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Explore New Solutions with IBM PowerVM Enhancements

IBM Redbooks Solution Guide

This IBM® Redbooks® Solution Guide describes a set of highly anticipated features for the IBM PowerVM® Virtual I/O Server V2.2.3, which are applicable to small, medium, and large corporations. The features include management and performance tuning software for PowerVM and enterprise features for high-end IBM Power Systems™ servers. Scalability, reliability, and performance enhancements are included with the Virtual I/O Server (VIOS) and the IBM Hardware Management Console (HMC).

PowerVM products and features can improve performance in several environments. Figure 1, for example, shows a shared storage pool (SSP) configuration, in which IBM Power Virtualization Performance™ (PowerVP™) and the Virtual I/O Server Performance Advisor provide configuration advice. The Virtual I/O Server enhancements include the best SSP implementation yet, as described in this Solution Guide.
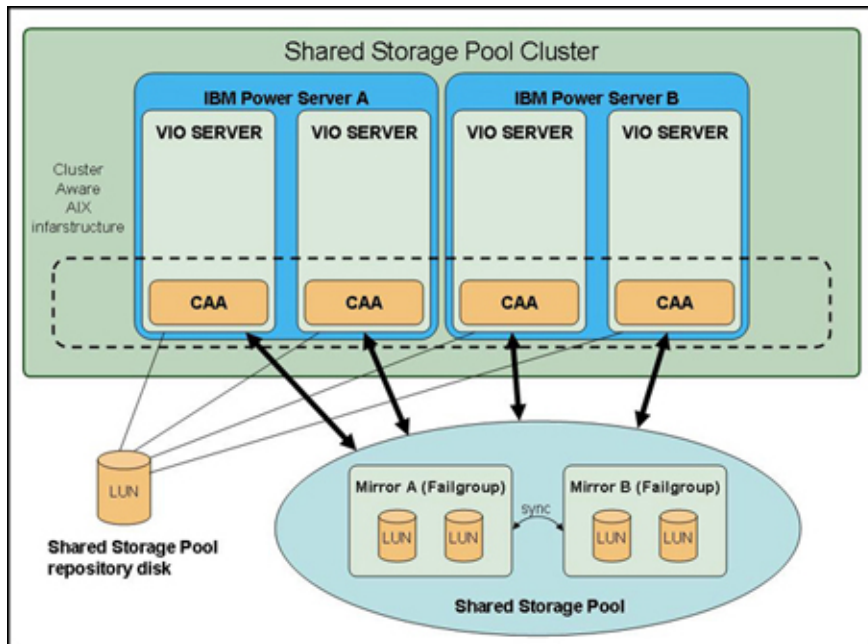

Figure 1. Design overview of the PowerVM shared storage pool (SSP) feature

Did you know?

Today, most IBM Power Systems servers are used in virtualized environments with PowerVM, the industrial-strength virtualization solution for IBM Power Systems servers and blades. New PowerVM enhancements continue to define the path for more efficient and flexible virtualization solutions, with less complexity for introducing cloud computing into data centers.

Business value

PowerVM is continually enhanced to incorporate what IBM clients expect for an enterprise-class virtualization solution. These new features deliver increased business value for IBM Power Systems clients and include the following items:

- *IBM Power Virtualization Performance (IBM PowerVP)* and the *Virtual I/O Server Performance Advisor* let you find bottlenecks and generate performance reports with ease. With newly added support for several configurations, including N_Port ID Virtualization (NPIV), shared Ethernet adapter (SEA), and shared storage pools (SSP), these two products can propose changes to your configuration and identify areas for further investigation in your virtualized environment.

- *IBM Power Virtualization Center™ (IBM PowerVC)* is a newly introduced product that is designed to simplify the management of virtual resources in your Power Systems environment. It uses an embedded OpenStack instance to lead your data center toward higher efficiencies.

- *IBM Power Enterprise Pools* with new mobile Capacity Upgrade on Demand (CUoD) enablement codes allow you to dynamically share processor and memory activations among a group of high-end Power Systems servers without contacting IBM.

- *IBM Power Integrated Facility for Linux (IBM Power IFL)* is a new IBM offering that enables the IBM Power 770, IBM Power 780, and Power 795 servers for the cost-efficient Linux environment. Now you can consolidate thousands of Linux servers on the most reliable hardware in the UNIX market.

- *Virtual I/O Server V2.2.3* contains the most comprehensive set of Shared Storage Pool functions to-date, including the ability to mirror a Shared Storage Pool between different storage subsystems for better resiliency.

- *HMC feature updates* provide new functions, including support for IBM Power Enterprise Pool management and the enablement for the IBM PowerVC Virtualization Center Standard Edition for Power Systems.

Each of the new functions and products is described in detail in this Solution Guide.

Solution overview

The new capabilities of PowerVM include improvements and product functions for the IBM Power Systems family of servers and for PowerVM virtualization technologies.

IBM PowerVC

IBM PowerVC can help simplify the management of your Power Systems virtual resources. After the product code is laid out, the no-menu interface of the IBM PowerVC guides you through three simple configuration steps to register physical hosts, storage providers, and network resources to start capturing and intelligently deploying your virtual machines (VMs).

This product is powered by the open source OpenStack software from the OpenStack Foundation. OpenStack is software that controls large pools of server, storage, and networking resources throughout a data center. IBM PowerVC and OpenStack work in concert to lead your data center toward higher efficiencies.

As described in the following table, IBM PowerVC is available in two editions: IBM PowerVC Express Edition and IBM PowerVC Standard Edition.

Table 1. Two editions of IBM PowerVC

IBM PowerVC *Express Edition*	IBM PowerVC *Standard Edition*
● Supports IBM Power Systems hosts managed by the Integrated Virtualization Manager (IVM). ● Supports storage area networks (SANs) that use virtual small computer system interface (vSCSI) storage, local storage, and a combination in the same environment. ● Supports a single Virtual I/O Server VM on each host.	● Supports IBM Power Systems hosts managed by HMC. ● Supports storage area networks. Deployed with NPIV SAN storage. ● Supports multiple Virtual I/O Servers VMs on each host.

For more information about IBM PowerVC, see *IBM PowerVC Introduction and Configuration*, SG24-8199.

IBM PowerVP

IBM PowerVP for Power Systems offers a performance view in to a PowerVM virtualized environment running on IBM Power Systems Firmware V7.7 or later. IBM PowerVP can show which virtual workloads are using specific physical resources on an IBM Power Systems server. You can then make configuration changes so that your system can capitalize on your most valued efficiencies.

IBM PowerVP helps reduce the time and complexity in finding performance bottlenecks by using a simple dashboard that shows system performance health. It can help simplify both prevention and troubleshooting tasks, thus reducing the cost of performance management.

The following figure shows a partial view of the IBM PowerVP dashboard for an IBM Power 795. Notice the slight processing activity on cores 0 and 7 from processor module number 2. Other components of the dashboard include a recording section that captures primary system activities for further analysis.
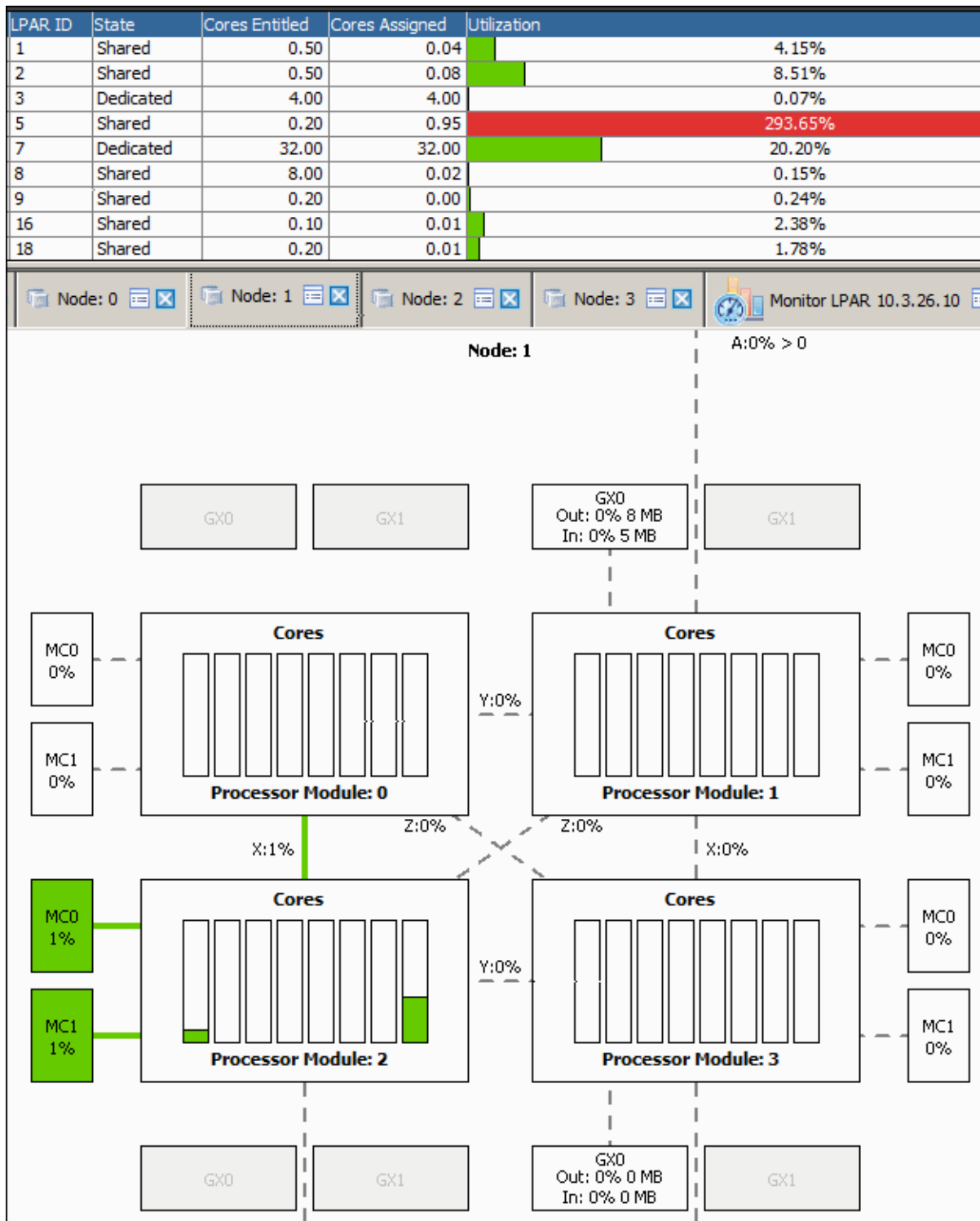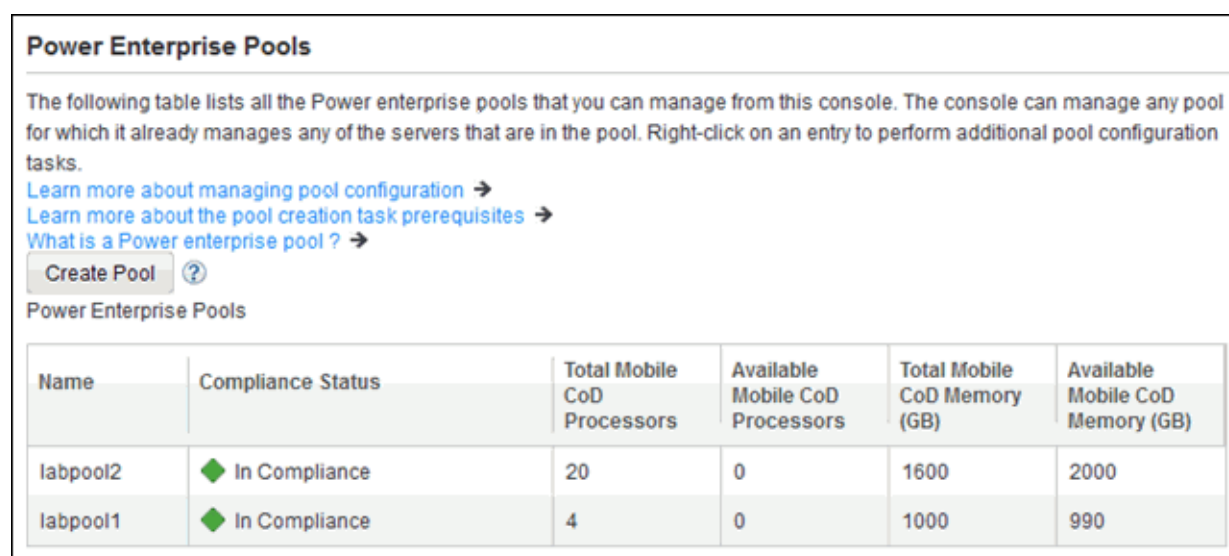
LPAR ID	State	Cores Entitled	Cores Assigned	Utilization	
1	Shared	0.50	0.04		4.15%
2	Shared	0.50	0.08		8.51%
3	Dedicated	4.00	4.00		0.07%
5	Shared	0.20	0.95		293.65%
7	Dedicated	32.00	32.00		20.20%
8	Shared	8.00	0.02		0.15%
9	Shared	0.20	0.00		0.24%
16	Shared	0.10	0.01		2.38%
18	Shared	0.20	0.01		1.78%

Figure 2. IBM PowerVC dashboard captures system activities (partial view is shown)

IBM Power Enterprise Pools

IBM Power Enterprise Pools enable you to dynamically share processor and memory activations among a group or pool of IBM Power Systems enterprise class servers without contacting IBM. These activations are called Mobile Capacity on Demand (CoD) resource activations.

IBM Power Enterprise Pools are ideal for further improvements to IBM Power Systems flexibility, improving load balancing, maintenance for continuous availability, and disaster recovery planning and operations.

The following figure shows a partial view of the main IBM Power Enterprise Pools management window, which is part of the HMC interface. From this window, you can monitor and manage your servers that are in pools and create pools.

Power Enterprise Pools

The following table lists all the Power enterprise pools that you can manage from this console. The console can manage any pool for which it already manages any of the servers that are in the pool. Right-click on an entry to perform additional pool configuration tasks.

Learn more about managing pool configuration →
Learn more about the pool creation task prerequisites →
What is a Power enterprise pool ? →

Create Pool ⑦

Power Enterprise Pools

Name	Compliance Status	Total Mobile CoD Processors	Available Mobile CoD Processors	Total Mobile CoD Memory (GB)	Available Mobile CoD Memory (GB)
labpool2	◆ In Compliance	20	0	1600	2000
labpool1	◆ In Compliance	4	0	1000	990

Figure 3. Hardware Management Console showing the Power Enterprise Pools main window (partial view is shown)

IBM Power IFL

IBM Power IFL is an enterprise-level offering that enables you to run Linux workloads on highly reliable systems at a low cost point. Like PowerVM, the Power IFL product can consolidate and integrate applications and data that are built on Linux with those of IBM AIX®, Linux with those of IBM i, or both.

IBM Power IFL uses the following aspects for clients who want to consolidate Linux workloads on the IBM POWER® architecture:

● Competitive pricing to add Linux to an Enterprise Power Systems system
● Scalable to 32-sockets with seamless growth
● Enterprise class reliability and serviceability

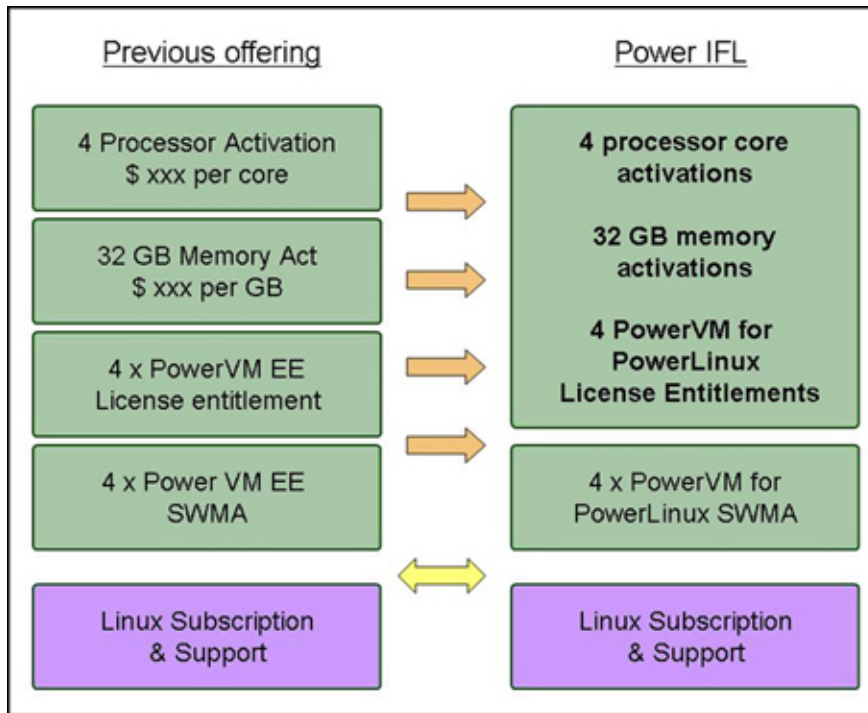The following figure shows the simplification of the offering that is introduced with IBM Power IFL.

Figure 4. IBM Power IFL simplified offering

Virtual I/O Server V2.2.3

The Virtual I/O Server (VIOS) is enhanced with flexibility, scalability, and resiliency features in the following areas:

● Shared Storage Pools
● Simplified shared Ethernet adapter

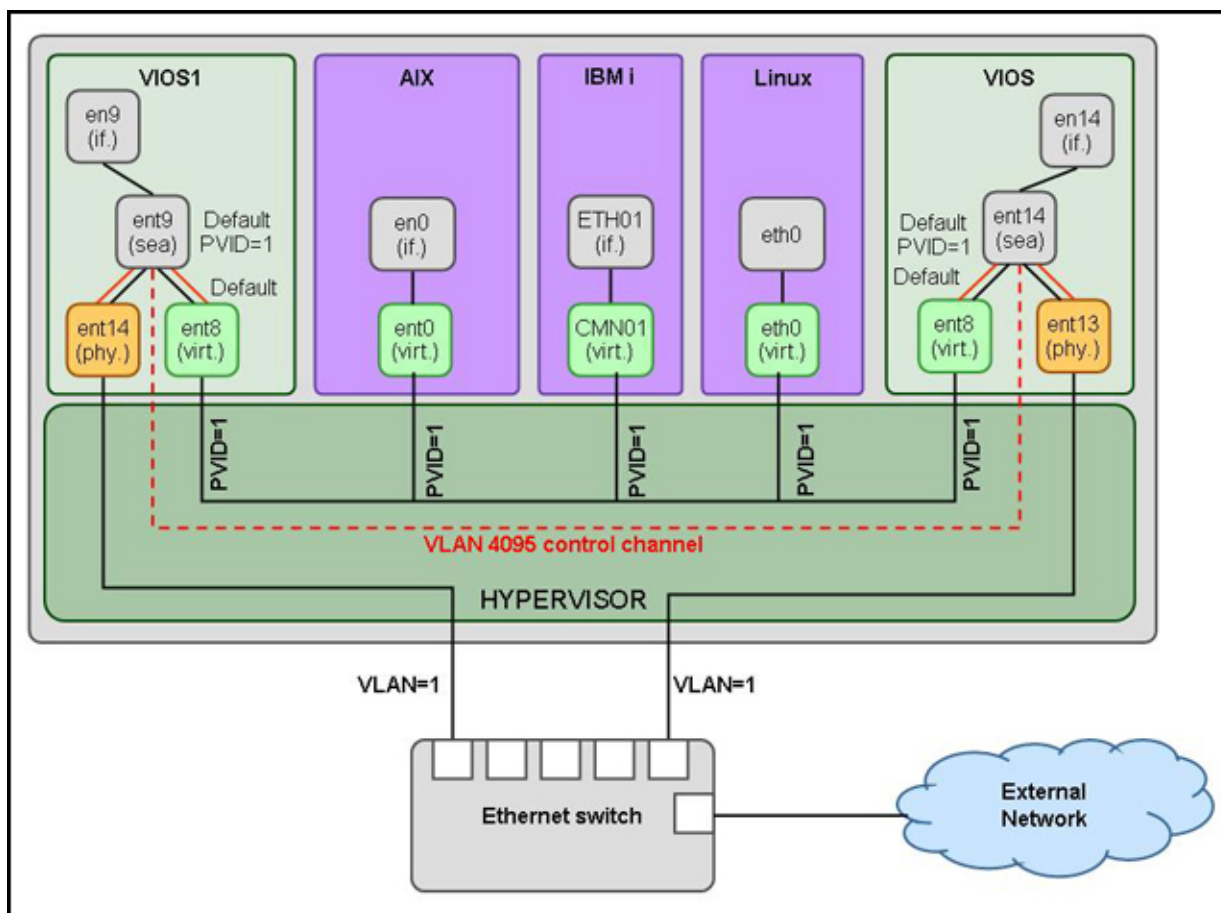The following figure shows an example of a simplified SEA configuration.

Figure 5. SEA simplified configuration example

Virtual I/O Server Performance Advisor

The Virtual I/O Server Performance Advisor tool provides advisory reports that are based on key performance metrics from various partition resources that are collected from the Virtual I/O Server environment. This tool provides health reports that contain proposals for making configuration changes to the Virtual I/O Server environment and to identify areas to investigate further.

Virtual I/O Server Performance Advisor is enhanced to provide support for NPIV and Fibre Channel, virtual networking and SEA, and SSP configurations.

Here are the types of advisory reports that are generated by the Virtual I/O Server Performance Advisor tool:

● System configuration advisory report
● CPU advisory report
● Shared Processing Pool advisory report
● Memory advisory report
● Disk Drives advisory report
● Disk adapter advisory report
● I/O activities (disk and network) advisory report
● Shared Storage Pool advisory report
● Shared Ethernet Adapter advisory report

The report is similar to the one that is shown in the following figure, where you can see that the Virtual I/O Server Performance Advisor provides suggested values for better performance. In this partial view of the window, the VIOS - Processor section shows a suggested value for the variable capacity weight.

VIOS - Processor						Risk/Impact 1=lowest 5=highest	
	Name	Measured Value	Suggested Value	First Observed	Last Observed	Risk	Impact
✓	CPU Capacity ?	1.0 ent		10/24/2013 04:34 PM			
i	CPU consumption ?	Average:61.2% (cores:0.7) High:64.0% (cores:0.7)		10/24/2013 04:34 PM	10/24/2013 04:44 PM		
i	Processin? Mode	Shared CPU, (UnCapped)		10/24/2013 04:34 PM			
⚠	Variable Capacity Weight ?	128	129-255	10/24/2013 04:34 PM		1	5
✓	Virtual Processors ?	4		10/24/2013 04:34 PM			
✓	SMT Mode ?	SMT4		10/24/2013 04:34 PM			

Figure 6. The Virtual I/O Server Performance Advisory report (partial view is shown)

HMC feature updates

With the release HMC V7.8, the HMC includes the following new functions:

● Support for IBM Power Enterprise Pool management.

● Enablement for IBM PowerVC Virtualization Center Standard Edition for Power Systems.

● User-defined thresholds that enable monitoring and alerting for workloads that can benefit from the dynamic workload optimizer (DWO), and optional automation to start the dynamic platform optimizer (DPO) when the threshold is exceeded. This function includes DPO scoring of LPARs, which indicates whether a VM benefits from DPO usage.

● Additional tracking of dynamic logical partition (DLPAR) activity within the current profile, which enables reactivation of a VM with all the configuration changes intact since the last shutdown.

● Improved group-based access control for lightweight directory access protocol (LDAP) users, which enables limiting users to a subset of HMCs.

Limitations and prerequisites for HMC

The following list shows the minimum requirements and prerequisites to update the HMC and work with the new enhancements:

● IBM Power Enterprise Pools and DWO enhancements for HMC require HMC firmware level 7.8 or later.

● To use and manage IBM Power Enterprise Pools or to use the IBM PowerVC enablement features, HMC requires a minimum of 2 GB of physical memory.

- The following HMC models cannot be upgraded to support this functionality:

    o   7042-CR4
    o   7310-CR4
    o   7310-C05
    o   7310-C06
    o   7042-C06
    o   7042-C07
    o   7315-CR3
    o   7310-CR3

- New GUI functionality is disabled automatically in the HMC. HMC operation then continues in traditional mode for HMC models with less than 2 GB of memory.

- HMC V7.7 is the last HMC code level upgrade for HMC models 7042-CR4, 7310-CR4, 7310-C05, 7310-C06, 7042-C06, 7042-C07, 7315-CR3, and 7310-CR3.

HMC and IBM Power Enterprise Pools interaction

HMC can be used to perform the following functions:

- Mobile CoD processor and memory resource activations can be assigned to systems with inactive resources. Mobile CoD activations remain on the system to which they are assigned until they are removed from the system.

- New systems can be added to the pool, and existing systems can be removed from the pool.

- New resources can be added to the pool, and existing resources can be removed from the pool.

- Pool information can be viewed, including pool resource assignments, compliance, and history logs.

HMC and IBM PowerVC interaction

IBM PowerVC manages PowerVM through a set of application programming interfaces (APIs) that interact with the HMC. These APIs provide the necessary instructions to the HMC to manage the IBM Power Systems hardware, the IBM Power Hypervisor, and the Virtual I/O Server.

Solution architecture

The technologies that are introduced in this Solution Guide are part of the architecture of several other IBM products and solution offerings:

- PowerVM
- IBM Power Systems
- IBM Flex Systems POWER nodes
- IVM
- HMC
- Virtual I/O Server
- SSPs
- Capacity Upgrade on Demand (CUoD)

Usage scenarios

This section presents an ordering example using IBM Configurator for e-business, commonly called e-config, which is available at the following website:

http://www.ibm.com/services/econfig/announce/disinstall.htm

The scenario is defined as follows:

- Client XYZ owns three IBM Power Systems 795 systems, which are called Power 795A (System 1), Power 795B (System 2), and Power 795B (System 3).

- The client wants to share a Power Enterprise Pool made up of 16 mobile processor core activations and 200 mobile GB of memory activations for workload ERP-XYZ that is running on Power 795B.

- Every month, workload ERP-XYZ goes 100% above its 8-core processing requirement.

- Client XYZ also wants to keep workload ERP-XYZ running on Power 795A and Power 795B, when Power 795C is undergoing maintenance.

- The client has selected Power 795A as the donor system for the resources that will be added to the pool.

The following tables show the fulfillment orders that meet this configuration scenario.

Table 2. Hardware and software fulfillment orders for Power 795A (System 1)

Feature code	Description	Quantity
9119-FHB	9119 Model FHB	1
2146	Primary OS - AIX	1
8002	PowerVM (Enterprise Edition)	16
9742	Customer Install MES	1
EB35	Mobile Enablement	1
EMA4	100 GB Mobile Memory Activation	2
EP23	1-Core Mobile Activation	16
5765-G99	IBM AIX Enterprise Edition Version 7.1	1
0017	Per Processor - Large IBM POWER7®	16
5765-PVE	PowerVM Enterprise Edition	1
0006	0006 Per Processor large system	16
5771-AEZ	Software Maintenance for AIX Enterprise Edition, 1 Year	1
1484	Per Proc Large 1 Year Reg Pwr 7	16
5771-PVE	PowerVM Enterprise Edition SW Maintenance: 1 Year	1
1199	Per processor large system 1yr reg	16

Table 3. Hardware and software fulfillment orders for Power 795B (System 2)

Feature code	Description	Quantity
9119-FHB	9119 Model FHB	1
2146	Primary OS - AIX	1
9742	Customer Install MES	1
EB35	Mobile Enablement	1

Table 4. Hardware and software fulfillment orders for Power 795C (System 3)

Feature code	Description	Quantity
9119-FHB	9119 Model FHB	1
2146	Primary OS - AIX	1
9742	Customer Install MES	1
EB35	Mobile Enablement	1

Integration

Several IBM product and solution offerings integrate PowerVM technologies into their foundation. Here are a few of them:

- IBM Power Systems
- IBM Flex Systems POWER Nodes
- IBM PureFlex™ System Foundations
- IBM SmartCloud® Entry for Power Systems

For more information about other products that can integrate with PowerVM technologies, contact your local IBM representative, or visit *Server virtualization with IBM PowerVM* at the following website:

http://www-03.ibm.com/systems/power/software/virtualization/resources.html

Additional resources are listed in the "Related information" section of this Solution Guide.

Supported platforms

Here are the supported platforms, which include several products running PowerVM solutions:

- IBM Power Systems
- IBM Flex Systems POWER Nodes
- IBM PureFlex System Foundations
- IBM SmartCloud Entry for Power Systems

For more information about other products that can integrate with PowerVM technologies, contact your local IBM representative, or visit *Server virtualization with IBM PowerVM* at the following website:

http://www-03.ibm.com/systems/power/software/virtualization/resources.html

Additional resources are listed in the "Related information" section of this Solution Guide.

Ordering information

For ordering information that applies to the scenario that is presented in this Solution Guide, see the "Usage scenarios" section of this Solution Guide. For more ordering information, contact your local IBM representative, or visit the IBM Offering Information page at the following website:

http://www-01.ibm.com/common/ssi/index.wss?request_locale=en

Additional resources are listed in the "Related information" section of this Solution Guide.

Related information

For more information, see the following resources:

- *IBM PowerVC Introduction and Configuration*, SG24-8199
  http://www.redbooks.ibm.com/abstracts/sg248199.html?Open

- *IBM PowerVM 2013 Enterprise Enhancements*, SG24-8198
  http://www.redbooks.ibm.com/abstracts/sg248198.html?Open

- *IBM PowerVM Virtualization Introduction and Configuration,* SG24-7940
  http://www.redbooks.ibm.com/abstracts/sg247940.html?Open

- *IBM PowerVM Virtualization Managing and Monitoring,* SG24-7590
  http://www.redbooks.ibm.com/abstracts/sg247590.html?Open

- *Implementing IBM PowerVC in Your Organization,* TIPS1136
  http://www.redbooks.ibm.com/abstracts/tips1136.html?Open

- *IBM PowerVM for Growing Businesses: Reduce Total Cost of Computing, and More, in a Virtual Environment,* TIPS1099
  https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/tips1099.html?Open

- *IBM PowerVM for Growing Businesses: Managing and Monitoring a Virtual Environment,* TIPS1091
  https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/tips1091.html?Open

- *IBM Power Systems* (product page)
  http://www-03.ibm.com/systems/power/

- *5765-PVS IBM PowerVM Standard Edition and PowerVM Enterprise Edition V2.2* (sales manual)
  http://www.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_sm/s/897/ENUS5765-PVS/index.html&lang=en&request_locale=en

- *5765-SLE IBM PowerVP Standard Edition V1.1* (sales manual)
  http://www.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_sm/e/897/ENUS5765-SLE/index.html&lang=en&request_locale=en

- *5765-VCS IBM PowerVC Standard Edition V1.2* (sales manual; also includes descriptions of IBM PowerVC Express Edition)
  http://www.ibm.com/common/ssi/ShowDoc.wss?docURL=/common/ssi/rep_sm/s/897/ENUS5765-VCS/index.html&lang=en&request_locale=en

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