change a reserved partition to an active partition in a channel subsystem (CSS), complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Type `s` next to the processor that you want to add a partition to, and press Enter.
3. Type `p` next to the CSS ID that you want to add a partition to, and press Enter.

12

Adding storage devices

This chapter describes how to define Fibre Connection (FICON) switches and FICON channel path IDs (CHPIDs), and connect them to a direct access storage device (DASD) control unit (CU). It includes a list of these potential configuration items and a short description about how to configure each of them by using Hardware Configuration Definition (HCD).

This chapter shows only the definition process. If you want a deeper understanding about how to use HCD and FICON, see these resources:

- *I/O Configuration Using z/OS HCD and HCM*, SG24-7804
- *FICON Planning and Implementation Guide*, SG24-6497
- Review *z/OS HCD Planning,* GA32-0907-40 in IBM Documentation

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

Note: Not all the following configuration items are necessarily required for your installation. In addition, the examples that are presented are not exhaustive.

This chapter includes the following topics:

- Defining more I/O by using HCD
- FICON CHPIDs, switches, and DASD CUs

12.1 Defining more I/O by using HCD

When defining new I/O components in an input/output definition file (IODF), certain definitions like operating system configurations (OSCONFIGs), partitions, FICON switches, CUs, and devices must be done first. After these items are defined, the connections can be made:

- Defining FICON switches (directors, storage area networks, and storage area network switches)
- Defining FICON CHPIDs and connecting them to a FICON switch
- Defining FICON CHPIDs for a direct connection to a 2107 control unit
- Defining FICON CHPIDs for switch connections to a 2107 control unit
- Defining 3390B devices to an OSCONFIG and Eligible Device Tables and Esoteric device groups

The following I/O definitions use HCD to demonstrate the examples. The examples continue by using the work example `SYS9.IODF81.WORK`.

12.1.1 Defining FICON switches (directors, storage area networks, and storage area network switches)

The following items are considerations for a new FICON switch:

- Switch ID
- Switch type
- Serial number (optional)
- Description (optional)
- Switch address
- Installed port range
- Switch CU number
- Switch device number

To add a FICON Switch by using HCD, complete the following steps:

1. From the main HCD panel, select option `1.2. Switches`.
2. In the CLI, enter `add` (see Figure 12-1 on page 287) to add a switch.
3. Make the following updates (we used a switch ID value of `41`), and press Enter:
   - Update `Switch ID` to `41`.
   - Update `Switch type` to `2032`.
   - Update `Description` to `ITSO test storage area network definition`.
   - Update `Switch address` to `41`.
   - Update `Installed port range` to `00` and `FE`.
   - Update `Switch CU number` to `0041`.
   - Update `Switch device number` to `0041`.

```
+---------------------------- Add Switch ----------------------------+
|                                                                    |
|                                                                    |
| Specify or revise the following values.                            |
|                                                                    |
| Switch ID . . . . . . . . 41  (00-FF)                              |
| Switch type . . . . . . . 2032_________  +                         |
| Serial number . . . . . . __________                               |
| Description . . . . . . . ITSO test SAN definition________         |
| Switch address  . . . . . 41  (01-EF) for a FICON switch           |
|                                                                    |
| Specify the port range to be installed only if a larger range      |
| than the minimum is wanted.                                       |
|                                                                    |
| Installed port range  . . 00  -  FE  +                             |
|                                                                    |
| Specify either numbers of existing control units and devices, or     |
| numbers for new control unit and device to be added.               |
|                                                                    |
| Switch CU numbers . . . 0041  ____  ____  ____  ____  +          |
| Switch device numbers . 0041  ____  ____  ____  ____             |
|                                                                    |
|                                                                    |
+--------------------------------------------------------------------+
```

Figure 12-1 Switches: Add Switch

Figure 12-2 shows the new FICON switch definition.

```
                                  Switch List         Row 1 of 3 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more switches, then press Enter. To add, use F11.

                                                                CU   Dev
/ ID Type +        Ad Serial-# + Description                    Num. Num.
_ 01 2032          01 10546MH    8960-F64 SAN64B-6 SW 01        0001 0001
_ 02 2032          02 10546MD    8960-F64 SAN64B-6 SW 03        0002 0002
_ 41 2032          41 __________ ITSO test SAN definition       0041 0041
******************************* Bottom of data *******************************






*----------------------------------------------------------------------*
| Switch control units 0041 and devices 0041 defined, but not yet |
| connected to both a processor and an operating system.               |
*----------------------------------------------------------------------*
```

Figure 12-2 Switches: FICON switch added

12.2 FICON CHPIDs, switches, and DASD CUs

This section describes the following topics:

- Defining FICON CHPIDs and connecting them to a FICON switch
- Defining FICON CHPIDs for a direct connection to a 2107 control unit
- Defining FICON CHPIDs for switch connections to a 2107 control unit
- Defining 3390B devices to an OSCONFIG and Eligible Device Tables and Esoteric device groups

12.2.1 Defining FICON CHPIDs and connecting them to a FICON switch

Here are considerations for a new FICON CHPID:

- CHPID
- Channel ID (CHID)
- Channel path type
- Operational mode
- Description
- Dynamic entry switch ID
- Entry switch ID
- Entry port
- Partition access list

Here are more considerations:

- For performance and redundancy, determine how many CHPIDs are required to connect to the FICON switch and then to one or more CUs.
- For performance and redundancy, determine how many I/O cards of that feature are installed in the processor and to what Peripheral Component Interconnect Express (PCIe) ports and on which central processor complex (CPC) drawer does the I/O cards connect to. (For a list of installed hardware, see the physical channel ID (PCHID)/CHID report.)
- After a CHPID is defined, it can be added to a predefined partition in that channel subsystem (CSS).
- After a CHPID is defined, it can be connected to a FICON switch.
- After a CHPID is defined, it can be connected to a CU (covered in a later step).

To define a FICON CHPID, connect to a FICON switch and provide access to a partition. Then, complete the following steps[1]:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the CSS ID that you want to add a CHPID to, and press Enter.
4. Press PF11 or in the CLI, enter `add` (see Figure 12-3 on page 289) to add a CHPID.
5. Make the following updates, and press Enter:
   - Update `Channel path ID` to `14`.
   - Update `Channel ID` to `114`.
   - Update `Channel path type` to `FC`.
   - Update `Operational mode` to `SHR`.

[1] in this book, we previously recommended to leave the PCHID blank and assign it using the CHPID Mapping Tool (CMT). For completeness. these steps show how to assign them by using the HCD.

– Update `Description` to whatever description that you want.
– Update `Dynamic entry switch ID` to `41`.
– Update `Entry switch ID` to `41` (optional but preferred).
– Update `Entry port` to `10` (optional but preferred).

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                           |
| Channel path ID  . . . . 14    +           Channel ID  114  +             |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . FC_   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +      |
| Description  . . . . . . FC#0462 32Gb FICON Exp32S SX____                 |
|                                                                           |
| Specify the following values only if connected to a switch:               |
| Dynamic entry switch ID  41  + (00 - FF)                                  |
| Entry switch ID  . . . . 41  +                                            |
| Entry port . . . . . . . 10  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 12-3 Processors: Add Channel Path

HCD now prompts you to select which partition the CHPID should have access to.

6. Type forward slash (/) next to the partition you want (see Figure 12-4), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                               Row 1 of 1 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the access list.          |
|                                                                           |
| Channel Subsystem ID : 3                                                  |
| Channel path ID  . . : 14     Channel path type  . : FC                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                   |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                       |
| / 3      PAVO33           3      OS    PAVO33 test OS partition          |
| **************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+
```

Figure 12-4 Processors: Define Access List

Because we have only one partition that is defined in this CSS, we do not see the Define Candidate List panel, even though we defined the CHPID as SHR.

HCD returns to the Channel Path List and shows the CHPID that was defined (see Figure 12-5).

```
                              Channel Path List      Row 1 of 1 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO        Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
```

Figure 12-5 Processors: Channel Path List

12.2.2 Defining FICON CHPIDs for a direct connection to a 2107 control unit

Here are considerations for a new FICON CHPID:

- CHPID
- CHID
- Channel path type
- Operational mode
- Description
- Partition access list

The direct connect method is used in an environment where there is only one processor. The FICON switch method, which is described in 12.2.3, “Defining FICON CHPIDs for switch connections to a 2107 control unit” on page 294, is used where multiple processors must connect to the same CUs. This situation might not always be the case.

Here are considerations for connecting a FICON CHPID to a DASD CU and its devices:

- For performance and redundancy, determine how many I/O cards of that feature are installed in the processor and to what PCIe ports on what CPC drawer does the I/O cards connect to. (For a list of installed hardware, see the PCHID/CHID report.)
- After a CHPID is defined, it can be added to a predefined partition in that CSS.
- The CHPID can be connected to a CU.

> **Note:** For FICON Express16S+ (Feature Code #0427 and Feature Code #0428), FICON Express16SA[a] (Feature Code #0436 and Feature Code #0437), and FICON Express32S (Feature Code #0461 and Feature Code #0462), defining both Fibre Channel (FC) and Fibre Channel Protocol (FCP) CHPID types on the same I/O card is not supported. (There is no mix that is supported by IBM z16). HCD issues the following error message during a Validate or Build Production for an IODF:
>
> `CBDA964I CHPID type mix detected on processor PAVO for channels: 1.6C, 0.6D`

a. FICON Express16SA is *not* supported on IBM z16 A02 and IBM z16 AGZ.

To define a FICON CHPID that connects directly to a CU and provides access to a partition, complete the following steps[2]:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the CSS ID that you want to add a CHPID to, and press Enter.
4. Press PF11 or in the CLI, enter `add` to add a CHPID.

[2] in this book, we previously recommended to leave the PCHID blank and assign it using the CMT. For completeness. these steps show how to assign them using the HCD.

5. Make the following updates (see Figure 12-6), and press Enter:
   - Update `Channel path ID` to `15`.
   - Update `Channel ID` to `115`.
   - Update `Channel path type` to `FC`.
   - Update `Operational mode` to `SHR`.
   - Update `Description` to the description that you want.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                           |
| Channel path ID  . . . . 15    +            Channel ID  115  +            |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . FC_   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +      |
| Description  . . . . . . FC#0462 32Gb FICON Exp32S SX____                 |
|                                                                           |
| Specify the following values only if connected to a switch:               |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 12-6 Processors: Add Channel Path

6. Type forward slash (/) next to the partition that you want CHPID to have access to (see Figure 12-7 on page 293), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                                 Row 1 of 1 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                            |
| Select one or more partitions for inclusion in the access list.           |
|                                                                            |
| Channel Subsystem ID : 3                                                   |
| Channel path ID  . . : 15     Channel path type  . : FC                   |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                            |
| / CSS ID Partition Name   Number Usage Description                        |
| / 3      PAVO33           3      OS    PAVO33 test OS partition           |
| *************************** Bottom of data **************************** |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 12-7 Processors: Define Access List

Because only one partition is defined in this CSS, we do not see the Define Candidate List panel, even though we defined the CHPID as SHR.

HCD now returns to the Channel Path List panel showing the CHPID that was defined (see Figure 12-8).

```
                              Channel Path List      Row 1 of 2 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+             Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
******************************* Bottom of data ********************************
```

Figure 12-8 Processors: Channel Path List

12.2.3 Defining FICON CHPIDs for switch connections to a 2107 control unit

There are two ways to define FICON connections to a CU: One is through a FICON switch, and the other is direct connect, which is described in 12.2.2, “Defining FICON CHPIDs for a direct connection to a 2107 control unit” on page 291.

The direct connect method is used in an environment where there is only one processor. The FICON switch method is used where multiple processors must connect to the same CUs. This situation might not always be the case.

- For FICON switch connections, there is usually a minimum of two FICON switches that the FICON CHPIDs connect through, primarily for failure or service redundancy of the FICON switches.

> **Note:** The device type of the CU depends on your storage server. An IBM DS8000 server uses a CU type of 2107.

- For this example, we connect to a predefined 2107 CU (A000), with a control unit address (CUADD) of 40 and devices A000-A0EF (3390B) and A0F0-A0FF (3390A).

> **Note:** For FICON Express16S+ (Feature Code #0427 and Feature Code #0428), FICON Express16SA[a] (Feature Code #0436 and Feature Code #0437), and FICON Express32S (Feature Code #0461 and Feature Code #0462), defining both FC and FCP CHPID types on the same I/O card is not supported. (There is no mix that is supported by IBM z16). HCD issues the following error message during a Validate or Build Production for an IODF:
>
> `CBDA964I CHPID type mix detected on processor PAVO for channels: 1.6C, 0.6D`
>
> a. FICON Express16SA is *not* supported on IBM z16 A02 and IBM z16 AGZ.

To define FICON CHPIDs for a switch connection, complete the following steps:

1. From the main HCD panel, select option `1.4. Control units`.
2. Scroll through the CU list until you find the CU that you want to connect to, or in the CLI, enter `L A000`. In our example, we use `A000`.
3. Enter `c` next to the CU definition, and press Enter.

4. Make the following updates for a FICON switch connection (see Figure 12-9), and press Enter:
   a. Update `Connected to switches` to `41`. Switch 41 is the switch ID that we defined in the previous example.
   b. Update `Ports` to `11`. Port 11 is the FICON switch port that the CU connects to (also known as the Destination Link Address (DLA) of the FICON CHPID).

```
*----------------- Change Control Unit Definition -------------------*
|                                                                      |
|                                                                      |
| Specify or revise the following values.                              |
|                                                                      |
| Control unit number  . . . . A000  +                                 |
|                                                                      |
| Control unit type  . . . . . 2107           +                        |
|                                                                      |
| Serial number  . . . . . . . __________  +                           |
| Description  . . . . . . . . DS8886 - SU2 - SSID=A000                |
|                                                                      |
| Connected to switches  . . . 41  __  __  __  __  __  __  __   +      |
| Ports  . . . . . . . . . . . 11  __  __  __  __  __  __  __   +      |
|                                                                      |
| Define more than eight ports . . 2   1.  Yes                         |
|                                      2.  No                          |
|                                                                      |
|                                                                      |
|                                                                      |
|                                                                      |
|                                                                      |
|                                                                      |
*----------------------------------------------------------------------*
```

Figure 12-9 Control units: Change Control Unit Definition

HCD now shows the Select Processor / CU panel. This panel is where the connection is now made between the FICON CHPID (14) and the CU FICON Switch Port (11) through the FICON switch (41).

5. Enter `c` next to the `Processor.CSS` that contains the partition that we want to have access to the CU and also has access to the CHPID that we want to connect to the CU. In our example, we use `PAV0.3`, and then press Enter.

6. Make the following updates to define the Processor / CU connection panel (see Figure 12-10), and press Enter:
   a. Update `Channel path IDs` to `14`. CHPID 14 is the CHPID that we defined in the previous example.
   b. Update `Link address` to `4111`. Link address 4111 is FICON switch 41 and CU Port 11.
   c. Update `Unit address` to `00`. Unit Address (UA) of 00 is the starting UA number on the CHPID.
   d. Update `Number of units` to `256`. The number of units of 256 equals A000 - A0FF (that is, 00 - FF or 256).
   e. Update `Logical address` to `40`. The logical address of 40 is the CUADD that is defined in the DS8886 that defines the location of the devices in the DS8886.

```
                           Select Processor / CU
*--------------------- Change Control Unit Definition ----------------------*
|                                                                          |
|                                                                          |
| Specify or revise the following values.                                  |
|                                                                          |
| Control unit number  . : A000        Type . . . . . . : 2107             |
| Processor ID . . . . . : PAVO        Pavo                                |
| Channel Subsystem ID . : 3                                               |
|                                                                          |
| Channel path IDs . . . . 14   __   __   __   __   __   __   __    +      |
| Link address . . . . . . 4111 ____ ____ ____ ____ ____ ____ ____  +      |
|                                                                          |
| Unit address . . . . . . 00   __   __   __   __   __   __   __    +      |
| Number of units  . . . . 256  ___  ___  ___  ___  ___  ___  ___          |
|                                                                          |
| Logical address  . . . . 40  + (same as CUADD)                           |
|                                                                          |
| Protocol . . . . . . . . __  + (D, S, or S4)                             |
| I/O concurrency level  . _   + (1, 2, or 3)                              |
|                                                                          |
|                                                                          |
|                                                                          |
*--------------------------------------------------------------------------*
```

Figure 12-10 Control units: Change Control Unit Definition detail

HCD now shows the Modify Device Parameters panel where you can override the UA numbers. For a 2107 DASD CU definition, the starting UA is usually `00` and the ending UA is `FF`, giving you 256 DASD definitions for the CU.

7. In our example, we do not change the defaults that are proposed by HCD (see Figure 12-11). Press Enter.

```
*------------------------- Modify Device Parameters -------------------------*
|                                                 Row 1 of 2 More:      > |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                            |
| Specify or revise any changes to the device parameters in the following list.  |
| To view attached control units, scroll to the right.                      |
|                                                                            |
| Processor ID . . . . : PAVO        Pavo                                   |
| Channel Subsystem ID : 3                                                  |
|                                                                            |
| ---------Device---------     ---UA----                  Preferred Exposure |
| No., Range Type         SS+ Old New + Time-Out STADET CHPID +   Device     |
| A000,240   3390B        _   00  00    No       Yes    __                   |
| A0F0,016   3390A        1   F0  F0    No       Yes    __                   |
| **************************** Bottom of data **************************** |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 12-11 Control units: Modify Device Parameters

HCD returns to the Select Processor / CU panel, which shows the CHPID (14) to DLA (11) through the FICON switch (41) connection definition (see Figure 12-12).

```
                            Select Processor / CU    Row 1 of 18 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : A000     Control unit type . . . : 2107

             ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ PAVO.3     14.4111 _______ _______ _______ _______ _______ _______ _______
_ HYDRA.0    _______ _______ _______ _______ _______ _______ _______ _______
_ HYDRA.1    _______ _______ _______ _______ _______ _______ _______ _______
_ HYDRA.2    _______ _______ _______ _______ _______ _______ _______ _______
_ LEPUS.0    _______ _______ _______ _______ _______ _______ _______ _______
_ LEPUS.1    _______ _______ _______ _______ _______ _______ _______ _______
_ LEPUS.2    _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.0     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.1     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.2     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.4     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.5     _______ _______ _______ _______ _______ _______ _______ _______
```

Figure 12-12 Processors: Select Processor / CU: CHPID to Link address connection

By pressing F20 (Right), you can see the other parts of the definition summary.

For a FICON direct connection to this CU definition, you omit the Link address values.

To define the Processor / CU connection (see Figure 12-13), update `Channel path IDs` to `15`, and press Enter.

```
                            Select Processor / CU
*---------------------- Change Control Unit Definition -----------------------*
|                                                                             |
|                                                                             |
| Specify or revise the following values.                                     |
|                                                                             |
| Control unit number  . : A000        Type . . . . . . : 2107                |
| Processor ID . . . . . : PAVO        Pavo                                   |
| Channel Subsystem ID . : 3                                                  |
|                                                                             |
| Channel path IDs . . . . 14    15    __    __    __    __    __    __    +  |
| Link address . . . . . . 4111  ____  ____  ____  ____  ____  ____  ____  +  |
|                                                                             |
| Unit address . . . . . . 00    __    __    __    __    __    __    __    +  |
| Number of units  . . . . 256   ___   ___   ___   ___   ___   ___   ___      |
|                                                                             |
| Logical address  . . . . 40  + (same as CUADD)                              |
|                                                                             |
| Protocol . . . . . . . . __  + (D, S, or S4)                                |
| I/O concurrency level  . _   + (1, 2, or 3)                                 |
|                                                                             |
|                                                                             |
|                                                                             |
*-----------------------------------------------------------------------------*
```

Figure 12-13 Control units: Change Control Unit Definition detail

8. HCD again shows the Modify Device Parameters panel where you can override the UA numbers. Press Enter to continue.

   HCD returns to the Select Processor / CU panel showing the CHPID (`15`) connection definition (see Figure 12-14 on page 299).

```
                              Select Processor / CU    Row 1 of 18 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : A000     Control unit type . . . : 2107

             ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ PAVO.3     14.4111 15      _______ _______ _______ _______ _______ _______
_ HYDRA.0    _______ _______ _______ _______ _______ _______ _______ _______
_ HYDRA.1    _______ _______ _______ _______ _______ _______ _______ _______
_ HYDRA.2    _______ _______ _______ _______ _______ _______ _______ _______
_ LEPUS.0    _______ _______ _______ _______ _______ _______ _______ _______
_ LEPUS.1    _______ _______ _______ _______ _______ _______ _______ _______
_ LEPUS.2    _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.0     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.1     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.2     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.4     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.5     _______ _______ _______ _______ _______ _______ _______ _______
```

Figure 12-14 Processors: Select Processor / CU: CHPID to Link address connection

Although a mixture of FICON switched and FICON direct connections are not recommended to the same CU, this configuration is possible.

A typical scenario might be where you were moving from direct connect DASD to a FICON switch connected DASD, but you cannot take the DASD offline to live systems.

12.2.4 Defining 3390B devices to an OSCONFIG and Eligible Device Tables and Esoteric device groups

The OSCONFIG name is the part of an IODF that determines what devices a z/OS system may access when it starts. Also, the partition that the z/OS system is restarted in also must have access to the CHPIDs that connect to the CUs and devices that match in the OSCONFIG.

The OSCONFIG also contains Esoterics device groups that are defined in Eligible Device Tables (EDTs) within an OSCONFIG.

Esoterics device groups are used to request allocation of a device that was defined in an Esoteric device group when using the **UNIT =** parameter in a **JCL DD** statement. However, this allocation can be overridden or intercepted by using DFSMS.

The OSCONFIG name includes these items:

- Device Parameters and Features
- EDT ID: Esoterics / VIO
- NIP Consoles

Here are the considerations for adding devices to an OSCONFIG and Esoteric:

- Adding a device to an OSCONFIG does not necessarily mean that the z/OS system has access to that device.
- Does the device need to be added to an Esoteric device group? Mostly, this item is installation-specific.
- The example adds the predefined 2107 devices A000 - A0EF (3390B) and A0F0 - A0FF (3390A).

To define 3390B devices to an OSCONFIG and EDT/Esoteric, complete the following steps:

1. From the main HCD panel, select option `1.5. I/O Devices`.
2. Scroll through the I/O Device List until you find the device number that you want to add to the OSCONFIG, or in the CLI, enter `L A000`. In our example, we use `A000`.
3. Enter `c` next to one or more device numbers, and press Enter.

   HCD displays the Change Device Definition panel where you can modify the CU that the devices are attached to (see Figure 12-15). Press Enter.

```
*------------------------ Change Device Definition -------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Device number  . . . . . . . : A000  (0000 - FFFF)                        |
| Number of devices  . . . . . : 240                                        |
| Device type  . . . . . . . . : 3390B                                      |
|                                                                           |
| Serial number  . . . . . . . . __________  +                              |
| Description  . . . . . . . . . ________________________________           |
|                                                                           |
| Volume serial number . . . . . ______  + (for DASD)                       |
|                                                                           |
| PPRC usage . . . . . . . . . . _  + (for DASD)                            |
|                                                                           |
| Connected to CUs . A000  ____  ____  ____  ____  ____  ____  ____  +      |
|                                                                           |
| ENTER to continue.                                                        |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 12-15 I/O Devices: Change Device Definition

   HCD displays the Device / Processor Definition panel where you can modify some of the Device parameters relating to Subchannel Set (SS), UA, and the Explicit Device Candidate List.

4. Enter `c` next to the `Proc.CCSID` item if you want to modify any of these parameters (see Figure 12-16), or press Enter to accept the defaults.

```
*---------------------- Device / Processor Definition -----------------------*
|                                                                   Row 1 of 1 |
| Command ===> __________________________________________ Scroll ===> CSR     |
|                                                                              |
| Select processors to change device/processor definitions, then press        |
| Enter.                                                                       |
|                                                                              |
| Device number  . . : A000       Number of devices  . : 240                  |
| Device type  . . . : 3390B                                                  |
|                                                                              |
|                                          Preferred  Device Candidate List |
| / Proc.CSSID  SS+  UA+  Time-Out  STADET  CHPID +    Explicit       Null |
| c PAV0.3      0    00   No        Yes     __         No             ___  |
| ***************************** Bottom of data ***************************** |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
*-----------------------------------------------------------------------------*
```

Figure 12-16 I/O Devices: Device / Processor Definition continued

5. Next is the HCD panel, where you define devices to the OSCONFIG. Scroll through the list of OSCONFIG definitions until you find the OSCONFIG that you want to add to the devices to, or in the CLI, enter `L ITSOTEST`. In our example, we use `ITSOTEST`.
6. Enter `s` next to the OSCONFIG, and press Enter.

   HCD displays the device parameters and features that are applicable to that device type. In our example, we add 3390B and 3390A devices to `ITSOTEST`.

7. Make the following updates to define the Processor / CU connection (see Figure 12-17), and press Enter:
   – Update `OFFLINE` to `No` (if you want these devices to be online during IPL time).
   – Update `DYNAMIC` to `Yes` (if you want the device to be changeable dynamically).
   – Update `LOCANY` to `Yes` (if the device UCB can be in 31-bit storage).
   – Update `WLMPAV` to `Yes` (if you want the device to be managed by Workload Manager).
   – Update `READ-ONLY` to `No` (use to set secondary devices to read only).
   – Update `SHARED` to `Yes` (if the device is going to be shared between other systems).
   – Update `SHAREDUP` to `No` (must be set to `No` if Shared is set to `Yes`).

```
*-------------------- Define Device Parameters / Features ---------------------*
|                                                                 Row 1 of 7 |
| Command ===> ___________________________________________ Scroll ===> CSR    |
|                                                                             |
| Specify or revise the following values.                                         |
|                                                                             |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16                |
| Device number  . . : A000         Number of devices  : 240                  |
| Device type  . . . : 3390B                                                  |
|                                                                             |
| Parameter/                                                                  |
| Feature    Value +          R Description                                   |
| OFFLINE    No                 Device considered online or offline at IPL    |
| DYNAMIC    Yes                Device supports dynamic configuration         |
| LOCANY     Yes                UCB can reside in 31-bit storage              |
| WLMPAV     Yes                Device supports work load manager             |
| READ-ONLY  No                 Restrict access to read requests (SEC or NO)  |
| SHARED     Yes                Device shared with other systems              |
| SHAREDUP   No                 Shared when system physically partitioned     |
| **************************** Bottom of data ***************************** |
|                                                                             |
|                                                                             |
|                                                                             |
*-----------------------------------------------------------------------------*
```

Figure 12-17 I/O Devices: Define Device Parameters / Features

The Assign/Unassign Device to Esoteric panel opens, where you can specify which Esoteric (if any) that you want the devices to be added to.

8. In the Assign/Unassign the Device to Esoteric panel (see Figure 12-18) under `Assigned`, enter `Yes`, and press Enter.

```
*-------------------- Assign/Unassign Device to Esoteric ---------------------*
|                                                                Row 1 of 1 |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                            |
| Specify Yes to assign or No to unassign.  To view devices already          |
| assigned to esoteric, select and press Enter.                              |
|                                                                            |
| Configuration ID : ITSOTEST          ITSO test OSCONFIG for z16            |
| Device number  . : A000              Number of devices  : 240              |
| Device type  . . : 3390B             Generic  . . . . . : 3390             |
|                                                                            |
| / EDT.Esoteric  Assigned  Starting Number Number of Devices                |
| _ 00.ITSOES01   Yes       ____            ____                             |
| ***************************** Bottom of data ***************************** |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 12-18 I/O Devices: Assign/Unassign Device to Esoteric

9. The final panel opens and shows that the devices are defined to the OSCONFIG (see Figure 12-19). Press Enter to return to the I/O Device List.

```
*----------- Define Device to Operating System Configuration -----------*
|                                                            Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                        |
| Select OSs to connect or disconnect devices, then press Enter.        |
|                                                                        |
| Device number  . : A000          Number of devices  : 240             |
| Device type  . . : 3390B                                              |
|                                                                        |
| Subchannel Sets used in processor configurations: 0                 |
|                                                                        |
| / Config. ID   Type     SS Description                    Defined     |
| _ ITSO         MVS         All ITSO devices                           |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16       Yes       |
| _ ZOSMAINT     MVS         z/OS Central Mgmt Image                    |
| _ ZOS24BAS     MVS         z/OS 2.4 ServerPac with P1D SSs            |
| _ ZOS24MLZ     MVS         z/OS 2.4 MLZ - clone of p1c                |
| _ ZOS24MPL     MVS         z/OS 2.4 demo clone of p1g                 |
| _ ZOS24P0B     MVS         z/OS 2.4 Clone of ZOS22BAS                 |
| _ ZOS24P0C     MVS         z/OS 2.4 ServerPac with P1D SSs            |
| _ ZOS24P0D     MVS         z/OS 2.4 Clone of ZOS22P0B                 |
| _ ZOS25BAA     MVS         z/OS 2.5 based from ZOSMAINT               |
| _ ZOS25BAS     MVS         z/OS 2.5 base system                       |
*-----------------------------------------------------------------------*
```

Figure 12-19 I/O Devices: Assign/Unassign Device to Esoteric completed

The same steps can now be performed for the remaining devices A0F0 - A0FF (3390A) for this example.

13

Adding network devices

This chapter describes how to define OSC, OSD, OSE, and Internal Queued Direct (IQD) channel path IDs (CHPIDs); control units (CUs); and devices.

Here is a list of these potential configuration items and a short description about how to do each of them by using Hardware Configuration Definition (HCD).

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

Note: Not all the following configuration items are necessarily required for your installation. In addition, the examples that are presented are not exhaustive.

This chapter includes the following topics:

- Defining more I/O by using HCD
- Open Systems Adapter CHPID definitions
- IQD CHPIDs for HiperSockets

13.1 Defining more I/O by using HCD

When defining I/O components in an input/output definition file (IODF), certain definitions like operating system configurations (OSCONFIGs), partitions, Fibre Connection (FICON) switches, CUs, and devices must be done first. After these items are defined, then the connections can be made:

- Defining OSC CHPIDs
- Defining OSC CHPID connections to an OSC control unit
- Defining 3270-X devices to an OSCONFIG
- Defining 3270-X devices to the Nucleus Initialization Program Console List within an OSCONFIG
- Defining OSD CHPIDs
- Defining OSD CHPID connections to an OSA control unit
- Defining OSA and OSAD devices to an OSCONFIG
- Defining OSE CHPIDs
- Defining OSE CHPID connections to an OSA control unit
- Defining OSA and OSAD devices to an OSCONFIG
- Defining IQD CHPIDs
- Defining IQD CHPID connections to an IQD control unit
- Defining IQD devices to an OSCONFIG

The following I/O definitions use HCD to demonstrate the examples. The examples continue with the work example `SYS9.IODF81.WORK`.

13.2 Open Systems Adapter CHPID definitions

This section covers defining OSC, OSD, and OSE CHPIDs, and their CUs and devices.

13.2.1 Defining OSC CHPIDs

When defining an OSC connection, first you must determine which type of Open Systems Adapter-Express (OSA-Express) feature that you need for your configuration:

- Fiber optical cable-based features:
  - OSA-Express7S 1.2-Gigabit Ethernet (GbE) Short Wave (SX) or Long Wave (LX)
  - OSA-Express7S GbE SX or LX
- Copper wire-based (unshielded twisted pair) feature:
  - OSA-Express7S 1.2 1000Base-T
  - OSA-Express7S 1000Base-T
  - OSA-Express6S 1000Base-T

Here are the considerations for a new OSC CHPID:

- CHPID.
- Channel ID (CHID).
- Channel path type.
- Operational mode.
- Description.
- Partition access list.
- For performance and redundancy, determine how many I/O cards of that feature are installed in the processor and to what Peripheral Component Interconnect Express (PCIe) ports on what central processor complex (CPC) drawer that the I/O cards connect to. (For a list of installed hardware, see the physical channel ID (PCHID)/CHID report.)

To define an OSC CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the channel subsystem (CSS) ID that you want to add a CHPID to, and press Enter.
4. Press PF11 or, in the CLI, enter `add` (see Figure 13-1) to add a CHPID.
5. Make the following updates, and press Enter:
   a. Update `Channel path ID` to `C6`.
   b. Update `Channel ID` to `11C`.
   c. Update `Channel path type` to `OSC`.
   d. Update `Operational mode` to `SHR`.
   e. Update `Description` to the description that you want.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID: 3                                                   |
|                                                                           |
| Channel path ID  . . . . C6    +           Channel ID  11C  +             |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . OSC   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No    (Yes or No)   I/O Cluster ________   +     |
| Description  . . . . . . FC#0446 OSA Express7S 1000Base-T                 |
|                                                                           |
| Specify the following values only if connected to a switch:               |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 13-1 Processors: Add Channel Path - OSC

6. HCD prompts you to select which partition the CHPID should have access to. Enter a forward slash (/) next to the partition that you want (see Figure 13-2), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                                Row 1 of 6 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the access list.           |
|                                                                           |
| Channel Subsystem ID: 3                                                   |
| Channel path ID  . . : C6     Channel path type  . : OSC                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| / 3      PAVO31           1      OS                                       |
| / 3      PAVO32           2      OS                                       |
| / 3      PAVO33           3      OS    PAVO33 test OS partition          |
| / 3      PAVO34           4      OS                                       |
| / 3      PAVO35           5      OS                                       |
| / 3      PAVO36           6      OS                                       |
| / 3      PAVO37           7      OS                                       |
| / 3      PAVO38           8      OS                                       |
| / 3      PAVO39           9      OS                                       |
| **************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+
```

Figure 13-2 Processors: Define Access List - OSC

In this example, because we select all partitions to the Access List, we do not see the Define Candidate List panel, even though we defined the CHPID as SHR.

HCD now returns to the Channel Path List, and you see the CHPID that was defined (see Figure 13-3).

```
                              Channel Path List       Row 1 of 3 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
****************************** Bottom of data *******************************
```

Figure 13-3 Processors: Channel Path List - OSC

13.2.2 Defining OSC CHPID connections to an OSC control unit

The only way to define an Open Systems Adapter (OSA) connection to its CU is direct connect.

You might want to connect the OSC CU definition to multiple CPCs even though the physical OSC is still unique to any one CPC. Also, you might want to span the OSC over multiple CSSs within a CPC.

Here are considerations for connecting an OSC CHPID to an OSC CU and its 3270-X devices:

- Determine how many OSCs are required to provide a primary and secondary/backup network connection.
- The example connects to a predefined OSC CU (1C60) and 3270-X devices 0700 - 070F.

To define OSC CHPID connections to an OSC CU, complete the following steps:

1. From the main HCD panel, select option `1.4. Control units`.
2. Scroll through the CU list until you find the CU that you want to connect to, or in the CLI, enter `L 1C60`. In our example, we use `1C60`.
3. Enter `c` next to the CU definition, and press Enter.
4. Changes the CU definition that you want (see Figure 13-4), and press Enter.

```
*----------------- Change Control Unit Definition ------------------*
|                                                                    |
|                                                                    |
| Specify or revise the following values.                            |
|                                                                    |
| Control unit number  . . . . 1C60  +                               |
|                                                                    |
| Control unit type  . . . . . OSC          +                        |
|                                                                    |
| Serial number  . . . . . . . __________  +                         |
| Description  . . . . . . . . ________________________________      |
|                                                                    |
| Connected to switches  . . . __ __ __ __ __ __ __ __  +            |
| Ports  . . . . . . . . . . . __ __ __ __ __ __ __ __  +            |
|                                                                    |
| Define more than eight ports . . 2   1.  Yes                       |
|                                      2.  No                        |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
*--------------------------------------------------------------------*
```

Figure 13-4 Control units: Change Control Unit Definition - OSC

HCD now shows the Select Processor / CU panel. This panel is where the connection is now made between the OSC CHPID (C6) and the CU (1C60).

5. Enter `c` next to the `Processor.CSS` that contains the partition that you want to have access to the CU and also has access to the CHPID you want to connect to the CU. Then, press Enter.

6. Update `Channel path IDs` to `C6` to define the Processor / CU connection (see Figure 13-5). CHPID C6 is the CHPID that we defined in the previous example. Press Enter.

```
                                 Select Processor / CU
*---------------------- Change Control Unit Definition -----------------------*
|                                                                              |
|                                                                              |
| Specify or revise the following values.                                      |
|                                                                              |
| Control unit number  . : 1C60        Type . . . . . . : OSC                  |
| Processor ID . . . . . : PAVO        Pavo                                    |
| Channel Subsystem ID . : 3                                                   |
|                                                                              |
| Channel path IDs . . . . C6    __    __    __    __    __    __    __    +   |
| Link address . . . . . . ____  ____  ____  ____  ____  ____  ____  ____  +   |
|                                                                              |
| Unit address . . . . . . 00    __    __    __    __    __    __    __    +   |
| Number of units  . . . . 254   ___   ___   ___   ___   ___   ___   ___       |
|                                                                              |
| Logical address  . . . . __  + (same as CUADD)                               |
|                                                                              |
| Protocol . . . . . . . . __  + (D, S, or S4)                                 |
| I/O concurrency level  . _   + (1, 2, or 3)                                  |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-5 Control units: Change Control Unit Definition detail - OSC

7. HCD now shows the Modify Device Parameters panel where you can override the Unit Address (UA) numbers. For most OSA definitions, the UA starts at `00`.
8. Update `UA New` to `00` to define the Modify Device Parameters (see Figure 13-6 on page 311), and press Enter.

```
*------------------------- Modify Device Parameters -------------------------*
|                                                  Row 1 of 1 More:        > |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                            |
| Specify or revise any changes to the device parameters in the list below.  |
| To view attached control units, scroll to the right.                       |
|                                                                            |
| Processor ID . . . . : PAVO        Pavo                                    |
| Channel Subsystem ID : 3                                                   |
|                                                                            |
| ---------Device---------     ---UA----                 Preferred Exposure  |
| No., Range Type          SS+ Old New + Time-Out STADET CHPID +   Device     |
| 0700,016   3270-X        _   10  00    No       No     __                  |
| **************************** Bottom of data ****************************  |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 13-6 Control units: Modify Device Parameters - OSC

HCD now returns to the Select Processor / CU panel showing the CHPID (C6) connection definition (see Figure 13-7).

```
                            Select Processor / CU   Row 10 of 18 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : 1C60     Control unit type . . . : OSC

             ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ PAVO.3     C6      _______ _______ _______ _______ _______ _______ _______
_ HYDRA.2    _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.0     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.1     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.2     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.4     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.5     _______ _______ _______ _______ _______ _______ _______ _______
```

Figure 13-7 Processors: Select Processor / CU: CHPID to Link address connection - OSC

9. By pressing F20 (Right), you can see the other parts of the definition summary.

13.2.3 Defining 3270-X devices to an OSCONFIG

The OSCONFIG name is the part of an IODF that determines what devices a z/OS system can access when it undergoes an IPL. Also, the partition that the z/OS system is restarted in also must be able to access the CHPIDs that connect to the CUs and devices that match in the OSCONFIG.

The OSCONFIG also contains Esoterics device groups, which are defined in Eligible Device Tables (EDTs) within an OSCONFIG. OSA definitions usually do not use Esoterics.

Here are considerations for adding devices to an OSCONFIG:

- Adding a device to an OSCONFIG does not necessarily mean that the z/OS system can access that device.
- In this example, we add the predefined OSC devices 0700 - 070F (3270-X).

To define 3270-X devices to an OSCONFIG, complete the following steps:

1. From the main HCD panel, select option `1.5. I/O Devices`.
2. Scroll through the I/O Device List until you find the device number that you want to add to the OSCONFIG, or in the CLI, enter `L 0700`. In our example, we use `0700`.
3. Enter `c` next to one or more device numbers, and press Enter.
4. HCD displays the Change Device Definition panel where you can modify the CU that the devices are attached to (see Figure 13-8). Press Enter.

```
*------------------------ Change Device Definition --------------------------*
|                                                                            |
|                                                                            |
| Specify or revise the following values.                                    |
|                                                                            |
| Device number  . . . . . . . : 0700  (0000 - FFFF)                         |
| Number of devices  . . . . . : 16                                          |
| Device type  . . . . . . . . : 3270-X                                      |
|                                                                            |
| Serial number  . . . . . . . . __________  +                               |
| Description  . . . . . . . . . ________________________________            |
|                                                                            |
| Volume serial number . . . . . ______  + (for DASD)                        |
|                                                                            |
| PPRC usage . . . . . . . . . . _  + (for DASD)                             |
|                                                                            |
| Connected to CUs . 1C60  ____  ____  ____  ____  ____  ____  ____  +       |
|                                                                            |
| ENTER to continue.                                                         |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 13-8 I/O Devices: Change Device Definition - OSC

5. HCD now displays the Device / Processor Definition panel where you may modify some of the device parameters relating to Subchannel Set (SS), UA, and the Explicit Device Candidate List (Figure 13-9).

```
*---------------------- Device / Processor Definition ------------------------*
|                                                              Row 10 of 10 |
| Command ===> __________________________________________ Scroll ===> CSR   |
|                                                                           |
| Select processors to change device/processor definitions, then press      |
| Enter.                                                                    |
|                                                                           |
| Device number  . . : 0700       Number of devices  . : 16                 |
| Device type  . . . : 3270-X                                               |
|                                                                           |
|                                           Preferred  Device Candidate List |
| / Proc.CSSID  SS+  UA+  Time-Out  STADET  CHPID +    Explicit        Null |
| _ PAVO.3      0    00   No        No      __         No              ___  |
| ***************************** Bottom of data **************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*-----------------------------------------------------------------------------*
```

Figure 13-9 I/O Devices: Device / Processor Definition continued - OSC

6. In the HCD panel, we define devices to the OSCONFIG. Scroll through the list of OSCONFIG definitions until you find the OSCONFIG that you want to add to the devices to, or in the CLI, enter `L ITSOTEST`. In our example, we use `ITSOTEST`.
7. Enter `s` next to the OSCONFIG, and press Enter.

   HCD displays the device parameters and features that are applicable to that device type. In our example, we add 3270-X devices to `ITSOTEST`.

8. Make the following updates to define the Device Parameter (see Figure 13-10), and press Enter:
   - Update `OFFLINE` to `No` (if you want these devices to be online during IPL time).
   - Update `DYNAMIC` to `Yes` (if you want the device to be dynamically changeable).
   - Update `LOCANY` to `Yes` (if the device UCB can be in 31-bit storage).
   - Update `DOCHAR` to `Yes` (if you want to use the US character set).

```
*-------------------- Define Device Parameters / Features ---------------------*
|                                                                   Row 1 of 22 |
| Command ===> ___________________________________________ Scroll ===> CSR     |
|                                                                               |
| Specify or revise the values below.                                           |
|                                                                               |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16                  |
| Device number  . . : 0700         Number of devices  : 16                     |
| Device type  . . . : 3270-X                                                   |
|                                                                               |
| Parameter/                                                                    |
| Feature    Value +          R Description                                     |
| OFFLINE    No                 Device considered online or offline at IPL      |
| DYNAMIC    Yes                Device has been defined to be dynamic           |
| LOCANY     Yes                UCB can reside in 31-bit storage                |
| ASCACHAR   No                 ASCII A Character Generator                     |
| ASCBCHAR   No                 ASCII B Character Generator                     |
| DOCHAR     Yes                United States English Character Generator       |
| FRCHAR     No                 French Character Generator                      |
| GRCHAR     No                 German Character Generator                      |
| KACHAR     No                 Katakana Character Generator                    |
| UKCHAR     No                 United Kingdom English Character Generator      |
| AUDALRM    No                 Audible Alarm                                   |
*-------------------------------------------------------------------------------*
```

Figure 13-10 I/O Devices: Define Device Parameters / Features - OSC

9. The Assign/Unassign Device to Esoteric panel opens. You can specify which Esoteric (if any) that you want the devices to be added to. Press Enter (see Figure 13-11 on page 315).

   In this example, we add only the OSC/3270-X devices to the OSCONFIG `ITSOTEST` and not to any Esoterics in this example.

```
*----------- Define Device to Operating System Configuration -----------*
|                                                            Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                        |
| Select OSs to connect or disconnect devices, then press Enter.        |
|                                                                        |
| Device number  . : 0700          Number of devices  : 16              |
| Device type  . . : 3270-X                                             |
|                                                                        |
| Subchannel Sets used in processor configurations  : 0                 |
|                                                                        |
| / Config. ID   Type     SS Description                     Defined    |
| _ ITSO         MVS         All ITSO devices                            |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16       Yes        |
| _ ZOSMAINT     MVS         z/OS Central Mgmt Image                     |
| _ ZOS24BAS     MVS         z/OS 2.4 ServerPac with P1D SSs             |
| _ ZOS24MLZ     MVS         z/OS 2.4 MLZ - clone of p1c                 |
| _ ZOS24MPL     MVS         z/OS 2.4 demo clone of p1g                  |
| _ ZOS24P0B     MVS         z/OS 2.4 Clone of ZOS22BAS                  |
| _ ZOS24P0C     MVS         z/OS 2.4 ServerPac with P1D SSs             |
| _ ZOS24P0D     MVS         z/OS 2.4 Clone of ZOS22P0B                  |
| _ ZOS25BAA     MVS         z/OS 2.5 based from ZOSMAINT                |
| _ ZOS25BAS     MVS         z/OS 2.5 base system                        |
*------------------------------------------------------------------------*
```

Figure 13-11 I/O Devices: Define Device to Operating System Configuration - OSC

10. The final panel opens and shows that the devices are defined to the OSCONFIG. Press Enter to return to the I/O Device List.

13.2.4 Defining 3270-X devices to the Nucleus Initialization Program Console List within an OSCONFIG

The Nucleus Initialization Program Console List determines the device addresses that are eligible to receive Nucleus Initialization Program or IPL messages in the early startup stages of when z/OS is started.

The devices must first be defined to an OSCONFIG so that they can be added to a Nucleus Initialization Program Console List within an OSCONFIG.

The Nucleus Initialization Program Console List also determines which console receives the Nucleus Initialization Program/IPL messages first. If that console is unavailable, then the Nucleus Initialization Program tries the next device in the list until all devices in the list are tried.

If the Nucleus Initialization Program cannot write IPL messages to any 3270-X device in the list, then the messages are written to the Hardware Management Console (HMC) Operating System Messages panel.

To view these messages, complete the following steps:

1. Select the logical partition (LPAR) for IPL on the HMC.
2. Click the **>>** breakout symbol next to the LPAR name.
3. Select **Daily** → **Operating System Messages**, as shown in Figure 13-12.

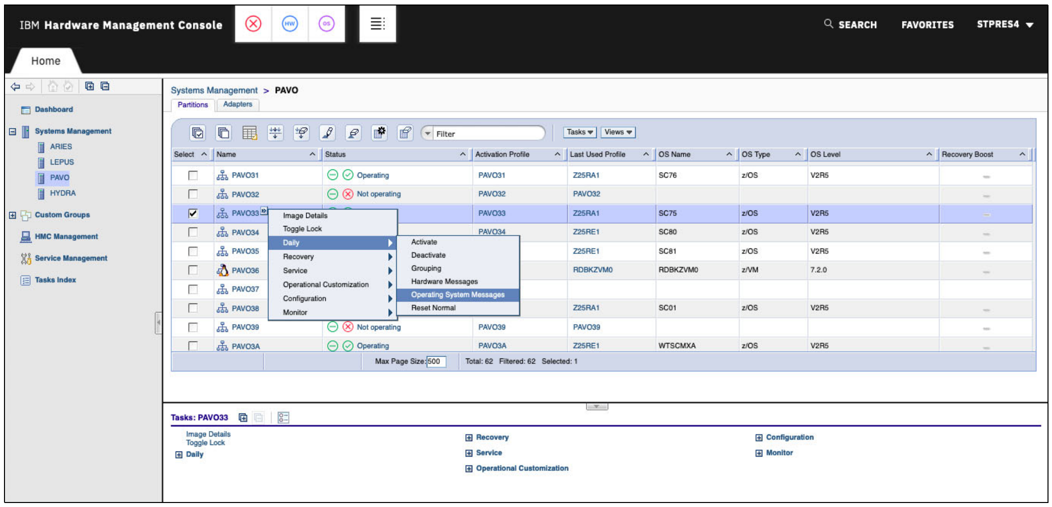

Figure 13-12 Operating System Messages

Commands and displays can be entered into the Command field (see Figure 13-13).

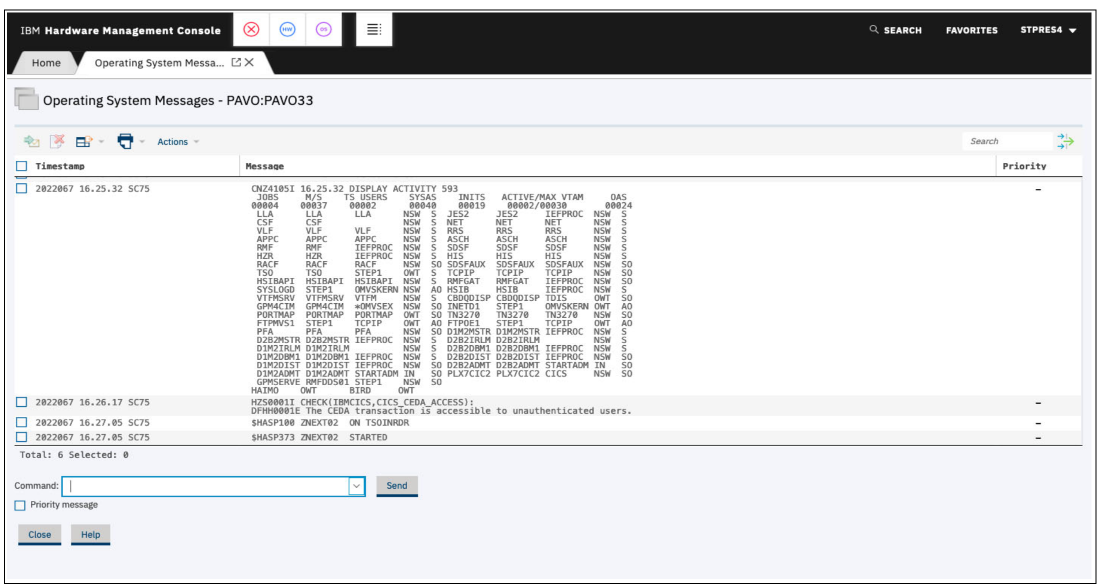

Figure 13-13 Operating System Messages command interface

Here are considerations for adding devices to a Nucleus Initialization Program Console List within an OSCONFIG:

- Adding a device to a Nucleus Initialization Program Console List within an OSCONFIG does not necessarily mean that the Nucleus Initialization Program may write IPL messages to that device.
- The devices that are defined in the Nucleus Initialization Program Console List also need CU and CHPID access to the partition where z/OS is being started.

- On the HMC under OSA Advanced Facilities, the OSC (Open Systems Adapter Integrated Console Controller (ICC) (OSA-ICC) console Server and Session definitions must be defined and activated.
- A valid 3270-X session (that uses IBM PCOM or an equivalent 3270 emulator) must also be connected to the OSA-ICC Session. This configuration enables a valid session to be established to the OSA-ICC for Nucleus Initialization Program messages to be delivered to that device.
- In this example, we add the predefined OSC devices 0700-0701 (3270-X).

To define 3270-X devices to the Nucleus Initialization Program within an OSCONFIG, complete the following steps:

1. From the main HCD panel, select option `1.1. Operating system configurations` to display the Operating System Configuration List.
2. Scroll through the list of OSCONFIG definitions until you find the OSCONFIG that you want to add to the 3270-X devices to the Nucleus Initialization Program Console List, or in the CLI, enter `L ITSOTEST`. In our example, we use `ITSOTEST`.
3. Enter `n` next to the OSCONFIG, and press Enter.

   HCD displays the defined devices in the Nucleus Initialization Program Console List (see Figure 13-14).

```
*--------------------------- NIP Console List ----------------------------*
|   Goto  Backup  Query  Help                                             |
| ----------------------------------------------------------------------  |
|                                                                         |
| Command ===> _______________________________________ Scroll ===> CSR    |
|                                                                         |
| Select one or more consoles, then press Enter. To add, use F11.         |
|                                                                         |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16            |
|                                                                         |
|   Order   Device                                                        |
| / Number  Number  Device Type                                           |
| *************************** Bottom of data **************************** |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
*-------------------------------------------------------------------------*
```

Figure 13-14 OCSONFIGs: NIP Console List

In our example, there are no devices that are defined in the Nucleus Initialization Program Console List.

4. In the CLI, enter `add` (see Figure 13-15) to add a 3270-X device to the Nucleus Initialization Program Console List.
5. Update `Device number of console` to `0700`, and press Enter.

```
*--------------------------- NIP Console List ----------------------------*
|   Goto  Backup  Query  Help                                             |
| ---------------------------------------------------------------------   |
|                                                                         |
| Command ===> _______________________________________ Scroll ===> CSR    |
|                                                                         |
| Select one or more consoles, then press Enter. To add, use F11.         |
|                                                                         |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16            |
|                   *-------------- Add NIP Console ---------------*      |
|   Order   Device  |                                              |      |
| / Number  Number  |                                              |      |
| **************** | Specify the following values.                | ***** |
|                   |                                              |      |
|                   | Device number of console . . . . . . 0700    |      |
|                   |                                              |      |
|                   | Order number . . . . . . . . . . . . 1       |      |
|                   |                                              |      |
|                   |                                              |      |
|                   |                                              |      |
|                   *----------------------------------------------*      |
|                                                                         |
|                                                                         |
*-------------------------------------------------------------------------*
```

Figure 13-15 OSCONFIGs: Add NIP Console

Because this device entry is the first one in the list, the order is 1 (see Figure 13-16 on page 319).

```
*--------------------------- NIP Console List ----------------------------*
|   Goto  Backup  Query  Help                                              |
| ---------------------------------------------------------------------   |
|                                                              Row 1 of 1 |
| Command ===> _______________________________________ Scroll ===> CSR    |
|                                                                         |
| Select one or more consoles, then press Enter. To add, use F11.         |
|                                                                         |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16            |
|                                                                         |
|   Order   Device                                                        |
| / Number  Number  Device Type                                           |
| _   1     0700    3270-X                                                |
| ************************** Bottom of data *************************** |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
*-------------------------------------------------------------------------*
```

Figure 13-16   OCSONFIGs: NIP Console added

6. Add device 0701 to the Nucleus Initialization Program Console List (see Figure 13-17).

```
*--------------------------- NIP Console List ----------------------------*
|   Goto  Backup  Query  Help                                              |
| ---------------------------------------------------------------------   |
|                                                              Row 1 of 2 |
| Command ===> _______________________________________ Scroll ===> CSR    |
|                                                                         |
| Select one or more consoles, then press Enter. To add, use F11.         |
|                                                                         |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16            |
|                                                                         |
|   Order   Device                                                        |
| / Number  Number  Device Type                                           |
| _   1     0701    3270-X                                                |
| _   2     0700    3270-X                                                |
| ************************** Bottom of data *************************** |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
|                                                                         |
*-------------------------------------------------------------------------*
```

Figure 13-17   OCSONFIGs: Extra NIP Console added

13.2.5 Defining OSD CHPIDs

When defining an OSD connection, first you must determine which type of OSA-Express feature that you need for your configuration:

- Fiber optical cable-based features:
  - OSA-Express7S 1.2 GbE SX or LX
  - OSA-Express7S 1.2 10 GbE SR or LR
  - OSA-Express7S 1.2 25 GbE SR or LR
  - OSA-Express7S 10 GbE SR or LR[1]
  - OSA-Express7S GbE SX or LX[1]
  - OSA-Express7S 25 GbE SR[1]
  - OSA-Express6S GbE SX or LX
  - OSA-Express6S 10 GbE SR or LR
- Copper wire-based (unshielded twisted pair) feature:
  - OSA-Express7S 1.2 1000Base-T
  - OSA-Express7S 1000Base-T[1]
  - OSA-Express6S 1000Base-T

Here are the considerations for a new OSD CHPID:

- CHPID.
- CHID.
- Channel path type.
- Operational mode.
- Description.
- Partition access list.
- For performance and redundancy, determine how many I/O cards of that feature are installed in the processor and to what PCIe ports on what CPC drawer do the I/O cards connect to. (For a list of installed hardware, see the PCHID/CHID report.)

To define an OSD CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the CSS ID that you want to add a CHPID to, and press Enter.
4. In the CLI, enter `add` (see Figure 13-18 on page 321) to add a CHPID.
5. Make the following updates, and press Enter:
   - Update `Channel path ID` to `E1`.
   - Update `Channel ID` to `128`.
   - Update `Channel path type` to `OSD`.
   - Update `Operational mode` to `SHR`.
   - Update `Description` to the description that you want.

[1] OSA Express7S features are not supported on the IBM z16 A02 and IBM z16 AGZ.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                           |
| Channel path ID  . . . . E1    +           Channel ID  128  +             |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . OSD   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +      |
| Description  . . . . . . FC#0445 OSA Express7s 10GbE SR__                 |
|                                                                           |
| Specify the following values only if connected to a switch:               |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 13-18 Processors: Add Channel Path - OSD

6. HCD now prompts you to specify `Will greater than 160 TCP/IP stacks be required for this channel?` The default is `No`, which we use for our example (see Figure 13-19). Press Enter.

```
*----------- Allow for more than 160 TCP/IP stacks -----------*
|                                                             |
|                                                             |
| Specify Yes to allow more than 160 TCP/IP stacks,           |
| otherwise specify No. Specifying Yes will cause priority    |
| queuing to be disabled.                                     |
|                                                             |
| Will greater than 160 TCP/IP stacks                         |
| be required for this channel?  . . . No                     |
|                                                             |
|                                                             |
*-------------------------------------------------------------*
```

Figure 13-19 Processors: Allow for more than 160 TCP/IP stacks - OSD

7. Next, HCD now prompts you to add or modify any physical network IDs. We do not use any physical network ID definitions for the OSD definition in this example.

8. Leave the default option for Physical Network IDs as blank fields (see Figure 13-20), and press Enter.

```
*--------------------- Add/Modify Physical Network IDs ---------------------*
|                                                                           |
|                                                                           |
| If the Channel ID (CHID) is associated to one or more physical networks,  |
| specify each physical network ID corresponding to each applicable         |
| physical port.                                                            |
|                                                                           |
| Physical network ID 1  . . ________________                               |
| Physical network ID 2  . . ________________                               |
| Physical network ID 3  . . ________________                               |
| Physical network ID 4  . . ________________                               |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 13-20 Processors: Add/Modify Physical Network IDs - OSD

9. HCD prompts you to select which partition the CHPID should have access to. Enter a forward slash (/) next to the partition that you want (see Figure 13-21), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                              Row 1 of 6 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the access list.           |
|                                                                           |
| Channel subsystem ID : 3                                                  |
| Channel path ID  . . : E1     Channel path type  . : OSD                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| / 3      PAV031           1      OS                                       |
| / 3      PAV032           2      OS                                       |
| / 3      PAV033           3      OS    PAV033 test OS partition          |
| / 3      PAV034           4      OS                                       |
| / 3      PAV035           5      OS                                       |
| / 3      PAV036           6      OS                                       |
| / 3      PAV037           7      OS                                       |
| / 3      PAV038           8      OS                                       |
| / 3      PAV039           9      OS                                       |
| *************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+
```

Figure 13-21 Processors: Define Access List - OSD

Because we select all partitions to the access list, we do not see the Define Candidate List panel, even though we defined the CHPID as `SHR`.

The HCD now returns to the Channel Path List panel and shows you the CHPID that was defined (see Figure 13-22).

```
                              Channel Path List      Row 1 of 4 More:      >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
```

Figure 13-22 Processors: Channel Path List - OSD

13.2.6 Defining OSD CHPID connections to an OSA control unit

The only way to define an OSA connection to its CU is direct connect.

You might want to connect the OSA CU definition to multiple CPCs even though the physical OSA is still unique to any one CPC. Also, you might want to span the OSA over multiple CSSs within a CPC.

Here are considerations for connecting an OSD CHPID to an OSA CU and its OSA/OSAD devices:

- Determine how many OSAs are required to provide a primary and secondary/backup network connection.
- The example connects to a predefined OSA CU (1E10), OSA devices 1E10 - 1E1E, and OSAD device 1E1F.

To define OSD CHPID connections to an OSA CU, complete the following steps:

1. From the main HCD panel, select option `1.4. Control units`.
2. Scroll through the CU list until you find the CU that you want to connect to, or in the CLI, enter `L 1E10`. In our example, we use `1E10`.
3. Enter `c` next to the CU definition, and press Enter.

4. Change the CU definition as you want (see Figure 13-23), and press Enter.

```
*----------------- Change Control Unit Definition ------------------*
|                                                                    |
|                                                                    |
| Specify or revise the following values.                            |
|                                                                    |
| Control unit number  . . . . 1E10  +                               |
|                                                                    |
| Control unit type  . . . . . OSA           +                       |
|                                                                    |
| Serial number  . . . . . . . __________  +                         |
| Description  . . . . . . . . 10G Fiber - PAVO                      |
|                                                                    |
| Connected to switches  . . . __ __ __ __ __ __ __ __  +            |
| Ports  . . . . . . . . . . . __ __ __ __ __ __ __ __  +            |
|                                                                    |
| Define more than eight ports . . 2   1.  Yes                       |
|                                      2.  No                        |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
*--------------------------------------------------------------------*
```

Figure 13-23 Control units: Change Control Unit Definition - OSD

HCD now shows the Select Processor / CU panel, where the connection is now made between the OSD CHPID (E1) and the CU (1E10).

5. Enter `c` next to the `Processor.CSS` that contains the partition that you want to access the CU and also access the CHPID that you want to connect to the control unit. Press Enter.

6. Update `Channel path IDs` to `E1` to define the Processor / CU connection (see Figure 13-24). CHPID E1 is the CHPID that we defined in the previous example. Press Enter.

```
                              Select Processor / CU
*---------------------- Change Control Unit Definition -----------------------*
|                                                                             |
|                                                                             |
| Specify or revise the following values.                                     |
|                                                                             |
| Control unit number  . : 1E10        Type . . . . . . : OSA                 |
| Processor ID . . . . . : PAVO        Pavo                                   |
| Channel Subsystem ID . : 3                                                  |
|                                                                             |
| Channel path IDs . . . . E1    __    __    __    __    __    __    __     + |
| Link address . . . . . . ____  ____  ____  ____  ____  ____  ____  ____   + |
|                                                                             |
| Unit address . . . . . . 00    __    __    __    __    __    __    __     + |
| Number of units  . . . . 255   ___   ___   ___   ___   ___   ___   ___      |
|                                                                             |
| Logical address  . . . . __  + (same as CUADD)                              |
|                                                                             |
| Protocol . . . . . . . . __  + (D, S, or S4)                                |
| I/O concurrency level  . _   + (1, 2, or 3)                                 |
|                                                                             |
|                                                                             |
|                                                                             |
*---------------------- Change Control Unit Definition -----------------------*
```

Figure 13-24 Control units: Change Control Unit Definition detail - OSD

7. HCD now shows the Modify Device Parameters panel where you may override the UA numbers. For most OSA definitions, the UA starts at `00`.

8. Make the following updates to define the Modify Device Parameters (see Figure 13-25), and press Enter:
   - Update `UA New` to `00` for the OSA device type.
   - Update `UA New` to `FE` for the OSAD device type.

```
*------------------------- Modify Device Parameters -------------------------*
|                                                   Row 1 of 2 More:       > |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                            |
| Specify or revise any changes to the device parameters in the list below. |
| To view attached control units, scroll to the right.                       |
|                                                                            |
| Processor ID . . . . : PAVO         Pavo                                   |
| Channel Subsystem ID : 3                                                   |
|                                                                            |
| ---------Device---------     ---UA----                Preferred Exposure   |
| No., Range Type          SS+ Old New + Time-Out STADET CHPID +   Device     |
| 1E10,015   OSA           _   00  00    No       No     __                  |
| 1E1F,001   OSAD          _   FE  FE    No       No     __                  |
| ***************************** Bottom of data ***************************** |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 13-25 Control units: Modify Device Parameters - OSD

HCD now returns to the Select Processor / CU panel, which shows the CHPID (E1) connection definition (see Figure 13-26).

```
-----------------------------Select Processor / CU   Row 15 of 18 More:       >
 Command ===> _______________________________________________ Scroll ===> CSR

 Select processors to change CU/processor parameters, then press Enter.

 Control unit number . . : 1E10     Control unit type . . . : OSA

              ---------------Channel Path ID . Link Address + ---------------
 / Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
 _ PAVO.3     E1      _______ _______ _______ _______ _______ _______ _______
 _ PAVO.4     _______ _______ _______ _______ _______ _______ _______ _______
 _ PAVO.5     _______ _______ _______ _______ _______ _______ _______ _______
 ****************************** Bottom of data *******************************
```

Figure 13-26 Processors: Select Processor / CU: CHPID to Link address connection - OSD

Press F20 (Right) to see the other parts of the definition summary.

13.2.7 Defining OSA and OSAD devices to an OSCONFIG

The OSCONFIG name is the part of an IODF that determines what devices a z/OS system may access when it undergoes an IPL. Also, the partition that the z/OS system is started in also must have access to the CHPIDs that connect to the CUs and devices that match in the OSCONFIG.

The OSCONFIG also contains Esoterics device groups, which are defined in EDTs within an OSCONFIG. OSA definitions usually do not use Esoterics.

Here are considerations for adding devices to an OSCONFIG:

- Adding a device to an OSCONFIG does not necessarily mean that the z/OS system has access to that device.
- In this example, we add the predefined OSA devices 1E10 - 1E1F (OSA/OSAD).

To define OSA and OSAD devices to an OSCONFIG, complete the following steps:

1. From the main HCD panel, select option `1.5. I/O Devices`.
2. Scroll through the I/O Device List until you find the device number that you want to add to the OSCONFIG, or in the CLI, enter `L 1E10`. In our example, we use `1E10`.

   Because OSA and OSAD are two different device types, they must be added separately to the OSCONFIG.
3. Enter `c` next to one or more device numbers, and press Enter.

4. HCD displays the Change Device Definition panel, where you may modify the CU that the devices are attached to (see Figure 13-27). Press Enter.

```
*------------------------- Change Device Definition --------------------------*
|                                                                              |
|                                                                              |
| Specify or revise the following values.                                      |
|                                                                              |
| Device number  . . . . . . . : 1E10  (0000 - FFFF)                           |
| Number of devices  . . . . . : 15                                            |
| Device type  . . . . . . . . : OSA                                           |
|                                                                              |
| Serial number  . . . . . . . . __________  +                                 |
| Description  . . . . . . . . . ________________________________              |
|                                                                              |
| Volume serial number . . . . . ______  + (for DASD)                          |
|                                                                              |
| PPRC usage . . . . . . . . . . _  + (for DASD)                               |
|                                                                              |
| Connected to CUs . 1E10  ____  ____  ____  ____  ____  ____  ____  +         |
|                                                                              |
| ENTER to continue.                                                           |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-27 I/O Devices: Change Device Definition - OSD

5. HCD now displays the Device / Processor Definition panel, where you may modify some of the Device parameters relating to SS, UA, and the Explicit Device Candidate List. Type `c` next to the `Proc.CCSID` item if you want to modify any of these parameters (see Figure 13-28 on page 329), or press Enter to accept the defaults.

```
*---------------------- Device / Processor Definition -----------------------*
|                                                                  Row 1 of 1 |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                             |
| Select processors to change device/processor definitions, then press       |
| Enter.                                                                      |
|                                                                             |
| Device number  . . : 1E10       Number of devices  . : 15                  |
| Device type  . . . : OSA                                                    |
|                                                                             |
|                                           Preferred  Device Candidate List |
| / Proc.CSSID  SS+  UA+  Time-Out  STADET  CHPID +    Explicit        Null  |
| _ PAVO.3      0    00   No        No      __         No              ___   |
| **************************** Bottom of data ***************************** |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
*-----------------------------------------------------------------------------*
```

Figure 13-28 I/O Devices: Device / Processor Definition continued - OSD

6. The HCD panel opens, where we define devices to the OSCONFIG. Scroll through the list of OSCONFIG definitions until you find the OSCONFIG that you want to add the devices to, or in the CLI, enter `L ITSOTEST`. In our example, we use `ITSOTEST`.
7. Enter `s` next to the OSCONFIG, and press Enter.

   HCD displays the device parameters and features that are applicable to that device type. In our example, we add OSA devices to `ITSOTEST`.

8. Make the following updates to define the device parameter (see Figure 13-29), and press Enter:
   - Update `OFFLINE` to `No` (if you want these devices to be online during IPL time).
   - Update `DYNAMIC` to `Yes` (if you want the device to be changeable dynamically).
   - Update `LOCANY` to `Yes` (if the device UCB can be in 31-bit storage).

```
*-------------------- Define Device Parameters / Features --------------------*
|                                                                   Row 1 of 3 |
| Command ===> ___________________________________________ Scroll ===> CSR     |
|                                                                              |
| Specify or revise the values below.                                          |
|                                                                              |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16                 |
| Device number  . . : 1E10         Number of devices  : 15                    |
| Device type  . . . : OSA                                                     |
|                                                                              |
| Parameter/                                                                   |
| Feature    Value +          R Description                                    |
| OFFLINE    No                 Device considered online or offline at IPL     |
| DYNAMIC    Yes                Device has been defined to be dynamic          |
| LOCANY     Yes                UCB can reside in 31-bit storage               |
| **************************** Bottom of data ****************************** |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-29 I/O Devices: Define Device Parameters / Features - OSD

9. The Assign/Unassign Device to Esoteric panel opens, where you can specify which Esoteric (if any) that you want the devices to be added to. We add only the OSA/OSAD devices to the OSCONFIG `ITSOTEST` and not to any Esoterics in this example. Press Enter (see Figure 13-30 on page 331).

```
*----------- Define Device to Operating System Configuration -----------*
|                                                          Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                       |
| Select OSs to connect or disconnect devices, then press Enter.        |
|                                                                       |
| Device number  . : 1E10          Number of devices  : 15              |
| Device type  . . : OSA                                                |
|                                                                       |
| Subchannel Sets used in processor configurations  : 0                 |
|                                                                       |
| / Config. ID   Type     SS Description                    Defined    |
| _ ITSO         MVS      0  All ITSO devices               Yes        |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16      Yes        |
| _ ZOSMAINT     MVS      0  z/OS Central Mgmt Image        Yes        |
| _ ZOS24BAS     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes      |
| _ ZOS24MLZ     MVS      0  z/OS 2.4 MLZ - clone of p1c    Yes        |
| _ ZOS24MPL     MVS      0  z/OS 2.4 demo clone of p1g     Yes        |
| _ ZOS24P0B     MVS      0  z/OS 2.4 Clone of ZOS22BAS     Yes        |
| _ ZOS24P0C     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes      |
| _ ZOS24P0D     MVS      0  z/OS 2.4 Clone of ZOS22P0B     Yes        |
| _ ZOS25BAA     MVS      0  z/OS 2.5 based from ZOSMAINT   Yes        |
| _ ZOS25BAS     MVS      0  z/OS 2.5 base system          Yes        |
*-----------------------------------------------------------------------*
```

Figure 13-30 I/O Devices: Define Device to Operating System Configuration - OSD

10.The final panel opens and shows that the devices are defined to the OSCONFIG. Press Enter to return to the I/O Device List.

11. Perform the same action of adding OSAD device 1E1F to OSCONFIG ITSOTEST. Press Enter (see Figure 13-31).

```
*----------- Define Device to Operating System Configuration -----------*
|                                                            Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                        |
| Select OSs to connect or disconnect devices, then press Enter.        |
|                                                                        |
| Device number  . : 1E1F          Number of devices  : 1               |
| Device type  . . : OSAD                                               |
|                                                                        |
| Subchannel Sets used in processor configurations  : 0                 |
|                                                                        |
| / Config. ID   Type     SS Description                     Defined    |
| _ ITSO         MVS      0  All ITSO devices                Yes        |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16      Yes        |
| _ ZOSMAINT     MVS      0  z/OS Central Mgmt Image         Yes        |
| _ ZOS24BAS     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes       |
| _ ZOS24MLZ     MVS      0  z/OS 2.4 MLZ - clone of p1c     Yes        |
| _ ZOS24MPL     MVS      0  z/OS 2.4 demo clone of p1g      Yes        |
| _ ZOS24P0B     MVS      0  z/OS 2.4 Clone of ZOS22BAS      Yes        |
| _ ZOS24P0C     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes       |
| _ ZOS24P0D     MVS      0  z/OS 2.4 Clone of ZOS22P0B      Yes        |
| _ ZOS25BAA     MVS      0  z/OS 2.5 based from ZOSMAINT    Yes        |
| _ ZOS25BAS     MVS      0  z/OS 2.5 base system           Yes        |
*------------------------------------------------------------------------*
```

Figure 13-31 I/O Devices: Define Device to Operating System Configuration continued - OSD

13.2.8 Defining OSE CHPIDs

When defining an OSE connection, first you must determine that one of the following copper wire-based (unshielded twisted pair) features is available:

- OSA-Express7S 1.2 1000Base-T
- OSA-Express7S 1000Base-T[2]
- OSA-Express6S 1000Base-T

Statements of Direction[a]:

- IBM z16 will be the last IBM Z to support the OSE CHPID type.
- IBM z16 will be the last IBM Z to support OSA Express 1000Base-T hardware adapters.

a. Statements by IBM regarding its plans, directions, and intent are subject to change or withdrawal without notice at the sole discretion of IBM.

[2] OSA Express7S features are not supported on IBM z16 A02 and IBM z16 AGZ.

Here are the considerations for a new OSE CHPID:

- CHPID.
- CHID.
- Channel path type.
- Operational mode.
- Description.
- Partition access list.
- For performance and redundancy, determine how many I/O cards of that feature are installed in the processor and to what PCIe ports on what CPC drawer do the I/O cards connect to. (For a list of installed hardware, see the PCHID/CHID report.)

To define an OSE CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the CSS ID that you want to add a CHPID to, and press Enter.
4. In the CLI, enter `add` (see Figure 13-32) to add a CHPID.
5. Make the following updates and press Enter:
   - Update `Channel path ID` to `C3`.
   - Update `Channel ID` to `1BC`.
   - Update `Channel path type` to `OSE`.
   - Update `Operational mode` to `SHR`.
   - Update `Description` to the description that you want.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                           |
| Channel path ID  . . . . C3    +           Channel ID  1BC  +             |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . OSE   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +      |
| Description  . . . . . . FC#0446 OSA Express7S 1000Base-T                 |
|                                                                           |
| Specify the following values only if connected to a switch:              |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 13-32 Processors: Add Channel Path - OSE

6. HCD now prompts you to select which partition that the CHPID should have access to. Enter a forward slash (/) next to the partition that you want (see Figure 13-33), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                                Row 1 of 6 |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the access list.          |
|                                                                           |
| Channel subsystem ID : 3                                                  |
| Channel path ID  . . : C3     Channel path type  . : OSE                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                       |
| _ 3      PAV031           1      OS                                       |
| _ 3      PAV032           2      OS                                       |
| / 3      PAV033           3      OS    PAV033 test OS partition          |
| _ 3      PAV034           4      OS                                       |
| _ 3      PAV035           5      OS                                       |
| _ 3      PAV036           6      OS                                       |
| _ 3      PAV037           7      OS                                       |
| _ 3      PAV038           8      OS                                       |
| _ 3      PAV039           9      OS                                       |
| *************************** Bottom of data ****************************** |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+
```

Figure 13-33 Processors: Define Access List - OSE

7. Because we have more that one partition that is defined in this CSS, HCD prompts us to define any Candidate list access. In our example, we do not define any Candidate list access (see Figure 13-34 on page 335). Press Enter.

```
*-------------------------- Define Candidate List --------------------------*
|                                                                Row 1 of 5 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the candidate list.        |
|                                                                           |
| Channel subsystem ID : 3                                                  |
| Channel path ID  . . : C3     Channel path type  . : OSE                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| _ 3      PAV034           4      OS                                       |
| _ 3      PAV035           5      OS                                       |
| _ 3      PAV036           6      OS                                       |
| _ 3      PAV037           7      OS                                       |
| _ 3      PAV038           8      OS                                       |
| _ 3      PAV039           9      OS                                       |
| **************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 13-34 Processors: Define Access List - OSE

The HCD returns to the Channel Path List panel and shows you the CHPID that was defined (see Figure 13-35).

```
                              Channel Path List       Row 1 of 5 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+             Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
****************************** Bottom of data *******************************
```

Figure 13-35 Processors: Channel Path List - OSE

13.2.9 Defining OSE CHPID connections to an OSA control unit

The only way to define an OSA connection to its CU is direct connect.

You might want to connect the OSA CU definition to multiple CPCs even though the physical OSA is still unique to any one CPC. Also, you might want to span the OSA over multiple CSSs within a CPC.

Here are considerations for connecting an OSE CHPID to an OSA CU and its OSA/OSAD devices:

- Determine how many OSAs are required to provide a primary and secondary/backup network connection.
- This example connects to a predefined OSA CU (1C30), OSA devices 1C30 - 1C3E, and OSAD device 1C3F.

To define OSE CHPID connections to an OSA CU, complete the following steps:

1. From the main HCD panel, select option `1.4. Control units`.
2. Scroll through the CU list until you find the CU that you want to connect to, or in the CLI, enter `L 1C30`. In our example, we use `1C30`.
3. Enter `c` next to the CU definition, and press Enter.
4. Change the CU definition that you want as needed (see Figure 13-36), and press Enter.

```
*----------------- Change Control Unit Definition ------------------*
|                                                                    |
|                                                                    |
| Specify or revise the following values.                            |
|                                                                    |
| Control unit number  . . . . 1C30  +                               |
|                                                                    |
| Control unit type  . . . . . OSA           +                       |
|                                                                    |
| Serial number  . . . . . . . __________  +                         |
| Description  . . . . . . . . 1KBT Copper - PAVO                    |
|                                                                    |
| Connected to switches  . . . __ __ __ __ __ __ __ __  +            |
| Ports  . . . . . . . . . . . __ __ __ __ __ __ __ __  +            |
|                                                                    |
| Define more than eight ports . . 2   1.  Yes                       |
|                                      2.  No                        |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
*--------------------------------------------------------------------*
```

Figure 13-36 Control units: Change Control Unit Definition - OSE

5. HCD now shows the Select Processor / CU panel, which is where the connection is now made between the OSE CHPID (C3) and the CU (1C30). Enter `c` next to the `Processor.CSS` that contains the partition that you want to access the CU and also access the CHPID that you want to connect to the CU. Press Enter.

6. Update `Channel path IDs` to `C3` to define the Processor / CU connection (see Figure 13-37). CHPID C3 is the CHPID that we defined in the previous example. Press Enter.

```
                          Select Processor / CU
*---------------------- Change Control Unit Definition -----------------------*
|                                                                              |
|                                                                              |
| Specify or revise the following values.                                      |
|                                                                              |
| Control unit number  . : 1C30        Type . . . . . . : OSA                  |
| Processor ID . . . . . : PAVO        Pavo                                    |
| Channel Subsystem ID . : 3                                                   |
|                                                                              |
| Channel path IDs . . . . C3    __    __    __    __    __    __    __    +   |
| Link address . . . . . . ____  ____  ____  ____  ____  ____  ____  ____  +   |
|                                                                              |
| Unit address . . . . . . 00    __    __    __    __    __    __    __    +   |
| Number of units  . . . . 255   ___   ___   ___   ___   ___   ___   ___       |
|                                                                              |
| Logical address  . . . . __  + (same as CUADD)                               |
|                                                                              |
| Protocol . . . . . . . . __  + (D, S, or S4)                                 |
| I/O concurrency level  . _   + (1, 2, or 3)                                  |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-37 Control units: Change Control Unit Definition detail - OSE

7. HCD now shows the Modify Device Parameters panel, where you may override the UA numbers. For OSA definitions, the UA usually starts at `00`.

8. Make the following updates to define the Modify Device Parameters (see Figure 13-38), and press Enter:
   - Update `UA New` to `00` for the OSA device type.
   - Update `UA New` to `FE` for the OSAD device type.

```
*------------------------- Modify Device Parameters -------------------------*
|                                                    Row 1 of 2 More:      > |
| Command ===> __________________________________________ Scroll ===> CSR    |
|                                                                             |
| Specify or revise any changes to the device parameters in the list below. |
| To view attached control units, scroll to the right.                       |
|                                                                             |
| Processor ID . . . . : PAVO        Pavo                                    |
| Channel Subsystem ID : 3                                                   |
|                                                                             |
| ---------Device---------     ---UA----                 Preferred Exposure |
| No., Range Type          SS+ Old New + Time-Out STADET CHPID +   Device    |
| 1C30,015   OSA           _   00  00    No       No     __                  |
| 1C3F,001   OSAD          _   FE  FE    No       No     __                  |
| ***************************** Bottom of data ***************************** |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
|                                                                             |
*----------------------------------------------------------------------------*
```

Figure 13-38 Control units: Modify Device Parameters - OSE

HCD returns to the Select Processor / CU panel, which shows the CHPID (C3) connection definition (see Figure 13-39).

```
                            Select Processor / CU   Row 12 of 18 More:      >
Command ===> _______________________________________________ Scroll ===> CSR

Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : 1C30     Control unit type . . . : OSA

             ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ PAVO.0     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.1     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.2     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.3     C3      _______ _______ _______ _______ _______ _______ _______
_ PAVO.4     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.5     _______ _______ _______ _______ _______ _______ _______ _______
******************************* Bottom of data ********************************
```

Figure 13-39 Processors: Select Processor / CU: CHPID to Link address connection - OSE

9. By pressing F20 (Right), you can see the other parts of the definition summary.

13.2.10 Defining OSA and OSAD devices to an OSCONFIG

The OSCONFIG name is the part of an IODF that determines what devices a z/OS system can access when it undergoes an IPL. Also, the partition that the z/OS system is started in also must have access to the CHPIDs that connect to the CUs and devices that match in the OSCONFIG.

The OSCONFIG also contains Esoterics device groups, which are defined in EDTs within an OSCONFIG. OSA definitions usually do not use Esoterics.

Here are considerations for adding devices to an OSCONFIG:

- Adding a device to an OSCONFIG does not necessarily mean that the z/OS system has access to that device.
- In this example, we add the predefined OSA devices 1C30 - 1C3F (OSA/OSAD).

To define OSA and OSAD devices to an OSCONFIG, complete the following steps:

1. From the main HCD panel, select option `1.5. I/O Devices`.
2. Scroll through the I/O Device List until you find the device number that you want to add to the OSCONFIG, or in the CLI, enter `L 1C30`. In our example, we use `1C30`.

   Because OSA and OSAD are two different device types, they must be added separately to the OSCONFIG.
3. Enter `c` next to the device numbers, and press Enter.

4. HCD displays the Change Device Definition panel where you may modify the CU that the devices are attached to (see Figure 13-40). Press Enter.

```
*------------------------- Change Device Definition --------------------------*
|                                                                             |
|                                                                             |
| Specify or revise the following values.                                     |
|                                                                             |
| Device number  . . . . . . . : 1C30  (0000 - FFFF)                          |
| Number of devices  . . . . . : 15                                           |
| Device type  . . . . . . . . : OSA                                          |
|                                                                             |
| Serial number  . . . . . . . __________  +                                  |
| Description  . . . . . . . . ________________________________               |
|                                                                             |
| Volume serial number . . . . . ______  + (for DASD)                         |
|                                                                             |
| PPRC usage . . . . . . . . . . _  + (for DASD)                              |
|                                                                             |
| Connected to CUs . 1C30  ____  ____  ____  ____  ____  ____  ____  +        |
|                                                                             |
| ENTER to continue.                                                          |
|                                                                             |
|                                                                             |
|                                                                             |
*-----------------------------------------------------------------------------*
```

Figure 13-40 I/O Devices: Change Device Definition - OSE

5. HCD now displays the Device / Processor Definition panel where you may modify some of the device parameters relating to SS, UA, and the Explicit Device Candidate List. Type `c` next to the `Proc.CCSID` item if you want to modify any of these parameters (see Figure 13-41), or press Enter to accept the defaults.

```
*---------------------- Device / Processor Definition -----------------------*
|                                                                Row 1 of 1 |
| Command ===> __________________________________________ Scroll ===> CSR   |
|                                                                            |
| Select processors to change device/processor definitions, then press      |
| Enter.                                                                     |
|                                                                            |
| Device number  . . : 1C30      Number of devices  . : 15                   |
| Device type  . . . : OSA                                                   |
|                                                                            |
|                                          Preferred  Device Candidate List |
| / Proc.CSSID  SS+  UA+  Time-Out  STADET  CHPID +    Explicit       Null  |
| _ PAVO.3      0    00   No        No      __         No             ___   |
| ***************************** Bottom of data ***************************** |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 13-41 I/O Devices: Device / Processor Definition continued - OSE

6. Next is the HCD panel, where we define devices to the OSCONFIG. Scroll through the list of OSCONFIG definitions until you find the OSCONFIG that you want to add the devices to, or in the CLI, enter `L ITSOTEST`. In our example, we use `ITSOTEST`.
7. Enter `s` next to the OSCONFIG, and press Enter.

   HCD displays the Device Parameters and Features that are applicable to that particular device type. In our example, we add OSA devices to `ITSOTEST`.
8. Make the following updates to define the Device Parameter (see Figure 13-42), and press Enter:
   - Update `OFFLINE` to `No` (if you want these devices to be online during IPL time).
   - Update `DYNAMIC` to `Yes` (if you want the device to be changeable dynamically).
   - Update `LOCANY` to `Yes` (if the device UCB can be in 31-bit storage).

```
*-------------------- Define Device Parameters / Features --------------------*
|                                                                    Row 1 of 3 |
| Command ===> ___________________________________________ Scroll ===> CSR     |
|                                                                              |
| Specify or revise the values below.                                          |
|                                                                              |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16                 |
| Device number  . . : 1C30         Number of devices  : 15                    |
| Device type  . . . : OSA                                                     |
|                                                                              |
| Parameter/                                                                   |
| Feature    Value +          R Description                                    |
| OFFLINE    No                 Device considered online or offline at IPL     |
| DYNAMIC    Yes                Device has been defined to be dynamic          |
| LOCANY     Yes                UCB can reside in 31-bit storage               |
| **************************** Bottom of data ***************************** |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-42 I/O Devices: Define Device Parameters / Features - OSE

9. The Assign/Unassign Device to Esoteric panel opens, where you can specify which Esoteric (if any) that you want the devices to be added to. We add only the OSA/OSAD devices to the OSCONFIG `ITSOTEST` and not to any Esoterics in this example. Press Enter (see Figure 13-43).

```
*----------- Define Device to Operating System Configuration -----------*
|                                                             Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                        |
| Select OSs to connect or disconnect devices, then press Enter.         |
|                                                                        |
| Device number  . : 1C30          Number of devices  : 15               |
| Device type  . . : OSA                                                 |
|                                                                        |
| Subchannel Sets used in processor configurations  : 0                  |
|                                                                        |
| / Config. ID   Type     SS Description                    Defined      |
| _ ITSO         MVS      0  All ITSO devices               Yes          |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16     Yes          |
| _ ZOSMAINT     MVS      0  z/OS Central Mgmt Image        Yes          |
| _ ZOS24BAS     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes        |
| _ ZOS24MLZ     MVS      0  z/OS 2.4 MLZ - clone of p1c     Yes        |
| _ ZOS24MPL     MVS      0  z/OS 2.4 demo clone of p1g     Yes          |
| _ ZOS24P0B     MVS      0  z/OS 2.4 Clone of ZOS22BAS     Yes          |
| _ ZOS24P0C     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes        |
| _ ZOS24P0D     MVS      0  z/OS 2.4 Clone of ZOS22P0B     Yes          |
| _ ZOS25BAA     MVS      0  z/OS 2.5 based from ZOSMAINT   Yes          |
| _ ZOS25BAS     MVS      0  z/OS 2.5 base system           Yes          |
*------------------------------------------------------------------------*
```

Figure 13-43 I/O Devices: Define Device to Operating System Configuration - OSE

10. The final panel opens and show that the devices are defined to the OSCONFIG. Press Enter to return to the I/O Device List.

11. Now, perform the same action of adding an OSAD device `1C3F` to OSCONFIG `ITSOTEST`.

12. Press Enter (see Figure 13-44).

```
*----------- Define Device to Operating System Configuration -----------*
|                                                            Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR    |
|                                                                        |
| Select OSs to connect or disconnect devices, then press Enter.        |
|                                                                        |
| Device number  . : 1C3F          Number of devices  : 1               |
| Device type  . . : OSAD                                               |
|                                                                        |
| Subchannel Sets used in processor configurations  : 0                 |
|                                                                        |
| / Config. ID   Type     SS Description                    Defined     |
| _ ITSO         MVS      0  All ITSO devices               Yes         |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16     Yes         |
| _ ZOSMAINT     MVS      0  z/OS Central Mgmt Image        Yes         |
| _ ZOS24BAS     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes       |
| _ ZOS24MLZ     MVS      0  z/OS 2.4 MLZ - clone of p1c     Yes       |
| _ ZOS24MPL     MVS      0  z/OS 2.4 demo clone of p1g     Yes         |
| _ ZOS24P0B     MVS      0  z/OS 2.4 Clone of ZOS22BAS     Yes         |
| _ ZOS24P0C     MVS      0  z/OS 2.4 ServerPac with P1D SSs  Yes       |
| _ ZOS24P0D     MVS      0  z/OS 2.4 Clone of ZOS22P0B     Yes         |
| _ ZOS25BAA     MVS      0  z/OS 2.5 based from ZOSMAINT   Yes         |
| _ ZOS25BAS     MVS      0  z/OS 2.5 base system           Yes         |
*------------------------------------------------------------------------*
```

Figure 13-44 I/O Devices: Define Device to Operating System Configuration continued - OSE

13.3 IQD CHPIDs for HiperSockets

This section describes the process to define IQD CHPIDs and their CUs and devices.

13.3.1 Defining IQD CHPIDs

When you define HiperSockets, use the CHPID type of IQD Communication. IQD CHPID also requires the virtual channel ID (VCHID) statement. The valid range for the VCHIDs are 7C0 - 7FF.

Like central processor (CP) CHPIDs, IQD CHPIDs are defined logically and internally to the processor and require no installed hardware (PCHIDs). However, a maximum of up to 32 high-speed virtual local area network (VLAN) attachments may be defined.

Each of the logical IQD VCHIDs can support only one CHPID, but the CHPIDs may be spanned across multiple CSSs.

Here are considerations for a new IQD CHPID:

- CHPID
- VCHID
- Channel path type
- Operational mode
- Description
- Partition access list

To define an IQD CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Type `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Type `s` next to the CSS ID that you want to add a CHPID to, and press Enter.
4. In the CLI, enter `add` (see Figure 13-45) to add a CHPID.
5. Make the following updates and press Enter:
   - Update `Channel path ID` to `F0`.
   - Update `Channel ID` to `7E0`.
   - Update `Channel path type` to `IQD`.
   - Update `Operational mode` to `SHR`.
   - Update `Description` to the description that you want.

```
*--------------------------- Add Channel Path ----------------------------*
|                                                                         |
|                                                                         |
| Specify or revise the following values.                                 |
|                                                                         |
| Processor ID . . . . : PAVO         Pavo                                |
| Configuration mode . : LPAR                                             |
| Channel Subsystem ID : 3                                                |
|                                                                         |
| Channel path ID  . . . . F0    +           Channel ID  7E0  +           |
| Number of CHPIDs . . . . 1                                              |
| Channel path type  . . . IQD   +                                        |
| Operation mode . . . . . SHR   +                                        |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +    |
| Description  . . . . . . IQD Internal Queued Direct Comms               |
|                                                                         |
| Specify the following values only if connected to a switch:             |
| Dynamic entry switch ID  __  + (00 - FF)                                |
| Entry switch ID  . . . . __  +                                          |
| Entry port . . . . . . . __  +                                          |
|                                                                         |
|                                                                         |
*-------------------------------------------------------------------------*
```

Figure 13-45 Processors: Add Channel Path - IQD

HCD now prompts you to specify the IQD Channel Parameters, where you set the maximum frame size in KB and what IQD function is used.

6. Leave the default option of `16` for the Maximum frame size, and select option `1. Basic HiperSockets` for the IQD function (see Figure 13-46). Press Enter.

```
*------------------- Specify IQD Channel Parameters --------------------*
|                                                                       |
|                                                                       |
| Specify or revise the values below.                                   |
|                                                                       |
| Maximum frame size in KB . . . . . . 16  +                            |
|                                                                       |
| IQD function . . . . . . . . . . . . 1   1.  Basic HiperSockets       |
|                                          2.  IEDN Access (IQDX)       |
|                                          3.  External Bridge          |
|                                                                       |
| Physical network ID  . . . . . . . . ________________                 |
|                                                                       |
|                                                                       |
|                                                                       |
|                                                                       |
*-----------------------------------------------------------------------*
```

Figure 13-46   Processors: Specify IQD Channel Parameters - IQD

HCD prompts you to select which partitions the CHPID should have access to.

7. Type forward slash (/) next to the needed partitions (see Figure 13-47), and press Enter.

```
*--------------------------- Define Access List -----------------------------*
|                                                                Row 1 of 6 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the access list.          |
|                                                                           |
| Channel subsystem ID : 3                                                  |
| Channel path ID  . . : F0     Channel path type  . : IQD                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| _ 3      PAV031           1      OS                                       |
| _ 3      PAV032           2      OS                                       |
| / 3      PAV033           3      OS    PAV033 test OS partition          |
| / 3      PAV034           4      OS                                       |
| _ 3      PAV035           5      OS                                       |
| _ 3      PAV036           6      OS                                       |
| _ 3      PAV037           7      OS                                       |
| _ 3      PAV038           8      OS                                       |
| _ 3      PAV039           9      OS                                       |
| *************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+
```

Figure 13-47   Processors: Define Access List - IQD

HCD now displays the Define Candidate List panel. In our example, we do not select any Candidate LPARs for this IQD CHPID. Press Enter.

The HCD returns to the Channel Path List and show you the CHPID that was defined (see Figure 13-48).

```
                              Channel Path List       Row 1 of 6 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
****************************** Bottom of data ********************************
```

Figure 13-48 Processors: Channel Path List - IQD

13.3.2 Defining IQD CHPID connections to an IQD control unit

The only way to define an IQD connection to its CU is direct connect. You might want to span the IQD CHPID over multiple CSSs within a CPC.

Here are considerations for connecting an IQD CHPID to an IQD CU and its IQD devices:

- Determine how many IQDs are required to provide the required HiperSocket bandwidth.
- In this example, we connect to a predefined IQD CU (F000) and IQD devices 0FA0 - 0FBF.

To define IQD CHPID connections to an IQD CU, complete the following steps:

1. From the main HCD panel, select option `1.4. Control units`.
2. Scroll through the CU list until you find the CU that you want to connect to, or in the CLI, enter `L F000`. In our example, we use `F000`.
3. Enter `c` next to the CU definition, and press Enter.

4. Change the CU definition that you want as needed (see Figure 13-49), and press Enter.

```
*----------------- Change Control Unit Definition ------------------*
|                                                                    |
|                                                                    |
| Specify or revise the following values.                           |
|                                                                    |
| Control unit number  . . . . F000  +                              |
|                                                                    |
| Control unit type  . . . . . IQD          +                       |
|                                                                    |
| Serial number  . . . . . . . __________  +                        |
| Description  . . . . . . . . ________________________________     |
|                                                                    |
| Connected to switches  . . . __  __  __  __  __  __  __  __  +    |
| Ports  . . . . . . . . . . . __  __  __  __  __  __  __  __  +    |
|                                                                    |
| Define more than eight ports . . 2   1.  Yes                      |
|                                      2.  No                       |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
*--------------------------------------------------------------------*
```

Figure 13-49   Control units: Change Control Unit Definition - IQD

5. HCD now shows the Select Processor / CU panel. This panel is where the connection is made between the IQD CHPID (F0) and the CU (F100). Enter `c` next to the `Processor.CSS` that contains the partition that you want to access the CU and the CHPID that you want to connect to the CU. Press Enter.

6. Update CHPID `F0` to define the Processor / CU connection (see Figure 13-50), and press Enter.

```
                              Select Processor / CU
*---------------------- Change Control Unit Definition -----------------------*
|                                                                               |
|                                                                               |
| Specify or revise the following values.                                       |
|                                                                               |
| Control unit number  . : F000         Type . . . . . . : IQD                  |
| Processor ID . . . . . : PAVO         Pavo                                    |
| Channel Subsystem ID . : 3                                                    |
|                                                                               |
| Channel path IDs . . . . F0    __    __    __    __    __    __    __    +    |
| Link address . . . . . . ____  ____  ____  ____  ____  ____  ____  ____  +    |
|                                                                               |
| Unit address . . . . . . 00    __    __    __    __    __    __    __    +    |
| Number of units  . . . . 256   ___   ___   ___   ___   ___   ___   ___        |
|                                                                               |
| Logical address  . . . . __  + (same as CUADD)                                |
|                                                                               |
| Protocol . . . . . . . . __  + (D, S, or S4)                                  |
| I/O concurrency level  . _   + (1, 2, or 3)                                   |
|                                                                               |
|                                                                               |
|                                                                               |
*-------------------------------------------------------------------------------*
```

Figure 13-50 Control units: Change Control Unit Definition detail - IQD

7. HCD now shows the Modify Device Parameters panel, where you may override the UA numbers. For IQD definitions, the UA starts at `00`. Update `UA New` to `00` for the IQD device type to define the Modify Device Parameters (see Figure 13-51), and press Enter.

```
*------------------------- Modify Device Parameters -------------------------*
|                                                    Row 1 of 1 More:       > |
| Command ===> __________________________________________ Scroll ===> CSR     |
|                                                                              |
| Specify or revise any changes to the device parameters in the list below.   |
| To view attached control units, scroll to the right.                         |
|                                                                              |
| Processor ID . . . . : PAVO          Pavo                                    |
| Channel Subsystem ID : 3                                                     |
|                                                                              |
| ---------Device---------     ---UA----                 Preferred Exposure    |
| No., Range Type          SS+ Old New + Time-Out STADET CHPID +   Device      |
| 0FA0,032   IQD           _   00  00    No       No     __                   |
| **************************** Bottom of data ****************************** |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-51 Control units: Modify Device Parameters - IQD

HCD returns to the Select Processor / CU panel and shows the CHPID (F0) connection definition (see Figure 13-52).

```
                            Select Processor / CU   Row 13 of 18 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : F000     Control unit type . . . : IQD

             ---------------Channel Path ID . Link Address + ---------------
/ Proc.CSSID 1------ 2------ 3------ 4------ 5------ 6------ 7------ 8------
_ PAVO.0     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.1     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.2     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.3     F0      _______ _______ _______ _______ _______ _______ _______
_ PAVO.4     _______ _______ _______ _______ _______ _______ _______ _______
_ PAVO.5     _______ _______ _______ _______ _______ _______ _______ _______
****************************** Bottom of data *******************************
```

Figure 13-52 Processors: Select Processor / CU: CHPID to Link address connection - IQD

8. By press F20 (Right), you can see the other parts of the definition summary.

13.3.3 Defining IQD devices to an OSCONFIG

The OSCONFIG name is the part of an IODF that determines what devices a z/OS system has access to when it undergoes an IPL. Also the partition that the z/OS system is started in must have access to the CHPIDs that connect to the CUs and devices that match in the OSCONFIG.

The OSCONFIG also contains Esoterics device groups that are defined in EDTs within an OSCONFIG. IQD definitions usually do not use Esoterics.

Here are considerations for adding devices to an OSCONFIG:

- Adding a device to an OSCONFIG does not necessarily mean that the z/OS system has access to that device.
- In this example, we add the predefined IQD devices 0FA0 - 0FBF (IQD).

To define IQD devices to an OSCONFIG, complete the following steps:

1. From the main HCD panel, select option `1.5. I/O Devices`.
2. Scroll through the I/O Device List until you find the device number that you want to add to the OSCONFIG, or in the CLI, enter `L 0FA0`. In our example, we use `0FA0`.
3. Enter `c` next to one or more device numbers, and press Enter.

4. HCD displays the Change Device Definition panel, where you may modify the CU that the devices are attached to (see Figure 13-53). Press Enter.

```
*------------------------ Change Device Definition --------------------------*
|                                                                             |
|                                                                             |
| Specify or revise the following values.                                     |
|                                                                             |
| Device number  . . . . . . . : 0FA0  (0000 - FFFF)                          |
| Number of devices  . . . . . : 32                                           |
| Device type  . . . . . . . . : IQD                                          |
|                                                                             |
| Serial number  . . . . . . . . __________  +                                |
| Description  . . . . . . . . . ________________________________             |
|                                                                             |
| Volume serial number . . . . . ______  + (for DASD)                         |
|                                                                             |
| PPRC usage . . . . . . . . . . _  + (for DASD)                              |
|                                                                             |
| Connected to CUs . F000  ____  ____  ____  ____  ____  ____  ____  +        |
|                                                                             |
| ENTER to continue.                                                          |
|                                                                             |
|                                                                             |
|                                                                             |
*-----------------------------------------------------------------------------*
```

Figure 13-53 I/O Devices: Change Device Definition - IQD

5. HCD now displays the Device / Processor Definition panel, where you may modify some of the device parameters relating to SS, UA, and the Explicit Device Candidate List. Enter `c` next to the `Proc.CCSID` item if you want to modify any of these parameters (see Figure 13-54), or press Enter to accept the defaults.

```
*--------------------- Device / Processor Definition -----------------------*
|                                                                Row 1 of 1 |
| Command ===> __________________________________________ Scroll ===> CSR   |
|                                                                           |
| Select processors to change device/processor definitions, then press      |
| Enter.                                                                    |
|                                                                           |
| Device number  . . : 0FA0       Number of devices  . : 32                 |
| Device type  . . . : IQD                                                  |
|                                                                           |
|                                          Preferred  Device Candidate List |
| / Proc.CSSID  SS+  UA+  Time-Out  STADET  CHPID +    Explicit       Null  |
| _ PAV0.3      0    00   No        No      __         No             ___   |
| ***************************** Bottom of data **************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 13-54 I/O Devices: Device / Processor Definition continued - IQD

6. The HCD panel where we define devices to the OSCONFIG is displayed. Scroll through the list of OSCONFIG definitions until you find the OSCONFIG that you want to add to the devices to, or in the CLI, enter `L ITSOTEST`. In our example, we use `ITSOTEST`.
7. Enter `s` next to the OSCONFIG, and press Enter.

   HCD displays the device parameters and features that are applicable to that device type. In our example, we add IQD devices to `ITSOTEST`.
8. Make the following updates to define the Device Parameter (see Figure 13-55), and press Enter:

   – Update `OFFLINE` to `No` (if you want these devices to be online during IPL time).
   – Update `DYNAMIC` to `Yes` (if you want the device to be changeable dynamically).
   – Update `LOCANY` to `Yes` (if the device UCB can be in 31-bit storage).

```
*-------------------- Define Device Parameters / Features --------------------*
|                                                                   Row 1 of 3 |
| Command ===> ___________________________________________ Scroll ===> CSR    |
|                                                                              |
| Specify or revise the values below.                                          |
|                                                                              |
| Configuration ID . : ITSOTEST     ITSO test OSCONFIG for z16                 |
| Device number  . . : 0FA0         Number of devices  : 32                    |
| Device type  . . . : IQD                                                     |
|                                                                              |
| Parameter/                                                                   |
| Feature    Value +         R Description                                    |
| OFFLINE    No                Device considered online or offline at IPL     |
| DYNAMIC    Yes               Device has been defined to be dynamic          |
| LOCANY     Yes               UCB can reside in 31-bit storage               |
| ***************************** Bottom of data ****************************** |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
*------------------------------------------------------------------------------*
```

Figure 13-55 I/O Devices: Define Device Parameters / Features - IQD

9. The Assign/Unassign Device to Esoteric panel is displayed, where you can specify which Esoteric (if any) that you want the devices to be added to. We add only the IQD devices to the OSCONFIG `ITSOTEST` and not to any Esoterics in this example. Press Enter (see Figure 13-56).

```
*----------- Define Device to Operating System Configuration -----------*
|                                                            Row 1 of 25 |
| Command ===> _____________________________________ Scroll ===> CSR     |
|                                                                        |
| Select OSs to connect or disconnect devices, then press Enter.         |
|                                                                        |
| Device number  . : 0FA0          Number of devices  : 32               |
| Device type  . . : IQD                                                 |
|                                                                        |
| Subchannel Sets used in processor configurations  : 0                  |
|                                                                        |
| / Config. ID   Type     SS Description                      Defined    |
| _ ITSO         MVS         All ITSO devices                            |
| _ ITSOTEST     MVS      0  ITSO test OSCONFIG for z16       Yes        |
| _ ZOSMAINT     MVS         z/OS Central Mgmt Image                     |
| _ ZOS24BAS     MVS         z/OS 2.4 ServerPac with P1D SSs             |
| _ ZOS24MLZ     MVS         z/OS 2.4 MLZ - clone of p1c                |
| _ ZOS24MPL     MVS         z/OS 2.4 demo clone of p1g                 |
| _ ZOS24P0B     MVS         z/OS 2.4 Clone of ZOS22BAS                 |
| _ ZOS24P0C     MVS         z/OS 2.4 ServerPac with P1D SSs             |
| _ ZOS24P0D     MVS         z/OS 2.4 Clone of ZOS22P0B                 |
| _ ZOS25BAA     MVS         z/OS 2.5 based from ZOSMAINT               |
| _ ZOS25BAS     MVS         z/OS 2.5 base system                        |
*------------------------------------------------------------------------*
```

Figure 13-56 I/O Devices: Define Device to Operating System Configuration - IQD

10. The final panel opens and shows that the devices are defined to the OSCONFIG. Press Enter to return to the I/O Device List.

14

Adding coupling connectivity

This chapter describes the steps to define CS5, CL5, and ICP channel path ID (CHPID) types, and the Coupling Facility (CF) links between these CHPID types.

It provides a list of these potential configuration items and a short description about how to do each of them by using a Hardware Configuration Definition (HCD).

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

Note: Not all the following configuration items are necessarily required for your installation. In addition, the examples that are presented are not exhaustive.

This chapter includes the following topics:

- Defining more I/O by using an HCD
- Coupling Facility logical partitions, CS5, CL5, and ICP CHPIDs

14.1 Defining more I/O by using an HCD

When defining new I/O components in an input/output definition file (IODF), certain definitions like operating system configurations (OSCONFIGs), partitions, Fibre Connection (FICON) switches, control units (CUs), and devices must be done first. After these items are defined, then the connections can be made:

- Defining Coupling Facility LPARs in a channel subsystem
- Defining CS5 CHPIDs
- Defining a Coupling Facility link with CS5 CHPIDs
- Defining CL5 CHPIDs
- Defining a Coupling Facility link with CL5 CHPIDs
- Defining ICP CHPIDs
- Defining a Coupling Facility link with ICP CHPIDs

The following I/O definitions use HCD to demonstrate the examples. The examples in this chapter continue the work example that was created in the previous chapters (for example, `SYS9.IODF81.WORK`).

14.2 Coupling Facility logical partitions, CS5, CL5, and ICP CHPIDs

This section covers defining CF logical partitions (LPARs) and the definitions for CS5, CL5, and ICP CHPID types.

14.2.1 Defining Coupling Facility LPARs in a channel subsystem

Here are considerations for a new (unreserved) partition:

- Partition name.
- Number.
- Usage.
- Description.
- To add CHPIDs to a partition, they first must be defined to the processor.
- Renaming an existing partition is a two-step process:
  a. Redefine the partition as reserved (`Partition name = *`), and activate the IODF on the processor.
  b. Redefine the partition with the new name, and activate the IODF on the processor.

To change a reserved partition to an active partition in a channel subsystem (CSS), complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a partition to, and press Enter.
3. Enter `p` next to the CSS ID that you want to add a partition to, and press Enter.
4. Enter `c` next to the Reserved Partition that you want to unreserve (we use `ID E` for this example), and press Enter.

5. Make the following updates (see Figure 14-1), and press Enter:
   – Update `Partition Name` to `PAVO3E` (a naming standard based on `CSS=3`, `Partition =E`).
   – Review `Partition usage` and change it if required. We use `CF` in this example.
   – Update `Description` to `PAVO3E test CF partition`.

```
 *----------------------------- Partition List -----------------------------*
|   Goto  Backup  Query  Help                                               |
| -----------------------------------------------------------------------   |
|                                                                           |
| Command ===> ________________________________________ Scroll ===> CSR     |
|                                                                           |
| Select one or more partitions, then press Enter. To add, use F11.         |
|                                                                           |
| Processor *-------------- Change Partition Definition ---------------*    |
| Configura |                                                          |    |
| Channel S |                                                          |    |
|           | Specify or revise the following values.                  |    |
| / Partiti |                                                          |    |
| _ *       | Partition name . . . PAVO3E                              |    |
| _ *       | Partition number . . E      (same as MIF image ID)       |    |
| _ *       | Partition usage  . . CF     +                            |    |
| c *       | UID uniqueness . . . N        (Y/N)                      |    |
| _ *       |                                                          |    |
| ********* | Description  . . . . PAVO3E test CF partition________    | *  |
|           |                                                          |    |
|           |                                                          |    |
|           |                                                          |    |
|           |                                                          |    |
*-----------*----------------------------------------------------------*---*
```

Figure 14-1 Processors: Change Partition Definition - Coupling Facility

14.2.2 Defining CS5 CHPIDs

When defining a CS5 CHPID to create a CF link between a CF LPAR and a z/OS LPAR, first determine which z/OS LPARs require access to which CF LPARs, how many CF links are required, and to how many different physical processors.

CS5 CF CHPIDs are defined by using Feature Code 0172 or 0176 (Integrated Coupling Adapter Short Reach (ICA SR and ICA-SR 1.1), which are two port (link) cards that are installed on the central processor complex (CPC) drawer instead of in the PCIe+ I/O drawer.

The ICA SR card has two ports (Port 1 and Port 2) that provide two physical connections to another ICA SR card on the same or different processor.

Each of the ports can have up to four CHPIDs defined to these ports.

Here are considerations for a new CS5 CHPID:

- CHPID.
- Channel path type.
- Operational mode.
- Description.
- Adapter ID (AID).

- Adapter port.
- Partition access list.
- For performance and redundancy, determine how many AID cards are installed in the processor and to what Peripheral Component Interconnect Express (PCIe) slot on what CPC drawer (for a list of installed hardware, see the physical channel ID (PCHID) / channel ID (CHID) report).

To define a CS5 CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter s next to the CSS ID that you want to add a CHPID to, and press Enter.
4. Press PF11, or in the CLI, enter `add` (see Figure 14-2) to add a CHPID.
5. Make the following updates and press Enter:
   - Update `Channel path ID` to `80`.
   - Update `Channel path type` to `CS5`.
   - Update `Operational mode` to `SHR`.
   - Update `Description` to the description that you want.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                            |
|                                                                            |
| Specify or revise the following values.                                   |
|                                                                            |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                            |
| Channel path ID  . . . . 80    +            Channel ID  ___  +            |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . CS5   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +     |
| Description  . . . . . . FC#0176 ICA SR 2 Links__________                |
|                                                                            |
| Specify the following values only if connected to a switch:              |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                            |
|                                                                            |
*----------------------------------------------------------------------------*
```

Figure 14-2 Processors: Add Channel Path - CS5

6. HCD prompts you to specify the adapter and port of the HCA attributes. Make the following updates (see Figure 14-3), and press Enter:
   - Update `Adapter of the HCA` to `00`.
   - Update `Port on the HCA` to `1`.

```
*------------------ Specify HCA Attributes -------------------*
|                                                             |
|                                                             |
| Specify or revise the values below.                         |
|                                                             |
| Adapter ID of the HCA  . . 00  +                            |
| Port on the HCA  . . . . . 1   +                            |
|                                                             |
|                                                             |
|                                                             |
|                                                             |
*-------------------------------------------------------------*
```

Figure 14-3 Processors: Specify HCA Attributes - CS5

7. HCD prompts you to select which partitions the CHPID should have access to. Type forward slash (/) next to the wanted partitions (see Figure 14-4), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                               Row 1 of 7 |
| Command ===> _________________________________________ Scroll ===> CSR   |
|                                                                           |
| Select one or more partitions for inclusion in the access list.           |
|                                                                           |
| Channel subsystem ID : 3                                                  |
| Channel path ID  . . : 80     Channel path type  . : CS5                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| / 3      PAVO3E           E      CF    PAVO3E test CF partition           |
| _ 3      PAVO31           1      CF/OS                                    |
| _ 3      PAVO32           2      CF/OS                                    |
| / 3      PAVO33           3      OS    PAVO33 test OS partition           |
| _ 3      PAVO34           4      CF/OS                                    |
| _ 3      PAVO35           5      CF/OS                                    |
| _ 3      PAVO36           6      CF/OS                                    |
| *************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 14-4 Processors: Define Access List - CS5

8. Because more partitions than the selected two are defined, the Define Candidate List panel opens. For this example, we do not add any partitions to the candidate list. Press Enter. HCD returns to the Channel Path List and shows you the CHPID that was defined (see Figure 14-5).

```
                              Channel Path List      Row 1 of 7 More:      >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+           Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ 80    00/1  CS5   SHR   __  __ __   N   No  FC#0176 ICA SR 2 Links
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
****************************** Bottom of data *******************************
```

Figure 14-5 Processors: Channel Path List - CS5

9. Proceed to define an extra CS5 CHPID as `84` to the same LPARs as `AID=17`, `Port=1` (see Figure 14-6).

```
                              Channel Path List      Row 1 of 8 More:      >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+           Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ 80    00/1  CS5   SHR   __  __ __   N   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   N   No  FC#0176 ICA SR 2 Links
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
****************************** Bottom of data *******************************
```

Figure 14-6 Processors: Channel Path List - CS5

14.2.3 Defining a Coupling Facility link with CS5 CHPIDs

The only way to define a CS5 CHPID to another CS5 CHPID is direct connect.

Here are considerations for creating a CF link by using CS5 CHPIDs:

- The ICA SR connection is a physical cable between two Feature Code #172 or #0176 cards on the same or different processors.
- Up to four logical CHPIDs per port can be defined over that physical connection.
- Determine how many CS5 CF links are required to provide enough primary and secondary links and coupling bandwidth.
- Determine which z/OS LPARs on the same or different processors need access to the CF LPARs.
- CF links provide Server Time Protocol (STP) connectivity for a Coordinated Timing Network (CTN) between processors and a sysplex.
- In this example, we connect two CS5 CHPIDs (80 and 84) on the same processor.

To define a CF link with CS5 CHPIDs, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to create the first CF link from, and press Enter.
3. Enter s next to the CSS ID that has the CS5 CHPID definition that you want to create the first CF link from, and press Enter.
4. Scroll through the Channel Path List until you find the first CS5 CHPID that you want to connect from, or in the CLI, enter `L 80`. In our example, we use `80`.
5. Enter `f` next to the CHPID definition (see Figure 14-7), and press Enter.

```
                              Channel Path List      Row 1 of 8 More:      >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+             Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
f 80    00/1  CS5   SHR   __  __ __   N   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   N   No  FC#0176 ICA SR 2 Links
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
******************************* Bottom of data ********************************
```

Figure 14-7 Processors: CF Channel Path Connectivity List - CS5

6. On the next panel, HCD prompts you to specify the second CS5 CHPID that you want to connect to. Scroll through the Channel Path List until you find the second CS5 CHPID you want to connect to, or in the CLI, enter `L 84`. In our example, we use `84`.

7. Enter `p` next to the CHPID definition (see Figure 14-8), and press Enter.

```
                     CF Channel Path Connectivity List              Row 1 of 2
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . : PAVO      Pavo
Source channel subsystem ID . : 3
Source partition name . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#-
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  Dev
_ 80  00/1  Y  CS5  SHR  N
p 84  17/1  Y  CS5  SHR  N
****************************** Bottom of data ********************************
```

Figure 14-8 Processors: CF Channel Path Connectivity List - CS5

8. HCD prompts you to specify which CF channel path to connect to. Make the following updates (see Figure 14-9), and press Enter:

   – Update `Destination processor ID` to `PAVO`.
   – Update `Destination channel subsystem ID` to 3.
   – Update `Destination channel path ID` to 80.

```
*---------------- Connect to CF Channel Path -----------------*
|                                                              |
|                                                              |
| Specify the following values.                                |
|                                                              |
| Source processor ID  . . . . . : PAVO                        |
| Source channel subsystem ID  . : 3                           |
| Source channel path ID . . . . : 84                          |
| Source channel path type . . . : CS5                         |
|                                                              |
| Destination processor ID . . . . . . PAVO      +             |
| Destination channel subsystem ID . . 3   +                   |
| Destination channel path ID  . . . . 80  +                   |
|                                                              |
| Timing-only link . . . . . . . . . . No                      |
|                                                              |
|                                                              |
|                                                              |
|                                                              |
*--------------------------------------------------------------*
```

Figure 14-9 Processors: Connect to CF Channel Path - CS5

9. HCD checks the available CU numbers and device addresses starting at FFFF and working backwards to provide suggestions. These suggestions can be overridden or accepted. We accept the suggestions for the second CS5 CHPID (see Figure 14-10), and press Enter.

```
*----------------- Add CF Control Unit and Devices ------------------*
|                                                                    |
|                                                                    |
| Confirm or revise the CF control unit number and device numbers    |
| for the CF control unit and devices to be defined.                 |
|                                                                    |
| Processor ID . . . . . . . : PAVO                                  |
| Channel subsystem ID . . . : 3                                     |
| Channel path ID  . . . . . : 84        Operation mode . . : SHR    |
| Channel path type  . . . . : CS5                                   |
|                                                                    |
| Control unit number  . . . . FFFE  +                               |
|                                                                    |
| Device number  . . . . . . . FFF8                                  |
| Number of devices  . . . . . 8                                     |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
*--------------------------------------------------------------------*
```

Figure 14-10 Processors: Add CF Control Unit and Devices - CS5

10. HCD provides suggested CU numbers and device addresses for the first CS5 CHPID (see Figure 14-11). Observe that the CU number is the same and that eight devices were allocated. Press Enter.

```
*----------------- Add CF Control Unit and Devices ------------------*
|                                                                    |
|                                                                    |
| Confirm or revise the CF control unit number and device numbers    |
| for the CF control unit and devices to be defined.                 |
|                                                                    |
| Processor ID . . . . . . . : PAVO                                  |
| Channel subsystem ID . . . : 3                                     |
| Channel path ID  . . . . . : 80        Operation mode . . : SHR    |
| Channel path type  . . . . : CS5                                   |
|                                                                    |
| Control unit number  . . . . FFFE  +                               |
|                                                                    |
| Device number  . . . . . . . FFF0                                  |
| Number of devices  . . . . . 8                                     |
|                                                                    |
|                                                                    |
|                                                                    |
|                                                                    |
*--------------------------------------------------------------------*
```

Figure 14-11 Processors: Add CF Control Unit and Devices - CS5

HCD provides a summary of the Source and Destination CF Connectivity List (see Figure 14-12).

```
                    CF Channel Path Connectivity List             Row 1 of 2
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . : PAVO      Pavo
Source channel subsystem ID . : 3
Source partition name . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#-
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  Dev
_ 80  00/1  Y  CS5  SHR  N     PAVO.3     84  17/1  Y  CS5  SHR    CFP   8
_ 84  17/1  Y  CS5  SHR  N     PAVO.3     80  00/1  Y  CS5  SHR    CFP   8
****************************** Bottom of data ********************************
```

Figure 14-12 Processors: Add CF Channel Path Connectivity List - CS5

14.2.4 Defining CL5 CHPIDs

When defining a CL5 CHPID to create a CF link between a CF LPAR and a z/OS LPAR, determine which z/OS LPARs require access to which CF LPARs, how many CF links are required, and to how many different physical processors.

CL5 CF CHPIDs are defined by using Feature Code #0434 (Coupling Express2 LR (CE LR)) cards, which are installed in the PCIe+ I/O drawer instead of on the CPC drawer.

The CE LR card has two ports (Port 1 and Port 2), which provide two physical connections between another CE LR card on the same or different processor. They can also connect to a CE LR (Feature Code 0433) on IBM z15 and IBM z14 machines.

Each of the ports can have up to four CHPIDs defined.

Here are considerations for a new CL5 CHPID:

- CHPID.
- CHID.
- Channel path type.
- Operational mode.
- Description.
- Partition access list.
- For performance and redundancy, determine how many CL5 cards are installed in the processor and to what PCIe slot on what CPC drawer does the I/O cards connect to (for a list of installed hardware, see the PCHID / CHID report).

To define a CL5 CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the CSS ID that you want to add a CHPID to, and press Enter.

4. In the CLI, enter `add` (see Figure 14-13) to add a CHPID.
5. Make the following updates and press Enter:
   – Update `Channel path ID` to `88`.
   – Update `Channel ID` to `1DC`.
   – Update `Channel path type` to `CL5`.
   – Update `Operational mode` to `SHR`.
   – Update `Description` to the description that you want.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                           |
| Channel path ID  . . . . 88    +           Channel ID  1DC  +             |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . CL5   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________    +     |
| Description  . . . . . . FC#0434 Coupling Express2 LR____                 |
|                                                                           |
| Specify the following values only if connected to a switch:               |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 14-13 Processors: Add Channel Path - CL5

6. HCD prompts you to specify the coupling PCHID/Port attributes. Update `Coupling Port` to `1` (see Figure 14-14), and press Enter.

```
*----------- Specify Coupling Pchid/Port Attribute -----------*
|                                                             |
|                                                             |
| Specify or revise the values below.                         |
|                                                             |
| Physical channel ID  . . . 1DC                              |
| Coupling port  . . . . . . 1   +                            |
|                                                             |
|                                                             |
|                                                             |
|                                                             |
*-------------------------------------------------------------*
```

Figure 14-14 Processors: Specify Coupling PCHIDs/Port Attributes - CL5

7. HCD prompts you to select which partitions the CHPID should have access to. Enter forward slash (/) next to the partitions that you want (see Figure 14-15), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                                Row 1 of 7 |
| Command ===> __________________________________________ Scroll ===> CSR   |
|                                                                           |
| Select one or more partitions for inclusion in the access list.           |
|                                                                           |
| Channel subsystem ID : 3                                                  |
| Channel path ID  . . : 88     Channel path type  . : CL5                  |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                    |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| / 3      PAVO3E           E      CF    PAVO3E test CF partition          |
| _ 3      PAVO31           1      CF/OS                                    |
| _ 3      PAVO32           2      CF/OS                                    |
| / 3      PAVO33           3      OS    PAVO33 test OS partition          |
| _ 3      PAVO34           4      CF/OS                                    |
| _ 3      PAVO35           5      CF/OS                                    |
| _ 3      PAVO36           6      CF/OS                                    |
| **************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 14-15 Processors: Define Access List - CL5

8. Because more partitions than the selected two are defined, the Define Candidate List panel opens. For this example, we do not add any partitions in the access list. Press Enter. HCD returns to the Channel Path List and shows you the CHPID that was defined (see Figure 14-16).

```
                              Channel Path List      Row 1 of 9 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ 80    00/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 88    1DC/1 CL5   SHR   __  __ __   N   No  FC#0434 Coupling Express2 LR
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
****************************** Bottom of data ********************************
```

Figure 14-16 Processors: Channel Path List - CL5

9. Define an extra CL5 CHPID as `8C` to the same LPARs as `CHID=23C, Port=1` (see Figure 14-17).

```
                              Channel Path List      Row 1 of 10 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO          Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ 80    00/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 88    1DC/1 CL5   SHR   __  __ __   N   No  FC#0434 Coupling Express2 LR
_ 8C    23C/1 CL5   SHR   __  __ __   N   No  FC#0434 Coupling Express2 LR
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
```

Figure 14-17 Processors: Channel Path List - CL5

14.2.5 Defining a Coupling Facility link with CL5 CHPIDs

The only way to define a CL5 CHPID to another CL5 CHPID is direct connect.

Here are considerations for creating a CF link by using CL5 CHPIDs:

- The CE LR connection is a physical cable between two CE2 LR, Feature Code #0434 cards on the same or different processors, or to a CE LR (Feature Code 0433) on IBM z15 or IBM z14 machines.
- Up to four logical CHPIDs per port can be defined over that physical connection.
- Determine how many CL5 CF links are required to provide enough primary and secondary links and coupling bandwidth.
- Determine which z/OS LPARs on the same or different processors need access to the CF LPARs.
- CF links also provide STP connectivity for a CTN between processors and a sysplex.
- In this example, we connect two CL5 CHPIDs (88 and 8C) on the same processor.

To define a CF link with CL5 CHPIDs, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter `s` next to the processor that you want to create the first CF link from, and press Enter.
3. Enter `s` next to the CSS ID that has the CL5 CHPID definition that you want to create the first CF link from, and press Enter.
4. Scroll through the Channel Path List until you find the first CL5 CHPID that you want to connect from, or in the CLI, enter `L 88`. In our example, we use `88`.

5. Enter `f` next to the CHPID definition (see Figure 14-18), and press Enter.

```
                             Channel Path List      Row 1 of 10 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO         Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+             Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 14    114   FC    SHR   41  41 10       No  FC#0462 32Gb FICON Exp32S SX
_ 15    115   FC    SHR   __  __ __       No  FC#0462 32Gb FICON Exp32S SX
_ 80    00/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
f 88    1DC/1 CL5   SHR   __  __ __   N   No  FC#0434 Coupling Express2 LR
_ 8C    23C/1 CL5   SHR   __  __ __   N   No  FC#0434 Coupling Express2 LR
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
```

Figure 14-18 Processors: CF Channel Path Connectivity List - CL5

6. HCD prompts you to specify the second CL5 CHPID that you want to connect to. Scroll through the Channel Path List until you find the second CL5 CHPID that you want to connect to, or in the CLI, enter `L 8C`. In our example, we use `8C`.
7. Type `p` next to the CHPID definition (see Figure 14-19), and press Enter.

```
                    CF Channel Path Connectivity List              Row 1 of 4
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . : PAVO      Pavo
Source channel subsystem ID . : 3
Source partition name . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#-
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  Dev
_ 80  00/1  Y  CS5  SHR  N     PAVO.3     84  17/1  Y  CS5  SHR    CFP   8
_ 84  17/1  Y  CS5  SHR  N     PAVO.3     80  00/1  Y  CS5  SHR    CFP   8
_ 88  1DC/1 Y  CL5  SHR  N
p 8C  23C/1 Y  CL5  SHR  N
****************************** Bottom of data ********************************
```

Figure 14-19 Processors: CF Channel Path Connectivity List - CL5

8. HCD prompts you to specify which CF channel path to connect to. Make the following updates (see Figure 14-20), and press Enter:
   - Update `Destination processor ID` to `PAVO`.
   - Update `Destination channel subsystem ID` to 3.
   - Update `Destination channel path ID` to 88.

```
*---------------- Connect to CF Channel Path -----------------*
|                                                             |
|                                                             |
| Specify the following values.                               |
|                                                             |
| Source processor ID  . . . . . : PAVO                       |
| Source channel subsystem ID  . : 3                          |
| Source channel path ID . . . . : 8C                         |
| Source channel path type . . . : CL5                        |
|                                                             |
| Destination processor ID . . . . . . PAVO      +            |
| Destination channel subsystem ID . . 3   +                  |
| Destination channel path ID  . . . . 88  +                  |
|                                                             |
| Timing-only link . . . . . . . . . . No                     |
|                                                             |
|                                                             |
|                                                             |
|                                                             |
*-------------------------------------------------------------*
```

Figure 14-20 Processors: Connect to CF Channel Path - CL5

9. HCD checks the available CU numbers and device addresses starting at FFFF and works backwards to provide suggestions. These suggestions can be overridden or accepted. We accept the suggestions for the second CL5 CHPID (see Figure 14-21), and press Enter.

```
*----------------- Add CF Control Unit and Devices -------------------*
|                                                                     |
|                                                                     |
| Confirm or revise the CF control unit number and device numbers     |
| for the CF control unit and devices to be defined.                  |
|                                                                     |
| Processor ID . . . . . . . : PAVO                                   |
| Channel subsystem ID . . . : 3                                      |
| Channel path ID  . . . . . : 8C        Operation mode . . : SHR     |
| Channel path type  . . . . : CL5                                    |
|                                                                     |
| Control unit number  . . . . FFFE  +                                |
|                                                                     |
| Device number  . . . . . . . FFE8                                   |
| Number of devices  . . . . . 8                                      |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
*---------------------------------------------------------------------*
```

Figure 14-21 Processors: Add CF Control Unit and Devices - CL5

10. HCD provides suggested CU numbers and device addresses for the first CL5 CHPID (see Figure 14-22). Observe that the CU number is the same and that eight devices were allocated. Press Enter.

```
*----------------- Add CF Control Unit and Devices -------------------*
|                                                                     |
|                                                                     |
| Confirm or revise the CF control unit number and device numbers     |
| for the CF control unit and devices to be defined.                  |
|                                                                     |
| Processor ID . . . . . . . : PAVO                                   |
| Channel subsystem ID . . . : 3                                      |
| Channel path ID  . . . . . : 88        Operation mode . . : SHR     |
| Channel path type  . . . . : CL5                                    |
|                                                                     |
| Control unit number  . . . . FFFE  +                                |
|                                                                     |
| Device number  . . . . . . . FFE0                                   |
| Number of devices  . . . . . 8                                      |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
*---------------------------------------------------------------------*
```

Figure 14-22 Processors: Add CF Control Unit and Devices - CL5

HCD provides a summary of the Source and Destination CF Connectivity List (see Figure 14-23).

```
                     CF Channel Path Connectivity List             Row 3 of 4
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . : PAVO      Pavo
Source channel subsystem ID . : 3
Source partition name . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#-
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  Dev
_ 88  1DC/1 Y  CL5  SHR  N     PAVO.3     8C  23C/1 Y  CL5  SHR    CFP   8
_ 8C  23C/1 Y  CL5  SHR  N     PAVO.3     88  1DC/1 Y  CL5  SHR    CFP   8
****************************** Bottom of data *******************************
```

Figure 14-23 Processors: Add CF Channel Path Connectivity List - CL5

14.2.6 Defining ICP CHPIDs

When defining an ICP CHPID to create a CF link between a CF LPAR and a z/OS LPAR, determine which z/OS LPARs require access to which CF LPARs, and how many CF links are required within the same physical processor.

ICP CF CHPIDs are defined logically and internally to the processor and require no installed hardware.

Note: The maximum number of ICP CHPIDs for an IBM z16 A01, IBM z16 A02, or IBM z16 AGZ) is 64.

Each of the logical ICP links can support only one CHPID at each end of the link. However, the CHPIDS can be spanned across multiple CSSs.

Here are considerations for a new ICP CHPID:

- CHPID
- Channel path type
- Operational mode
- Description
- Partition access list

To define an ICP CHPID and provide access to a partition, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter s next to the processor that you want to add a CHPID to, and press Enter.
3. Enter `s` next to the CSS ID that you want to add a CHPID to, and press Enter.
4. In the CLI, enter `add` (see Figure 14-24) to add a CHPID.
5. Make the following updates, and press Enter:
   - Update `Channel path ID` to `FC`.
   - Update `Channel path type` to `ICP`.
   - Update `Operational mode` to `SHR`.
   - Update `Description` to the description that you want.

```
*---------------------------- Add Channel Path -----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO         Pavo                                  |
| Configuration mode . : LPAR                                               |
| Channel Subsystem ID : 3                                                  |
|                                                                           |
| Channel path ID  . . . . FC    +            Channel ID  ___  +            |
| Number of CHPIDs . . . . 1                                                |
| Channel path type  . . . ICP   +                                          |
| Operation mode . . . . . SHR   +                                          |
| Managed  . . . . . . . . No   (Yes or No)   I/O Cluster ________   +      |
| Description  . . . . . . ICP Internal Coupling Peer______                 |
|                                                                           |
| Specify the following values only if connected to a switch:               |
| Dynamic entry switch ID  __  + (00 - FF)                                  |
| Entry switch ID  . . . . __  +                                            |
| Entry port . . . . . . . __  +                                            |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 14-24 Processors: Add Channel Path - ICP

6. HCD prompts you to select which partitions the CHPID should have access to. Enter a forward slash (/) next to the partitions that you want (see Figure 14-25), and press Enter.

```
*--------------------------- Define Access List ----------------------------*
|                                                                Row 1 of 7 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                           |
| Select one or more partitions for inclusion in the access list.          |
|                                                                           |
| Channel Subsystem ID : 3                                                  |
| Channel path ID  . . : FC     Channel path type  . : ICP                 |
| Operation mode . . . : SHR    Number of CHPIDs . . : 1                   |
|                                                                           |
| / CSS ID Partition Name   Number Usage Description                        |
| / 3      PAVO3E           E      CF    PAVO3E test CF partition           |
| _ 3      PAVO31           1      CF/OS                                    |
| _ 3      PAVO32           2      CF/OS                                    |
| / 3      PAVO33           3      OS    PAVO33 test OS partition           |
| _ 3      PAVO34           4      CF/OS                                    |
| _ 3      PAVO35           5      CF/OS                                    |
| _ 3      PAVO36           6      CF/OS                                    |
| **************************** Bottom of data ***************************** |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 14-25 Processors: Define Access List - ICP

Because more partitions than the selected two are defined, the Define Candidate List panel opens. For this example, we do not add any partitions in the access list. Press Enter.

HCD returns to the Channel Path List and shows you the CHPID that was defined (see Figure 14-26).

```
                              Channel Path List      Row 3 of 11 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO        Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 80    00/1  CS5   SHR   __  __ __    Y   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __    Y   No  FC#0176 ICA SR 2 Links
_ 88    1DC/1 CL5   SHR   __  __ __    Y   No  FC#0434 Coupling Express2 LR
_ 8C    23C/1 CL5   SHR   __  __ __    Y   No  FC#0434 Coupling Express2 LR
_ C3    1BC   OSE   SHR   __  __ __        No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __        No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __        No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __        No  IQD Internal Queued Direct Comms
_ FC    _____ ICP   SHR   __  __ __    N   No  ICP Internal Coupling Peer
****************************** Bottom of data ********************************
```

Figure 14-26 Processors: Channel Path List - ICP

7. Define an extra ICP CHPID as `FD` to the same LPARs (see Figure 14-27).

```
                              Channel Path List      Row 3 of 12 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO        Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+            Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 80    00/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 88    1DC/1 CL5   SHR   __  __ __   Y   No  FC#0434 Coupling Express2 LR
_ 8C    23C/1 CL5   SHR   __  __ __   Y   No  FC#0434 Coupling Express2 LR
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
_ FC    _____ ICP   SHR   __  __ __   N   No  ICP Internal Coupling Peer
_ FD    _____ ICP   SHR   __  __ __   N   No  ICP Internal Coupling Peer
*----------------------------------------------------------------------------*
```

Figure 14-27 Processors: Channel Path List - ICP

14.2.7 Defining a Coupling Facility link with ICP CHPIDs

The only way to define an ICP CHPID to another ICP CHPID is as a logical internal connection within the processor.

Here are considerations for creating a CF link by using ICP CHPIDs:

- Each of the logical ICP links can support only one CHPID at each end of the link.
- Determine how many ICP CF links are required to provide enough coupling bandwidth.
- Determine which z/OS LPARs on the same processors need access to the CF LPARs.
- In this example, we connect two ICP CHPIDs (Fibre Channel (FC) and FD) on the same processor.

To define a CF link with ICP CHPIDs, complete the following steps:

1. From the main HCD panel, select option `1.3. Processors`.
2. Enter s next to the processor that you want to create the first CF link from, and press Enter.
3. Enter s next to the CSS ID that has the ICP CHPID definition that you want to create the first CF link from, and press Enter.
4. Scroll through the Channel Path List until you find the first ICP CHPID that you want to connect from, or in the CLI, enter `L FC`. In our example, we use `FC`.

5. Enter f next to the CHPID definition (see Figure 14-28), and press Enter.

```
                              Channel Path List      Row 3 of 12 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter. To add use F11.

Processor ID . . . . : PAVO          Pavo
Configuration mode . : LPAR
Channel Subsystem ID : 3

        CHID+             Dyn Entry +
/ CHPID AID/P Type+ Mode+ Sw+ Sw Port Con Mng Description
_ 80    00/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 84    17/1  CS5   SHR   __  __ __   Y   No  FC#0176 ICA SR 2 Links
_ 88    1DC/1 CL5   SHR   __  __ __   Y   No  FC#0434 Coupling Express2 LR
_ 8C    23C/1 CL5   SHR   __  __ __   Y   No  FC#0434 Coupling Express2 LR
_ C3    1BC   OSE   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ C6    11C   OSC   SHR   __  __ __       No  FC#0446 OSA Express7S 1000Base-T
_ E1    128   OSD   SHR   __  __ __       No  FC#0445 OSA Express7s 10GbE SR
_ F0    7E0   IQD   SHR   __  __ __       No  IQD Internal Queued Direct Comms
f FC    _____ ICP   SHR   __  __ __   N   No  ICP Internal Coupling Peer
_ FD    _____ ICP   SHR   __  __ __   N   No  ICP Internal Coupling Peer
*-----------------------------------------------------------------------------*
```

Figure 14-28 Processors: CF Channel Path Connectivity List - ICP

6. HCD prompts you to specify the second ICP CHPID that you want to connect to. Scroll through the Channel Path List until you find the second ICP CHPID that you want to connect to, or in the CLI, enter `L FD`. In our example, we use `FD`.
7. Type p next to the CHPID definition (see Figure 14-29), and press Enter.

```
                     CF Channel Path Connectivity List              Row 1 of 6
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . . : PAVO      Pavo
Source channel subsystem ID . . : 3
Source partition name . . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#-
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  Dev
_ 80  00/1  Y  CS5  SHR  N     PAVO.3     84  17/1  Y  CS5  SHR    CFP   8
_ 84  17/1  Y  CS5  SHR  N     PAVO.3     80  00/1  Y  CS5  SHR    CFP   8
_ 88  1DC/1 Y  CL5  SHR  N     PAVO.3     8C  23C/1 Y  CL5  SHR    CFP   8
_ 8C  23C/1 Y  CL5  SHR  N     PAVO.3     88  1DC/1 Y  CL5  SHR    CFP   8
_ FC        Y  ICP  SHR  N
p FD        Y  ICP  SHR  N
****************************** Bottom of data *******************************
```

Figure 14-29 Processors: CF Channel Path Connectivity List - ICP

8. HCD prompts you to specify which CF channel path to connect to. Make the following updates (see Figure 14-30), and press Enter:
   - Update `Destination processor ID` to `PAVO`.
   - Update `Destination channel subsystem ID` to 3.
   - Update `Destination channel path ID` to `FC`.

```
*---------------- Connect to CF Channel Path -----------------*
|                                                              |
|                                                              |
| Specify the following values.                                |
|                                                              |
| Source processor ID  . . . . . : PAVO                        |
| Source channel subsystem ID  . : 3                           |
| Source channel path ID . . . . : FD                          |
| Source channel path type . . . : ICP                         |
|                                                              |
| Destination processor ID . . . . . . PAVO      +             |
| Destination channel subsystem ID . . 3   +                   |
| Destination channel path ID  . . . . FC  +                   |
|                                                              |
| Timing-only link . . . . . . . . . . No                      |
|                                                              |
|                                                              |
|                                                              |
|                                                              |
*--------------------------------------------------------------*
```

Figure 14-30 Processors: Connect to CF Channel Path - ICP

9. HCD checks the available CU numbers and device addresses starting at FFFF and works backwards to provide suggestions. These suggestions can be overridden or accepted. We accept the suggestions for the second ICP CHPID (see Figure 14-31), and press Enter.

```
*----------------- Add CF Control Unit and Devices -------------------*
|                                                                     |
|                                                                     |
| Confirm or revise the CF control unit number and device numbers     |
| for the CF control unit and devices to be defined.                  |
|                                                                     |
| Processor ID . . . . . . . : PAVO                                   |
| Channel subsystem ID . . . : 3                                      |
| Channel path ID  . . . . . : FD         Operation mode . . : SHR    |
| Channel path type  . . . . : ICP                                    |
|                                                                     |
| Control unit number  . . . . FFFE  +                                |
|                                                                     |
| Device number  . . . . . . . FFD9                                   |
| Number of devices  . . . . . 7                                      |
|                                                                     |
|                                                                     |
|                                                                     |
|                                                                     |
*---------------------------------------------------------------------*
```

Figure 14-31 Processors: Add CF Control Unit and Devices - ICP

10. HCD provides suggested CU numbers and device addresses for the first ICP CHPID (see Figure 14-32). Observe that the CU number is the same and that seven devices were allocated. Press Enter.

```
*----------------- Add CF Control Unit and Devices -------------------*
|                                                                      |
|                                                                      |
| Confirm or revise the CF control unit number and device numbers      |
| for the CF control unit and devices to be defined.                   |
|                                                                      |
| Processor ID . . . . . . . : PAVO                                    |
| Channel subsystem ID . . . : 3                                       |
| Channel path ID  . . . . . : FC         Operation mode . . : SHR     |
| Channel path type  . . . . : ICP                                     |
|                                                                      |
| Control unit number  . . . . FFFE  +                                 |
|                                                                      |
| Device number  . . . . . . . FFD2                                    |
| Number of devices  . . . . . 7                                       |
|                                                                      |
|                                                                      |
|                                                                      |
|                                                                      |
*----------------------------------------------------------------------*
```

Figure 14-32 Processors: Add CF Control Unit and Devices - ICP

HCD provides a summary of the Source and Destination CF Connectivity List (see Figure 14-33).

```
                     CF Channel Path Connectivity List              Row 5 of 6
Command ===> ____________________________________________ Scroll ===> CSR

Select one or more channel paths, then press Enter.

Source processor ID . . . . . : PAVO      Pavo
Source channel subsystem ID . : 3
Source partition name . . . . : *

  ----------Source----------   -----------Destination-----------   -CU-  -#-
/ CHP CHID  CF Type Mode Occ   Proc.CSSID CHP CHID  CF Type Mode   Type  Dev
_ FC        Y  ICP  SHR  N     PAVO.3     FD        Y  ICP  SHR    CFP   7
_ FD        Y  ICP  SHR  N     PAVO.3     FC        Y  ICP  SHR    CFP   7
******************************* Bottom of data ******************************
```

Figure 14-33 Processors: Add CF Channel Path Connectivity List - ICP

15

Adding Peripheral Component Interconnect Express devices

This chapter describes the steps to define Peripheral Component Interconnect Express (PCIe) functions, features, and devices for Internal Shared Memory (ISM), Remote Direct Memory Access over Converged Ethernet (RoCE), and zHyperLink.

It includes a list of these potential configuration items and a short description about how to do each of them by using Hardware Configuration Definition (HCD). It also includes an overview of PCIe functions.

Naming: The IBM z16 systems that are targeted by this publication consist of IBM z16 A01, IBM z16 A02, and IBM z16 AGZ. Throughout this chapter, we might refer to these machines as IBM z16. Wherever features and functions differ across these systems, they are explicitly mentioned.

Note: The examples that are shown in this chapter are based on the IBM z16 A01 (3931). However, these examples can also be used with the IBM z16 A02 and IBM z16 AGZ (3932).

Note: Not all the following configuration items are necessarily required for your installation. In addition, the examples that are presented are not exhaustive.

This chapter includes the following topics:

- Defining PCIe functions by using HCD
- PCIe feature definitions

15.1 Defining PCIe functions by using HCD

When defining new I/O components in an input/output definition file (IODF), certain definitions like operating system configurations (OSCONFIGs), partitions, Fibre Connection (FICON) switches, control units (CUs), and devices must be done first. After these items are defined, then the following connections can be made:

- Defining an ISM PCIe function
- Defining a RoCE PCIe function
- Defining a zHyperLink PCIe function

The following I/O definitions use HCD to demonstrate the examples. This section continues to use the work example `SYS9.IODF81.WORK`.

> **Note:** Starting with the IBM z15, the IBM zEnterprise Data Compression (zEDC) PCIe feature is no longer available as a separate hardware feature, Compression functions are implemented directly on the processor chip. Therefore, an HCD configuration is no longer required.

15.2 PCIe feature definitions

This section provides a brief overview of the **`Function`** statement and covers defining ISM, RoCE, and zHyperLink PCIe features.

15.2.1 Overview

PCIe adapters that are attached to a system can provide the operating system (OS) with various “PCIe functions” that are used by entitled logical partitions (LPARs).

Currently, HCD supports the following features for an IBM z16:

- ISM PCIe Adapter: A virtual PCIe (vPCIe) adapter for which a virtual channel ID (VCHID) must be defined.
- RoCE: PCIe functions of type RoCE-2 may be assigned to external physical networks by specifying corresponding PNET IDs.
- zHyperLink: Requires a new PCIe function attribute for identifying a port on the adapter to which the function is related.

> **Note:** The support of virtual functions (VFs), the allowed range of virtual function IDs (VFIDs), and the support of PNETIDs depends on the processor type and support level. For more information, see *Input/Output Configuration Program User’s Guide*, SB10-7177. HCD offers prompts for VFIDs and ensures that the validation rules are fulfilled.

HCD provides dialog boxes to define, change, delete, and view PCIe functions, and to control which LPARs access which PCIe functions.

In addition, HCD provides the following reports:

- The PCIe Function Summary Report displays the partitions in the access and candidate lists, which are entitled to access the available PCIe functions.
- The PCIe Function Compare Report shows the changes of PCIe functions between processors of two IODFs.

HCD supports the new I/O configuration statement **FUNCTION** for defining and configuring PCIe functions.

The input/output (I/O) subsystem, which controls channel operations, requires specific data about the hardware I/O configuration.

To define PCIe functions for the I/O subsystem, you must specify the following items:

- LPARs
- PCIe adapter functions on the central processor complex (CPC) and their assignment to LPARs

A PCIe function is defined by a unique identifier: the function ID (FID). Each function specifies a function type and a channel ID (CHID). Multiple functions may be specified to the same CHID value if each of these functions defines a unique VF number when defining a PCIe function. Example 15-1 shows definitions for a zHyperLink card for Port 1 and multiple VFIDs, each assigned to a specific LPAR.

Example 15-1 zHyperLink definitions

```
RESOURCE PARTITION=((CSS(0),(PAV00A,A),(PAV00B,B),(PAV001,1),(*
               PAV002,2),(PAV003,3),(PAV004,4),(PAV005,5),(PAV006,6),(P*
               AV007,7),(PAV008,8),(PAV009,9),(*,C),(*,D),(*,E),(*,F)),*
               (CSS(1),(PAV01A,A),(PAV01B,B),(PAV01C,C),(PAV01D,D),(PAV*
               01E,E),(PAV01F,F),(PAV011,1),(PAV012,2),(PAV013,3),(PAV0*
               14,4),(PAV015,5),(PAV016,6),(PAV017,7),(PAV018,8),(PAV01*
               9,9)),(CSS(2),(PAV02A,A),(PAV02B,B),(PAV02C,C),(PAV021,1*
               ),(PAV022,2),(PAV023,3),(PAV024,4),(PAV025,5),(PAV026,6)*
               ,(PAV027,7),(PAV028,8),(PAV029,9),(*,D),(*,E),(*,F)),(CS*
               S(3),(PAV03A,A),(PAV03B,B),(PAV03C,C),(PAV03D,D),(PAV03E*
               ,E),(PAV03F,F),(PAV031,1),(PAV032,2),(PAV033,3),(PAV034,*
               4),(PAV035,5),(PAV036,6),(PAV037,7),(PAV038,8),(PAV039,9*
               )),(CSS(4),(PAV041,1),(PAV042,2),(PAV043,3),(PAV044,4),(*
               PAV045,5),(PAV046,6),(PAV047,7),(PAV048,8),(PAV049,9),(**
               ,A),(*,B),(*,C),(*,D),(*,E),(*,F)),(CSS(5),(*,1),(*,2),(*
               *,3),(*,4),(*,5),(*,6),(*,7),(*,8),(*,9),(*,A)))
************************************************************************
* FOR zHyperLink
************************************************************************
**
         FUNCTION FID=2131,VF=1,PCHID=150,PART=((PAV031),(=)),TYPE=HYL,*
               PORT=1
         FUNCTION FID=2132,VF=2,PCHID=150,PART=((PAV032),(=)),TYPE=HYL,*
               PORT=1
         FUNCTION FID=2133,VF=3,PCHID=150,PART=((PAV033),(=)),TYPE=HYL,*
               PORT=1
         FUNCTION FID=2134,VF=4,PCHID=150,PART=((PAV034),(=)),TYPE=HYL,*
               PORT=1
         FUNCTION FID=2135,VF=5,PCHID=150,PART=((PAV035),(=)),TYPE=HYL,*
```

```
                PORT=1
**
```

Table 15-1 shows the list of applicable functions to the various function types.

Table 15-1 Keyword applicability for functions

Function[a]	Function type		
	HYL (zHyperLink)	**ISM**	**ROC2 (ROCE - 2)**
Physical channel ID (PCHID)	Yes	No	Yes
VCHID	No	Yes	No
PNETID	No	Yes	Yes
PORT	Yes	No	Yes
VF	Yes	Yes	Yes

a. The CHPID types between parentheses are HCD function names. The other types are input/output configuration program (IOCP) function names.

For more information about the maximum values for each machine type, see *IBM Z Input/Output Configuration Program User's Guide,* SB10-7177.

15.2.2 Defining an ISM PCIe function

The IBM z16 system supports ISM vPCIe devices to enable optimized cross-LPAR TCP communications by using socket-based Direct Memory Access (DMA), that is, SMC - Direct Memory Access over Internal Shared Memory (SMC-D).

SMC-D uses a vPCIe adapter and is configured like a physical PCIe device. There are up to 32 ISM adapters, each with a unique Physical Network ID per CPC.

Internal Shared Memory technology

ISM is a virtual PCI network adapter that enables direct access to shared virtual memory, providing highly optimized network communications for OSs within the same IBM Z platform.

Virtual memory is managed by each z/OS (similar to SMC - Remote Direct Memory Access over Converged Ethernet Express (SMC-R) logically shared memory) following the existing IBM Z PCIe I/O conversion architecture.

For more information about the management of SMC-D, see *IBM z/OS V2R2 Communications Server TCP/IP Implementation Volume 1: Base Functions, Connectivity, and Routing*, SG24-8360.

ISM configuration

In this example, we define these items:

- `CHID=7F1` to FIDs 0040 (`VF=1`) and 0041 (`VF=2`) on `CPC = PAVO`
- `CHID=7F2` to FIDs 0050 (`VF=1`) and 0051 (`VF=2`) on `CPC = PAVO`

Complete the following steps:

1. From the main HCD panel, select option `1.3. Processor List`.
2. Enter `f` (work with PCIe functions) next to the processor (`PAVO`) to which you want to define the ISM functions, as shown in Figure 15-1, and press Enter.

```
                                Processor List       Row 1 of 4 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
f PAVO     3931     A01      LPAR  071A083931 Pavo
******************************* Bottom of data ********************************
```

Figure 15-1 Processor List: Adding PCIe functions to a processor - ISM

3. To add a PCIe function, enter `add` on the CLI in the PCIe Function List panel (Figure 15-2).

```
                              PCIe Function List
Command ===> add____________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
******************************* Bottom of data ********************************
```

Figure 15-2 PCIe Function List: Adding PCIe functions to a processor - ISM

4. Make the following updates (Figure 15-3), and press Enter:
   - Update `Function ID` to `0040`.
   - Update `Type` to `ISM`.
   - Update `Channel ID` to `7F1`.
   - Update `Virtual Function ID` to `1`.
   - Update `Description` to the description that you want.

```
*---------------------------- Add PCIe Function ----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID  . . . . : PAVO        Pavo                                  |
|                                                                           |
| Function ID . . . . . . 0040                                              |
| Type  . . . . . . . . . ISM________  +                                    |
|                                                                           |
| Channel ID . . . . . . . . . . . 7F1  +                                   |
| Port . . . . . . . . . . . . . . _    +                                   |
| Virtual Function ID  . . . . . . 1__  +                                   |
| Number of virtual functions  . . 1                                        |
| UID  . . . . . . . . . . . . . . ____                                     |
|                                                                           |
| Description  . . . . . . . . . . ISM FID=0040 VFID=1 CHID=7F1____         |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 15-3   PCIe Function List: Adding PCIe functions to a processor - ISM

5. Update `Physical network ID` to `PERFNET` in the Add/Modify Physical Network IDs panel (Figure 15-4), and press Enter.

```
*--------------------- Add/Modify Physical Network IDs ---------------------*
|                                                                           |
|                                                                           |
| If the Channel ID (CHID) is associated to one or more physical networks,  |
| specify each physical network ID corresponding to each applicable         |
| physical port.                                                            |
|                                                                           |
| Physical network ID 1  . . PERFNET_________                               |
| Physical network ID 2  . . ________________                               |
| Physical network ID 3  . . ________________                               |
| Physical network ID 4  . . ________________                               |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 15-4   Add/Modify Physical Network IDs: Adding network ID - ISM

6. Select the required Access LPAR for Function access list. In our example, we use LPAR `PAV033(OS)`. Press Enter (Figure 15-5).

```
*--------------------------- Define Access List ----------------------------*
|                                                                Row 1 of 7 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                            |
| Select one partition for the access list.                                  |
|                                                                            |
| Function ID  . . . . : 0040                                                |
|                                                                            |
| / CSS ID Partition Name   Number Usage Description                         |
| _ 3      PAV031           1      OS                                        |
| _ 3      PAV032           2      OS                                        |
| / 3      PAV033           3      OS    PAV033 test OS partition            |
| _ 3      PAV034           4      OS                                        |
| _ 3      PAV035           5      OS                                        |
| _ 3      PAV036           6      OS                                        |
| _ 3      PAV037           7      OS                                        |
| _ 3      PAV038           8      OS                                        |
| _ 3      PAV039           9      OS                                        |
| **************************** Bottom of data ***************************** |
|                                                                            |
|                                                                            |
+---------------------------------------------------------------------------*
```

Figure 15-5 Define Access List: Selecting partition for Function access - ISM

7. Select the `Any Candidate LPARs for Function` access list. In our example, we do *not* select any candidate LPARs. Press Enter.

   HCD returns to the PCIe Function List panel where you can see that the function is now defined (Figure 15-6).

```
                              PCIe Function List      Row 1 of 1 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
_ 0040   7F1    _   1    ISM           ____  ISM FID=0040 VFID=1 CHID=7F1
******************************* Bottom of data ********************************
```

Figure 15-6 PCIe Function List: Function now created - ISM

8. Now, define the other FIDs according to the example so far (Figure 15-7).

```
                              PCIe Function List      Row 1 of 4 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
_ 0040   7F1    _   1    ISM           ____  ISM FID=0040 VFID=1 CHID=7F1
_ 0041   7F1    _   2    ISM           ____  ISM FID=0041 VFID=2 CHID=7F1
_ 0050   7F2    _   1    ISM           ____  ISM FID=0050 VFID=1 CHID=7F2
_ 0051   7F2    _   2    ISM           ____  ISM FID=0051 VFID=2 CHID=7F2
******************************* Bottom of data ********************************
```

Figure 15-7 PCIe Function List: All Functions now created - ISM

ISM management

From an operational standpoint, SMC-D is like SMC-R. However, SMC-D uses DMA instead of Remote Direct Memory Access (RDMA), and it uses a virtual PCI adapter that is called ISM rather than an RDMA network interface card (RNIC). The ISM interfaces are associated with IP interfaces (for example, HiperSockets or Open Systems Adapter-Express (OSA-Express)), and are dynamically created, automatically started and stopped, and auto-discovered.

SMC-D over ISM does not use queue pair (QP) technology like SMC-R. Therefore, links and Link Groups based on QPs (or other hardware constructs) are not applicable to ISM. The SMC-D protocol has a design concept of a “logical point-to-point connection” that is called an SMC-D link.

Note: The SMC-D information in the **`netstat`** command output is related to ISM link information (not Link Groups).

15.2.3 Defining a RoCE PCIe function

As described in 2.5.4, “Network connectivity” on page 28, the following features are supported on the IBM z16 system:

- 10-Gigabit Ethernet (GbE) RoCE Express2 (Feature Code #0412, carry forward only)
- 10 GbE RoCE Express2.1 (Feature Code #0432, carry forward only)
- 10 GbE RoCE Express3 SR (Feature Code #0440)
- 10 GbE RoCE Express3 Long Reach (LR) (Feature Code #0441)
- 25 GbE RoCE Express2 (Feature Code #0430, carry forward only)
- 25 GbE RoCE Express2.1 (Feature Code #0450, carry forward only)
- 25GbE RoCE Express3 SR (Feature Code #0452)
- 25GbE RoCE Express3 LR (Feature Code #0453)

This section provides information about the configuration of the SMC-R on an IBM z16.

RoCE overview

The IBM Z RoCE Express features are native PCIe features, so the HCD and IOCP definition rules differ from a non-native PCIe card such as OSA-Express. Here are the rules:

- The PCIe function ID (PFID) must be defined in HCD or Hardware Configuration Manager (HCM) to create IOCP input:
  - FID is a three hexadecimal value (0000 - 47FF) that specifies the PCIe function.
  - The PFID *cannot* be assigned to a channel subsystem (CSS), so any LPAR can be defined to a function.
  - The PFID has a **PARTITION** parameter that dedicates it to one LPAR or enables reconfiguration among a group of LPARs. A function cannot be defined as *shared*.
  - In z/OS system commands, a PFID is represented as `PFID`.
- If the intended PCIe hardware supports multiple partitions, it has a decimal VF number (`VF=`) in the range 1 - *n*, where *n* is the maximum number of partitions that the PCIe feature supports.
- Other parameters that are specific to the PCIe feature. For example, the IBM RoCE Express2 requires a Physical Network Identifier (`PNETID=`)[1], and supports a port identifier (`PORT=`).
- For function mapping to hardware, assign a PCHID to identify the hardware feature in a specific PCIe I/O drawer and the slot to be used for the defined function. The following methods can be used:
  - Manually, by using the configurator (eCONFIG) PCHID report.
  - Using the channel path ID (CHPID) Mapping Tool (CMT) and the eConfig CFReport input.

> **Note:** Unlike CHPIDs, multiple functions can be mapped to the same PCHID. This approach is conceptually like mapping multiple InfiniBand coupling CHPIDs to the same adapter and port.
>
> The example in “RoCE configuration” is for a 10 GbE RoCE Express3 SR Card. The same principles also apply to the other supported RoCE Express cards on IBM z16 systems.

RoCE configuration

For more information about the PCHID and Resource Group (RG), see the PCHID report for the processor (see Example 15-2).

Example 15-2 PCHID Report: RoCE information from the PCHID report

```
Machine: 3931-A01  SN1
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  Source          Drwr  Slot  F/C    PCHID/Ports or AID              Comment
  A15/LG12/J02    Z01B  10    0440   11C/D1D2             RG3
  A15/LG12/J01    Z17B  17    0440   1B0/D1D2             RG2
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
Legend:
  Source  Book Slot/Fanout Slot/Jack
  RG3     Resource Group 3
  RG2     Resource Group 2
  0440    10GbE RoCE Express3 SR
```

[1] PNETID is optional. However, z/OS requires that the PNETID is set.

In this example, we define these items:

- PCHID 11C to FIDs 3133 (VF 4) Port 1 and 3233 (VF 4) Port 2 on CPC PAVO to Physical Network ID 1 PERFNET
- PCHID 1B0 to FIDs 3333 (VF 4) Port 1 and 3433 (VF 4) Port 2 on CPC PAVO to Physical Network ID 1 PERFNET

Complete the following steps:

1. From the main HCD panel, select option `1.3. Processor List`.
2. Enter `f` (work with PCIe functions) next to the processor (`PAVO`) to which you want to define the RoCE-2 functions, and press Enter (see Figure 15-8).

```
                                Processor List        Row 1 of 4 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
f PAVO     3931     A01      LPAR  071A083931 Pavo
******************************* Bottom of data ********************************
```

Figure 15-8 Processor List: Adding PCIe functions to a processor - RoCE-2

3. To add a PCIe function, enter `add` on the CLI in the PCIe Function List panel (see Figure 15-9).

```
                              PCIe Function List      Row 1 of 5 More:       >
Command ===> add____________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
```

Figure 15-9 PCIe Function List: Adding PCIe functions to a processor - RoCE-2

4. Make the following updates (see Figure 15-10 on page 385), and press Enter:
   – Update `Function ID` to `3133`.
   – Update `Type` to `ROCE-2`.
   – Update `Channel ID` to `11C`.
   – Update `Port` to `1`.
   – Update `Virtual Function ID` to `4`.
   – Update `Description` to the description that you want.

```
*---------------------------- Add PCIe Function ----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID . . . . : PAVO        Pavo                                   |
|                                                                           |
| Function ID . . . . . . 3133                                              |
| Type  . . . . . . . . . ROCE-2       +                                    |
|                                                                           |
| Channel ID . . . . . . . . . . . 11C  +                                   |
| Port . . . . . . . . . . . . . . 1    +                                   |
| Virtual Function ID  . . . . . . 4__  +                                   |
| Number of virtual functions  . . 1                                        |
| UID  . . . . . . . . . . . . . . ____                                     |
|                                                                           |
| Description  . . . . . . . . . . RoCE-2 FID=3133 VFID=4 CHID=11C_         |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 15-10 PCIe Function List: Adding PCIe functions to a processor - RoCE-2

5. Update `Physical network ID` to `PERFNET` in the Add/Modify Physical Network IDs panel (see Figure 15-11), and press Enter.

```
*--------------------- Add/Modify Physical Network IDs ---------------------*
|                                                                           |
|                                                                           |
| If the Channel ID (CHID) is associated to one or more physical networks,  |
| specify each physical network ID corresponding to each applicable         |
| physical port.                                                            |
|                                                                           |
| Physical network ID 1  . . PERFNET_________                               |
| Physical network ID 2  . . ________________                               |
| Physical network ID 3  . . ________________                               |
| Physical network ID 4  . . ________________                               |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 15-11 Add/Modify Physical Network IDs: Adding network ID - RoCE-2

6. Select the required Access LPAR for Function access list. In our example, we use LPAR PAVO33 (OS). Press Enter (see Figure 15-12).

```
*--------------------------- Define Access List ----------------------------*
|                                                                  Row 1 of 7 |
| Command ===> _________________________________________ Scroll ===> CSR    |
|                                                                            |
| Select one partition for the access list.                                  |
|                                                                            |
| Function ID  . . . . : 3133                                                |
|                                                                            |
| / CSS ID Partition Name   Number Usage Description                         |
| _ 3      PAVO31           1      OS                                        |
| _ 3      PAVO32           2      OS                                        |
| / 3      PAVO33           3      OS    PAVO33 test OS partition            |
| _ 3      PAVO34           4      OS                                        |
| _ 3      PAVO35           5      OS                                        |
| _ 3      PAVO36           6      OS                                        |
| _ 3      PAVO37           7      OS                                        |
| _ 3      PAVO38           8      OS                                        |
| _ 3      PAVO39           9      OS                                        |
| **************************** Bottom of data ***************************** |
|                                                                            |
|                                                                            |
+---------------------------------------------------------------------------*
```

Figure 15-12 Define Access List: Selecting the partition for function access - RoCE-2

7. Select the `Any Candidate LPARs for Function` access list. In our example, we do not select any candidate LPARs. Press Enter.

   HCD returns to the PCIe Function List panel where you can see the function that is defined (see Figure 15-13).

```
                              PCIe Function List      Row 5 of 5 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
_ 3133   11C    1   4    ROCE-2        ____  RoCE-2 FID=3133 VFID=4 CHID=11C
```

Figure 15-13 PCIe Function List: Function now created - RoCE-2

8. Define the other FIDs according to the example so far (see Figure 15-14).

```
                              PCIe Function List      Row 5 of 8 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
_ 3133   11C    1   4    ROCE-2        ____  RoCE-2 FID=3133 VFID=4 CHID=11C
_ 3233   11C    2   4    ROCE-2        ____  RoCE-2 FID=3233 VFID=4 CHID=11C
_ 3333   1B0    1   4    ROCE-2        ____  RoCE-2 FID=3333 VFID=4 CHID=1B0
_ 3433   1B0    2   4    ROCE-2        ____  RoCE-2 FID=3433 VFID=4 CHID=1B0
```

Figure 15-14 PCIe Function List: All Functions now created - RoCE-2

RoCE management

This section introduces the z/OS commands that are related to the IBM Z RoCE Express PCIe features, and shows the responses on our test system.

DISPLAY PCIE command

You can use the **DISPLAY PCIE** command to display these items:

- All registered device drivers (with assigned printable names).
- All available or in-use PCIe functions and their associated device types.
- Information about a specific PCIe device with a list of the client address spaces that use the device.

Example 15-3 is an example of the **DISPLAY PCIE** command. You can confirm the FID and VFID that you defined. The FID is represented as PFIDs.

Example 15-3 Example of the D PCIE command

```
DISPLAY PCIE
IQP022I 16.32.22 DISPLAY PCIE 845
PCIE     0012 ACTIVE
PFID      DEVICE TYPE NAME        STATUS  ASID  JOBNAME  CHID VFN  PN
00003133  RoCE Express3           CNFG                   011C 0004 1
00003233  RoCE Express3           CNFG                   011C 0004 2
00003333  RoCE Express3           CNFG                   01B0 0004 1
00003433  RoCE Express3           CNFG                   01B0 0004 2
00002133  8GB zHyperLink          STNBY                  0150 0003 1
00002333  8GB zHyperLink          STNBY                  019C 0003 1
00002233  8GB zHyperLink          STNBY                  0150 0003 2
00002433  8GB zHyperLink          STNBY                  019C 0003 2
```

Example 15-4 is an example of the **DISPLAY PCIE,PFID=pfid** command. After you define the new PCIe function, enter this command and confirm that its status is ACTIVE.

Example 15-4 Example of the DISPLAY PCIE,PFID=pfid command

```
DISPLAY PCIE,PFID=3433
IQP024I 17.36.27 DISPLAY PCIE 821
PCIE     0012 ACTIVE
PFID      DEVICE TYPE NAME        STATUS  ASID  JOBNAME  CHID VFN  PN
00003433  RoCE Express3           CNFG                   01B0 0004 2
 CLIENT ASIDS: NONE
 PNetID 1: PERFNET
```

Example 15-5 is example of the **DISPLAY PCIE,DD** command. You can confirm the details of the device drives that are installed in the system.

Example 15-5 Example of the DISPLAY PCIE,DD command

```
DISPLAY PCIE,DD
IQP023I 17.37.18 DISPLAY PCIE 825
PCIE     0012 ACTIVE
DEV TYPE   DEVICE TYPE NAME
10140613   8GB zHyperLink
15B36750   10GbE RoCE
15B31003   10GbE RoCE
15B31004   10GbE RoCE Express
15B31016   RoCE Express2
15B31014   RoCE Express2
15B3101E   RoCE Express3
101404ED   ISM
```

The CONFIG command

You can use the **CONFIG** command to bring the PFID online or offline.

Example 15-6 is an example of a **CONFIG PFID(xx),ONLINE** command.

Example 15-6 Example of a CONFIG PFID(xx),ONLINE command

```
CONFIG PFID(3433),ONLINE
IEE504I PFID(3433),ONLINE
IEE712I CONFIG   PROCESSING COMPLETE
```

Example 15-7 is an example of a **CONFIG PFID(xx),OFFLINE** command.

Example 15-7 Example of a CF PFID(x),OFFLINE command

```
CONFIG PFID(3433),OFFLINE
IEE505I PFID(3433),OFFLINE
IEE712I CONFIG   PROCESSING COMPLETE
```

For more information about how to manage a RoCE Express feature, see *IBM z/OS V2R2 Communications Server TCP/IP Implementation Volume 1: Base Functions, Connectivity, and Routing*, SG24-8360.

15.2.4 IBM Integrated Accelerator for zEDC

On the IBM z16 system, an IBM Integrated Accelerator for zEDC replaces the IBM zEDC Express PCIe adapter.

The IBM z16 processor chip has two integrated accelerators in the design. IBM integrated on-chip compression uses an algorithm for file compression that reduces the size of data to save storage space or increase the data transfer rate. This on-chip compression capability delivers industry-leading throughput and replaces the zEDC Express adapter on the z14 and earlier systems. There are no more input/output configuration data set (IOCDS) definitions that are needed to use the compression function.

However, all data interchange remains compatible. IBM z16 and zEDC capable CPCs co-exist. Data that is compressed and written with zEDC is read and decompressed by IBM z16 systems.

Note: All z/OS configuration prerequisites stay the same. BSAM / QSAM and SMF Logstream compression still need software enablement as a chargeable feature.

15.2.5 Defining a zHyperLink PCIe function

The zHyperLink Express is a direct-connect, short-distance IBM Z I/O feature that works with a High-Performance FICON storage area network (SAN) infrastructure.

IBM zHyperLink dramatically reduces latency by interconnecting the IBM z16 directly to the I/O bay of the DS8880 storage system or later.

zHyperLink uses a PCIe feature that is called zHyperLink Express (Feature Code #0451 or Feature Code #0431).

There are two ports per feature, and up to 127 VFIDs can be defined per port.

zHyperLink configuration

In this example, we define these items:

- `CHID=150` to `FID = 2133, VFIDs = 3, Port = 1,` on `CPC = PAVO`
- `CHID=150` to `FID = 2233, VFIDs = 3, Port = 2,` on `CPC = PAVO`
- `CHID=19C` to `FID = 2333, VFIDs = 3, Port = 1,` on `CPC = PAVO`
- `CHID=19C` to `FID = 2433, VFIDs = 3, Port = 2,` on `CPC = PAVO`

Complete the following steps:

1. From the main HCD panel, select option `1.3. Processor List`. Enter `f` (work with PCIe functions) next to the processor (`PAVO`) to which you want to define the zHyperLink functions, and press Enter (see Figure 15-15).

```
                                Processor List        Row 1 of 4 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more processors, then press Enter. To add, use F11.


/ Proc. ID Type +   Model +  Mode+ Serial-# + Description
_ HYDRA    8562     LT2      LPAR  03F7A88562 Hydra
_ LEPUS    3907     ZR1      LPAR  0BB4B73907 Lepus
f PAVO     3931     A01      LPAR  071A083931 Pavo
******************************* Bottom of data ********************************
```

Figure 15-15 Processor List: Adding PCIe functions to a processor - zHyperLink

2. To add a PCIe function, enter `add` on the CLI in the PCIe Function List panel (Figure 15-16).

```
                              PCIe Function List      Row 1 of 5 More:       >
Command ===> add____________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
```

Figure 15-16 PCIe Function List: Adding PCIe functions to a processor - zHyperLink

3. Make the following updates (Figure 15-17), and press Enter:
   – Update `Function ID` to `2133`.
   – Update `Type` to `ZHYPERLINK`.
   – Update `Channel ID` to `150`.
   – Update `Port ID` to `1`.
   – Update `Virtual Function ID` to 3.
   – Update `Description` to the description that you want.

```
*---------------------------- Add PCIe Function ----------------------------*
|                                                                           |
|                                                                           |
| Specify or revise the following values.                                   |
|                                                                           |
| Processor ID  . . . . : PAVO         Pavo                                 |
|                                                                           |
| Function ID . . . . . . 2133                                              |
| Type  . . . . . . . . . ZHYPERLINK    +                                   |
|                                                                           |
| Channel ID . . . . . . . . . . . 150  +                                   |
| Port . . . . . . . . . . . . . . 1    +                                   |
| Virtual Function ID  . . . . . . 3    +                                   |
| Number of virtual functions  . . 1                                        |
| UID  . . . . . . . . . . . . . . ____                                     |
|                                                                           |
| Description  . . . . . . . . . . zHYL FID=2133 VFID=3 CHID=150___         |
|                                                                           |
|                                                                           |
|                                                                           |
*---------------------------------------------------------------------------*
```

Figure 15-17 PCIe Function List: Adding PCIe functions to a processor - zHyperLink

4. Select the required `Access LPAR for Function` access list. In our example, we use LPAR `PAVO33 (OS)`. Press Enter (see Figure 15-18).

```
*--------------------------- Define Access List ----------------------------*
|                                                                  Row 1 of 7 |
| Command ===> _________________________________________ Scroll ===> CSR     |
|                                                                             |
| Select one partition for the access list.                                   |
|                                                                             |
| Function ID  . . . . : 2133                                                 |
|                                                                             |
| / CSS ID Partition Name   Number Usage Description                          |
| _ 3      PAVO31           1      OS                                         |
| _ 3      PAVO32           2      OS                                         |
| / 3      PAVO33           3      OS    PAVO33 test OS partition             |
| _ 3      PAVO34           4      OS                                         |
| _ 3      PAVO35           5      OS                                         |
| _ 3      PAVO36           6      OS                                         |
| _ 3      PAVO37           7      OS                                         |
| _ 3      PAVO38           8      OS                                         |
| _ 3      PAVO39           9      OS                                         |
| *************************** Bottom of data **************************** |
|                                                                             |
|                                                                             |
+----------------------------------------------------------------------------*
```

Figure 15-18 Define Access List: Selecting the partition for function access - zHyperLink

5. Select the `Any Candidate LPARs for Function` access list. In our example, we do *not* select any candidate LPARs. Press Enter.

   HCD returns to the PCIe Function List panel, where you can see the function now defined (see Figure 15-19).

```
                             PCIe Function List      Row 5 of 9 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
_ 2133   150    1   3    ZHYPERLINK    ____  zHYL FID=2133 VFID=3 CHID=150
```

Figure 15-19 PCIe Function List: Function now created - zHyperLink

6. Now, define the other FIDs according to the example so far (see Figure 15-20).

```
                              PCIe Function List     Row 5 of 12 More:       >
Command ===> _______________________________________________ Scroll ===> CSR

Select one or more PCIe functions, then press Enter. To add, use F11.

Processor ID . . . . : PAVO         Pavo



/ FID    CHID+  P+  VF+  Type+         UID   Description
_ 2133   150    1   3    ZHYPERLINK    ____  zHYL FID=2133 VFID=3 CHID=150
_ 2233   150    2   3    ZHYPERLINK    ____  zHYL FID=2233 VFID=3 CHID=150
_ 2333   19C    1   3    ZHYPERLINK    ____  zHYL FID=2333 VFID=3 CHID=19C
_ 2433   19C    2   3    ZHYPERLINK    ____  zHYL FID=2433 VFID=3 CHID=19C
```

Figure 15-20 PCIe Function List: All Functions now created - zHyperLink

Managing zHyperLink Express

To enable IBM Db2 to use zHyperLinks, the Db2 zParm must be modified to enable zHyperLink, as shown in the example in Figure 15-21.

```
DSNIIPA3             INSTALL Db2 - DATA PARAMETERS PANEL
===>

Check parameters and reenter to change:
 1 PERMANENT UNIT NAME    ==> 3390     Device type for MVS catalog and
                                       partitioned data sets
 2 TEMPORARY UNIT NAME    ==> SYSDA    Device type for temporary data sets
 3 Db2 zHyperlinks SCOPE  ==> ENABLE   Scope of zHyperlinks I/O connections:
                                       (ENABLE, DISABLE, DATABASE, LOG)

                                         ---------------- SMS -----------------
                              VOL/SER    DATA CLASS    MGMT CLASS    STOR CLASS
                              -------    ----------    ----------    ----------
 4 CLIST ALLOCATION       ==> ______  ==> ________  ==> ________  ==> ________
 5 NON-VSAM DATA          ==> ______  ==> ________  ==> ________  ==> ________
 6 VSAM CATALOG, DEFAULT, ==> ______  ==> ________  ==> ________  ==> ________
   AND WORK FILE DATABASE
 7 LOG COPY 1, BSDS 2     ==> ______  ==> ________  ==> ________  ==> ________
 8 LOG COPY 2, BSDS 1     ==> ______  ==> ________  ==> ________  ==> ________



PRESS:  ENTER to continue   RETURN to exit   HELP for more information
```

Figure 15-21 Db2 zParm: zHyperLink

The acceptable values for the Db2 zHyperLink Scope are the following ones:

`ENABLE` Db2 requests the zHyperLink protocol for all eligible I/O requests.

`DISABLE` Db2 does not use the zHyperLink for any I/O requests.

`DATABASE` Db2 requests the zHyperLink protocol for only database synchronous read I/Os.

`LOG` Db2 requests the zHyperLink protocol for only log-write I/Os.

> **Note:** Db2 12 with APAR PH05030 supports zHyperLink writes for active Db2 logs, and APAR OA52876 provides read support for VSAM data sets.

To enable z/OS for zHyperLink, the **ZHPF=YES** and **ZHYPERLINK OPER=ALL** statements must be added to the `IECIOSxx` parmlib member, as shown in Example 15-8.

Example 15-8 IECIOSxx parmlib enabled for zHyperLink read I/Os

```
VIEW       SYS1.PARMLIB(IECIOS00 ) - 01.22                  Columns 00001 00072
Command ===>                                                  Scroll ===> PAGE
****** ***************************** Top of Data ******************************
000001 CTRACE(CTIIOS00)
000006 HYPERPAV=XPAV
000007 MIDAW=YES
000008 ZHPF=YES

000009 ZHYPERLINK OPER=ALL
****** **************************** Bottom of Data ****************************
```

This process can also be done dynamically by entering the **SETIOS ZHYPERLINK,OPER=ALL** console command. The corresponding display command is **DISPLAY IOS,ZHYPERLINK**, as shown in Example 15-9.

Example 15-9 DISPLAY IOS,ZHYPERLINK

```
D IOS,ZHYPERLINK
IOS634I 14.16.46 IOS SYSTEM OPTION 375
ZHYPERLINK IS ENABLED FOR READ AND WRITE OPERATIONS
D IOS,ZHYPERLINK
IOS634I 02.47.30 IOS SYSTEM OPTION 262
ZHYPERLINK IS ENABLED FOR READ AND WRITE OPERATIONS
```

The **DISPLAY PCIE** command can be used to display the available PFIDs for zHyperLink, as shown in Example 15-10.

Example 15-10 DISPLAY PCIE

```
DISPLAY PCIE
IQP022I 21.52.27 DISPLAY PCIE 034
PCIE     0012 ACTIVE
PFID      DEVICE TYPE NAME         STATUS  ASID  JOBNAME  CHID VFN  PN
00003133  RoCE Express3            CNFG                   011C 0004 1
00003233  RoCE Express3            CNFG                   011C 0004 2
00003733  RoCE Express3            CNFG                   01FC 0004 1
00003833  RoCE Express3            CNFG                   01FC 0004 2
00003533  RoCE Express3            CNFG                   0158 0004 1
00003633  RoCE Express3            CNFG                   0158 0004 2
```

```
00003333  RoCE Express3          CNFG                   01B0 0004 1
00003433  RoCE Express3          CNFG                   01B0 0004 2
00002133  8GB zHyperLink         ALLC    0019  IOSAS    0150 0003 1
00002333  8GB zHyperLink         ALLC    0019  IOSAS    019C 0003 1
00002233  8GB zHyperLink         ALLC    0019  IOSAS    0150 0003 2
00002433  8GB zHyperLink         ALLC    0019  IOSAS    019C 0003 2
```

Example 15-11 shows the **DISPLAY PCIE=pfid** command to display a specific zHyperLink PFID.

Example 15-11 DiSPLAY PCIE=pfid

```
DISPLAY PCIE,PFID=2233
IQP024I 21.56.56 DISPLAY PCIE 037
PCIE     0012 ACTIVE
PFID      DEVICE TYPE NAME        STATUS  ASID  JOBNAME  CHID VFN  PN
00002233  8GB zHyperLink          ALLC    0019  IOSAS    0150 0003 2
 CLIENT ASIDS: NONE
 CU WWNN: 500507630AFFD049  CU Link Id: 0180
 S/W State: Allocated
 Port State: Operational
 CU Node Descriptor: 002107.996.IBM.75.0000000LBN71
```

The results of running the **DISPLAY M=CU(cun)** command against a CU that is enabled for zHyperLink are shown in Example 15-12.

Example 15-12 DISPLAY M=CU(cun)

```
DISPLAY M=CU(690)
IEE174I 21.59.10 DISPLAY M 039
CONTROL UNIT 0690
CHP                    40   42   41   43
ENTRY LINK ADDRESS     0124 0125 0224 0225
DEST LINK ADDRESS      010C 010B 020C 020B
CHP PHYSICALLY ONLINE  Y    Y    Y    Y
PATH VALIDATED         Y    Y    Y    Y
MANAGED                N    N    N    N
ZHPF - CHPID           Y    Y    Y    Y
ZHPF - CU INTERFACE    Y    Y    Y    Y
INTERFACE ID           0030 0230 0100 0300
CONNECTION SECURITY    None None None None
MAXIMUM MANAGED CHPID(S) ALLOWED = 0
DESTINATION CU LOGICAL ADDRESS = 90
CU ND             = 002107.996.IBM.75.0000000LBN71.0030
CU NED            = 002107.996.IBM.75.0000000LBN71.9000
TOKEN NED         = 002107.900.IBM.75.0000000LBN71.9000
WWNN              = 500507630AFFD049
FUNCTIONS ENABLED = ZHPF, ZHYPERLINK, XPAV
XPAV CU PEERS     = 0690
DEFINED DEVICES
  09000-090EF
DEFINED PAV ALIASES
  090F0-090FF
USABLE HYPERPAV ALIASES = 16
ZHYPERLINKS
```

```
  PFID      PCHID  Port  LinkId  S/W St   Port St
  00002233  0150   02    0180    Alloc    Oper
  00002433  019C   02    0280    Alloc    Oper
```

The results for the **DISPLAY M=DEV(devno)** command against a device that is enabled for zHyperLink are shown in Example 15-13.

Example 15-13 DISPLAY M=DEV(devno)

```
DISPLAY M=DEV(9000)
IEE174I 22.03.39 DISPLAY M 041
DEVICE 09000   STATUS=ONLINE
CHP                   40   42   41   43
ENTRY LINK ADDRESS    0124 0125 0224 0225
DEST LINK ADDRESS     010C 010B 020C 020B
PATH ONLINE           Y    Y    Y    Y
CHP PHYSICALLY ONLINE Y    Y    Y    Y
PATH OPERATIONAL      Y    Y    Y    Y
MANAGED               N    N    N    N
CU NUMBER             0690 0690 0690 0690
INTERFACE ID          0030 0230 0100 0300
CONNECTION SECURITY   None None None None
MAXIMUM MANAGED CHPID(S) ALLOWED:  0
DESTINATION CU LOGICAL ADDRESS = 90
SCP CU ND         = 002107.996.IBM.75.0000000LBN71.0030
SCP TOKEN NED     = 002107.900.IBM.75.0000000LBN71.9000
SCP DEVICE NED    = 002107.900.IBM.75.0000000LBN71.9000
WWNN              = 500507630AFFD049
HYPERPAV ALIASES CONFIGURED = 16
ZHYPERLINKS AVAILABLE = 2
FUNCTIONS ENABLED = MIDAW, ZHPF, XPAV, ZHYPERLINK
```

This display command is enhanced with the new parameter **ZHYPERLINK** to show whether the device can use zHyperLink. The response is shown for a device that can use zHyperLink in an z/OS environment that is enabled for read/write, as shown in Example 15-14.

Example 15-14 DISPLAY M=DEV(devno),ZHYPERLINK: Device enabled for zHyperLink

```
DISPLAY M=DEV(9000),ZHYPERLINK
IEE587I 22.06.49 DISPLAY M 043
DEVICE 09000   STATUS=ONLINE
DEVICE IS ENABLED FOR ZHYPERLINK
READ AND WRITE OPERATIONS ARE ENABLED
ZHYPERLINKS AVAILABLE = 2
```

The result for a device that cannot use zHyperLink is shown in Example 15-15.

Example 15-15 DISPLAY M=DEV(devno,ZHYPERLINK: Device not enabled for zHyperLink

```
DISPLAY M=DEV(0F00),ZHYPERLINK
IEE587I 22.26.51 DISPLAY M 086
DEVICE 00F00   STATUS=ONLINE
DEVICE IS DISABLED FOR ZHYPERLINK FOR THE FOLLOWING REASON(S):
  CONTROL UNIT DOES NOT SUPPORT ZHYPERLINK
  CONTROL UNIT WWNN COULD NOT BE RETRIEVED
```

A

System relocation and discontinuance

This appendix describes the process for relocating or discontinuing an IBM z16 server.

Table A-1 illustrates the first part of the process.

Table A-1 Discontinuance Part 1: Tasks performed before powering the machine down

Action	Notes
Remove or disable On/Off Capacity on Demand (OOCoD), Customer Initiated Upgrade, or Capacity BackUp.	To remove existing OOCoD records (installed and staged), see Chapter 8, “Deleting temporary Capacity on Demand records”, in *Capacity on Demand User’s Guide*, SC28-7025.
If the server is part of a sysplex, check the timing links.	To identify the timing links in use, go to the Hardware Management Console (HMC) **Manage System Time** task, select the server, and click **See active local STP Links**. For more information, see *IBM Z Server Time Protocol Guide*, SG24-8480.
If the server is part of a Coordinated Timing Network (CTN), remove any Server Time Protocol (STP) roles that are assigned to the server.	To change or remove the STP roles that are assigned to the server that is being discontinued, go to the HMC **Manage System Time** and select **STP Actions** → **Modify Assigned Server Roles**. For more information, see *IBM Z Server Time Protocol Guide*, SG24-8480.
Zeroize the crypto cards.[a]	See Chapter 10, “Specialized features” on page 233.
Remove UDX files.	See Chapter 10, “Specialized features” on page 233.

a. The "zeroize” procedure will erase all keys stored in the card. If the client wants to make their crypto cards unusable, they can request the IBM SSR to remove all installed Crypto adapters from the machine and cut their internal battery wire. This action will effectively erase all information stored in the cards.

Table A-2 illustrates the second part of the process.

Table A-2 Discontinuance Part 2: Tasks performed by the IBM Systems Service Representative

Action	Notes
Remove object definitions.	Log on as an Administrator (ACSADMIN) and perform the “Remove Object Definition” task for the systems that are being discontinued. For more information, see *Hardware Management Console Operations Guide Version 2.12.0*, SC28-6919.
Discontinue HMC and Support Element (SE).	An IBM Systems Service Representative (IBM SSR) performs the “Discontinue the Hardware Management Console and Support Elements” tasks. The procedure loads a “vanilla” version of the HMC and SE Code, which resets the machine to a manufacturing configuration, and erases all customer information, setup, and configuration data.
Drain system water.	If the system that is being discontinued uses radiator cooling, the IBM SSR uses the “Drain the System” procedure to drain the water from the system.
Check the Base and Proprietary Services.	If the system will no longer be serviced by IBM, The IBM SSR performs the “Base service and Proprietary services states” task. Proprietary Services support provides the full maintenance package, including the Call Home and Repair and Verify procedures to assist the IBM SSR with problem repairs.

Table A-3 illustrates the second part of the process.

Table A-3 Discontinuance Part 3: Validating the performed Tasks

Action	Notes
Remove STP definitions.	Verify whether all STP definitions for the system being discontinued were successfully removed. For more information, see *IBM Z Server Time Protocol Guide*, SG24-8480.
Remove UDX files.	To verify whether the UDX files were removed, see Chapter 10, “Specialized features” on page 233.
Zeroize crypto cards.[a]	To verify whether all crypto cards were zeroized, see Chapter 10, “Specialized features” on page 233.
Remove object definitions.	Log on as an Administrator (ACSADMIN) and verify whether the system object was removed. For more information, see *Hardware Management Console Operations Guide Version 2.12.0*, SC28-6919.
Validate discontinuance tasks. (Client and IBM SSR).	The following queries should be used to verify and certify the state of the SE and HMC: 1. Customize Network Information 2. Customize Customer Information 3. Certificate Management 4. User Management 5. Customize Outbound Connectivity 6. View Security Logs
Complete the Relocation Services Inventory (RSI) form.[b]	The IBM SSR who is performing the Discontinuance completes the RSI form. The form will be signed by the IBM SSR and the client to testify that the work was completed. The IBM SSR indicates in the comments field that the system was restored to a manufacturing state.

a. The "zeroize" procedure will erase all keys stored in the card. If the client wants to make their crypto cards unusable, they can request the IBM SSR to remove all installed Crypto adapters from the machine and cut their internal battery wire. This action will effectively erase all information stored in the cards

b. The RSI form is available for download, For more information, see Appendix B, “Additional material” on page 401.

B

Additional material

This book refers to additional material that can be downloaded from the internet as described in the following sections.

Locating the web materials

The web material that is associated with this book is available in softcopy on the internet from the IBM Redbooks web server:

https://www.redbooks.ibm.com/abstracts/sg248960.html

Alternatively, you can go to the IBM Redbooks website:

ibm.com/redbooks

Search for SG248960, select the title, and then click **Additional materials** to open the directory that corresponds with the IBM Redbooks form number, SG248960.

Using the web materials

The additional web materials that accompany this book includes the following files:

File name	*Description*
Relocation Services Inventory.pdf	System Discontinuance / Relocation form
8460_DH2_Image_worksheet.xlsx	Worksheet for gathering setup information

Downloading and extracting the web material

Create a subdirectory (folder) on your workstation, and extract the contents of the web material compressed file into this folder.

Abbreviations and acronyms

4HRA	4-hour rolling average
AES	Advanced Encryption Standard
AID	adapter ID
BTS	Backup Time Server
CCA	Common Cryptographic Architecture
CCN	Configuration Control Number
CE LR	Coupling Express2 LR
CF	Coupling Facility
CFACT	Coupling Facility Activity
CFCC	Coupling Facility Control Code
CFOVER	Coupling Facility Overview
CHID	channel ID
CHPID	channel path ID
CMPCS	compression co-processor
CMT	CHPID Mapping Tool
CP	central processor
CPACF	CP Assist for Cryptographic Functions
CPC	central processor complex
CSS	channel subsystem
CST	Coordinated Server Time
CTC	channel-to-channel
CTN	Coordinated Timing Network
CTS	Current Time Server
CU	control unit
CUADD	control unit address
DASD	direct access storage device
DES	Data Encryption Standard
DFT	distributed function terminal
DHD	defer host disconnect
DLA	Destination Link Address
DMA	Direct Memory Access
DPM	Dynamic Partition Manager
DRNG	Deterministic Random Number Generation
DREQ	Direct Memory Access request
DWDM	Dense Wavelength Division Multiplexing
EDT	Eligible Device Table
ETS	External Time Source
FC	Fibre Channel
FCP	Fibre Channel Protocol
FCTC	Fibre Connection channel-to-channel
FICON	Fibre Connection
FID	function ID
FINRA	Financial Industry Regulatory Authority
GbE	Gigabit Ethernet
Gbps	gigabytes per second
GRS	global resource serialization
HA	high availability
HCD	Hardware Configuration Definition
HCM	Hardware Configuration Manager
HDD	hard disk drive
HMA	Hardware Management Appliance
HMC	Hardware Management Console
IBM	International Business Machines Corporation
IBM SSR	IBM Systems Service Representative
IC	Internal Coupling
ICA	Integrated Coupling Adapter
ICA SR	Integrated Coupling Adapter Short Reach
ICC	Integrated Console Controller
ICF	Internal Coupling Facility
ICSF	Integrated Cryptographic Service Facility
IFP	integrated firmware processor
IML	Initial Microcode Load
IOCDS	input/output configuration data set
IOCP	input/output configuration program
IODF	input/output definition file
IPv4	Internet Protocol Version 4
IQD	Internal Queued Direct
IQDIO	internal queued direct input/output
ISM	Internal Shared Memory
ISPF	Interactive System Productivity Facility
JES2	Job Entry Subsystem 2
KVM	Kernel-based Virtual Machine

LAN	local area network
LCSS	logical channel subsystem
LIC	Licensed Internal Code
LPAR	logical partition
LR	Long Reach
LUN	logical unit number
LX	Long Wave
MAC	Media Access Control
MCB	Message Command Block
MCS	Master Control Service
MES	miscellaneous equipment specification
MIF	Multiple Image Facility
MRB	Message Response Block
NMS	national market system
NTP	Network Time Protocol
OAT	OSA Address Table
OOCoD	On/Off Capacity on Demand
OS	operating system
OSA	Open Systems Adapter
OTC	over-the-counter
PCHID	physical channel ID
PCIe	Peripheral Component Interconnect Express
PDU	power distribution unit
PFC	Priority Flow Control
PFID	PCIe function ID
PKCS	Public Key Cryptography Standards
POR	Power on Reset
PPS	Pulse Per Second
PRNG	Pseudo-Random Number Generation
PTF	program temporary fix
PTP	Precision Time Protocol
PTS	Preferred Time Server
QP	queue pair
RCE	Regional Crypto Enablement
RDMA	Remote Direct Memory Access
RG	Resource Group
RMF	Resource Measurement Facility
RNIC	RDMA network interface card
RoCE	Remote Direct Memory Access over Converged Ethernet
RSI	Relocation Services Inventory
RTO	read timeout
SACF	Stand-alone Coupling Facility
SAN	storage area network
SCM	storage-class memory
SE	Support Element
SMC	Shared Memory Communications
SMC-D	SMC - Direct Memory Access over Internal Shared Memory
SMC-R	SMC - Remote Direct Memory Access over Converged Ethernet Express
SMCAT	Shared Memory Communications Applicability Tool
SNA	Systems Network Architecture
SR	Short Reach
SS	Subchannel Set
SSC	Secure Service Container
STP	Server Time Protocol
SX	Short Wave
TDES	Triple Data Encryption Standard
TKE	Trusted Key Entry
TOD	time of day
TRNG	True Random Number Generation
TSO	Time Sharing Option
UA	Unit Address
VCHID	virtual channel ID
VF	virtual function
VFID	virtual function ID
VFM	Virtual Flash Memory
VLAN	virtual local area network
VM	virtual machine
vPCIe	virtual PCIe
VTAM	Virtual Telecommunications Access Method
WWN	worldwide name
WWPN	worldwide port name
zBNA	Z Batch Network Analyzer
zEDC	zEnterprise Data Compression
zHPF	High Performance FICON for IBM Z
zIIP	IBM Z Integrated Information Processor

Redbooks

IBM z16 Configuration Setup

SG24-8960-01

ISBN 0738423629

(0.5” spine)
0.475”<->0.873”
250 <-> 459 pages

SG24-8960-01

ISBN 0738423629

Printed in U.S.A.

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