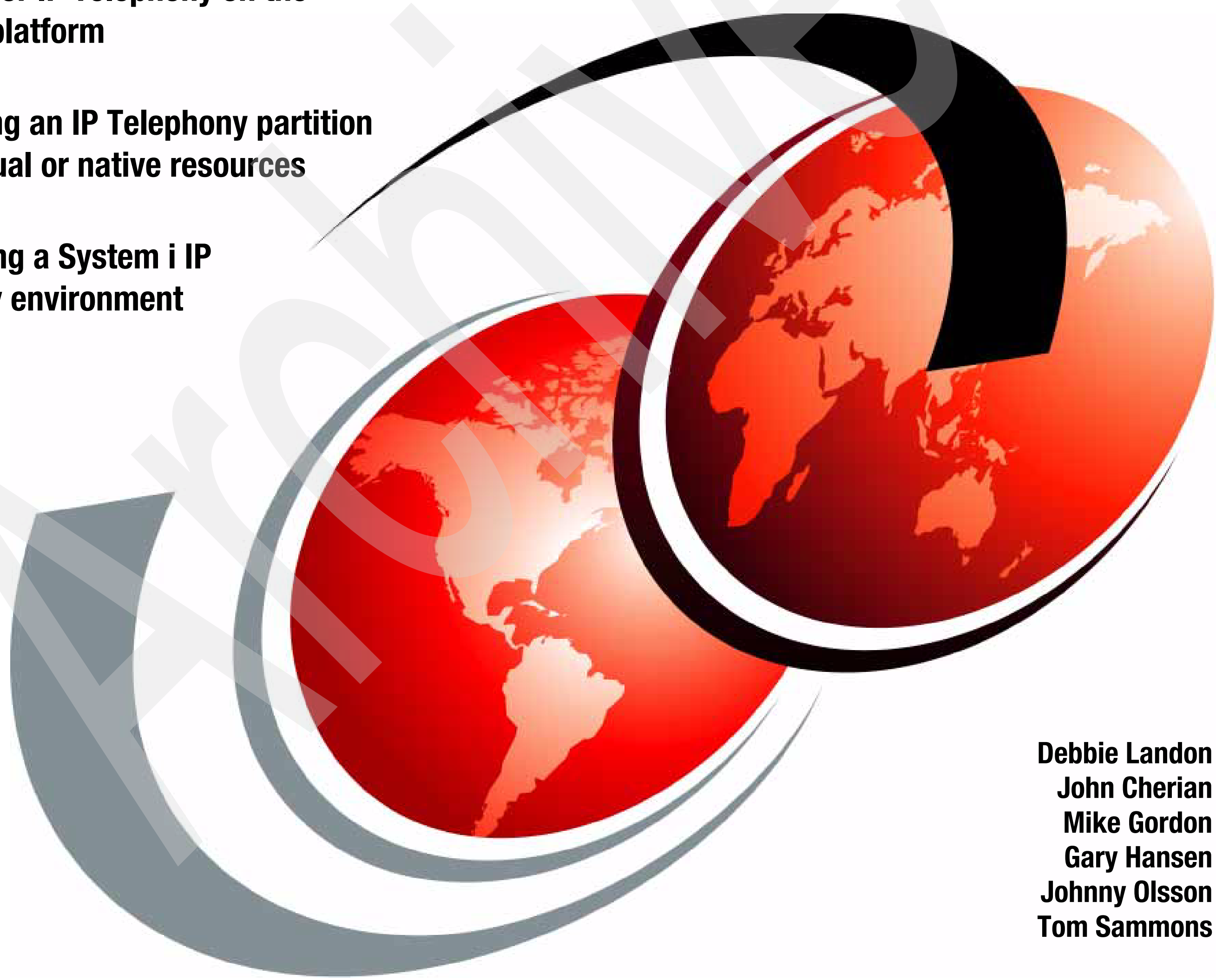
IBM

IBM System i IP Telephony: Configuring the System i Infrastructure

Planning for IP Telephony on the System i platform

Configuring an IP Telephony partition using virtual or native resources

Maintaining a System i IP Telephony environment



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IBM System i IP Telephony: Configuring the System i Infrastructure

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Note: Before using this information and the product it supports, read the information in “Notices” on page vii.

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Contents

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Preface

In today's highly competitive business environment, companies want to extract business advantage from every technology in the enterprise, especially from customer-facing communications such as their telephony systems. Many are looking to IP Telephony as a way to lower costs, simplify network management, and use existing systems and resources, while more tightly integrating business applications and customer communication with their voice and data networks.

At the same time, many of these companies face the challenge of an overly complex IT environment. They seek the benefits of an integrated business system that can help them become more responsive to their customers, improve productivity, operate without interruption, and secure their data and communications without large, up-front investments in time, skills, or money.

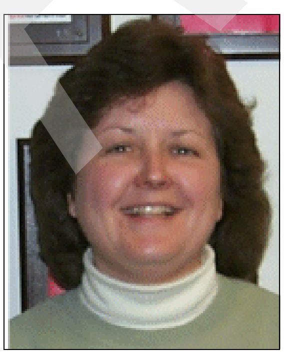
With IBM® System i™ IP Telephony, you can get the business benefits and simplicity you seek from both your telephony and IT environments with one integrated, secure, and reliable solution delivered by two industry leaders, 3Com and IBM.

System i IP Telephony delivers the proven solutions of 3Com, a leading supplier of secure, converged voice and data networking, on the IBM System i platform. With System i IP Telephony, you can enjoy the benefits you have come to expect from System i: integration, simplicity, vertical growth, and, above all, security and reliability applied to IP Telephony.

This IBM Redbooks® publication is intended for system administrators and field technicians. It will help them to understand and prepare their system for deploying a System i IP Telephony solution. It introduces you to the System i IP Telephony environment, with a brief discussion about the general topic of IP Telephony and the specific benefits of 3Com IP Telephony on the System i platform. It shows how to prepare your system using either direct or virtual resources, as well as how to maintain the IP Telephony environment on the System i platform. It includes information on how to set up the network environment to support IP Telephony, and guides you through all the steps required to set up and install the IP Telephony solution, leaving you ready for your IBM IP Telephony-approved business partner or 3Com installation team to configure your IP Telephony system for use in your enterprise.

The team that wrote this book

This book was produced by a team of specialists from around the world working at the International Technical Support Organization, Rochester Center.



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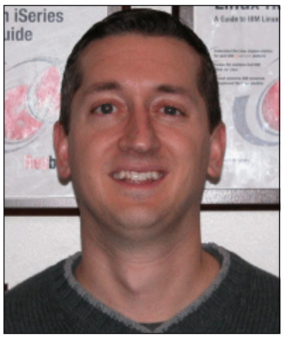

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1

Introduction

This chapter provides an overview of the IBM System i IP Telephony solution. The following topics are covered:

- About IP Telephony
- Benefits of IP Telephony
- Benefits of IP Telephony on the System i platform
- Architecture of the System i IP Telephony solution

1.1 About IP Telephony

Voice communications is a mission-critical function for businesses of all kinds and sizes around the world. As technology has evolved over the years, so has the architecture and functionality of voice communications systems. At first, manual telephone exchanges connected calls from a source to a destination by having a human operator talk to the person at the source and ask for the destination. Mechanical telephone exchanges using analog signaling began to replace some human operators using electro-mechanical switches.

The next evolution of voice communications was electronic (or digital) telephone exchanges that used digital signaling, which has been the primary technology for the past 20 to 30 years. These electronic telephone exchanges provide automatic call routing within the Public Switched Telephone Network (PSTN) and within an enterprise using equipment referred to as a Private Branch Exchange (PBX).

While the PBXs of today provide feature-rich voice functionality within the enterprise, they are based on proprietary hardware and software, provide only voice functionality, and are based on costly dedicated infrastructure. For enterprises with multiple locations, PBXs are in effect "islands" of functionality that require local management for moving, adding, or changing phones. Due to proprietary signaling, enterprises are locked into the vendor's specific phone sets that are supported with a particular PBX model and version. In addition, integration with other applications is difficult and costly because the PBXs were designed to handle one application: voice.

The most recent evolution of voice communications is the ability to digitally packetize and transport voice signaling and voice traffic on Internet Protocol (IP) data networks. This technology is referred to by several names, including Voice over IP (VoIP), IP Telephony, and IP-PBX. Keep in mind that we are referring to an enterprise-class solution for delivering voice services over an IP network, which is not the same as "voice over Internet" applications that exist today. These applications use peer-to-peer, shareware, and broadband protocols that are typically used for personal and residential use and do not inherently provide quality of service, security, reliability, scalability, and features that are requirements for an enterprise-class solution.

The IP network is ubiquitous today both within an enterprise and outside of it, providing the ability for computers and software applications to communicate with one another in a reliable, scalable, and cost-effective manner. An IP network inside an enterprise is referred to as a local area network (LAN). An IP network outside an enterprise that connects LANs is referred to as a wide area network (WAN).

Figure 1-1 on page 3 illustrates an example of the connectivity of today's data networks and legacy voice systems within a multi-site enterprise. This diagram illustrates the proliferation of servers across the enterprise, the need to have individual PBX systems with their own adjacent voice mail systems, and the need to have wiring for both the phone system and the data network. It highlights the legacy voice architecture as a group of islands, each with their own administration and management functions. In this architecture, mobility is virtually non-existent, where even the user interfaces may vary from location to location, let alone the management functions.

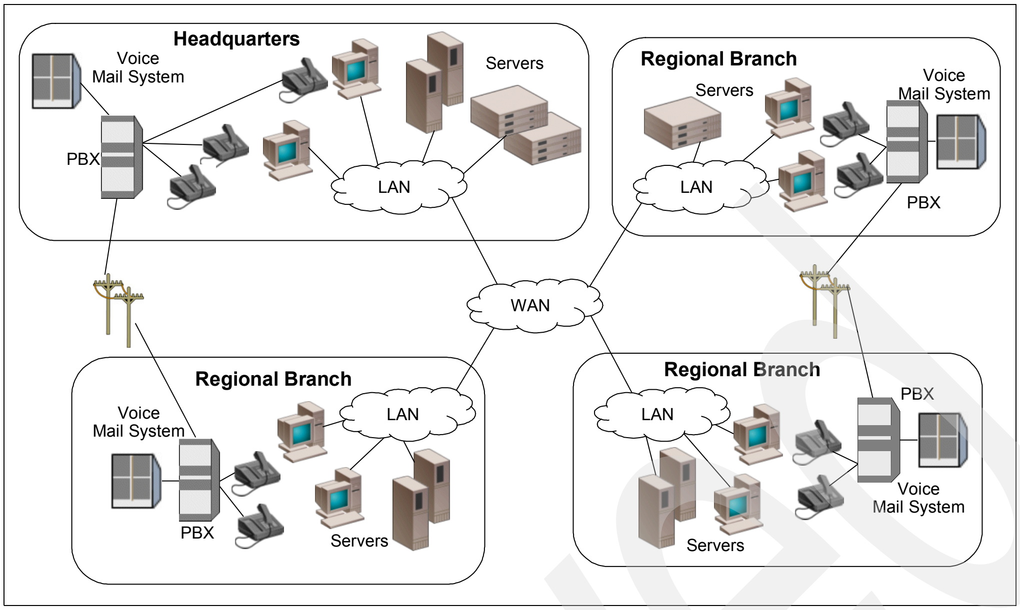

Figure 1-1 Example of legacy voice and data networks

Several different enterprise-class protocols, or methods, of implementing IP Telephony technology have been developed and implemented. These include H.323, Megaco, and Session Initiation Protocol (SIP). While not all vendors implement IP Telephony using the same protocol, SIP has emerged as the industry leader due to its relative simplicity, multi-media capability, and strong interoperability between devices and applications.

Of course the real-time demands of telephony have required two important IP network improvements: quality of service packet prioritization services (so that local print jobs do not interrupt conversations) and power over Ethernet (to eliminate power bricks at each IP phone). The use of IP Telephony as a means to transport the spoken word has created new categories of products. The IP-PBX, for example, has continued to grow in performance and functionality such that sales of IP-PBX systems began to exceed that of digital PBXs in 2006 (source: Business Communications Review Magazine January 1, 2006).

While IP Telephony can be used in general to describe an enterprise-class VoIP solution, it is specifically used in this document to refer to IBM's new and exciting offering of the 3Com IP Telephony Suite for IBM System i. Based on end-to-end SIP signaling, the 3Com IP Telephony Suite for the System i platform is comprised of the following functions:

- IP Telephony
- IP Messaging
- IP Conferencing
- IP Presence

The remainder of this chapter explores the benefits of IP Telephony in general, the benefits of the 3Com IP Telephony Suite running on a System i in particular, and ends with a high-level overview of the architecture of the solution.

1.2 Benefits of IP Telephony

Here we can examine some of the general benefits of IP Telephony as a technology. One of the most important justifications used for the transition to IP Telephony is a reduction in overall costs. By converging voice and data on the same IP network, enterprises now have a single wiring plant to construct and maintain instead of two. Organizations can simplify administration by centralizing the ability to provision devices and users, reduce long distance phone bills between locations, and they can centralize business productivity applications like voice mail and conferencing. Industry standards like Power over Ethernet (PoE) also take advantage of a common wiring and switching infrastructure to provide power to phones, again reducing cabling and wall outlet requirements.

Productivity gains are also an important benefit for a transition to IP Telephony. The ability to implement location and presence-aware applications allows employees to find each other easier and quicker. Doing away with islands of functionality in favor of centrally deployed applications improves mobility so that you are able to use your same corporate extension regardless of your current location, check your messages regardless of their type or origin, and use the same applications you use at your desk when you are traveling on hand-held devices or a mobile computer.

Applications like instant messaging with click-to-call functionality and integrated video and Web conferencing can at the same time increase productivity while also reducing costs. Consider an employee in one location who uses an enterprise-wide directory and a presence-aware application with integrated instant messaging to communicate with another employee at some other location. They have just used an IP Telephony application and have not even used voice! This not only saves money by avoiding long distance phone calls, but saves time for the employees to productively go about their business. These applications play directly into the even more important benefit of increasing customer satisfaction while at the same time reducing overall costs.

As we look toward the future, one of the other exciting benefits that IP Telephony will bring is the integration of business data and applications with the voice infrastructure. Today, this integration is difficult and costly due to proprietary interfaces and systems that were not designed to communicate with one another. With the convergence of voice and data networks with voice running as an application within a data network, the ability to create software that can interface to existing databases and applications during a call and present that information in a useful manner will become easier and less costly.

Flexibility is another benefit that IP Telephony solutions can provide, especially when they are based on open standards and an open architecture. For example, the ability to integrate with legacy phone equipment, other vendor’s phones, applications, and databases provides greater flexibility and choices as enterprises migrate to IP Telephony solutions.

The early adopters of IP Telephony have typically been businesses in the small to medium sized market. Many have multiple locations across a wide geographic area. Making a transition to IP Telephony can be done in a “forklift” manner (cut-over of all users at one time) or in a customer-planned migration that minimizes disruptions to communications and provides integration with an existing PBX infrastructure. Implementing IP Telephony in a newly constructed building is an easy choice because only one wiring and switching infrastructure is required.

Benefits of IP Telephony in general include:

- Convergence of voice and data networks onto the same wiring and switching infrastructure
- Audio, video, and data conferencing
- Instant messaging and Web collaboration
- Mobility within and outside of the enterprise, converging mobile devices with in-house applications such as e-mail and instant messaging
- Location-aware and presence-based applications

- Centralized applications, administration, and management
- Telecommuter solutions that utilize the same corporate applications and phone extensions with secure and accessible communications
- Greater scalability and reduced costs
- Higher productivity and stronger customer interactions
- Flexibility and integration with applications and legacy voice equipment

These benefits provide an opportunity for your enterprise to change the way your employees and customers collaborate with each other. Each enterprise will find the benefits that are unique to their situation, and experience has shown that when new technology is adopted, enterprises find even newer ways to utilize that technology to their advantage.

1.3 Benefits of IP Telephony on the System i platform

We can see that IP Telephony brings many benefits to the table for enterprises, but why should enterprises be interested in IBM's offering of 3Com's IP Telephony solution on the System i platform? The answer to this question can be found within the IBM System i platform, the 3Com IP Telephony solution, and in the shared values of the two products.

With System i and 3Com IP Telephony, enterprises benefit from one integrated, secure, and reliable communications solution delivered by two industry leaders:

- Lower your traditional telephony costs and enhance productivity with IP Telephony solutions
- Implement a complete IP Telephony solution on one easy-to-manage system using System i management tools
- Extend the advantages of simplicity, integration, vertical growth, and security to IP Telephony communications

In today's highly competitive business environment, companies everywhere want to extract business advantage from every technology in the enterprise, especially client-facing communications such as their telephony systems. At the same time, many companies face the challenge of an overly complex IT environment. With the System i IP Telephony solution, you can benefit from an integrated business system that can help you:

- Become more responsive to clients
- Improve productivity
- Operate without interruption
- Secure data and communications without large up-front investments in time, skills, or money

3Com IP Telephony and the System i platform deliver the perfect solution to help achieve these benefits. Companies of all sizes are replacing traditional phone systems with IP Telephony solutions to realize both the productivity benefits of easily accessible advanced applications and the infrastructure cost savings resulting from a single, converged voice and data network.

1.3.1 System i advantages

The IBM System i platform is renowned for its reliability, scalability, and integration. Enterprises of all kinds rely on this platform to run their business-critical applications, ensuring the maximum amount of up-time and integrity of the data in a secure environment that helps their business run efficiently and effectively. The System i platform and the i5/OS operating system provide several important benefits including virtualization of I/O resources, dynamic allocation of I/O resources, and server consolidation. The System i platform supports on-demand scalability in processor power, memory, and disk storage space.

As enterprises grow and merge with other enterprises, the sheer number of servers running specific applications across the business presents a maintenance and management challenge. Server consolidation becomes another key benefit of the System i platform, which provides a single scalable platform with a common set of management tools, reducing the costs of training and simplifying IT support requirements. Figure 1-2 illustrates how multiple server types can be consolidated on the System i platform.

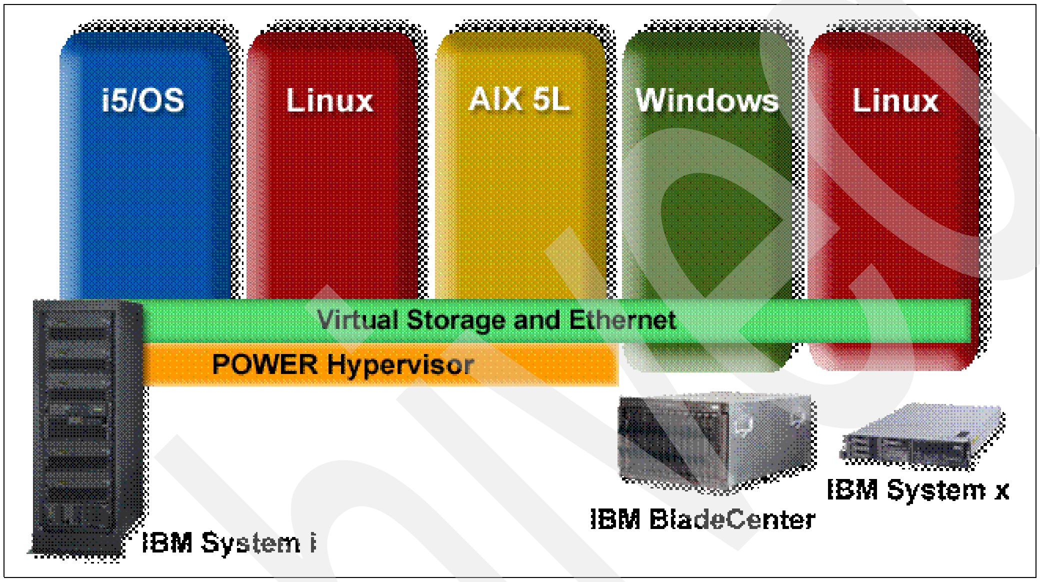

Figure 1-2 Server consolidation on the System i platform

Relying on open standards helps to ease the integration of different systems and applications. Open standards helps to prevent enterprises from being locked in to a particular proprietary solution, providing them with the ability to make choices that make sense for their business needs.

The ability to provide scalability for processors, memory, and disk storage on the System i platform means enterprises can grow either in size or number of applications in a simpler manner. The System i platform supports the ability to dynamically allocate computing resources which provides on-demand capacity for enterprises with workloads that vary over time. In addition, the System i platform supports the virtualization of I/O resources so that applications can share the same hardware without even knowing it is being shared. This allows simplification of backup strategies, helps to reduce hardware costs, and provides a common set of tools to manage the hardware.

1.3.2 Benefits of 3Com IP Telephony

The 3Com IP Telephony solution is based on the same concepts of open standards, reliability, scalability, and integration as the System i platform. The 3Com IP Telephony solution is implemented within a hardened Linux operating system that allows it to easily run within a System i partition in an appliance-like manner with no additional Linux licensing required. The 3Com IP Telephony solution allows enterprises to implement converged applications like IP Telephony, IP Messaging, IP Conferencing, and IP Presence on a single platform with centralized administration in a secure, reliable, and scalable manner.

3Com has been a leader in developing open standards in networking throughout its history. By supporting open standards, the 3Com IP Telephony solution can operate on most any vendor's IP data network infrastructure that supports the standards for quality of service (for example, 802.1p and 802.1Q) and power over Ethernet (802.3af).

The 3Com IP Telephony solution supports integration with other applications, such as e-mail, using open standards (for example SMTP, POP3, and IMAP4), which allows enterprises to gain productivity with their existing infrastructure and help reduce overall costs by maintaining their original investment in the applications.

As illustrated in Figure 1-3, telephony is being transformed into an enterprise application that enables convergence of voice and data. With IP Telephony, the infrastructure for enterprise computing and enterprise communications is united. Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) applications are store-and-forward, database-oriented workflows that coexist on the same network infrastructure as the company's real-time communications application (telephony), as does e-mail and Web browsing.

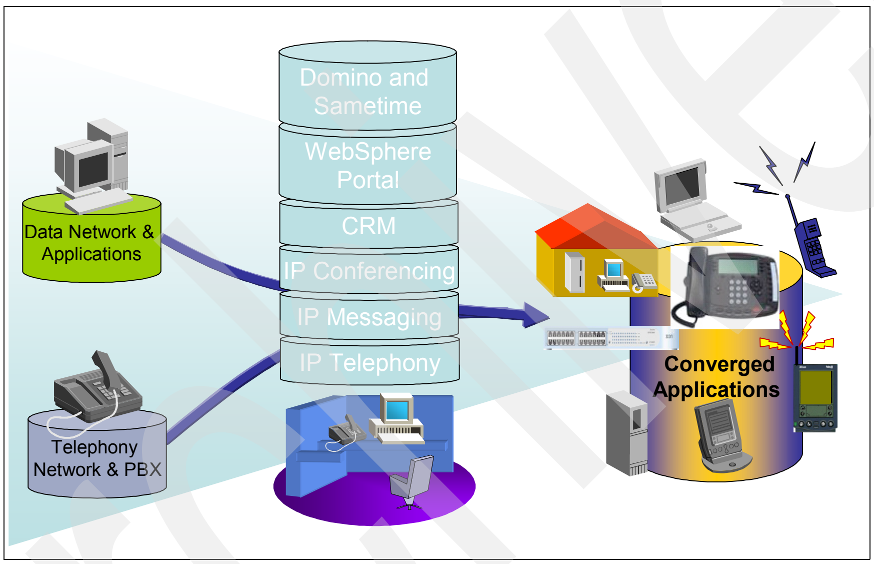

Figure 1-3 Converged applications

But unified infrastructure is only the beginning. Enterprise deployment of next-generation convergence applications (real-time, human-to-human communications) will depend on a robust and open platform capable of IP Telephony, presence-aware applications, and even messaging applications. In upcoming releases, 3Com will be enhancing integration of the IP Telephony system with other IBM applications such as Lotus Sametime.

With a completely end-to-end standards-based enterprise-class system using SIP, the System i IP Telephony solution supports integration with other third-party SIP-based equipment such as hard phones, soft phones, applications, and devices. 3Com maintains a program for voice hardware and software vendors to perform interoperability testing to ensure the highest degree of compatibility with the IP Telephony solution.

3Com has been shipping IP Telephony solutions to the small to mid-size market since 1998 and has over 30,000 IP Telephony installations in over 30 countries worldwide. This focus on the small-to-mid-size market is another shared value between 3Com and the IBM System i platform, helping to assure customers that their needs are understood and will be met.

Reliability and scalability are the other pillars of the 3Com IP Telephony solution that match the System i platform directly. Built-in redundancy of the IP Telephony solution takes advantage of the reliability characteristics of the System i platform to provide maximum up-time. With its ability to support geographic redundancy, the 3Com IP Telephony solution can provide voice services even in the event of a power or network failure at one location. Simplicity of administration and ease of use allow enterprises to take advantage of centralized management of their voice applications. In fact, in 2006, this survivable architecture has garnered the 3Com IP Telephony solution an award for “the most survivable, distributed IP-PBX” in the industry from Miercom, a leading technology testing firm.

The shared values of IBM and 3Com provide many potential benefits to implementing a System i IP Telephony solution, including:

- Reliability
- Scalability
- Using a single System i machine for the IP Telephony solution, business-critical applications and IT infrastructure
- Dynamic resource allocation
- Virtualization of resources
- Focus on small to medium-sized enterprises
- No Linux licensing required to run the System i IP Telephony solution
- End-to-end SIP architecture for simple integration with SIP-based applications and legacy voice network equipment
- Consolidation of voice services on a single computing platform
- Simplicity in administration with centralized control of telephony resources
- Centralized management of converged voice applications and data network elements
- Advanced features and low-cost phone calls over data network
- Unified messaging, conferencing, instant messaging
- Integration with business applications and collaboration applications
- Support of mobile and remote workers within a secure framework

We’ve discussed many benefits and advantages to implementing IP Telephony on the System i platform, but these are going to be different for every enterprise and can be difficult to visualize. To help quantify the Return On Investment (ROI) of an IP Telephony solution for your enterprise, IBM and 3Com provide an ROI Analysis tool that analyzes your current telephony spending and opportunities for improvement, quantifying the value of upgrading to one of several IP Telephony solution options. The tool uses telephony cost metrics to provide initial estimates, then allows you to customize the data based on your experience and needs.

> **Note:** This tool is available to IBM and 3Com sales staff as well as IP Telephony accredited business partners.

1.4 Architecture of System i IP Telephony

The 3Com IP Telephony solution provides a standards-based pure IP converged application solution for enterprises with one or more locations requiring a highly resilient communications system, while lowering operational costs through a centralized management and provisioning system. The 3Com IP Telephony solution enables the convergence of enterprise-wide communications and applications that can integrate with your existing data network infrastructure. Running in one or more partitions on a System i machine, the 3Com IP Telephony solution takes advantage of the virtualization of I/O resources to provide cost-effective, reliable, and scalable operation of your communication system.

The 3Com architecture transforms IP Telephony into an enterprise application by converging voice and data applications on a secure network with a common infrastructure for authentication, call control, presence, privacy, and management. This enables you to deliver centralized voice and data applications to your users regardless of their location in the network. By supporting end-to-end Session Initiation Protocol (SIP) signaling throughout the architecture, the 3Com IP Telephony solution provides scalability in both number of users and types of applications, including messaging, audio conferencing, video conferencing, data collaboration, instant messaging, and more.

The 3Com IP Telephony architecture provides flexibility with built-in redundancy that enables you to deploy an IP Telephony solution that is highly available and scalable.

As illustrated in Figure 1-4, the 3Com IP Telephony architecture consists of an access tier and an application tier that communicate via SIP signaling. These tiers are encapsulated by administration and management functions providing connectivity, call processing, and applications that can be configured to meet your needs. 3Com has a complete set of media gateways for reliable and scalable connections to the PSTN and analog devices. In addition, 3Com offers a robust portfolio of IP phones.

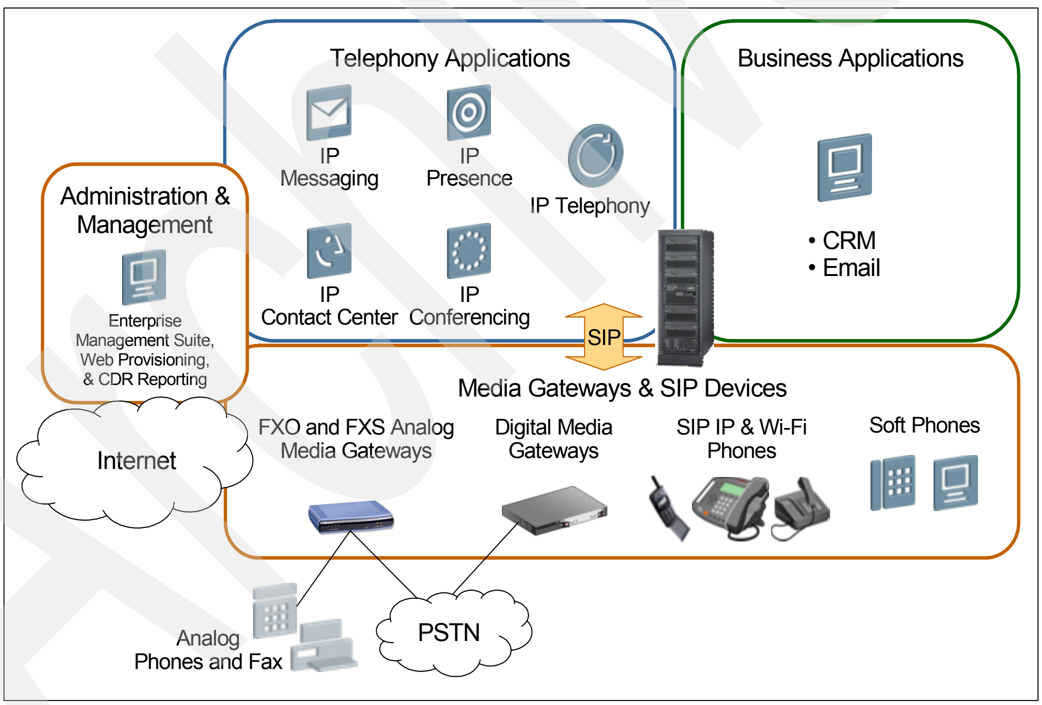

Figure 1-4 3Com IP Telephony architecture

1.4.1 SIP signaling concepts

One of the important aspects of the 3Com IP Telephony solution is its end-to-end use of the SIP signaling protocol. Figure 1-5 on page 10 provides a simplified example of how a phone call is made with the solution.

When a user dials a number, an INVITE is sent to the IP Telephony application, which sends an INVITE to the destination, which will respond with a 200 OK when the call is answered. The IP Telephony application forwards the 200 OK to the source, which then establishes the audio path using the standard Real Time Protocol (RTP). Once the signaling is complete, the IP Telephony application is not involved in the call until further signaling takes place. Allowing the audio to be point-to-point frees the IP Telephony application to do other work, such as handle new calls. Point-to-point communications takes up very little bandwidth and processing power, thus allowing the System i IP Telephony solution to be very scalable.

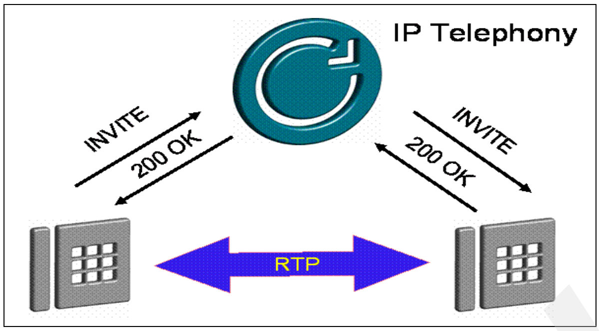

Figure 1-5 SIP signaling with IP Telephony

1.4.2 IP Telephony redundancy concepts

To ensure high availability, the 3Com IP Telephony solution supports an inherent redundant capability. As illustrated in Figure 1-6, one of the call processors is identified as Primary and the other as Secondary. No voice path is established to the IP Telephony call processors, only SIP signaling, requiring minimal network bandwidth for call setup.

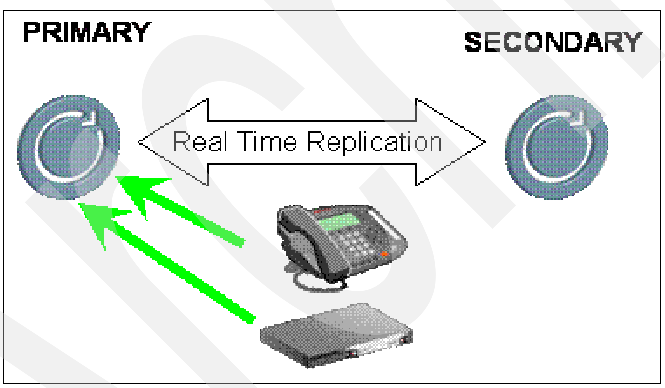

Figure 1-6 Normal connection to primary IP Telephony server

As illustrated in Figure 1-7 on page 11, in the case of Primary call processor connectivity failure, users will failover to the Secondary call processor. This failover occurs automatically the next time an inbound call arrives, an action occurs at the gateway or phone (for example, placing a call), or when a keep-alive response is not received from the currently registered call processor. Active calls stay live and do not get dropped. There is no loss of functionality after switchover to the Secondary call processor.

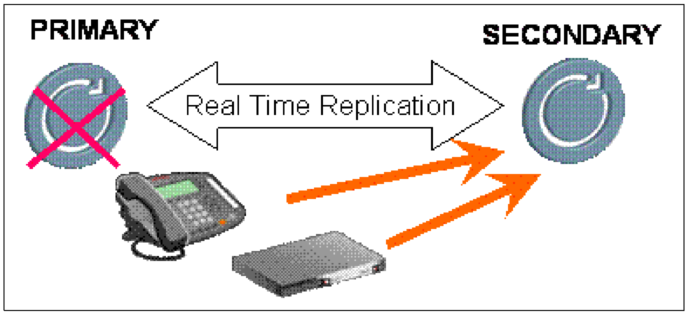

Figure 1-7 Failover to secondary IP Telephony server

3Com phones work in survivability mode when there is a multiple point of failure. As illustrated in Figure 1-8, phones go to gateways directly if the call processors fail, going into a limited support mode where inbound calls can be received and outgoing calls can be placed (outgoing calls only when the phone is configured via DHCP).

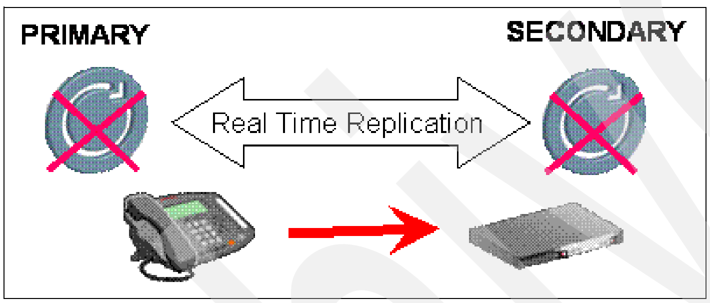

Figure 1-8 PSTN survivability

The 3Com IP Telephony solution also provides a robust set of routing features, including alternative routes. As illustrated in Figure 1-9, the IP Telephony call processor uses alternate routes to other gateways if a route to a particular gateway is not found. The IP Telephony call processor continues to monitor the gateway, automatically allowing traffic to flow through the gateway upon its availability.

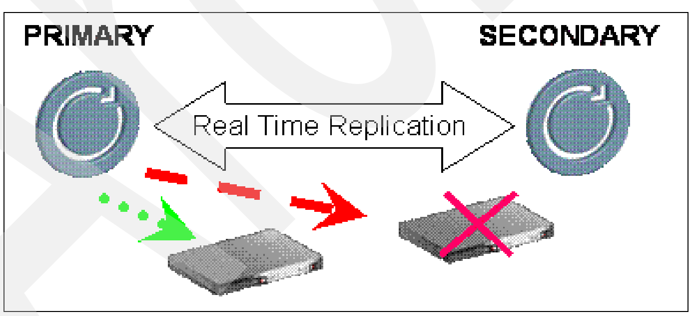

Figure 1-9 Alternative routing with IP Telephony media gateways

1.4.3 IP Telephony system configurations

The System i IP Telephony solution can be implemented in various configurations, which are described in more detail in 2.6, "Typical IP Telephony implementation scenarios" on page 41.

The System i IP Telephony solution supports virtual I/O, dedicated I/O, or a combination of both. The specific configuration for your enterprise depends on your unique requirements.

Figure 1-10 illustrates the redundancy aspects of a multi-site IP Telephony deployment using virtual I/O, including IP Telephony, IP Messaging, and media gateways.

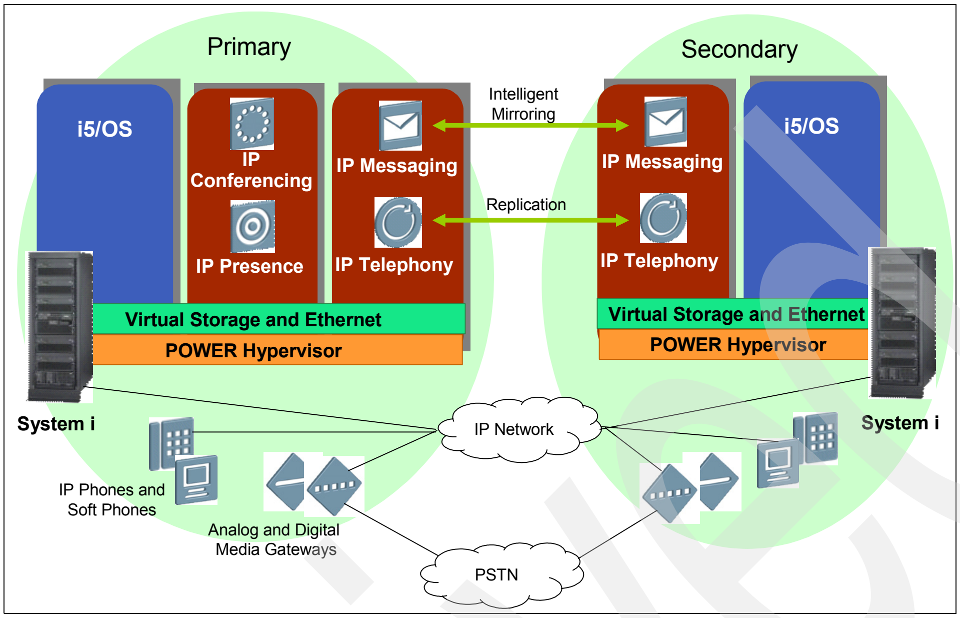

Figure 1-10 System i IP Telephony system configuration

1.5 Additional information

The remaining chapters of this book cover information about planning for an installation, setting up IP Telephony partitions, installing IP Telephony software, maintenance activities, and much more.

To find more information about the IBM System i IP Telephony solution, refer to the following Web sites:

- IBM System i IP Telephony

  http://www.ibm.com/systems/i/solutions/iptelephony/

- 3Com IP Telephony for IBM System i

  http://www.3com.com/index_jump/ibm_iptel.html

1.5.1 3Com reference material

3Com provides installation, administration, maintenance, and user documentation for the applications and hardware in the IP Telephony suite. This documentation is available from the 3Com Web site:

http://csoweb4.3com.com/VCX/vcx_doc.cfm

2

Planning

This chapter provides information to help you plan for System i IP Telephony partition setup and installation. The following topics are covered:

- Concepts and terminology
- Introduction to System i console options
- Planning for resource allocation
- Planning for logical partitioning using VPM or HMC
- Virtual I/O verses hybrid I/O verses direct I/O
- Typical IP Telephony implementation scenarios
- Backup strategies
- Network planning
- Capacity planning
- IP Telephony licenses
- System i IP Telephony Express offerings

Note: For detailed information about Linux partition planning, refer to *Implementing PowerPC Linux on System i Platform,* SG24-6388.

2.1 Concepts and terminology

This section discusses some concepts and terminology that are introduced in this book and that you need to know as you work with the configuration of IP Telephony partitions on your System i machine. Prior to proceeding with creating your IP Telephony partition, you should understand all of the concepts and terminology discussed in this section.

2.1.1 System i partitioning

A partition is a subset of the System i resources that can support an instance of i5/OS, Linux, or AIX® operating systems. This book describes an environment in which an i5/OS partition exists and is utilized to provide storage resources to a Linux partition into which the IP Telephony software will be installed. This environment is commonly referred to as a *hosted* or *guest* partition since the Linux partition is booting from storage served by the i5/OS.

Although this book does not describe creating an i5/OS partition, the process of doing so is largely the same as that for creating a Linux partition or an AIX partition. There are, however, characteristics that are unique to each operating system and therefore the machine has three different partition types:

- i5/OS partitions
- Linux/AIX partitions
- Virtual I/O server

The AIX partition type is not relevant to this discussion. However, the 3Com IP Telephony Suite software is a customized version of Linux and is therefore installed into a Linux partition. The primary difference between the partition types is the interface to the hardware. There are distinct differences in the way i5/OS manages hardware and the way Linux manages hardware.

Partitioning consists of defining the appropriate hardware resources in sufficient quantities to allow the partition to be started and run the workload for which it was created. There are two methods of allocating resources on a System i machine. These are Hardware Management Console (HMC) and Virtual Partition Manager (VPM). For more information about the differences between these two methods see 2.2, “Introduction to System i consoles” on page 20.

Hardware resources consist of processors, memory, and I/O adapters. Regardless of the partition type, every partition must have a minimum amount of processor and memory assigned to it, but the I/O needs will vary. The System i platform provides the capability of assigning a whole processor or processors (*dedicated processor*) to a partition or alternatively pooling processor resources and assigning fractions of the processor as virtual processors to partitions (*shared processors*). This capability enables the user to maximize the processor cycles across a larger number of partitions. In addition, the System i platform has the capability to allow a partition to use idle processor cycles above what it has been allocated. This feature is referred to as *uncapped processing*. See 2.1.3, “Processor concepts” on page 18 for more details.

I/O devices on the System i can be physical or virtual adapters. Some I/O devices may be required for particular workloads, while others may not. In some cases, physical I/O can be moved between partitions to be used for specific needs. An example of this usage might be a system with a single tape or optical drive that is shared between partitions. This would require an HMC managed system.

An alternative to moving a device back and forth between partitions would be to use virtual devices to provide the function. An example of virtual devices eliminating the need for additional hardware or work involved in moving the hardware between partitions would be the previous scenario in which only one optical drive is available. The optical device could be assigned to the i5/OS partition and shared with the Linux partition by using virtual SCSI adapters and a Network Server Description (NWSD). This is the usual case when Linux is installed. It saves the user from having to monitor where a device is and repeatedly move the device from one partition to the other. See 2.1.2, "Virtual I/O" on page 16 for more information about virtual I/O.

HMC is the most versatile of the two partitioning schemes. It is more flexible and scalable than VPM, which is designed for small or mid-size businesses that require a single i5/OS partition and a modest Linux environment.

Note: AIX partitions are not supported on a VPM-managed system. See 2.4, "Planning for logical partitioning using VPM or HMC" on page 38 for more details on the limitations of VPM.

On a VPM system, i5/OS is the partition manager and initially all the resources belong to it. To create a partition, it is necessary to remove resources from the i5/OS partition and add them to the partition being created. Linux partitions created with VPM cannot use physical I/O. It requires all virtual adapters that are created by the firmware and cannot be manually added. Also, a much smaller number of virtual devices and partitions is possible than with HMC. Reconfiguration of VPM partitions is a static process since dynamic logical partitioning is not supported.

On an HMC system, resources are initially owned by the managed system, which is the System i hardware platform without reference to an operating system. The resources can be assigned to a partition using a partition profile, or dynamically added using *Dynamic Logical Partitioning* or *DLPAR*. DLPAR is a process for adding and removing resources without restarting the partitions involved.

The creation of a partition involves defining the resources that the partition will require. This information is contained in a *partition profile* that is used to activate the partition and request the resources from the system. A partition profile is created as part of the partition creation.

A partition profile is a template that defines resources that a partition will utilize, and how they will be used. It defines a minimum amount of processor or memory that the partition must have to be activated, a desired amount, which is an optimal amount the partition can use if that amount is available when the partition is activated, and a maximum amount, which is the maximum amount of the resource that can be moved to the partition dynamically. It also defines any physical and virtual I/O that the system will require or will use optionally if it is available.

Changes to a partition profile require that the partition be deactivated and reactivated with the changed profile to register the changes. It is also the case that the partition must be stopped and restarted to register the configuration when the partition is initially created. After the partition is created there may be times when more resources are required or it is discovered that a resource was omitted, but it is inconvenient or impossible to stop the partition. System i enables DLPAR (dynamic logical partitioning) to provide for this case.

DLPAR can be used to provide the resource until the partition can be stopped and the profile changes saved. This process is often used when virtual adapters that are required have been omitted during the partition creation. Rather than shut down the i5/OS, the virtual adapter is added dynamically and the profile changed so that when the partition can be restarted the change will be saved.

Note: An IPL of an i5/OS partition does not change the configuration. To save changes to the partition profile you need to power down the system without restarting it and then activate the partition using the profile that you want.

All of the same processes that apply to creating a partition for i5/OS, AIX, Red Hat and Novell SuSE Linux apply to creating a partition for IP Telephony. Creating the i5/OS objects is also the same for any of the environments. This book does not intend to provide a detailed LPAR configuration for either Linux or i5/OS. This type of information can be found in the IBM Systems Hardware Information Center at:

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp

Configuring a partition to install the 3Com IP Telephony Suite software differs from existing Linux partitions in the fact that the 3Com IP Telephony software is its own distribution and has its own requirements. It does not require a Red Hat or Novell SUSE distribution to be installed first. There are some minor differences in configuring the NWSD to install the software, and there is likely to be only the one virtual disk.

2.1.2 Virtual I/O

Virtual I/O provides resources that are not physical hardware but that appear to the operating system as actual hardware that can be used to do I/O operations. The advantage of virtual I/O is that it can minimize the amount of actual hardware that is required. There are potentially other advantages as well, such as the ability to save the virtual disk using the i5/OS backup processes and quickly restore it if the file system becomes corrupted or the system becomes unbootable.

Important: It is not possible to save a physical disk attached to the Linux partition (direct I/O) using the i5/OS backup utilities.

The virtual resources that are used for the IP Telephony partition are the same resources utilized by a Linux partition running Red Hat Enterprise or Novell SuSE Enterprise software.

Virtual adapters

Virtual resources are provided by virtual adapters. Virtual adapters are of three types:

- **Virtual SCSI adapters** provide access to SCSI storage devices of disk, optical, and tape. Virtual SCSI is client server based. In the case in which i5/OS is serving storage to a Linux partition, it has a virtual SCSI server adapter defined and the Linux partition would have a virtual client SCSI adapter pointing at the server partition.
- **Virtual Serial adapters** provide console functionality to partitions since there are no video adapters. Virtual serial adapters have the opposite pairing from the virtual SCSI adapters. That is, i5/OS needs a client adapter to communicate with the server adapter on the Linux partition.

  Note: Console support is also available through the HMC without creating a virtual serial adapter in the i5/OS partition.

- **Virtual Ethernet adapters** provide network connectivity. Virtual Ethernet is a peer-to-peer relationship; therefore, every partition that wants to participate in a particular virtual Ethernet network needs to have a virtual Ethernet adapter configured for the same virtual Ethernet LAN ID.

Virtual resources

i5/OS-managed storage devices are made available by a *Network Server Description* or *NWSD*.

An NWSD describes a single hosted server instance to the i5/OS. It provides specific parameters to find the virtual server SCSI adapter, and makes the i5/OS storage devices available. Additionally, it can be configured to power on the partition and tell it where to boot from. It can be thought of as a switch that allows Linux to interface with the i5/OS disk, optical, and tape hardware.

The NWSD has historically provided support for the System i integrated server support, which you may recognize as IXS, IXA, or iSCSI implementations of Intel® and AMD processor-based Microsoft® and Linux servers. There are a number of possible parameters in the NWSD that do not apply to the support for Linux in a partition.

Virtual resources can consist of the following:

- **Virtual disk or disks (NWSSTG)** - A Network Server Storage Space (NWSSTG) object is a file in the i5/OS integrated file system which appears to the Linux partition as a single SCSI hard drive. The installation of the IP Telephony software creates several disk partitions on this drive and creates the file system on it. These disks can be as large as 1 TB.
- **Virtual optical drives** - This includes the i5/OS optical drives and the image catalog. The optical drive must be varied on to be used. This virtual optical functionality is normally used to install the OS from an optical disk and to install applications or update the software as appropriate in Linux partitions on the System i machine.
- **Shared tape and virtual tape** - The tape drive has to be varied off and the tape formatted as a non-labelled volume. This shared hardware could be used to back up the partition using Linux backup applications and not the i5/OS backup procedures. The tape appears to Linux as a locally attached tape drive.

> **Important:** An NWSD does not have to have NWSSTG attached to it. It could be used to provide disk or optical support as well. In an HMC environment you could have an NWSD communicating with one set of virtual SCSI adapters and another NWSD communication over a second set to provide optical or tape support to the partition. In a VPM environment the Linux partition has to get all of its storage resources from a single virtual SCSI adapter.

Other virtual resources

The other virtual resources include:

- **Virtual Ethernet** capability is provided by virtual Ethernet adapters that are created by HMC or provided automatically by VPM. It can be utilized in any number of ways, but in this environment it will be used to communicate with the i5/OS, which will be used to route traffic to and from the network for the partition.
- **Virtual serial server adapters** are created by default in every partition for use with console connectivity. The main interest in this environment would be to use them for virtual console connection to a Linux partition. In the VPM environment there is nothing in particular to configure, but in an HMC environment a client serial adapter connecting to the server serial adapter must be created and will enable you to connect a virtual console to the Linux partition from i5/OS.

2.1.3 Processor concepts

There are two options for processor assignments for logical partitions, dedicated or shared.

- Dedicated processors

  When a system is logically partitioned using dedicated processors, each processor in its entirety is assigned to a partition. Dedicated processors may get better performance than shared processors, but shared processors are more flexible and allow better use of the processors for multiple partitions.

- Shared processors

  Shared processors allow you to assign fractions of a processor to a logical partition and are held in the shared processing pool. This allows multiple logical partitions to share a processor.

  Note: Most IP Telephony partitions will use shared processors.

Also, the System i platform introduces the concept of capped or uncapped partitions. Results of your capacity planning and your system hardware configuration will help you determine your optimal processor assignments for each of your logical partitions. One logical partition may need dedicated processors while another logical partition can use the shared processing pool.

Virtual processors

A virtual processor represents a single physical processor to the operating system of the logical partition. This is a whole number of concurrent operations that the operating system can use. Selecting the optimal number of virtual processors depends on the workload of the partition. One partition may benefit from greater concurrent operations while another may benefit from greater power.

The default setting for virtual processors is based on the number of processing units specified for a logical partition. The number of processing units is rounded up to the next whole number to get the minimum number of virtual processors. If you have 1.5 processing units, two virtual processors will be assigned by default.

Shared processor pool

The shared processor pool is a group of physical processors that provide processing power to multiple logical partitions. With this shared pool, you can assign fractions of processors (or shared processor units) to logical partitions. There is only one shared processor pool for the system. Also, the shared processor pool is automatically created by the system and consists of all of the processors that are assigned as ‘dedicated’ processors to logical partitions.

Note: The number of virtual processors should not exceed the number of physical processors in the shared pool.

When shared processors are used, a physical processor may be moved from one logical partition to another logical partition many times a second. This allows for flexible use of the processor and maximizes processing power across the logical partitions. However, there is a performance impact due to the cost of switching from one logical partition to another. In addition, memory caches are reloaded when processors are switched between logical partitions.

Shared processor units

Shared processor units are a unit of measure for shared processing power across one or more virtual processors. One shared processing unit on one virtual processor accomplishes approximately the same work as one dedicated processor.

Partitions that use shared processors are assigned these shared processor units. The minimum units that can be assigned to a partition are 0.10 processor units per virtual processor. If 2 virtual processors are assigned to the logical partition, then 0.20 processor units must be assigned as a minimum.

Capped and uncapped logical partitions

The capped and uncapped setting is only for partitions that leverage shared processor units.

A capped partition is limited to using the number of shared processor units that it has been assigned. It is never allowed to exceed that processing capacity. This allows for very predictable performance and should be used when doing any performance benchmarks.

Uncapped partitions are a feature of the System i platform. While an uncapped partition is guaranteed the number of shared processor units it has been assigned, it is now allowed to automatically consume any unused processor capacity in the shared processor pool. An uncapped logical partition can consume unused processor capacity up to its maximum virtual processor setting.

Uncapped partitions are given a relative weight to other uncapped partitions. This weight is a value from 0 to 255 with 255 being the highest weight. The default weight is 128. The i5 system and the POWER Hypervisor will move processor resources to other partitions based on the activity in the partitions and the relative weight given to those partitions.

Note: Most IP Telephony partitions on the System i platform are configured as uncapped partitions.

We can illustrate this point by taking an example. You have a multiple partitioned system. Partitions 1, 2, and 3 are uncapped. Partition 1 has two processing units assigned to it and is using 50% of its allocated processing resource. Partition 3 has one processing unit assigned to it, but it is running at 100% utilization and is in need of more processing resource. Since partition 3 is uncapped and has two virtual processors, the unused processor units in Partition 1 can be used in Partition 3, thus increasing its processor capacity and allowing it to complete its workload.

If Partition 2 required additional resources at the same time, unused processing capacity would be distributed to both partitions. The distribution would be determined by the uncapped weight of each of the partitions. If Partition 2 had a weight of 100 and Partition 3 had a weight of 200, Partition 3 would get twice the unused processing capacity as Partition 2.

Note: Capacity on Demand (CUoD) processors that have not yet been activated cannot be used by uncapped logical partitions. CUoD processors that are activated are immediately available to the shared processor pool for assignment to active partitions.

2.1.4 Guest partition concepts

This section discusses the components of System i IP Telephony partition setup and configuration required for i5/OS to host the I/O resources of the IP Telephony logical partition.

Many of these i5/OS components are generated when the IP Telephony partition is created using the methods discussed in this book.

Network Server Description (NSWD)

One object that is created by the user on i5/OS is the Network Server Description (NWSD). This object is used to give a name to the configuration and provides an interface to start and stop the IP Telephony partition. It provides a link between the IP Telephony Linux operating system and its virtual disk.

Network Server Storage Space (NWSSTG)

A Network Server Storage Space (NWSSTG) represents the virtual disk that the IP Telephony partition will use when i5/OS is the hosting partition. It is the actual storage space allocated for an IP Telephony hosted partition. The object can be found in the i5/OS integrated file system QFPNWSSTG directory and would include the complete IP Telephony application and its configuration and data files.

2.2 Introduction to System i consoles

Different types of consoles are available to manage your System i machine:

- Operations console, direct attached or LAN attached
- Thin console
- Hardware Management Console (HMC) 5250 console

The system console you use determines what method is used to create and configure your logical partitions for IP Telephony. The console choice that you make has a considerable impact on the process of logical partition configuration. Figure 2-1 on page 21 is a flowchart that discusses the available System i console options and the corresponding process for creating logical partitions for IP Telephony.

Figure 2-1 on page 21also provides references to various sections of this book that describe the process that would be used for partition configuration, installation and maintenance. Verify your System i configuration with what process you are going to use for IP Telephony configuration and make sure you have the corresponding system console to support your selected solution.

Note: IP Telephony does not require the use of a Hardware Management Console (HMC) for the creation of logical partitions. In many environments there is a need for system console functions with a standard “green screen” or 5250 emulation interface—an operations console or thin console can be used to provide this function.

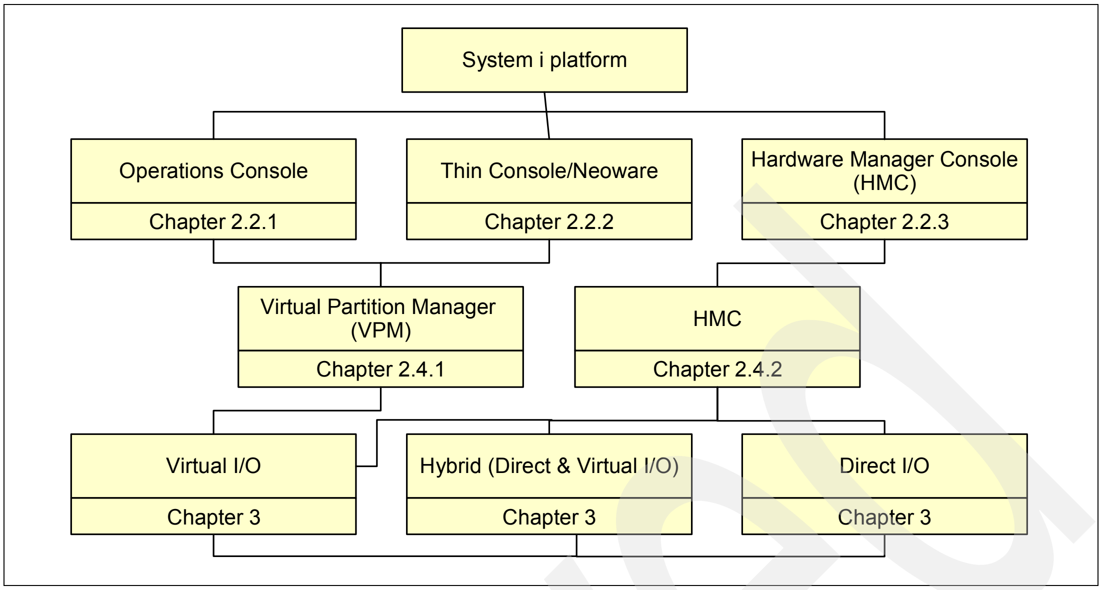

Figure 2-1 System i console options

2.2.1 Operations console, direct attach or LAN attached

The operations console runs on a PC as part of the iSeries Access for Windows®. A green screen console session is provided by the 5250 emulation function of either iSeries Access, or IBM Personal Communications. You can also use iSeries Navigator for management functions. Operator panel functions to a non-partitioned system or to the primary partition are available through a graphical interface. The direct attached operations console requires an additional, special cable.

LAN console allows console sessions to multiple systems or partitions at the same time. More than one PC configured as LAN console can connect to a single system or partition. However, only one can take control of the console session at a given moment.

Both direct attached and LAN consoles allow incoming dial-in connections to the PC, which facilitates remote access and system management.

2.2.2 Thin console

The thin console for System i offers an inexpensive, simple alternative to a twinax-attached system console. It frees PCI ports previously used by a twinax solution and supports the IBM System i5 520 and 550 in a single-partition i5/OS operating environment. Tailored to support the operator console in an i5/OS environment, it provides a dedicated console for systems with a single i5/OS partition. In addition, using the i5/OS Virtual Partition Manager (VPM) capability, the thin console can support a System i machine with up to four Linux partitions if only i5/OS virtual I/O is used by the Linux partitions.

The thin console interfaces to a 5250 green screen display acting as a 520 or 550 i5/OS system console and supports any i5/OS command that can be entered on a 5250 display console. The thin console is plugged into the Hardware Management Console (HMC) port of a 520 or 550 system unit. Because no I/O processor (IOP) or I/O adapter (IOA) cards are required, you benefit from added flexibility in your system configuration.

The following are prerequisites for the thin console:

- System i5 520 or 550 with a single i5/OS partition
- i5/OS V5R3 or later
- Firmware level of SF240

2.2.3 Hardware Management Console (HMC) 5250 console

With the introduction of the 5xx models, the LPAR configuration and management functions were removed from the service tool functions and transferred to the Hardware Management Console or HMC. The HMC performs logical partitioning functions, service functions, and various system management functions. It is a prerequisite to LPAR configuration and Capacity on Demand on any System i machine.

The HMC connects to the managed system via an Ethernet LAN connection to port HMC1 or HMC2 of the Flexible Service Processor (FSP) in the CEC. A virtual console terminal can be configured to run on the HMC for each partition, thus reducing the need for extra hardware in each partition. One of these console types is 5250.

> **Note:** When you use the HMC as a partition console, you can connect to the 5250 console locally or remotely.

2.3 Planning for resource allocation

Planning for the IP Telephony implementation on the System i platform consists of determining resource allocation in the following areas:

- Minimum hardware and software prerequisites, including processor and memory
- Deciding to use either HMC or VPM
- Understanding the IP Telephony architecture
- Determining your network configuration

This section discusses considerations for allocating resources (process, memory, and I/O adapter). It also provides steps for determining current resource allocation on your System i machine and discusses considerations for allocating resources for the logical partitions that will contain the resources for the IP Telephony partitions.

2.3.1 Minimum requirements

This section provides information about the minimum hardware and operating system requirements for IP Telephony logical partitions.

> **Important:** System i Power 5 hardware with L3 Cache is required for IP Telephony workloads.

Minimum hardware requirements

Each IP Telephony partition requires the following minimum hardware resources:

- Processor unit: 600 CPW
- Memory: 1 GB
- Disk storage: 15 GB
- Network interface: one virtual Ethernet adapter for virtual I/O or dedicated for direct I/O

Note: At the time of writing this book these were the minimum requirements.

Minimum software requirements

Each i5/OS hosting partition requires the following minimum software requirements:

- Operating System level: V5R3 or V5R4

Note: Virtual Partition Manager (VPM) on i5/OS V5R3 requires the latest PTF cumulative package to be installed.

2.3.2 Hardware Management Console and server firmware requirements

This section discusses the recommended values for the Hardware Management Console (HMC) and firmware for a successful IP Telephony configuration.

Hardware Management Console (HMC)

The HMC is used to create partitions and partition profiles. Partition profiles are a unique aspect of partitioning on the System i platform. If you are new to LPAR or from a previous version of LPAR on the POWER4™ version, you will need to be familiar with this new concept. Refer to *Logical Partitions on System i5: A Guide to Planning and Configuring LPAR with HMC on System i,* SG24-8000.

The Hardware Management Console version minimum requirement for configuring IP Telephony partitions on System i is Version 5 Release 2.1 or higher. To verify the current release of HMC, select **Licensed Internal Code Maintenance** → **HMC Code Update** as shown in Figure 2-2 on page 24.

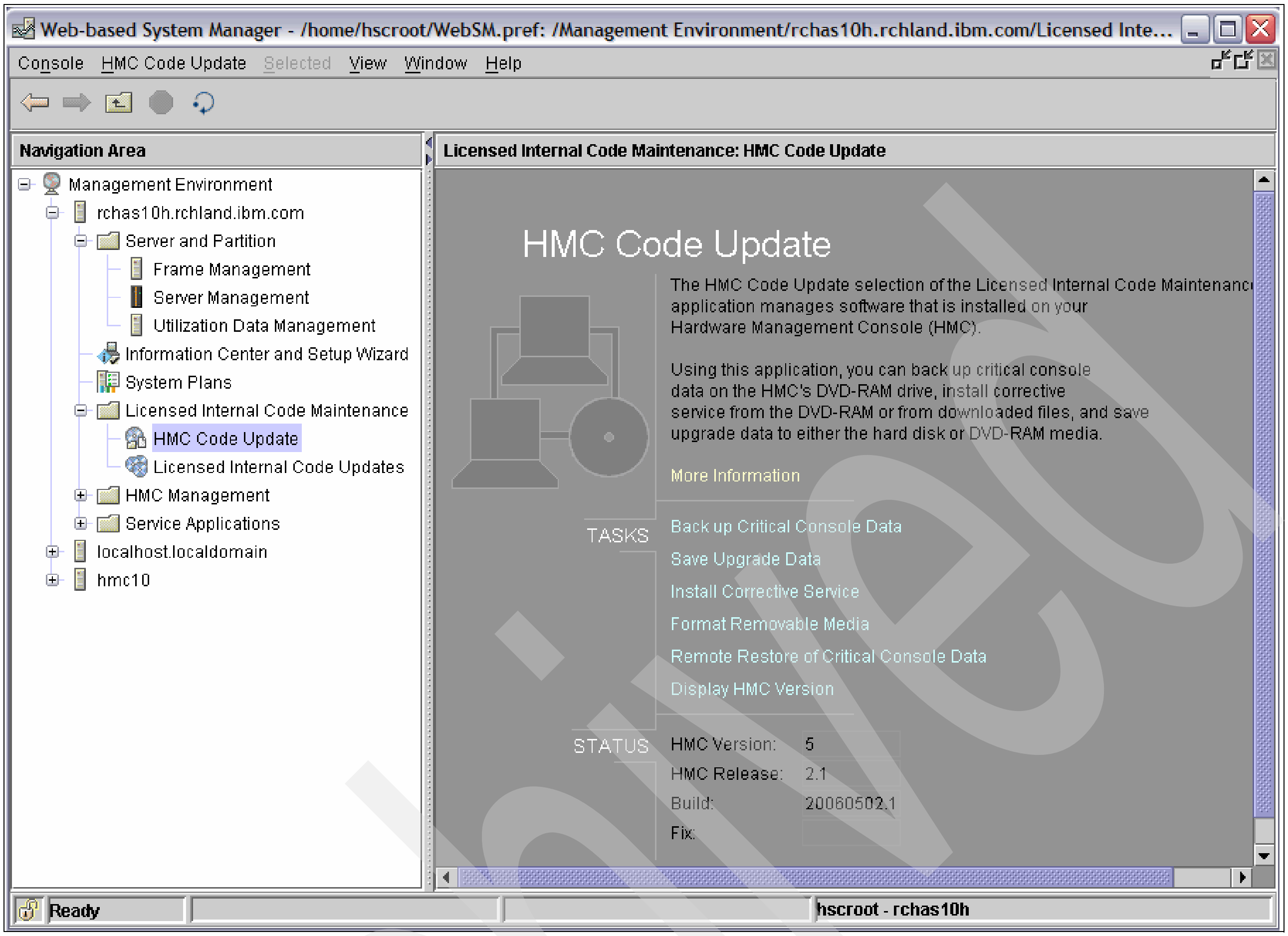

Figure 2-2 Verifying the HMC version and release

Refer to the following documentation on the process to upgrade the HMC version:

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp?topic=/ipha5/fixeshmc_upgrades.htm

Server firmware code

Server firmware code includes code for the server processor, Hypervisor, and other low-level components of the System i family. It is made up of FSP (flexible service processor), PHYP (converged power PC Hypervisor), SPCN (power code), and PFW (partition firmware) and is physically located on the FSP hardware (similar to a processor card) on the System i family hardware.

Server firmware version minimum requirement for configuring IP Telephony partitions is SF240 Level 219 or higher.

Perform the following steps from the HMC to verify the current version of server firmware as shown in Figure 2-3 on page 25:

1. Click **Licensed Internal Code Maintenance** → **License Internal Code Updates**. See Figure 2-2.
2. Select **Change License Internal Code for current release**.
3. Select **Target object selection** and click **OK**.

4. Select **View system information** and click **OK**.
5. Select **None - Display current values** and click **OK**.

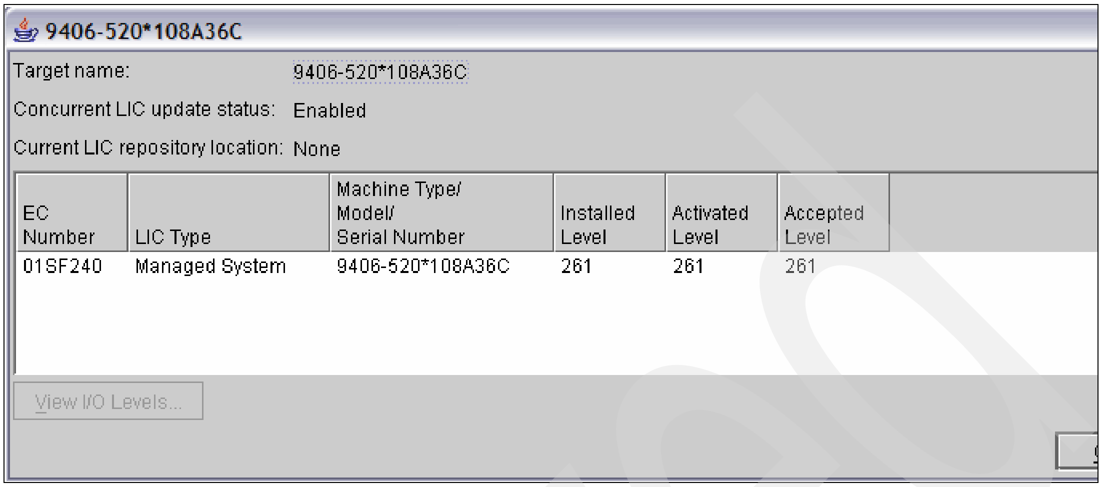

Figure 2-3 Server firmware installed level

HMC and firmware reference material

Following are reference sources for the HMC and firmware:

- The IBM Support: the Fix Central Web site can be used to obtain updates for HMC and server firmware:

  http://www-912.ibm.com/eserver/support/fixes/fixcentral

  On the Fix Central Web page, select **System i family** → **Hardware Management Console** or **Server Firmware**.

- The *IBM iSeries Hardware Management Console Frequently Asked Questions,* which is available on the following Web site:

  http://www-912.ibm.com/8625680A007CA5C6/1AC66549A21402188625680B0002037E/48859A914DB132A586256F42006003A7

- Use the *Support for IBM System i* Web site to access the Technical Databases link for access to the Software Knowledge Base. Here you can find information about technical documents for System i products.

  http://www.ibm.com/servers/eserver/support/iseries/index.html

  On the *Support for IBM System i* Web page, select **Technical Databases** → **Software Knowledge Base** → **Hardware Management Console**.

2.3.3 Processor allocation

The following needs to be considered for processor allocation to the IP Telephony logical partition:

- Whole/Partial processor allocation
- Number of virtual processors
- Capped/Uncapped setting

Whole/Partial processor allocation

The System i platform supports the allocation of processor resources to a logical partition as either a whole/dedicated processor or as partial/shared processor units. A dedicated processor is a processor that is allocated in totality to a single logical partition and used exclusively by that partition. A partial processor allows for the sharing of a processor across a number of logical partitions (up to 10 partitions on a single processor). Additionally, the use of shared processor units allows for the automatic movement of processor units between partitions as determined by the Hypervisor. For details, see “Capped and uncapped logical partitions” on page 19.

The allocation of dedicated processors is the most efficient use of a processor on the System i platform because there are no processor migration or task switching events that need to be managed by the Hypervisor. The use of shared processors, on the other hand, allows for a fuller exploitation of the overall resources of the system because many workloads that can be implemented on the System i platform require less than a full processor allocation.

> **Note:** Most IP Telephony implementations on the System i platform make use of the shared processor feature.

As you review the system resource settings for the overall system and the i5/OS partition, it is helpful to complete an LPAR planning sheet similar to the one shown in Example 2-1.

Example 2-1 LPAR planning sheet

```
Hosting i5/OS Partition

Name:          ____________________Partition ID:____________

Profile Name:____________________

Memory:      Min:_____   Desired: ______Max:______

Processor:   Min:   _____Desired:______ Max:______

Uncapped:    Weight:_____

Virtual Proc:Min:_____   Desired:______ Max:______

Virtual Slots:
   Slot         Adapter              Connection/LAN #
   0              Server Serial
   1              Server Serial
   2              ___________           ______________
   3              ___________          ______________
   4            ___________          ______________
   5            ___________          ______________
   6            ___________          ______________
   7            ___________          ______________
   8              ___________          ______________
   9              ___________          ______________
   10          ___________           ______________
```

One step of planning for an IP Telephony partition is a determination of the current processor allocation on the system. For an HMC-managed system, the current resource allocation can be reviewed through the properties of the managed system. Perform the following steps:

1. From the HMC left navigation pane, click **Management Environment** → **Server and Partition** → **Server Management.** Right-click the managed system in the contents pane and select **Properties**, as shown in Figure 2-4.

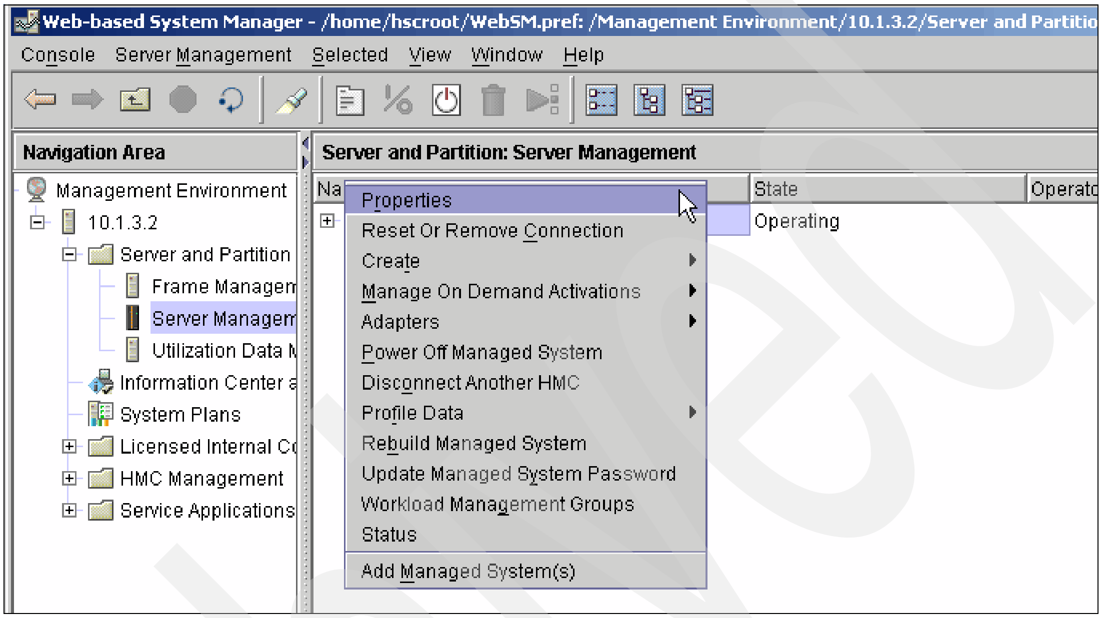

Figure 2-4 Managed system properties selection

2. On the Managed System Property window (Figure 2-5), click the **Processors** tab to review the current processor allocation.

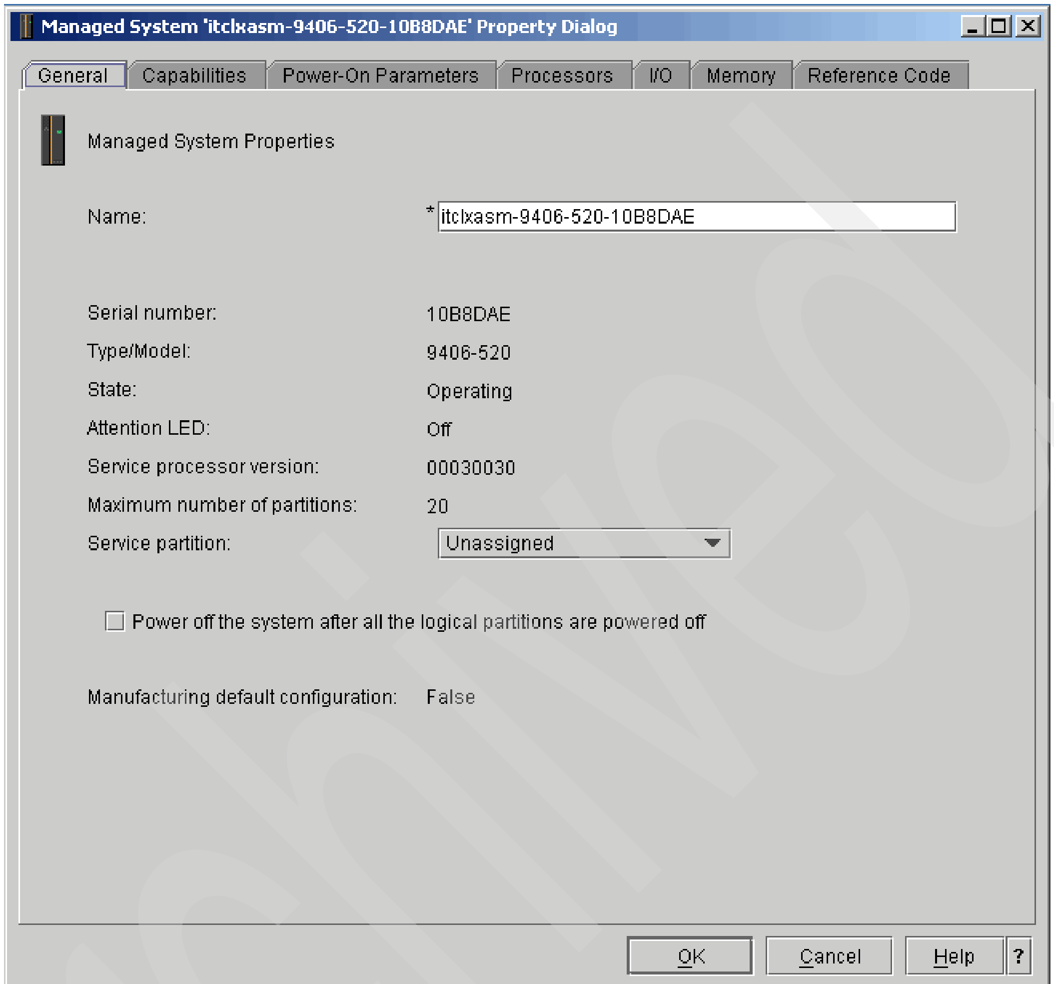

Figure 2-5 Managed system properties

3. As shown in Figure 2-6, the Property dialog indicates the total processor allocation across all of the partitions that are currently active on the managed system.

   As this example shows, there are two processors on the managed system, with 1.25 processor units currently allocated across two logical partitions leaving 0.75 processor units that can be allocated to additional logical partitions.

   > **Note:** On VPM-managed systems, all processor resources are initially allocated to the single i5/OS partition on the system. The SST screens of VPM will be used to free up processor resources and allocate them to the IP Telephony partition.

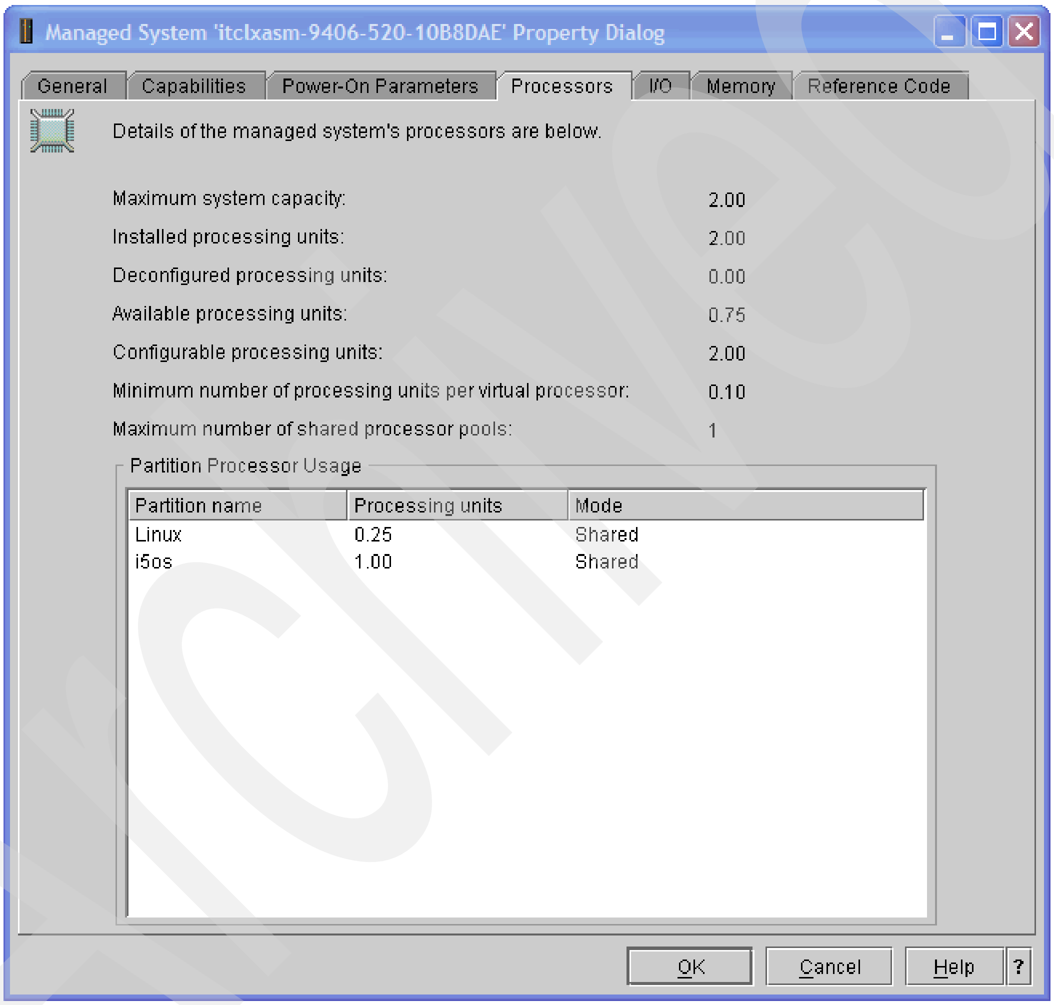

Figure 2-6 Managed system properties, Processors tab

Number of virtual processors

Once the amount of processor resource has been determined, the number of virtual processors to spread the workload across needs to be determined. A virtual processor can be thought of as a manifestation of a processor and is represented to the operating system as a processor thread. The number of virtual processors to allocate to a logical partition can be affected by a number of factors including:

- Type of workload
- Amount of processor allocation
- Number of physical processors in the system

There are certain workloads, such as databases, that can benefit from a large number of processor threads. However, most workloads that are implemented on the System i platform do not require a large number of processor threads. Each processor thread that will be allocated to a logical partition requires at least 1/10th of a processor unit allocated to the partition. Additionally, no more than a full processor (for example, 1.00 processor units) can be allocated to a single processor thread. To put it another way: if 4.20 processor units are allocated to a partition, then the minimum number of virtual processors that can be allocated is 5, while the maximum number of virtual processors that can be allocated is 42.

As a general rule for IP Telephony partitions, the number of virtual processors allocated will be the least amount required by the allocation of processor units to the platform.

> **Note:** On the System i platform, for each virtual processor allocated to the logical partition, the Linux operating system will actually see two processors. This is due to the SMP support on the System i platform and ensures that the Linux operating system will benefit from multi-threading even across a single virtual processor.

Capped or uncapped setting

The System i platform provides the ability for the system to balance the allocation of processor resources across the system based upon the active workloads. This is referred to as *uncapped* partitions. For more information about capped verses uncapped processors, see “Capped and uncapped logical partitions” on page 19.

> **Note:** Most IP Telephony partitions on the System i platform are configured as uncapped partitions.

2.3.4 Memory allocation

Memory is allocated to the logical partitions on the System i platform from the overall memory installed in the system. The amount of memory to allocate to an IP Telephony partition is directly dependent on the workload that will be implemented in the IP Telephony partition as well as the type of I/O (virtual or native) that will be allocated to the partition.

For each partition on the managed system, the Hypervisor sets aside memory resources to manage the memory addressing for the partition. This memory is referred to as the Hardware Paging Table (HPT). The size of the HPT is based on the maximum memory definition for the partition and provides a set of offsets from the partition’s memory address to the physical memory of the system. The size of the HPT can be calculated by taking the maximum memory definition for the partition, dividing that figure by 64, and then rounding to the next power of 2.

When a partition leverages I/O resources hosted by another partition (for example, an i5/OS partition hosting resources for a Linux partition), memory resources are required in the hosting partition to process the I/O requests from the guest partition. To put it another way, for each guest partition hosted by i5/OS, consideration for the amount of memory allocated to the i5/OS partition needs to be made. The amount of additional memory required in the hosting partition will vary based on the I/O footprint of the guest partitions.

For an HMC-managed system, the current memory allocation on the managed system can be reviewed through the properties of the managed system. Perform the following steps:

1. From the Managed System Property Dialog window (see Figure 2-5 on page 28), click the **Memory** tab to display the memory allocation on the managed system.

2. Available memory (as shown in Figure 2-7) reflects the overall memory installed in the managed system less the amount of memory allocated to each active partition, as well as memory set aside for the Hardware Paging Tables and overhead for Hypervisor overhead.

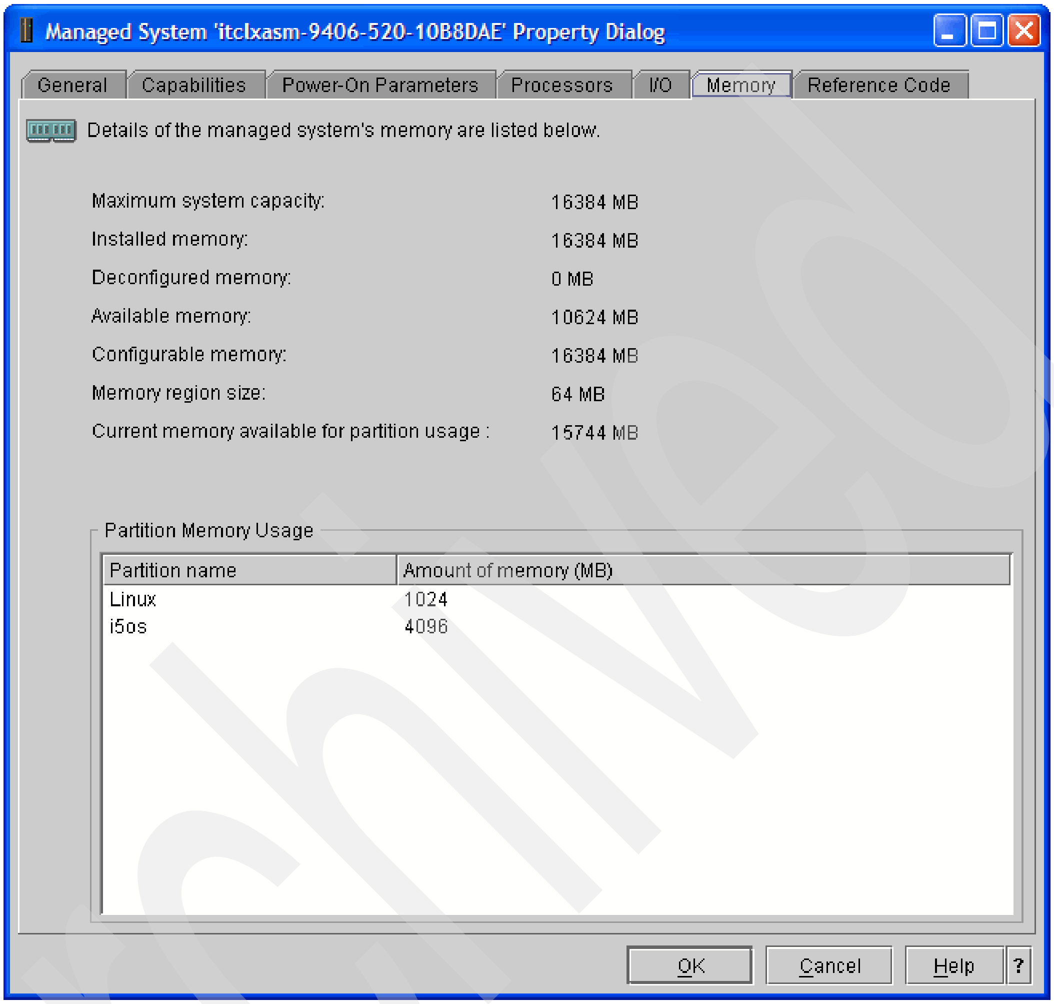

Figure 2-7 Managed system properties, Memory tab

2.3.5 I/O adapter allocation

Each logical partition on the System i platform can have both virtual and native I/O adapters allocated to it. For IP Telephony partitions, I/O adapters are typically used for accessing storage devices (either virtual or direct).

Virtual I/O adapter

Virtual I/O is storage devices (DASD, CD/DVD, tape, etc.) that are physically owned by one partition and accessed by the operating system running in another partition. Virtual I/O is the predominant method of storage allocation for an IP Telephony partition on the System i platform.

For planning purposes, access to virtual I/O resources requires that a virtual SCSI pairing be established between the IP Telephony partition and the i5/OS partition that will host the I/O resources. Therefore, it is important that the current virtual I/O configuration of the partition that will host the I/O resources be reviewed and documented. For an HMC managed system, perform the following steps:

1. From the HMC, right-click the partition profile of the i5/OS partition that will host the I/O resources for IP Telephony partition and select **Properties**. See Figure 2-8.

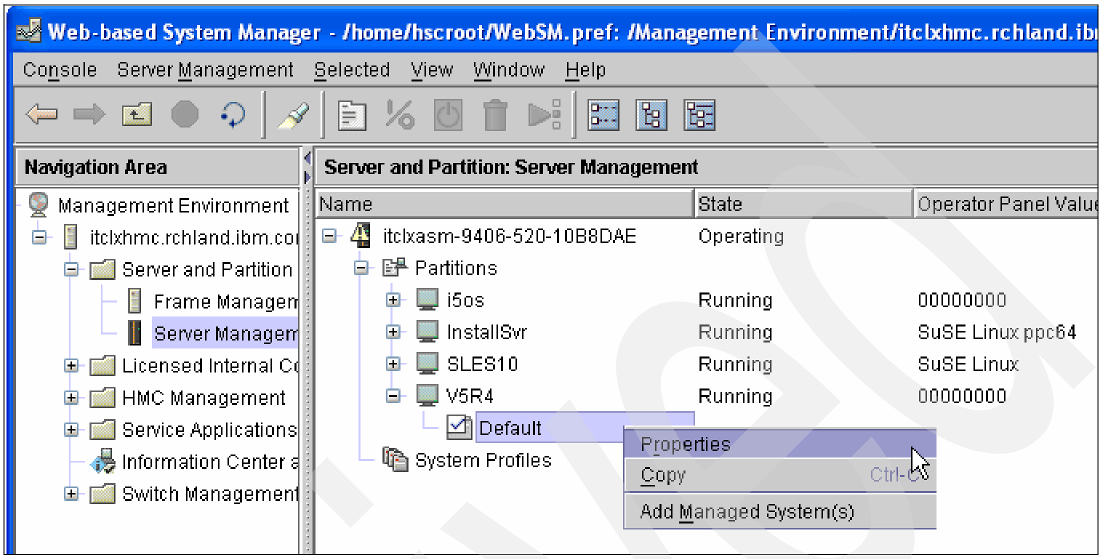

Figure 2-8 Hosting an i5/OS partition, properties selection

2. On the Logical Partition Profile Properties window (Figure 2-9), click the **Virtual I/O Adapters** tab to display a list of virtual I/O adapters configured for the partition.

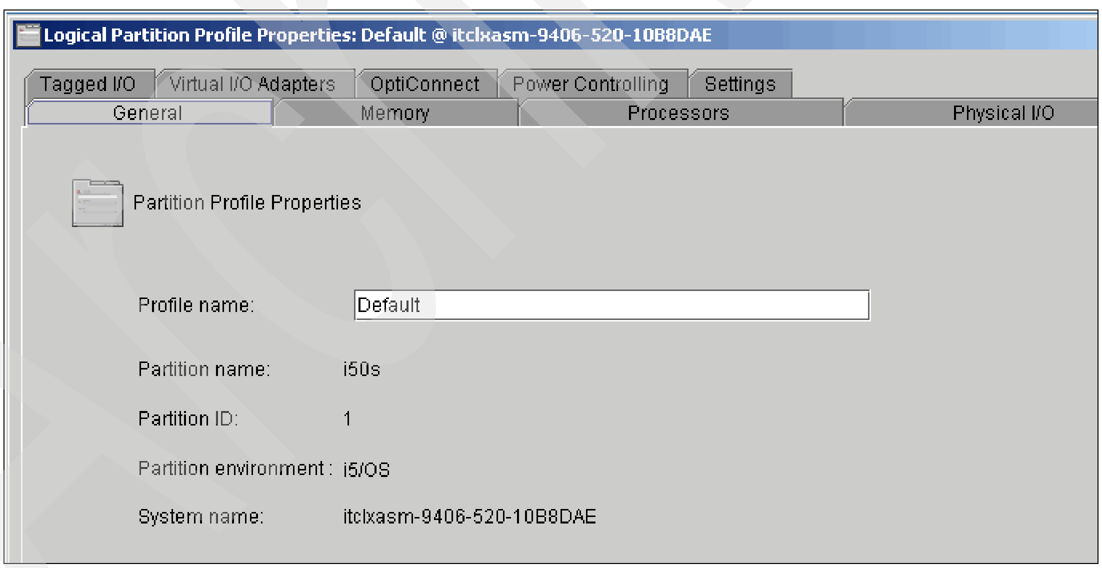

Figure 2-9 Logical partition properties

3. The Virtual I/O Adapters tab (Figure 2-10) shows all of the virtual I/O adapters configured for the partition. The configuration of the virtual I/O adapters needs to be documented to help in the configuration of the guest partition for IP Telephony. Detailed information for each adapter type can be displayed by clicking the **Ethernet** and **Serial** tabs (see Figure 2-11 on page 34 and Figure 2-12 on page 35).

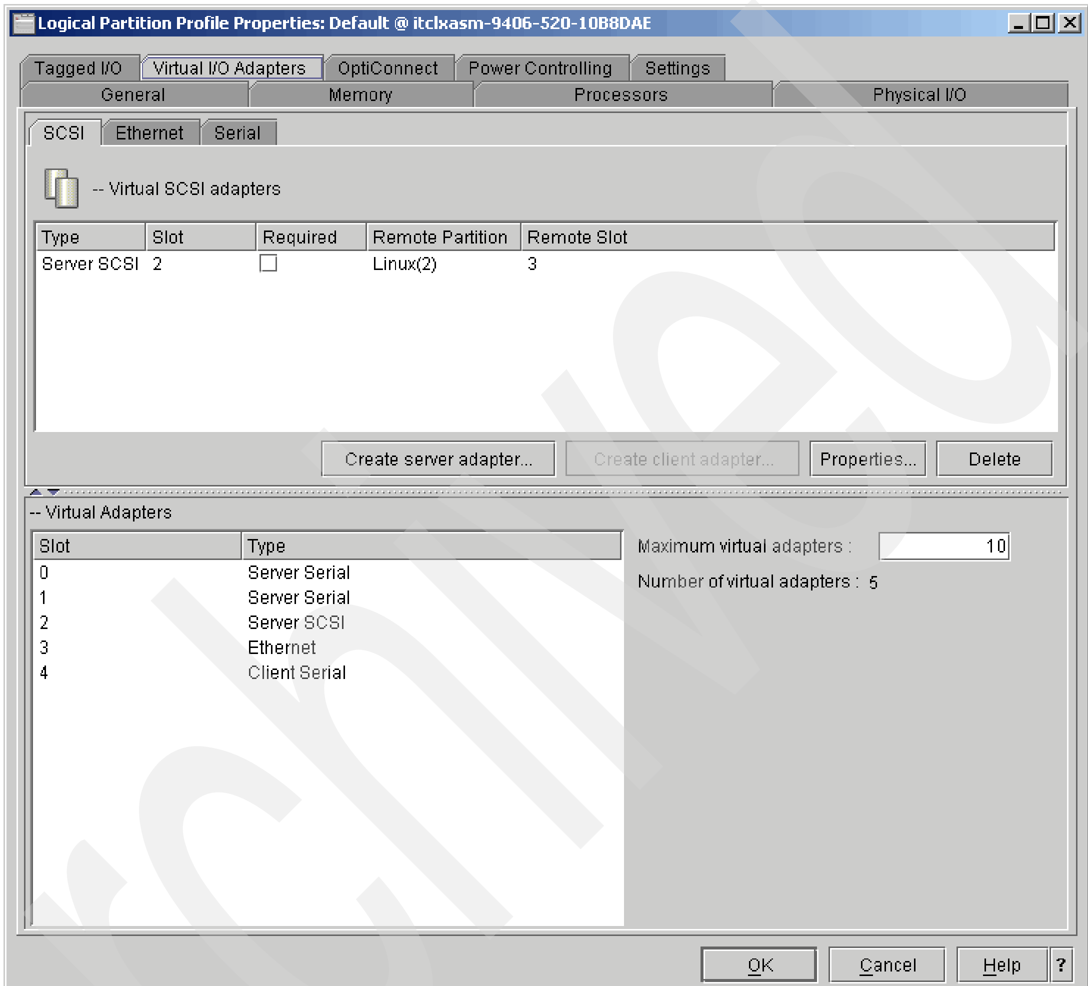

Figure 2-10 Logical Partition Profile Properties - Virtual I/O Adapters (SCSI)

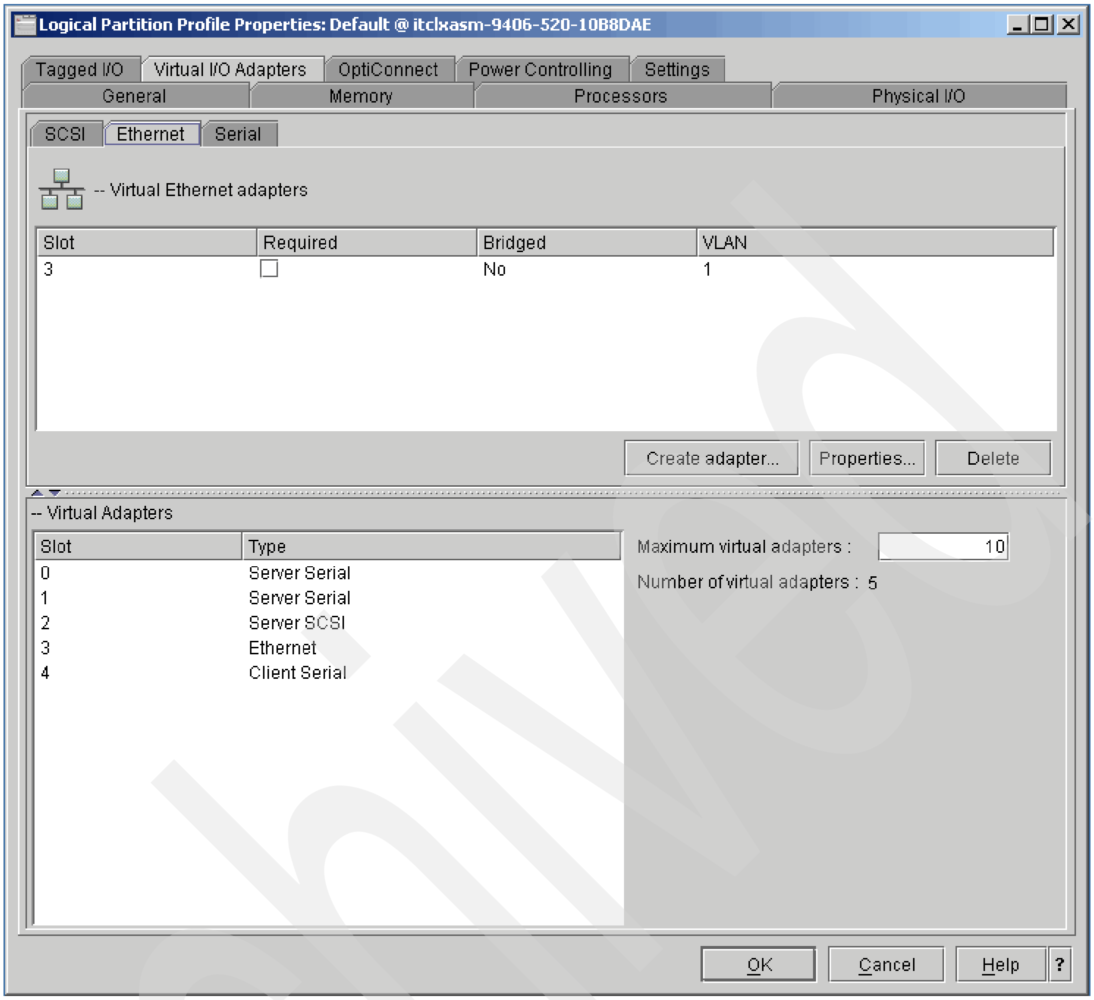

Figure 2-11 Logical Partition Profile Properties - Virtual I/O Adapters (Ethernet)

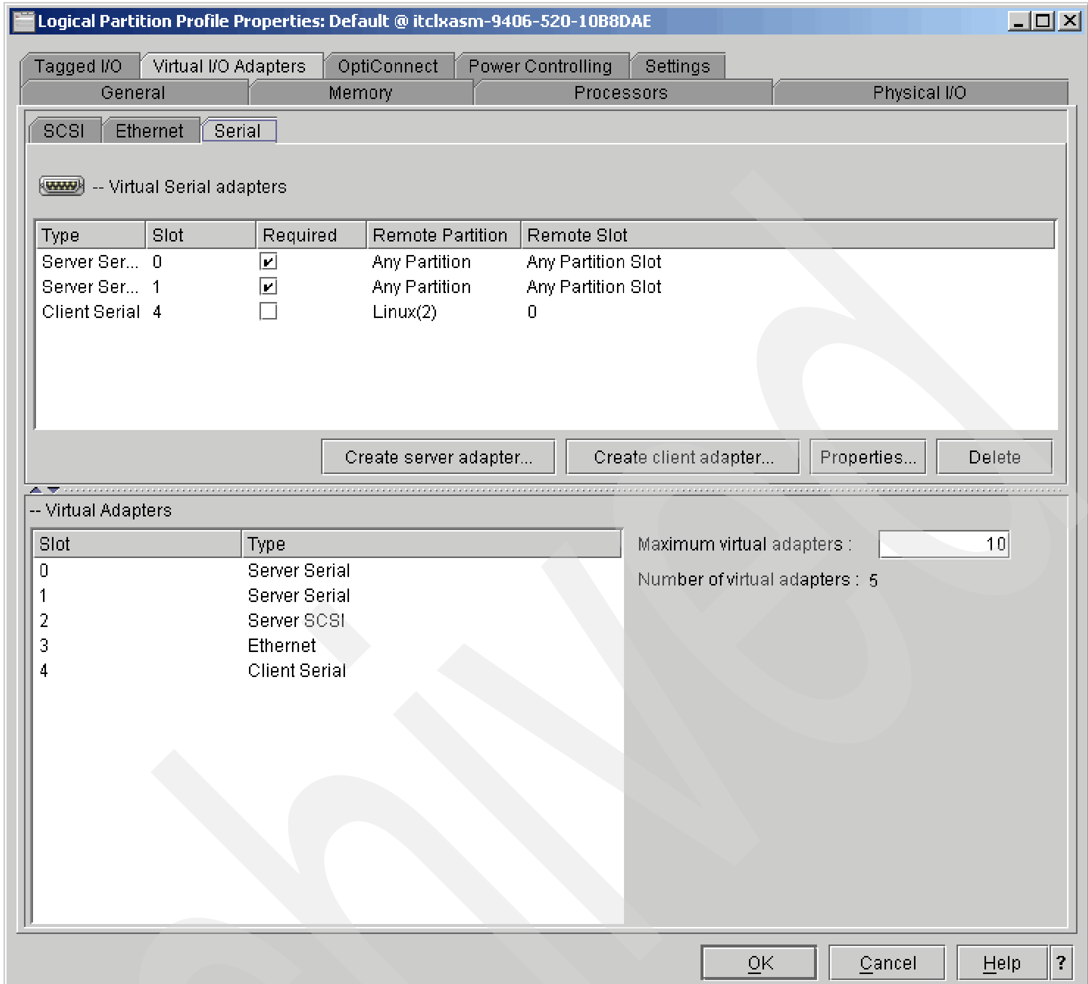

Figure 2-12 Logical Partition Profile Properties - Virtual I/O Adapters (Serial)

4. One way to document this configuration is to build a diagram of the virtual I/O adapters. As an example, Figure 2-13 would represent the virtual I/O Adapter configuration of the i5/OS partition.

   The lines connecting the client and server adapters show the relationship between the adapters. The information presented in this configuration diagram could be used when creating the IP Telephony guest partition to determine the placement of the Virtual Server SCSI adapter.

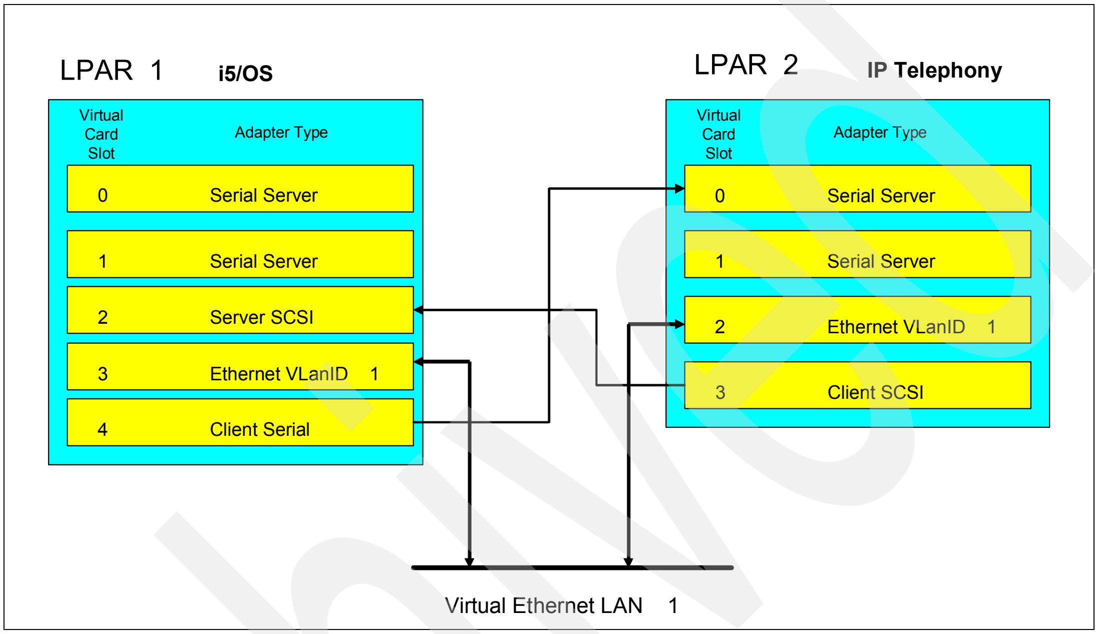

Figure 2-13 Virtual I/O configuration example

Direct I/O adapter

Direct I/O or native I/O is storage devices (DASD, CD/DVD, Tape, etc.) that are physically owned by the logical partition that IP Telephony will be running in. In this case, a physical storage adapter will be allocated to the logical partition that IP Telephony will be running in.

Keep in mind that only I/O Adapters (IOA) can be allocated to the IP Telephony partition. The Linux operating system does not support I/O Processors (IOP) and they cannot be allocated to the partition. For planning purposes, the current allocation of physical adapters should be reviewed to determine what IOAs are available for allocation to the IP Telephony partition.

For an HMC-managed system, the physical hardware installed in the managed system as well as current hardware assignment can be reviewed by clicking the **I/O** tab on the properties window for the managed system. See Figure 2-14 on page 37.

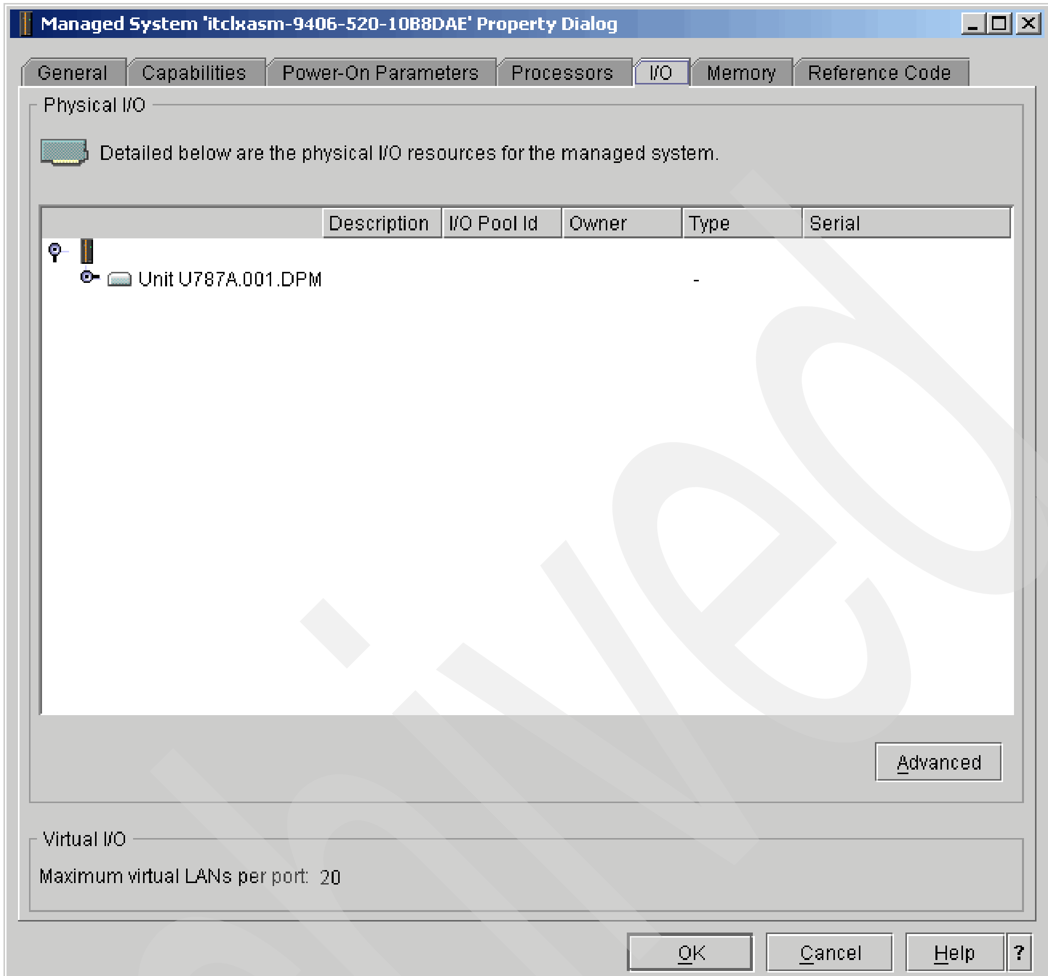

Figure 2-14 Managed System Properties - I/O tab

The hardware is displayed in a hierarchical form with units containing buses that contain IOPs and IOAs. Clicking the symbol in front of each level will display the next level. Figure 2-15 on page 38 shows the fully expanded list of hardware.

The owner column indicates the active partition that currently has the resource assigned. Remember that when allocating physical resources to an IP Telephony partition, I/O adapters can be allocated, but I/O Processors (IOPs) cannot be allocated.

> **Note:** Sometimes when an i5/OS partition is defined, the hardware assignment takes place at the IOP level, which will automatically take the related IOAs as well. In this case, you would need to modify the partition/profile definition of the i5/OS partition and remove the IOA so that it can be assigned to a different partition.

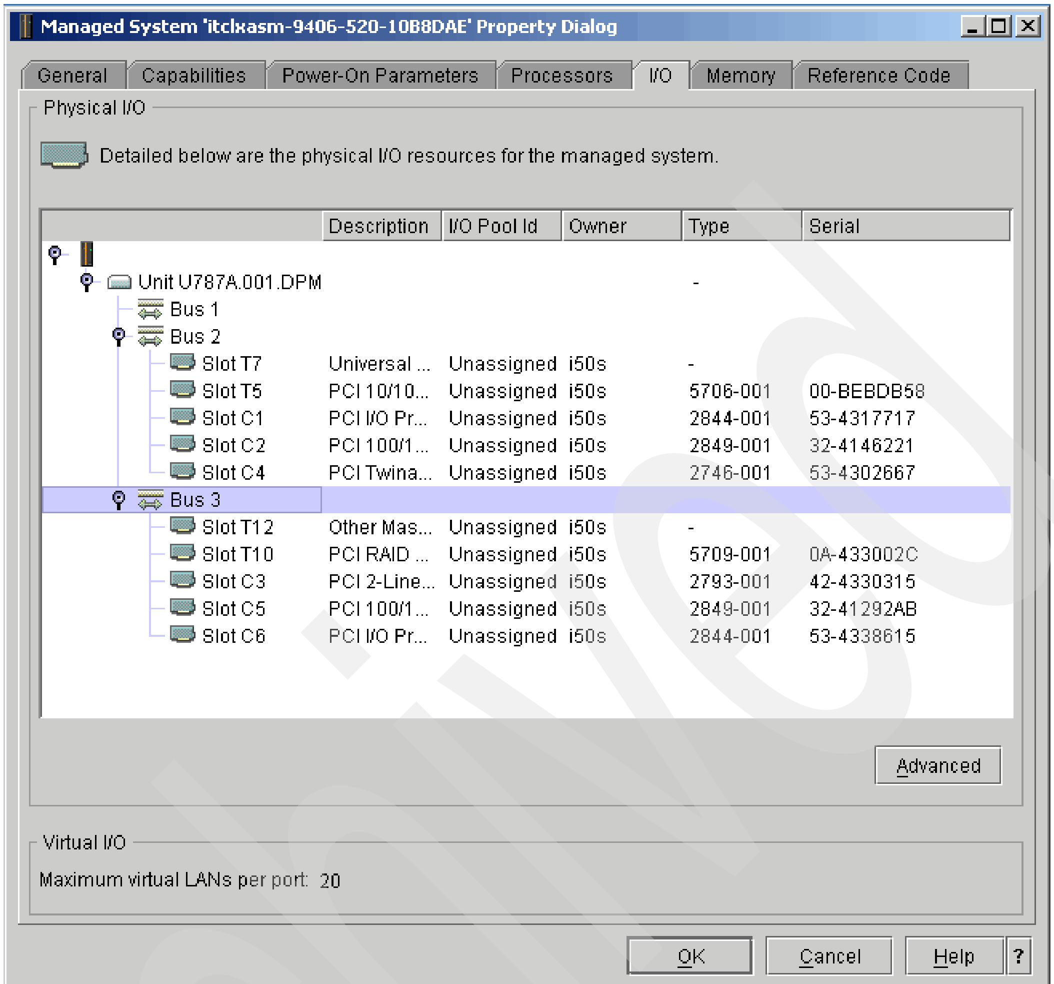

Figure 2-15 Managed System Properties - expanded I/O listing

2.4 Planning for logical partitioning using VPM or HMC

Virtual Partition Manager (VPM) or the Hardware Management Console (HMC) can be used to create IP Telephony partitions, depending on your System i configuration. For small and medium businesses an HMC may not be required for configuration of simple IP Telephony partitions.

Note: An HMC is required for configuring logical partitions with direct attached resources.

2.4.1 Virtual Partition Manager (VPM)

Virtual Partition Manager is for simple guest partition configurations. You can create up to five logical partitions where you can have a maximum of one i5/OS partition and up to four guest partitions without HMC. In terms of IP Telephony, you can have up to four hosted partitions with one i5/OS hosting partition. All IP Telephony partitions would use virtual I/O to access disk, tape, DVD, and Ethernet resources that are owned by the i5/OS partition.

VPM leverages i5/OS's 5250 command-line interface, which does not require the investment in an HMC.

For more information about VPM, refer to the following IBM publications:

- *Implementing PowerPC Linux on System i Platform,* SG24-6388
- *Virtual Partition Manager, A Guide to Planning and Implementation,* REDP-4013

2.4.2 Hardware Management Console (HMC)

The HMC is a system that controls and manages systems, including the management of logical partitions and the use of Capacity on Demand. The HMC can be used to create and manage IP Telephony partitions. You can manage multiple systems from an HMC.

The following are configurations that would require an HMC to be used for configuring IP Telephony partitions:

- **Direct I/O** - Using direct I/O, an IP Telephony partition is able to communicate directly with the System i hardware, such as disk units and Ethernet adapters. In such a scenario, I/O resources dedicated to the IP Telephony partition are owned by and are under the control of the IP Telephony partition. It does not depend on i5/OS for any of its resources. Consequently, i5/OS cannot use these resources since they are allocated to the IP Telephony partition.
- **Two or more i5/OS partitions -** If you need more than one i5/OS instance on your System i machine, an HMC is required.

Adding a new system to an existing HMC

In some cases a new System i machine may be purchased for IP Telephony and an HMC will not be required if an HMC already exists in the environment since you can manage multiple systems from one HMC.

To add a managed system to the HMC, you must establish a network connection between the HMC and the service processor of the new system. Configuring the HMC to work with the new managed system depends on how you have set up and configured the existing network connections between the HMC and the already installed managed systems, including connections to the logical partitions.

To add a managed system to an existing HMC environment, refer to the following link in the IBM Systems Hardware Information Center:

`http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp?topic=/iphal/addingmanagedsystems.htm`

2.4.3 Comparison of VPM and HMC

Table 2-1 summarizes the functions and limitations of VPM compared to HMC.

Table 2-1 Comparison of VPM and HMC

Function	Virtual Partition Manager	Hardware Management Console
Operating systems supported	i5/OS and Linux	i/5OS, Linux, and AIX 5L™
Maximum number of partitions	5 (one i5/OS and four Linux)	254
Uncapped partition support	Yes	Yes
Dynamic resource movement	No	Yes
I/O support for Linux	Virtual	Virtual and Direct

Function	Virtual Partition Manager	Hardware Management Console
Maximum number of virtual Ethernet	4	4094
Maximum virtual disk per partition	64 TB	64 TB

2.5 Virtual I/O versus hybrid I/O versus direct I/O

IP Telephony supports virtual I/O and direct I/O (native I/O) or a combination of both. These implementations are referred to as hosted, non-hosted, and hybrid, respectively.

2.5.1 Virtual I/O: Hosted IP Telephony partitions

With virtual I/O, the resources are owned and managed by the i5/OS logical partition that is hosting the IP Telephony logical partition. The i5/OS shares its resources (disk, tape, CD-ROM, etc.) with the hosted IP Telephony partition. The i5/OS provides the DASD protection and some backup/restore facilities for the IP Telephony environment. Virtual Ethernet provides 1Gb communications paths between logical partitions without requiring additional hardware resources.

The IP Telephony partition is started from the hosting i5/OS logical partition by varying the Network Server Description (NWSD). This IP Telephony partition can only be active when the i5/OS hosting logical partition is active. If the i5/OS hosting logical partition is in restricted state, then the NWSDs are in a varied off state.

Refer to 2.6.1, “High availability, two-system virtual I/O scenario” on page 41 for more information about this environment.

2.5.2 Hybrid I/O: Combining hosted and non-hosted IP Telephony partitions

With hybrid I/O, the resources can be a combination of virtual and direct I/O at the same time. An example would be an IP Telephony partition that takes advantage of a hosted disk from i5/OS and has a dedicated Ethernet card and a virtual optical drive. Any combination of these resources is considered a hybrid environment for IP Telephony.

For more information about this environment, refer to 2.6.2, “High availability, two-system hybrid scenario” on page 41.

2.5.3 Direct I/O: Non-hosted IP Telephony partitions

With direct I/O, the resources are owned by and are under the control of an IP Telephony partition. It does not depend on i5/OS for any of its resources. Consequently, i5/OS cannot use these resources because they are allocated to the IP Telephony partition. For directly attached hardware, all failure and diagnostic messages are displayed within the IP Telephony partition.

Note: An HMC is required for configuring logical partitions with direct attached resources.

For more information about this environment, refer to 2.6.2, “High availability, two-system hybrid scenario” on page 41.

2.6 Typical IP Telephony implementation scenarios

IP Telephony can take advantage of virtual and direct I/O resources, which can be interchanged and used to build highly available IP Telephony solutions on the System i platform. Typical IP Telephony solutions require different pieces of hardware for high availability. The System i platform has the unique ability to manage multiple IP Telephony partitions on one system. It brings security, reliability, scalability, and server consolidation to IP Telephony.

This section highlights some of the typical System i IP Telephony implementation environments. For details on configuring these scenarios, see Chapter 3, “Creating logical partitions for IP Telephony” on page 49.

2.6.1 High availability, two-system virtual I/O scenario

Important: This two-system virtual I/O scenario is considered to be the most commonly implemented System i IP Telephony solution.

The IP Telephony and Messaging servers have built-in support for replication between primary and secondary servers. Roles may be swapped to allow maintenance on either server. Dial tone is not lost and phone service is handled by the active IP Telephony/Messaging server. This is typically accomplished using two System i machines with the primary and secondary replicated across the network as shown in Figure 2-16.

High availability is very important when using virtual resources. Implementing certain saves requires the i5/OS hosting partition to be in a restricted state. With virtual I/O, disk spaces are not available to hosted IP Telephony partitions. Having failover is critical to the success of an IP Telephony solution.

Virtual Partition Manager (VPM) or Hardware Management Console (HMC) could be used to configure the IP Telephony scenario in Figure 2-16.

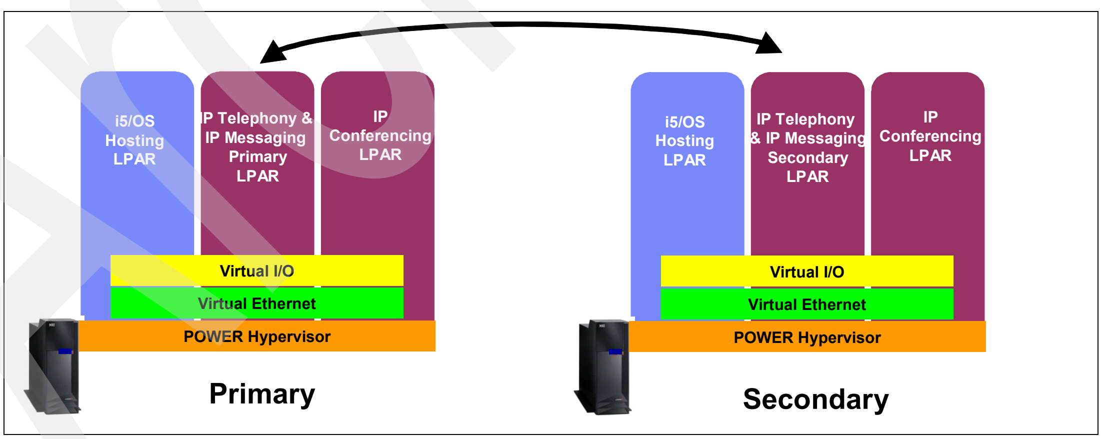

Figure 2-16 High availability, two-system virtual I/O scenario

2.6.2 High availability, two-system hybrid scenario

IP Telephony can take advantage of virtual and direct I/O resources at the same time. This type of configuration would be considered a hybrid scenario, that is, combining direct I/O and virtual I/O at the same time.

In this high availability hybrid scenario, the IP Telephony and Messaging partitions have both a combination of physical, virtual I/O, and direct I/O attached. Figure 2-17 shows the primary system with the IP Telephony and Messaging primary partition taking advantage of virtual I/O resources while having a dedicated Ethernet adapter.

The secondary system with the IP Telephony and Messaging secondary partition is using direct I/O. The secondary System i i5/OS hosting partition could be taken down in a restricted state while the secondary IP Telephony and Messaging partition would still be active. Both the disk space and the network are directly attached to the partition and do not require i5/OS resources.

> **Important:** A Hardware Management Console (HMC) is required to configure the IP Telephony partitions in this scenario, since direct resources are being used on both primary and secondary IP Telephony partitions.

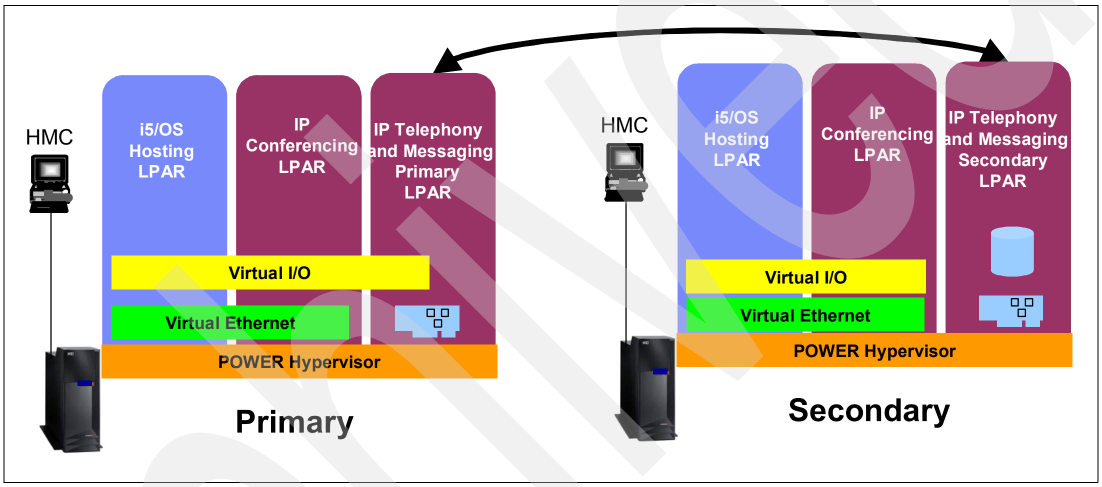

Figure 2-17 High availability hybrid scenario

2.6.3 High availability, single system scenario

A high available IP Telephony scenario with a single system and multiple IP Telephony partitions for primary and secondary IP Telephony and Messaging is shown in Figure 2-18 on page 43. This scenario could be used when true high availability is not required and abundant resources are available on the System i machine.

> **Note:** A Hardware Management Console would be required in this scenario since there are multiple i5/OS partitions.

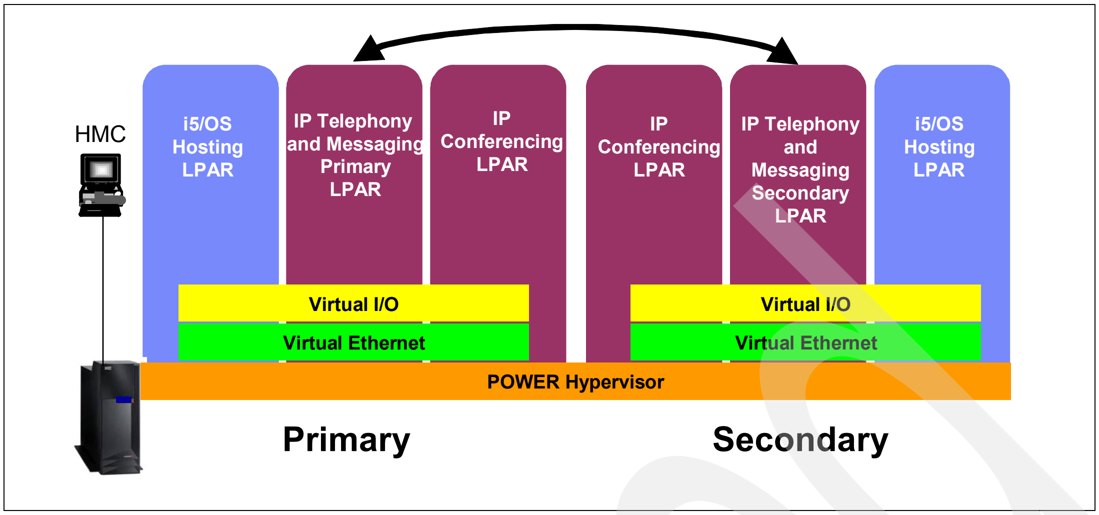

Figure 2-18 High availability, single system

2.7 Backup strategies

In the basic configuration of the i5/OS as the hosting partition for the IP Telephony partitions, i5/OS provides the disk space and Ethernet connectivity for the IP Telephony partitions. If the hosting partition is in the restricted state (SAVE option 21, for example) then the disk spaces are *not* available to the guest partitions. With high availability solutions, as discussed in the previous section, the backup considerations are minimal. Customized CL programs or Backup Recovery and Media Services (BRMS) may be needed to save user data while leaving the network storage spaces for the hosted IP Telephony partitions available.

The IP Telephony application comes with Linux-based backup and recovery scripts. Use these IP Telephony backup tools in the IP Telephony partitions to back up the IP Telephony server data and move the TGZ files from the IP Telephony partition into the i5/OS integrated file system.

Use BRMS or other backup tools in i5/OS to save to media. The use of the IBM Portable Utilities for i5/OS (5733-SC1, option *BASE and option 1) allows the use of SFTP and SCP to be used in Linux scripts to automate the movement of the backup TGZ files from the IP Telephony partitions into the i5/OS integrated file system.

For details on backing up an IP Telephony partition, see 7.1, “Backup and recovery” on page 184.

2.8 Network planning

Virtual Ethernet, Proxy ARP, and a DHCP server can be configured on i5/OS to be used in conjunction with the IP Telephony partitions. This section addresses virtual Ethernet and proxy ARP. For information about configuring the i5/OS as a DHCP server, see Appendix C, “Optional network configuration” on page 267.

> **Important:** Network Address Translation (NAT) is not supported for the IP Telephony solution and should not be used.

2.8.1 Virtual Ethernet

Virtual Ethernet provides the same function as using the 1 GB Ethernet adapter without requiring additional hardware. It can be used by logical partitions to establish high speed connections to other logical partitions on the same System i machine. Virtual Ethernet adapters can be created or removed dynamically and can be restricted for security or traffic requirements.

When a virtual Ethernet adapter is defined for i5/OS, the i5/OS creates a virtual Ethernet communications port, CMNxx, with a resource type of 268C. This resource is used to configure the Ethernet line descriptions and set up the virtual LAN.

Compared to a physical Ethernet adapter whose link exists externally to the System i machine, the virtual Ethernet exists internally to the system and runs over the system memory bus providing the highest level of reliability.

For details on configuring i5/OS for virtual Ethernet, see 5.2, “Networking with virtual interfaces” on page 144.

2.8.2 Proxy ARP

Proxy ARP is a method for forwarding traffic between virtual and external (or physical) Ethernet networks. It is a built-in function of TCP/IP and uses transparent subnetting to associate a logical partition’s virtual interface with an external interface. Essentially, i5/OS becomes a router for a subnet of addresses that will be assigned to the virtual LAN. Proxy ARP is the recommended method to use for virtual Ethernet configurations.

Figure 2-19 shows an example of proxy ARP. A subnet is established that ranges from 10.1.1.25 to 10.1.1.30. This range of addresses is assigned to the virtual LAN and is associated with an interface on the physical LAN (in this case 10.1.1.3) to act as the router for the subnet. The range of addresses for the subnet is determined by an address on the network along with the subnet mask.

For details on configuring proxy ARP, see 5.2.4, “Implementing proxy ARP on i5/OS” on page 154.

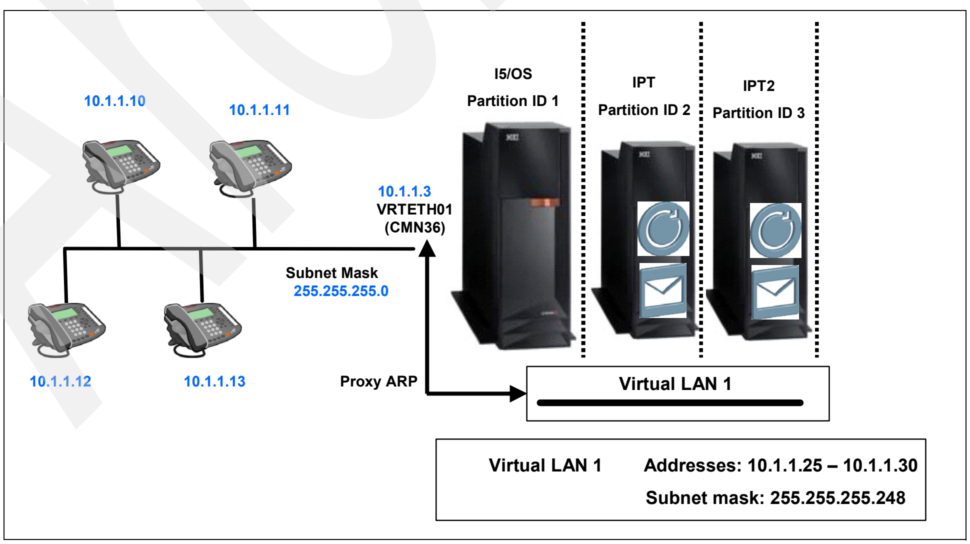

Figure 2-19 Proxy ARP example

2.9 Capacity planning

This section describes the different tools available to help you plan an IP Telephony solution using System i and 3Com software, phones, gateways. and switches.

To assist with the design and planning of an IP Telephony project, 3Com provides the following tools:

- VoIP Designer tool

  The VoIP Designer tool is a Web-based tool that uses a wizard to help you generate technical designs and a corresponding bill of materials for the 3Com portion of the project. For details, see 2.9.2, “VoIP Designer tool” on page 46.

- System Planning Guide

  The System Planning Guide is a set of questions that help you qualify and plan for an IP Telephony project. For details, see 2.9.3, “System Planning Guide” on page 47.

2.9.1 Workload Estimator

Workload Estimator is an interactive Java™-based tool for sizing a System i machine for mixed workloads. For many existing systems, you can import IBM Performance Management (PM/400) data directly into the Workload Estimator and use it to analyze your company growth and server needs. The purpose of the Workload Estimator is to provide recommendations for estimating an appropriate configuration for a system running one or more workloads associated with e-business or collaboration, such as IP Telephony.

Using Workload Estimator, you can try different scenarios and print the results for comparison. The Workload Estimator is not a replacement for the advice of an IBM representative or Business Partner who is experienced with IP Telephony requirements. If you are new to or are not familiar with sizing methodologies, we strongly recommend that you obtain expert assistance before you select a final System i configuration.

To size your System i machine based upon your business needs, we recommend to use the *IBM Systems Workload Estimator*. The 3Com IP Telephony Suite for System i WLE-based Sizing Guide is available from the fast path link at:

`http://www.developer.ibm.com/graphics/estimator/HTML/IP3Com.html`

Or you can access this sizing guide from the following Search Sizing Guide Web page by selecting **IBM System i** in the Choose type of the Server Platform field.

`http://ibm.com/servers/sizing`

See Figure 2-20 on page 46 for an example of the 3Com IP Telephony Suite for System i WLE-based Sizing Guide.

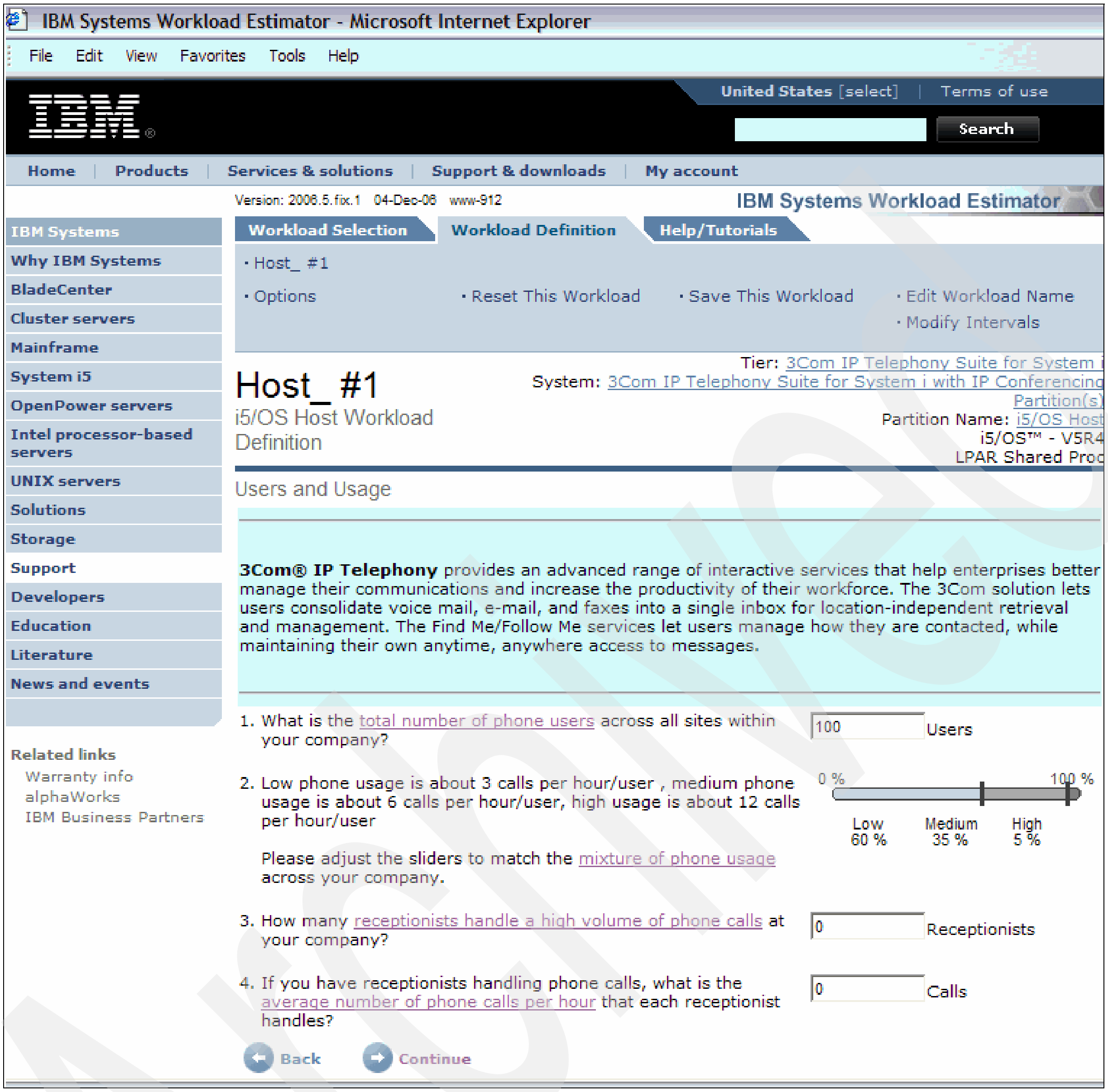

Figure 2-20 3Com IP Telephony for System i Sizing Guide

2.9.2 VoIP Designer tool

3Com provides an online tool referred to as the *VoIP Designer* that enables sales personnel to design an IP Telephony system and create a bill of materials for the 3Com equipment. This tool is available at the following Web site:

`http://configurator.3com.com/3com/asp/users/loginform.asp`

> **Note:** The Web site is password-protected and is available to 3Com, IBM, and Business Partners that have a 3Com partner access user ID and password.

The VoIP Designer tool allows you to input simple business requirements and analyze various system options based on the inputs provided. Each alternative includes a bill of materials and pricing.

The tool is based on a wizard that enables you to:

- Generate technical designs optimized to your needs
- Create a bill of materials corresponding to your designs
- Produce custom quotes for prospective clients
- Manage your portfolio of designs, bill of materials, and quotes

A folder system is provided that allows you to organize the designs you create. In addition, you can create your own custom folders and place your designs in any of them. You can create any number of folders and folder hierarchies, rename them, and delete them as needed. The VoIP Designer tool makes recommendations for the products that apply to the project based on the input business requirements, but it also allows you to customize the design.

2.9.3 System Planning Guide

The IP Telephony System Planning Guide offers a method to document pre-sales information used to qualify, design, and price a System i IP Telephony opportunity. It provides a set of questions for different phases of the pre-sales process. It is used to define the project, infrastructure, application, maintenance, training, and installation services requirements. The System Planning Guide can be effectively used to track information collected for an opportunity, understand the customer's detailed technical requirements, and to communicate what will be available during and after an implementation.

A template document is provided, which is copied to a separate file for each opportunity. This document should be maintained throughout the pre-sales process, collecting more information (and more detailed information) as the process advances.

The System Planning Guide is organized into the following sections:

- Project Survey

  This is a set of questions used to gather basic information about a System i IP Telephony opportunity. This information can be obtained from a marketing survey or from the customer during a customer event or meeting.

- Qualification Survey

  This is a set of questions used to determine whether an opportunity is a good fit for the IP Telephony on System i solution, including:

  - Voice network
  - Data network
  - Applications
  - System i environment
  - Maintenance, training, and installation services
  - Third party products and currently not supported functionality

  These questions are typically asked during a first meeting or conference call before or after an overview presentation of the solution. As a result of answering these questions, an initial high-level system design can be created and budgetary list pricing can be provided.

- System Design

  Use the VoIP Designer tool to design the system and create a bill of materials. It defines how the IP Telephony system will interconnect to each of the interfaces and what functionality the system will provide over the interfaces. Should also include a system network architecture diagram.

  At the completion of this phase, you will have a detailed system design, bill of materials, and budgetary pricing for installation, maintenance, and training services.

- Feature Review

  This is a set of detailed questions that ensure a more complete understanding of the customer's IP Telephony, voice applications, and management requirements. The answers to this section allow final services pricing to be completed and a Statement of Work to be developed, which, in conjunction with the previous System Planning Guide sections, presents a very complete picture of the system that will be installed.

2.10 IP Telephony licenses

IP Telephony software license keys are generated based on the machine ID of the logical partition. The machine ID is based on the system and the physical and virtual adapters that are associated with the logical partition. CPU and memory resources are *not* considered in order that users can adjust the CPU, memory, and disk resources as needed without changing the machine ID and thereby invalidating the license.

> **Important:** New license keys are needed if the virtual Ethernet adapter or physical Ethernet adapter are changed.

2.10.1 Obtaining license activation keys

To obtain license activation keys, submit an activation key request to the following 3Com IP Telephony for IBM System i Software and Service Home Page Web site (click **License Key Request**):

`http://csoweb4.3com.com/iseries/`

> **Important:** You cannot obtain licence activation keys until you install the System i IP Telephony software. Refer to Appendix 6, "Installing IP Telephony, IP Messaging and IP Conferencing" on page 159.

2.11 System i IP Telephony Express offerings

The System i IP Telephony Express is an IP Telephony solution designed and priced for 100 to 1000 users. The System i IP Telephony Express offers packaged solutions containing the System i machine and IP Telephony software and licenses from 3Com. These Express solutions are packaged and priced for 100, 250, 500, and 1,000 users. System i Business Partners provide 3Com IP Telephony handsets and gateways to deliver a total IP Telephony solution.

High availability is critical to your telephony environment and, with System i IP Telephony Express, you have the freedom to achieve availability in the way that best suites your environment. The four Express solution packages listed here are available both with and without a secondary System i machine. If you have an existing System i machine to use as a backup system, you can optimize resources and purchase the base Express package. However, if you want a complete standalone solution, or do not have an existing System i to be used for backup, you can select an attractively priced Express solution with the secondary system included.

For more information about the System i IP Telephony Express offerings, see:

`http://www.ibm.com/systems/i/solutions/iptelephony/express.html`

3

Creating logical partitions for IP Telephony

This chapter presents methods for creating logical partitions on the System i platform for supporting IP Telephony, including the use of the Hardware Management Console (HMC) for creating logical partitions, as well as the use of Virtual Partition Manager (VPM). Creating logical partitions with both virtual I/O as well as I/O dedicated to an IP Telephony partition is also discussed.

Information presented in this chapter is based on the scenarios that you are most likely to be establishing for IP Telephony partitions. Essentially four different scenarios are covered:

- "Partitioning with all virtual resources via HMC" on page 51
- "Partitioning with all virtual resources via Virtual Partition Manager" on page 87
- "Partitioning with virtual disk and physical network via HMC" on page 98
- "Partitioning with all physical resources via HMC" on page 101

Note: Our discussion of HMC in this chapter is focused on the configuration of logical partitions for IP Telephony. For general discussions of HMC and LPAR, refer to *Logical Partitions on IBM PowerPC: A Guide to Working with LPAR on POWER5 for IBM @server i5 Servers*, SG24-8000.

3.1 Before you begin

By using logical partitioning (LPAR), a single physical system can be divided into multiple logical partitions, each running its own operating system image. LPAR on the System i platform provides a framework for system consolidation.

Before you begin creating your logical partition for IP Telephony, there are additional concepts and terms you need to know. Also, you should be familiar with the terms and concepts discussed in 2.1, “Concepts and terminology” on page 14.

Partition ID

The *partition ID* is a whole number used to identify logical partitions.

Partition profile

A *partition profile* specifies the resources and settings for a logical partition. This includes the memory, processor, and I/O allocations. To activate a logical partition, one of the partition profiles for that logical partition must be activated.

You can have multiple partition profiles with different resource specifications for a single logical partition based on the requirements of that logical partition. However, only one partition profile can be active at a time. Activating a different partition profile requires the logical partition to be shut down.

If you have multiple partition profiles, any one of them can be designated as the default partition profile. The HMC will activate the default profile unless you specify a different partition profile to be activated.

It is possible that a partition profile will not activate due to an overcommitment of resources on the system. The HMC shows all of the resources available on the system, but does not specify whether these resources are already in use by an activated partition profile. As a partition profile is activated, the system attempts to allocate the resources specified. If the resources are already in use, the partition profile will not activate.

Minimum, desired, and maximum values

As you set up the partition profile, you are asked to input the minimum, desired, and maximum values for memory and processor units. If your system resources are not overcommitted, the logical partition will get the desired values.

However, if resources are overcommitted, the logical partition will be given a value between the minimum value and the desired value. If the minimum value cannot be met, the partition profile will not activate, meaning that you cannot start the operating system of that partition. Maximum indicates the maximum value that can be dynamically set.

Full system partition profile

A *full system partition profile* is a partition profile that has been set up to use all the resources of the system including memory, processors, I/O, and disks. A full system partition profile can be used for i5/OS only.

When this partition profile is activated, all system resources are committed to the associated logical partition. No other partition profiles and logical partitions will be allowed to be activated as long as this full partition profile and associated logical partition are active. Conversely, a full system partition profile cannot be activated when other partition profiles and logical partitions are already active.

If additional hardware resources are added to the system and then a full system partition profile is activated, the associated logical partition automatically recognizes and uses the new hardware.

Important: Because all the disks are allocated to this full system partition profile, the logical partition may overwrite the disk resources on the system.

System profile

A *system profile* is an ordered list of partition profiles on the managed system. When a system profile is activated, the managed system attempts to activate the partition profiles in the order they are listed in the system profile. A system profile is helpful when changing the managed system from one set of logical partitions to another.

It is possible to create a system profile that contains a partition profile with overcommitted resources. The HMC can be used to validate the system profile against currently available resources, or against the total system resources. This validation ensures that your I/O devices and processing resources are not overcommitted. However, memory requirements are only estimated. Thus, it is possible for a system profile to pass the validation test, but not have enough memory to be activated.

Service partition

The HMC reports hardware errors to IBM. If the HMC is unavailable, then a service partition can report errors. This partition has the authority needed to update the system and other policy parameters without having to power off the system.

On i5 systems, only an i5/OS logical partition can act as the service partition. This service partition typically has a physical connection to a network attached to the HMC and virtual connections to the other logical partitions on the system. This allows the service partition to receive server errors from the other logical partitions and report the errors to IBM.

3.2 Partitioning with all virtual resources via HMC

Partitioning with all virtual resources is probably the most common configuration for IP Telephony on the System i platform. In this configuration, all of the resources (for example, disk and network) that will be used for IP Telephony are actually owned by an i5/OS partition. WIth this configuration, only virtual I/O adapters are allocated to the IP Telephony partition.

The explanation provided in this section assumes that an i5/OS partition has been created. (It is beyond the scope of this book to document the configuration of the i5/OS partition.) Here we discuss creating partitions for IP Telephony to use virtual I/O, because it is assumed that this will be the common environment. (For a description of how to configure partitions for IP Telephony with direct I/O, refer to 3.5, “Partitioning with all physical resources via HMC” on page 101.)

Here we describe how to create a logical partition for IP Telephony by using the Hardware Management Console (HMC). The HMC is used to create partitions and partition profiles.

Partition profiles are a unique aspect of partitioning on the System i platform. They were not used on the earlier versions of LPAR on iSeries servers. If the LPAR on iSeries servers concept is new to you, or if you are only familiar with a previous version of LPAR on the POWER4 version of the iSeries servers, you will need to become familiar with this new concept. You can refer to *Logical Partitions on IBM PowerPC: A Guide to Working with LPAR* *on POWER5 for IBM @server i5 Servers*, SG24-8000, for additional information about this topic.

HMC has a wizard to handle both partition and partition profile creation; refer to 3.2.2, "Creating the logical partition" on page 56 for a description of how to use this wizard.

Note: To create a partition or partition profile, you must have administrator or operator privileges in the HMC.

Creating the logical partition environment to support IP Telephony can be broken down into four broad areas:

- Reviewing system resource allocation
- Creating the logical partition
- Adding virtual adapters to the hosting i5/OS partition
- Registering the IP Telephony partition with the system firmware

In the following sections, we describe each topic in more detail.

3.2.1 Reviewing system resource allocation

When partitioning a system, you need to consider what resources are already allocated, what resources are available, and what resources each partition will require. This task will be more complex in a system that has already been partitioned into working environments than for a brand new system.

In our example, we address the situation where a single i5/OS partition has been created and the IP Telephony partition will be created to use virtual I/O. This situation would differ from an environment in which you are adding partitions to an existing installation because the resource allocation would probably be spread across a number of partitions and thus require more time to assess the available and allocated resources. However, the same considerations apply; creating the IP Telephony partition will be the same in either environment.

In an HMC-managed system, the available and allocated resources can be displayed by viewing the properties of the managed system. Perform the following steps:

1. From the HMC, to view the properties of the managed system, expand the Managed Environment folder and then expand the managed system. Double-click **Server Management** as shown in Figure 3-1 on page 53.

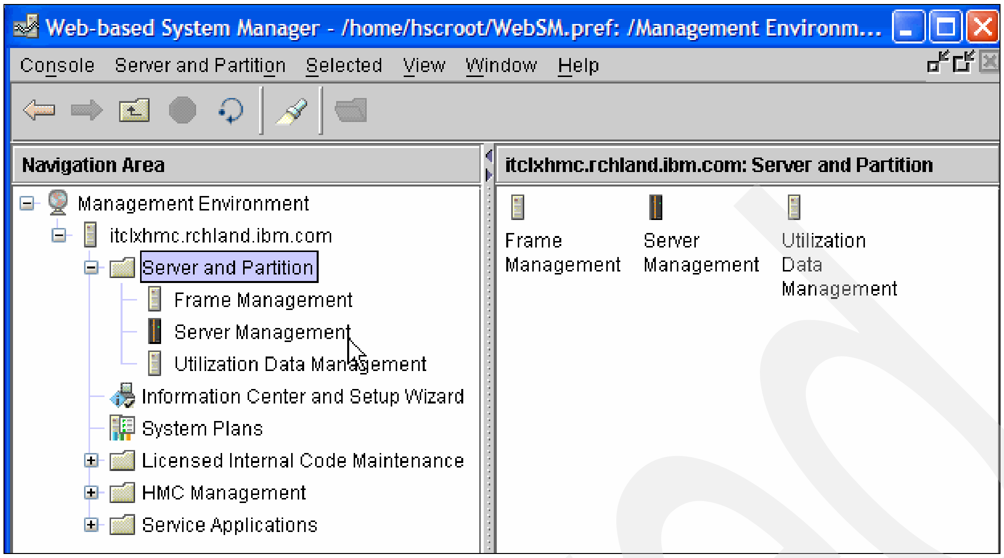

Figure 3-1 Selecting Server Management

2. In our example, there is only one managed system, but there might be more than one, so select the managed system you will be working with, right-click it, and select **Properties** to display the managed server properties; see Figure 3-2.

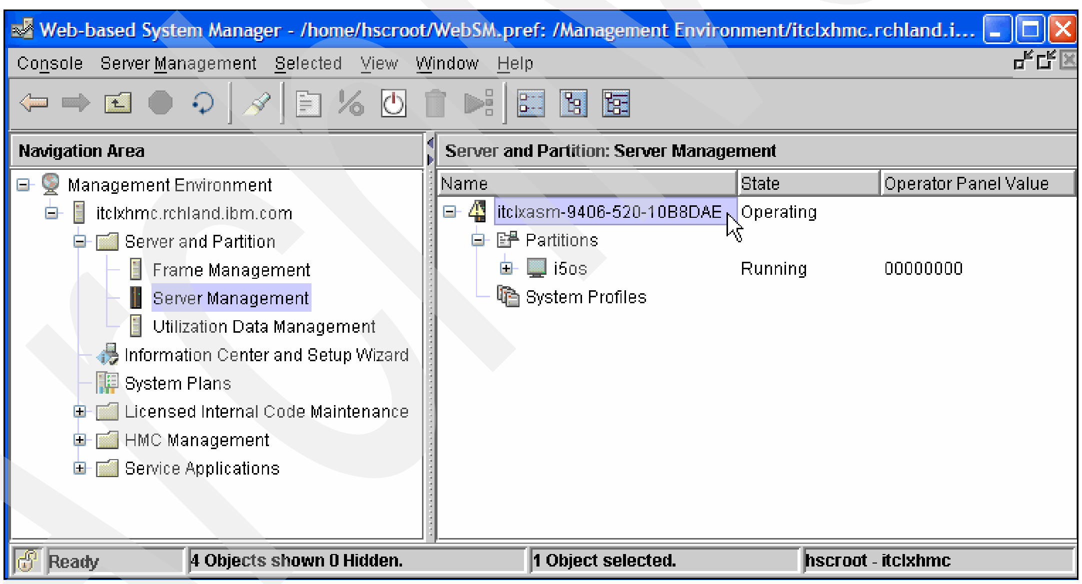

Figure 3-2 Selecting the managed system

3. Displaying the managed server properties shows the characteristics of the managed system, including the available resources and the resources in use for each of the following:

   – Processors
   – Memory
   – I/O (physical hardware)

   It also indicates which partitions are using how much of each resource, how much of each resource is available, and the installed or total amount of the resource that the system has.

In the example shown in Figure 3-3, clicking the **Processors** tab shows a partition is using .5 processors, and 1.5 processors are available. In this example you would need to consider how much of the 1.5 processors are available to allocate to the new IP Telephony partition you are going to create. Similarly, check the available memory and I/O by clicking the appropriate tabs.

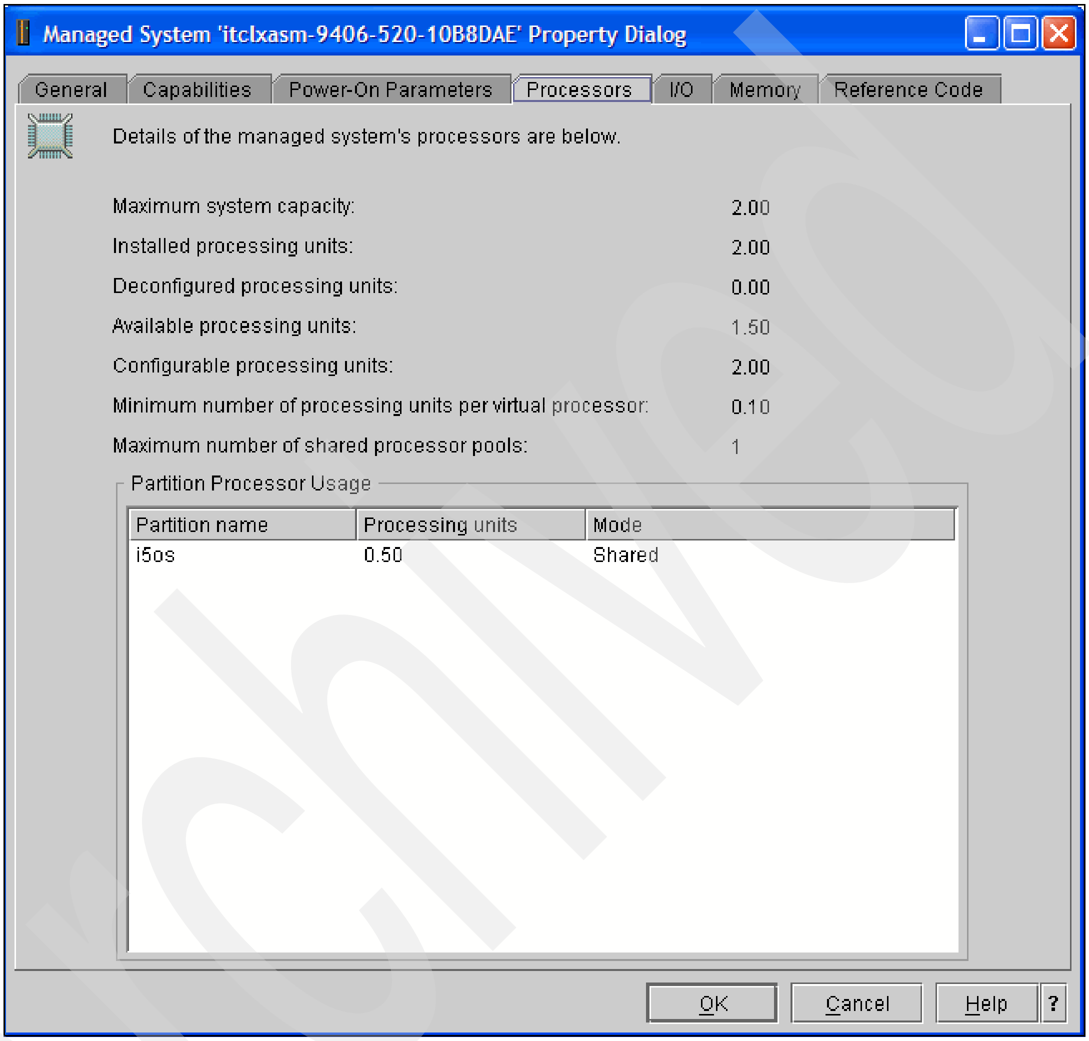

Figure 3-3 Displaying managed systems resource use

Resources are defined for a partition by creating a *partition profile*. When you create a partition, you define the resources for it and say whether they are required for the partition to start. This process creates a profile for the partition.

In the IP Telephony environment, it would be unlikely to require more than one profile because the partition is dedicated to the same application all the time and you would not be installing additional applications. However, it might be necessary to change the amount of resource needed. In this case, the profile could be edited or, if appropriate, Dynamic Logical Partitioning (DLPAR) could be used to move processors.

> **Note:** IP Telephony partitions do not support dynamic allocation of memory.

In the case of a system that has one i5/OS partition, you need to verify that the profile for the partition was not set to use all the managed systems resources. To do this, expand the partition to display the profile or profiles associated with each partition and right-click the profile to show the properties. When a partition is activated with a profile that uses all the resources, there are no resources available to be allocated to other partitions.

To verify this, perform the following steps:

1. Expand the partition to show the associated profile (Figure 3-4).

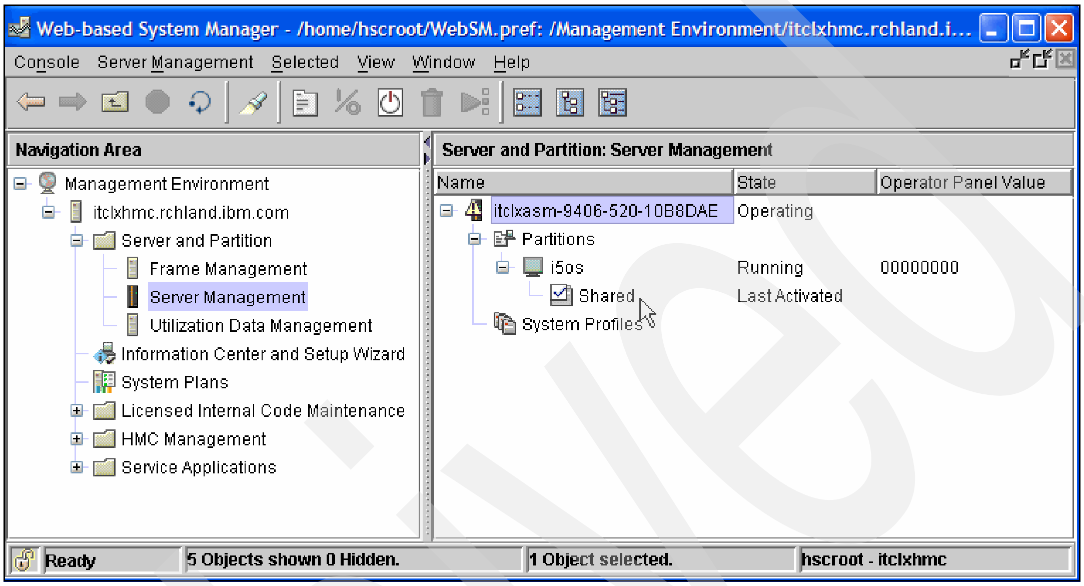

Figure 3-4 Selecting the partition profile

2. Right-click the profile and select **Properties**; see Figure 3-5.

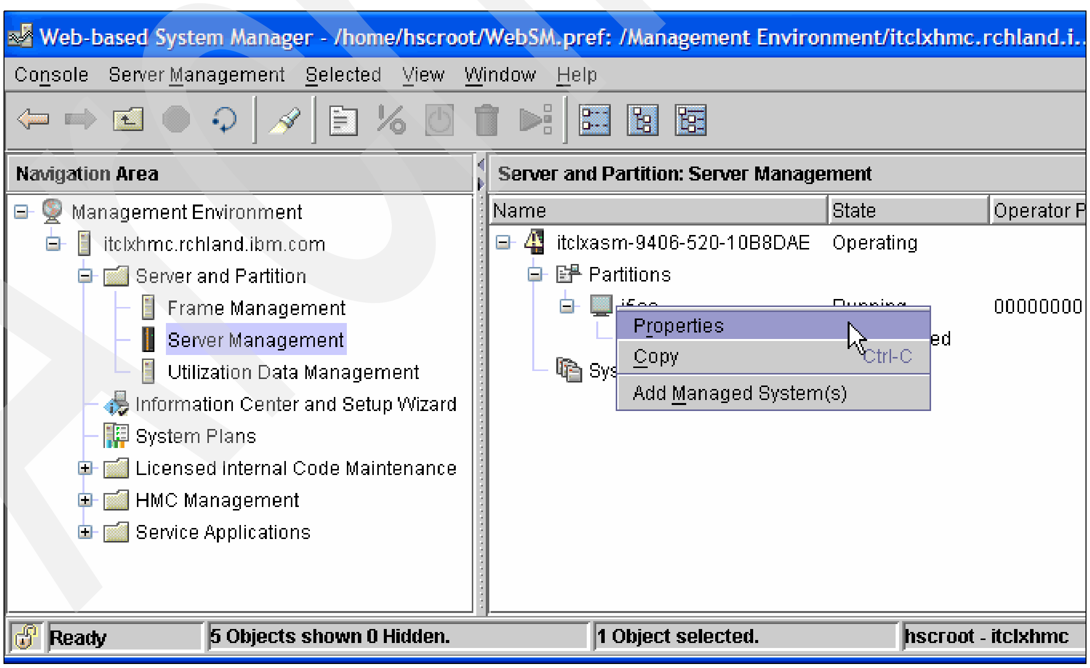

Figure 3-5 Selecting a partition's properties

3. On the Logical Partition Profile Properties window (Figure 3-6), General tab, it will show whether the profile is set to use all the resources.

   If all the resources are in use, you will need to either change the current profile or create a new profile to assign the appropriate resources for the i5/OS partition while making available sufficient resources for other partitions. If all of the resources were not in use, you would need to verify that sufficient amounts are available to support your IP Telephony partition.

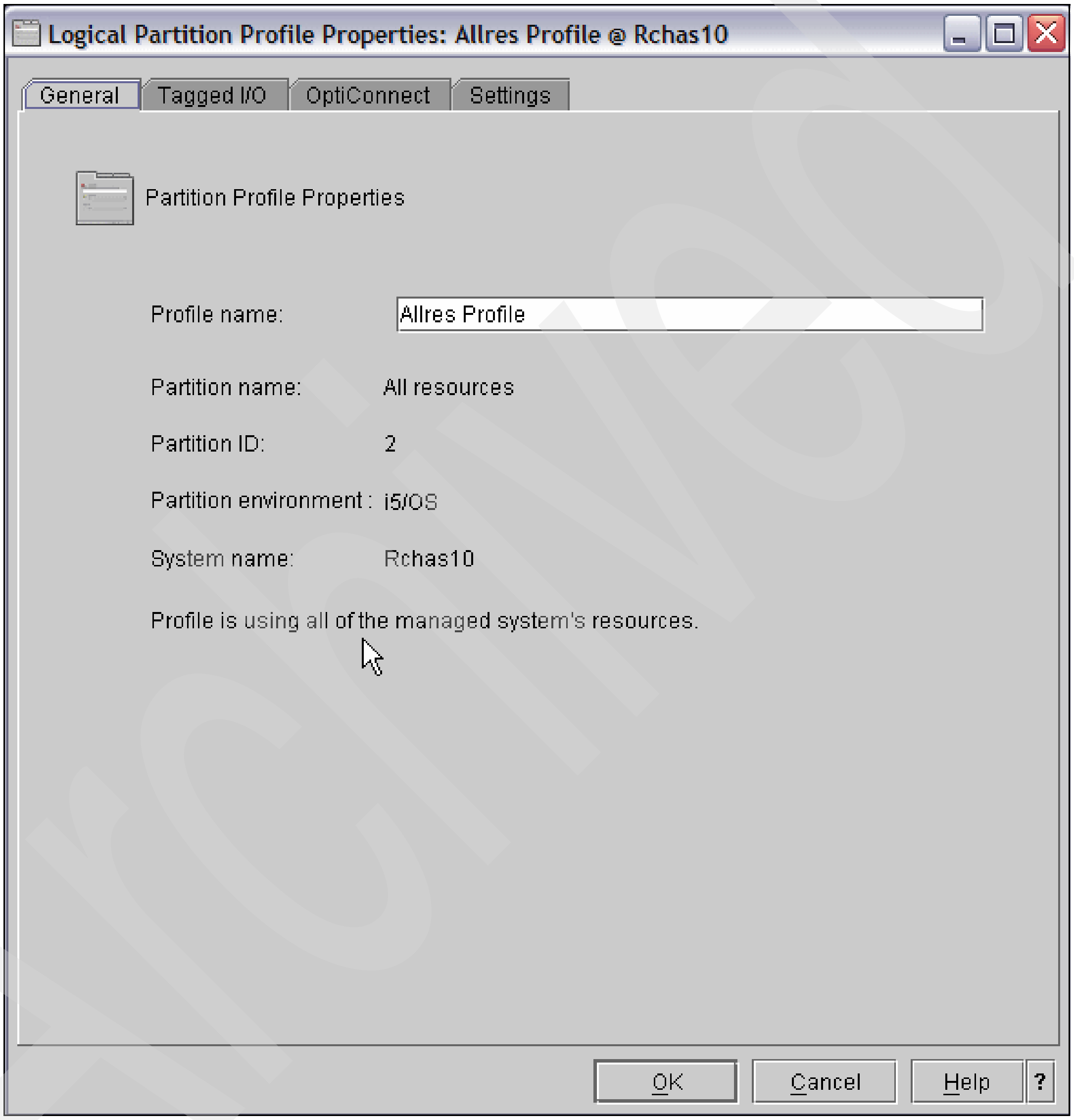

Figure 3-6 Profile specifying to use all resources

3.2.2 Creating the logical partition

The 3Com IP Telephony software runs as an application in Linux and therefore in a Linux partition. As previously mentioned, every partition requires processor and memory resources. Because Linux does not support dynamic allocation of memory, you need to plan for the maximum amount of memory that the partition will need. The minimum amount of memory required for an IP Telephony partition is 1 GB.

Important: The 3Com IP Telephony software is a customized version of Linux. It is not part of the Red Hat or Novell SUSE distributions. Therefore, if there is a question related to the Linux operating system in the IP Telephony partitions, contact 3Com support or refer to 3Com documentation.

Also, although the procedure to start the install is similar to these other distributions, you should use this publication along with 3Com documentation rather than existing documentation for Red Hat and Novell SUSE on the System i platform.

Perform the following steps to create an IP Telephony partition using HMC:

1. In the left navigation pane of the HMC, click **Server and Partition** → **Server Management**. Then in the right-hand contents pane, right-click **Partitions** and select **Create** → **Logical partition** as shown in Figure 3-7.

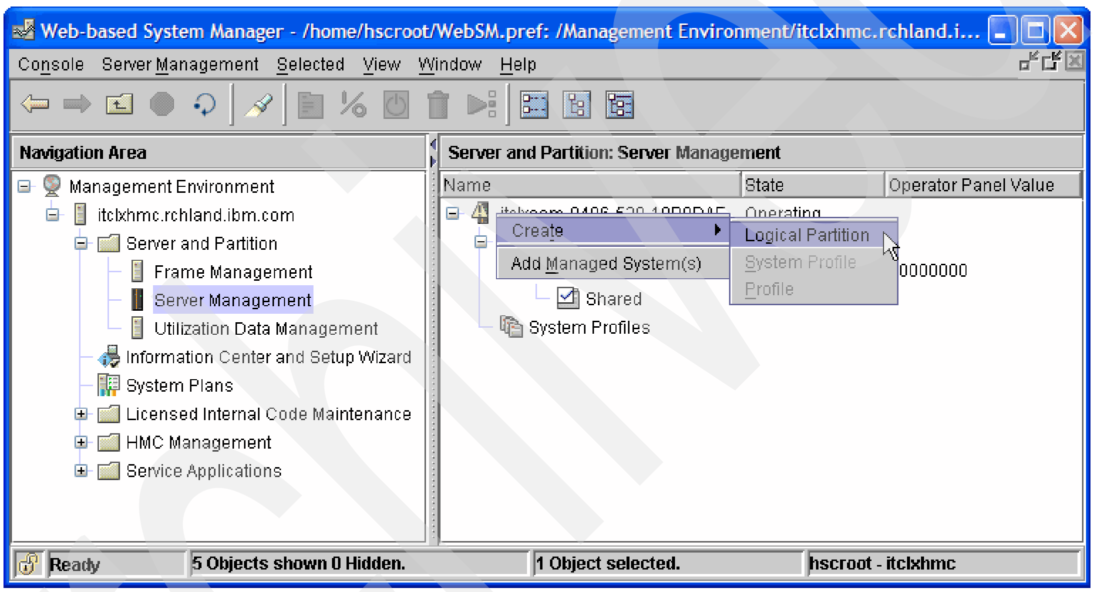

Figure 3-7 Starting the Create Logical Partition Wizard

2. The Create Logical Partition Wizard is started (Figure 3-8):
   a. The Partition ID is an integer number that is used by the system to uniquely identify the partition and typically is left at the default value displayed. The partition ID number must be unique across all of the partitions on the system.
   b. You need to provide the Partition name (for our example, we specified IPT as the partition name).
   c. Select the partition environment of **AIX or Linux.**

   Click **Next** to continue.

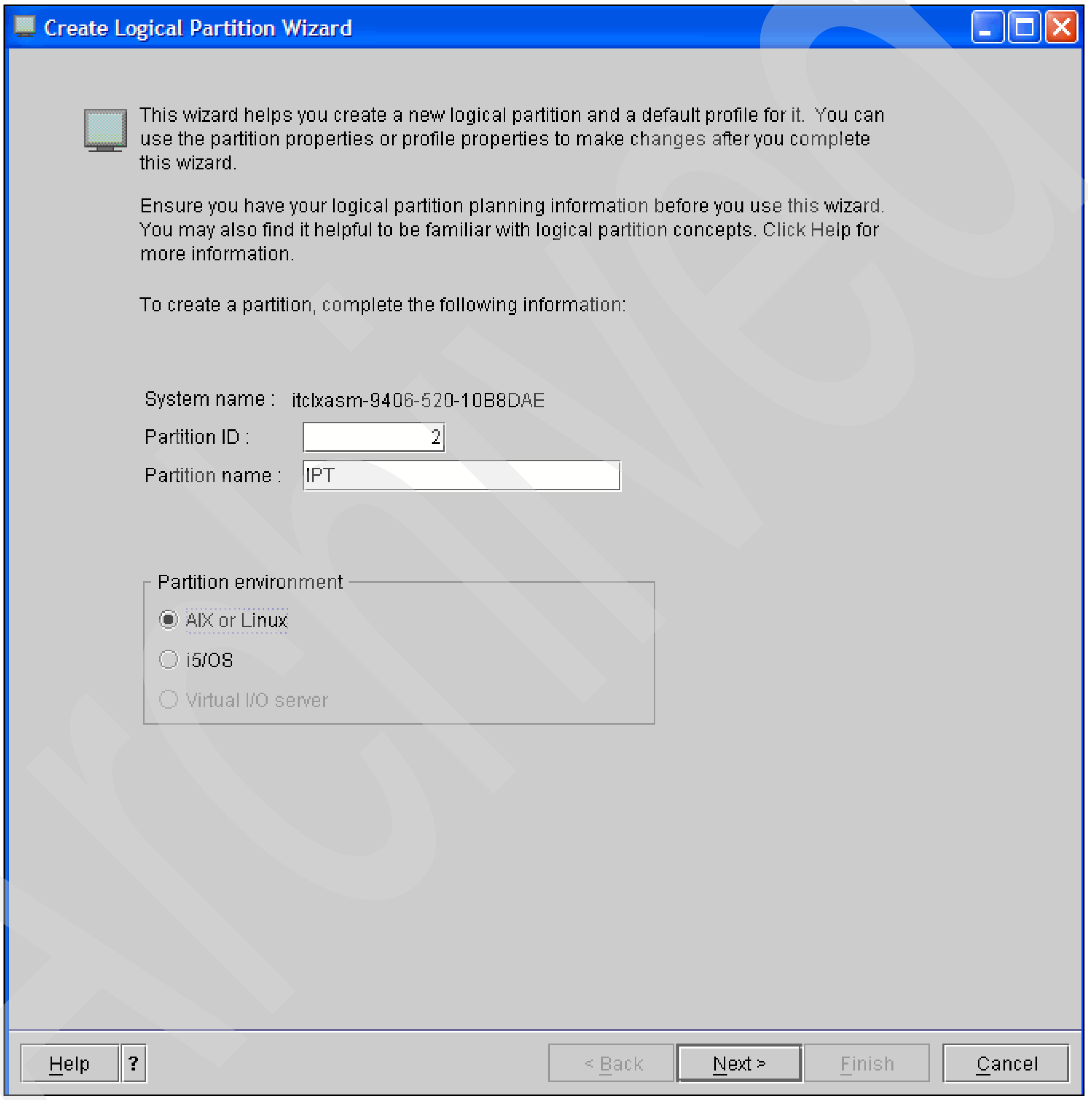

Figure 3-8 Creating a new partition

3. The next window (Figure 3-9) provides the option for the partition to be a part of a group of partitions that can be managed by a workload application (in our example, we selected **No**). Click **Next** to continue.

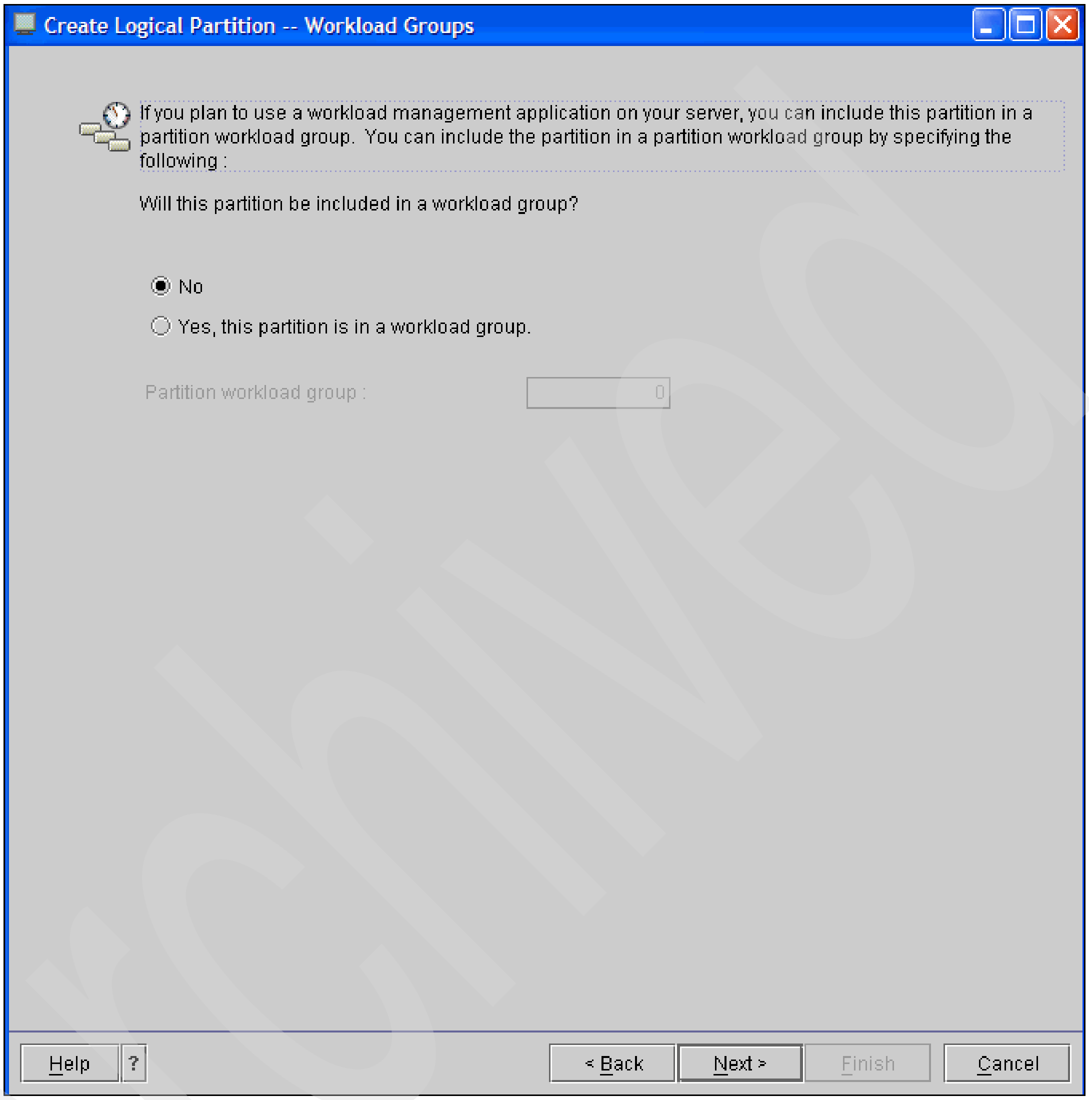

Figure 3-9 Creating a new partition - workload groups

4. The next step is to create a partition profile. A partition profile specifies characteristics of the partition, such as the memory, processors, physical and virtual adapters. As shown in Figure 3-10, type the name of the profile (in our example, we type the profile name of Default). Click **Next** to continue.

> **Attention:** Do *not* check the Use all the resources in the system option. If you select this option, the partition that is associated with this profile will try to obtain all of the physical resources in the system when the partition profile is activated. If a partition owns all of the physical resources, then there can only be one active partition on the system.

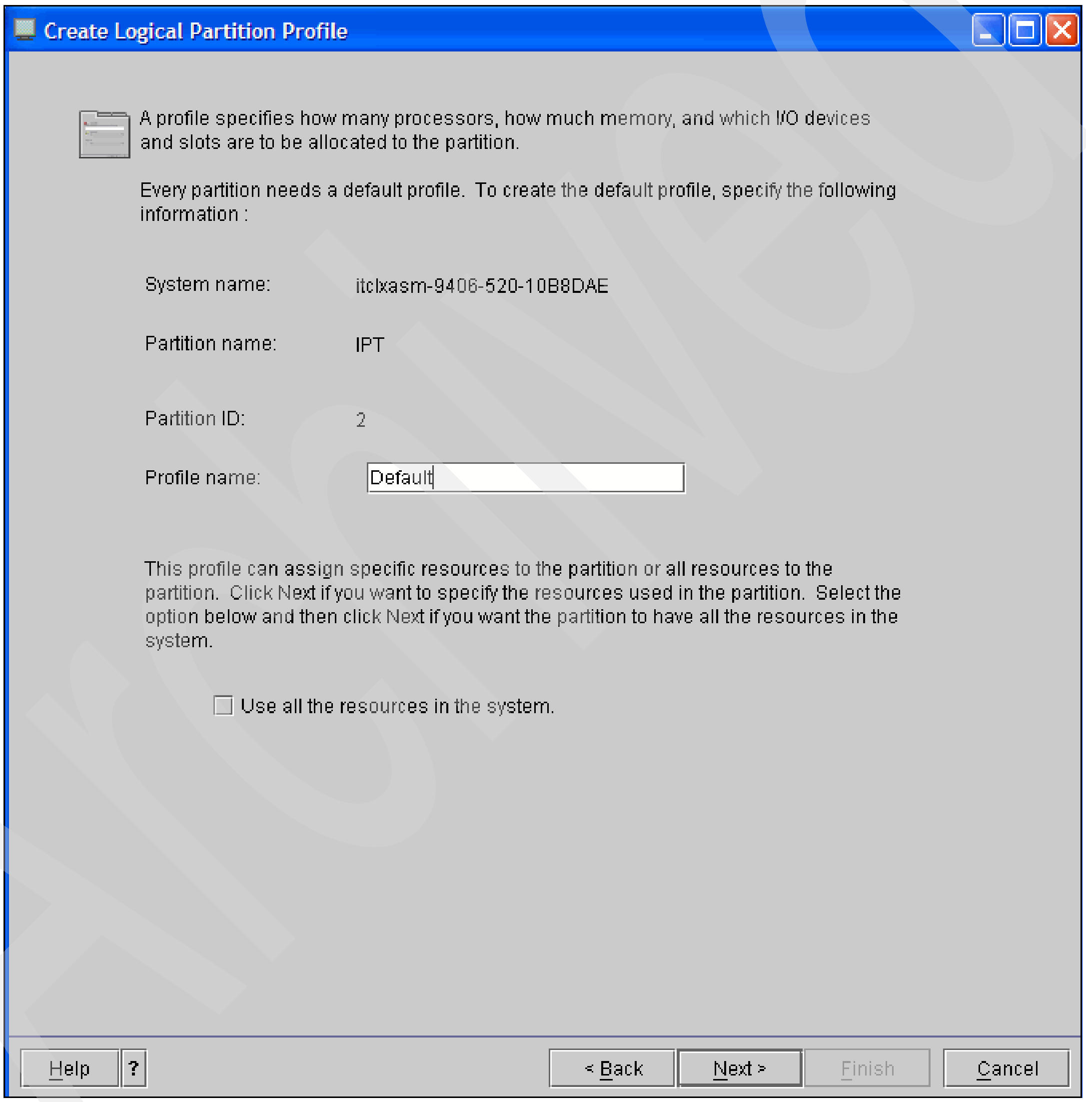

Figure 3-10 Creating a new partition - logical partition profile

5. Next, we specify the memory size that the partition profile will manage as shown in Figure 3-11 on page 62. Use this window to specify the memory management information for this partition profile. You must specify three memory levels:
   - The *minimum memory* is the minimum amount of memory that the logical partition must have to be activated. If the system cannot allocate this much memory, the activation of this partition will fail.
   - The *desired memory* is the amount of memory that you want the logical partition to have when you activate the logical partition.
   - The *maximum memory* is the maximum amount of memory that the logical partition is allowed to have when you dynamically move memory.

   When the partition is activated, an attempt will be made to allocate the desired amount of memory defined for the partition profile. If the desired amount of memory is not available, then an additional check will be made to see if the amount of unallocated memory left on the managed system is more than, or equal to, the minimum amount of memory defined for the partition profile. If the amount of memory is equal to or greater then the minimum defined memory, then it will be allocated to the partition; otherwise, the partition will fail to activate.

   In our example, the minimum amount of memory that the partition will be activated with is 1 GB, the desired amount of memory is 1.5 GB, and the maximum amount of memory is also 1.5 GB.

   Click **Next** to continue.

   > **Note:** Dynamic memory movement (that is, adding or removing memory from the partition while the Linux operating system is active) is not supported in the Linux kernel currently supported by the IP Telephony solution.
   >
   > Therefore, the ability to dynamically change the memory allocation for an IP Telephony partition is not supported on the System i platform.

   For more information about minimum, desired, and maximum memory amounts, see 2.3.4, “Memory allocation” on page 30.

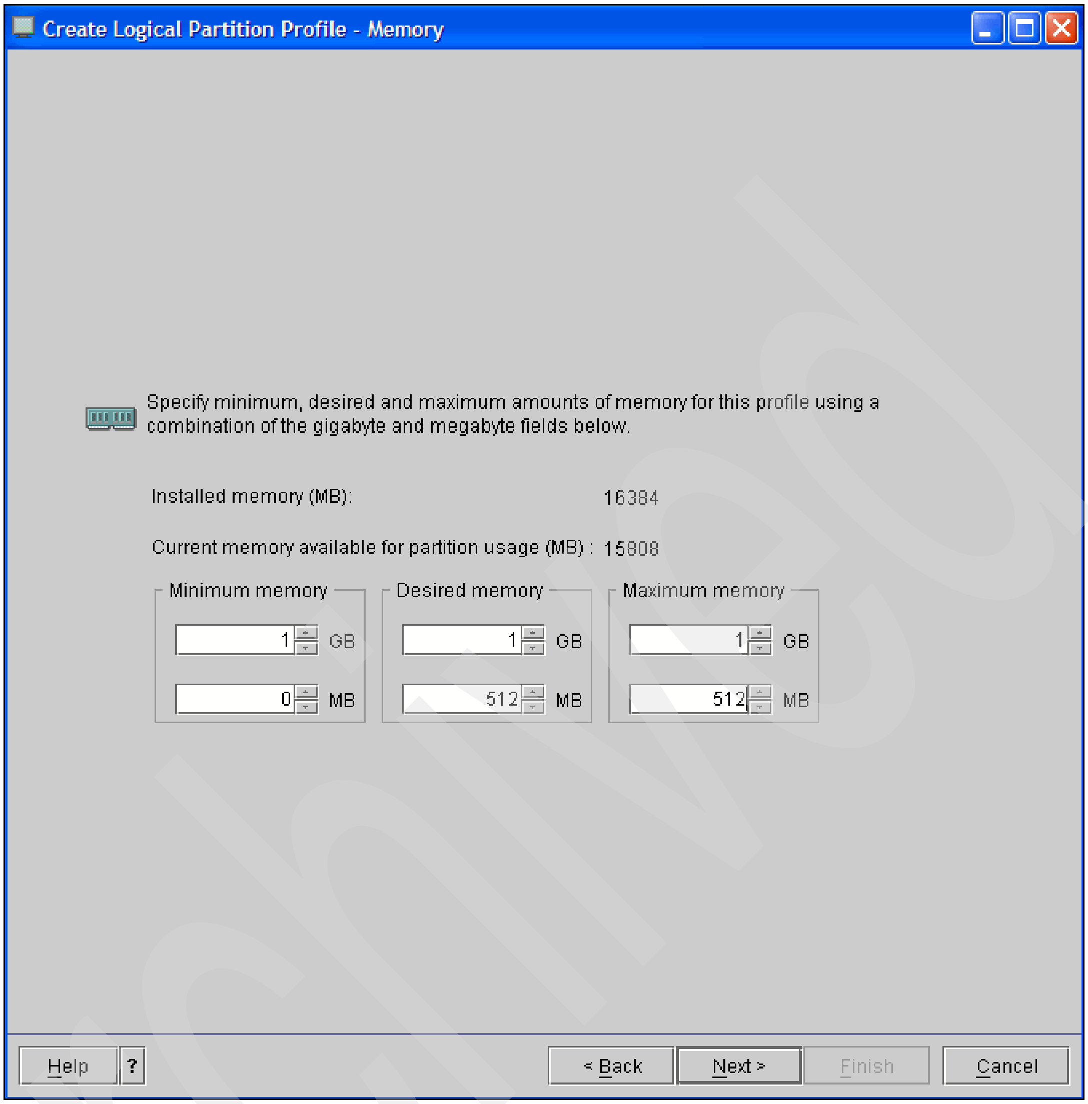

Figure 3-11 Creating a new partition - specifying memory

6. Now you choose shared or dedicated processors. *Dedicated* means you are not sharing the processor with other partitions. With the *shared* option, you can utilize the subprocessor feature where each partition can run with 0.1 processing unit at a minimum. While the minimum processor (for shared) is .10, the definition can be in the hundredths of processor units (for example, 0.15). This is referred as *micro-partitioning*.

   For most IP Telephony partitions, you will be using shared processors because using dedicated processors means allocating a whole processor to the partition, regardless of the processing environment. (In our example, we select the **Shared** option as shown in Figure 3-12.)

   For more information about processor allocation, see 2.3.3, “Processor allocation” on page 25.

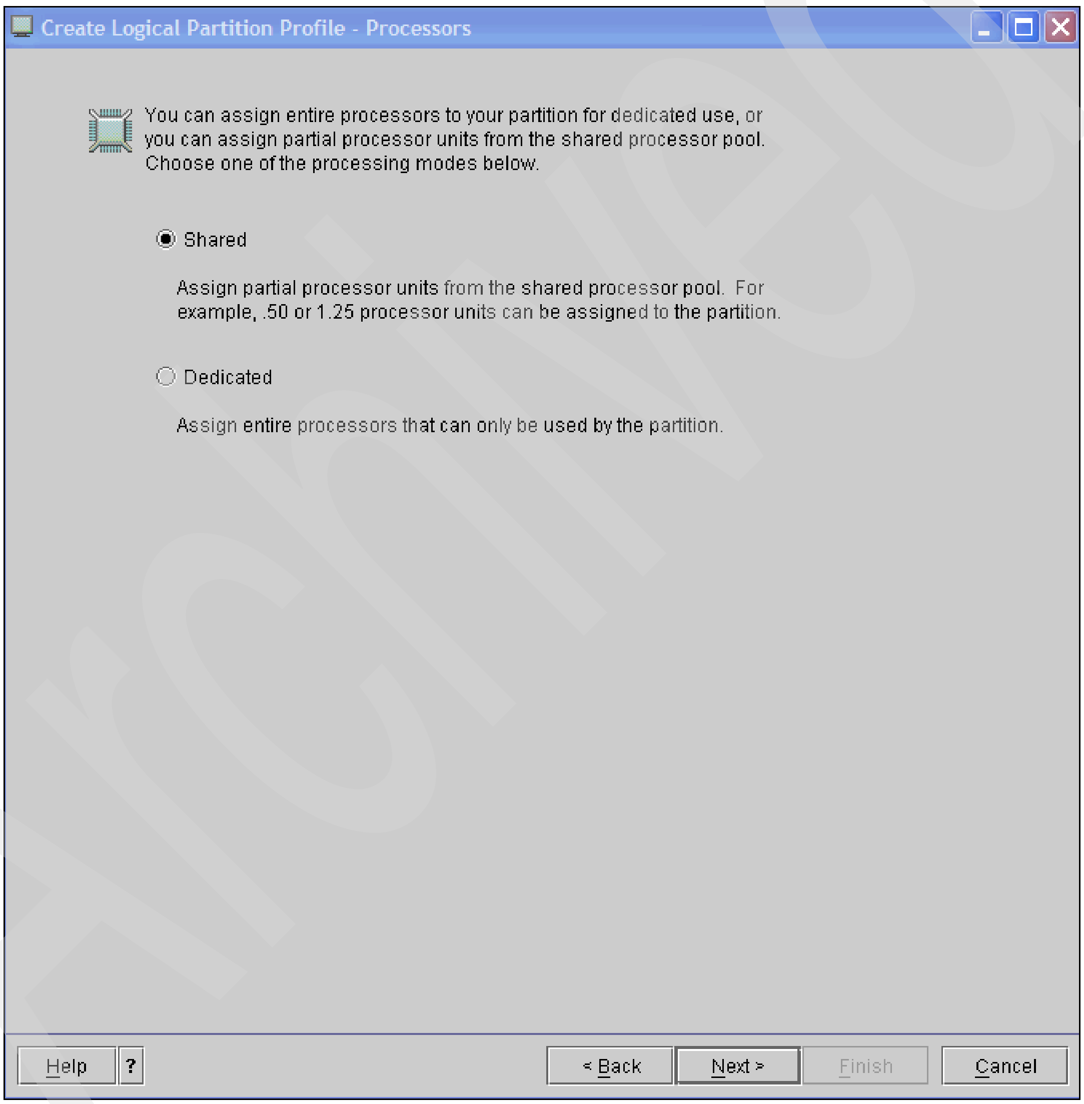

Figure 3-12 Creating a new partition - specifying shared or dedicated processors

7. For the shared processor option, you are prompted to specify the minimum, maximum, and desired processing units of the partition.

   When the partition is activated, an attempt will be made to allocate the desired amount of processors defined for the partition profile. If the amount of desired processors is not available, then an additional check will be made to see if the amount of unallocated processors left on the managed system is more then or equal to the minimum amount of processors defined for the partition profile. If the amount of processors is equal to or greater then the minimum defined processors, then it will be allocated to the partition, otherwise the partition will fail to activate.

   (As shown in Figure 3-13, we define 0.3 unit of a processor to be our minimum processing units, 0.3 unit of processor power as our desired amount, and 1.0 as the maximum processing units.) Click the **Advanced** button.

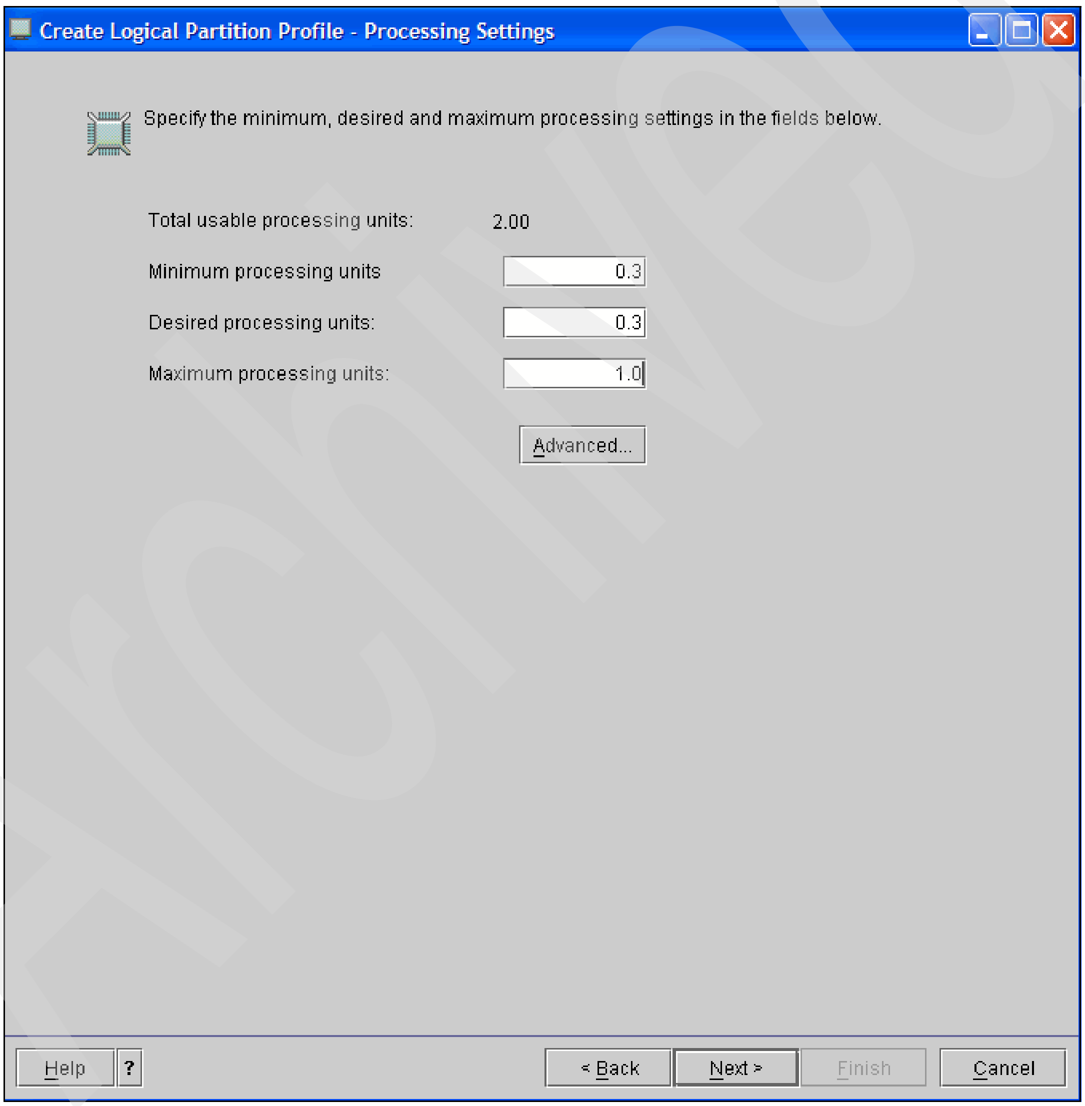

Figure 3-13 Creating a new partition - processing settings

8. When shared processing units are defined in a partition profile, additional settings can be set for the number of virtual processors as well as the capped/uncapped setting. As shown in Figure 3-14, the sharing mode can be set to either Capped or Uncapped.

   An *uncapped* partition has the ability to have additional processing units allocated to it by the Hypervisor on an "as needed" basis, based on the performance of the overall system. A *capped* partition will only have access to the processing units allocated to it when first started (or changed through Dynamic LPAR).

   For definitions of the terms uncappped processing, weight, and virtual processors, see 2.1.3, "Processor concepts" on page 18.

   (In our example, we set the sharing mode of the partition to uncapped with a weight of 128 and set the number of virtual processors to a minimum of 1, desired of 1, and a maximum of 2.) Click **OK** and then click **Next** on the Create Logical Partition Profile - Processing Settings window.

> **Note:** For further information about shared processors and uncapped processors, refer to the following URL:
>
> http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp?topic=/iphat/iphatsharedproc.htm
>
> For additional information about virtual processors, refer to the IBM Systems Hardware Information Center and select **Partitioning the server** → **Concepts for partitioning the server** → **Partitioning tools** → **Hardware Management Console Partition profile**. In this last section there is a concise discussion of virtual processors:
>
> http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp

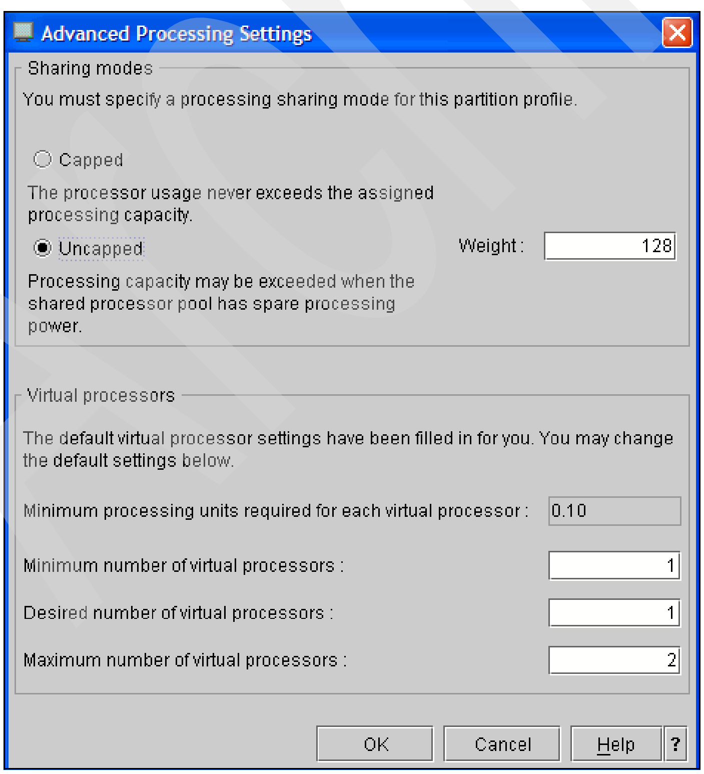

Figure 3-14 Creating a new partition - Advanced Processing Settings

9. The next window displayed is for the allocation of physical hardware resources to the partition. As shown in Figure 3-15, the window displays the hardware installed in the managed system and allows for selection of hardware for the partition profile. Because this partition profile will be using all virtual resources, click **Next**.

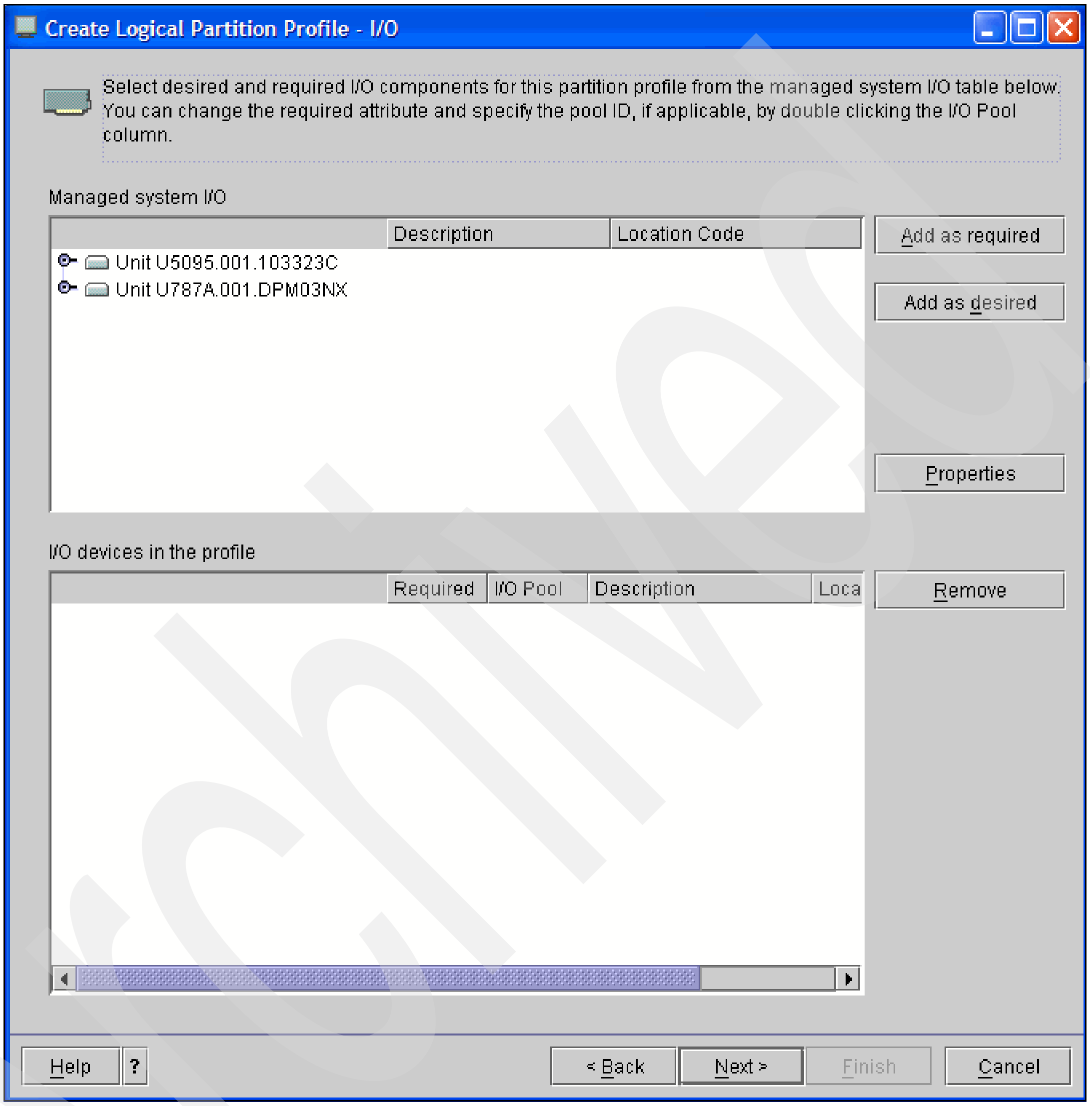

Figure 3-15 Creating a new partition - allocating physical hardware

10. The next window shown in Figure 3-16, is for adding I/O pools. Linux partitions do not use I/O pools, so click **Next** to continue.

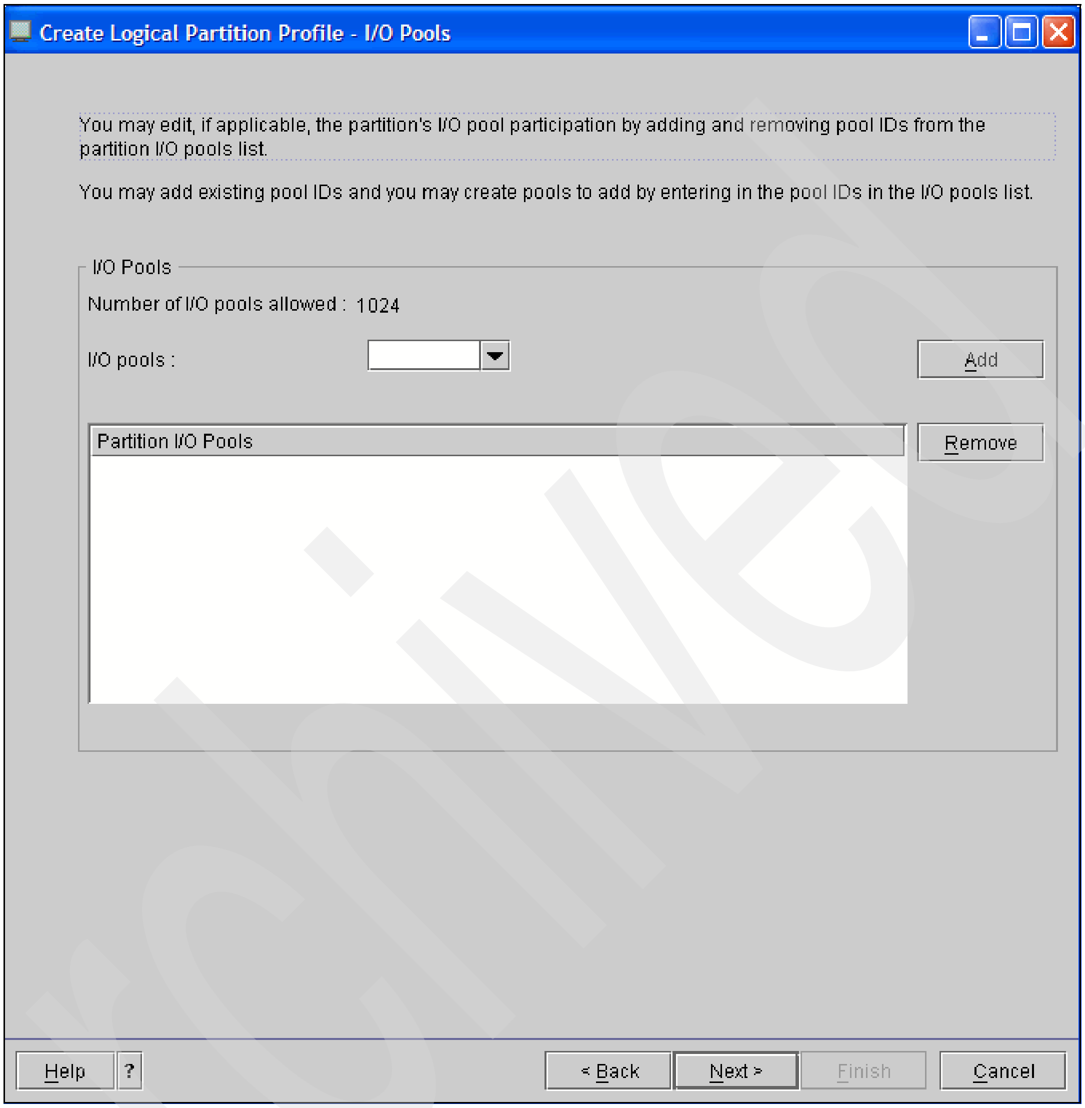

Figure 3-16 Creating a new partition - I/O pools

11. On the Virtual I/O Adapters window (Figure 3-17), because this partition will be using hosted I/O (I/O that is owned by another partition), select **Yes, I want to specify virtual I/O adapters**. Click **Next** to continue.

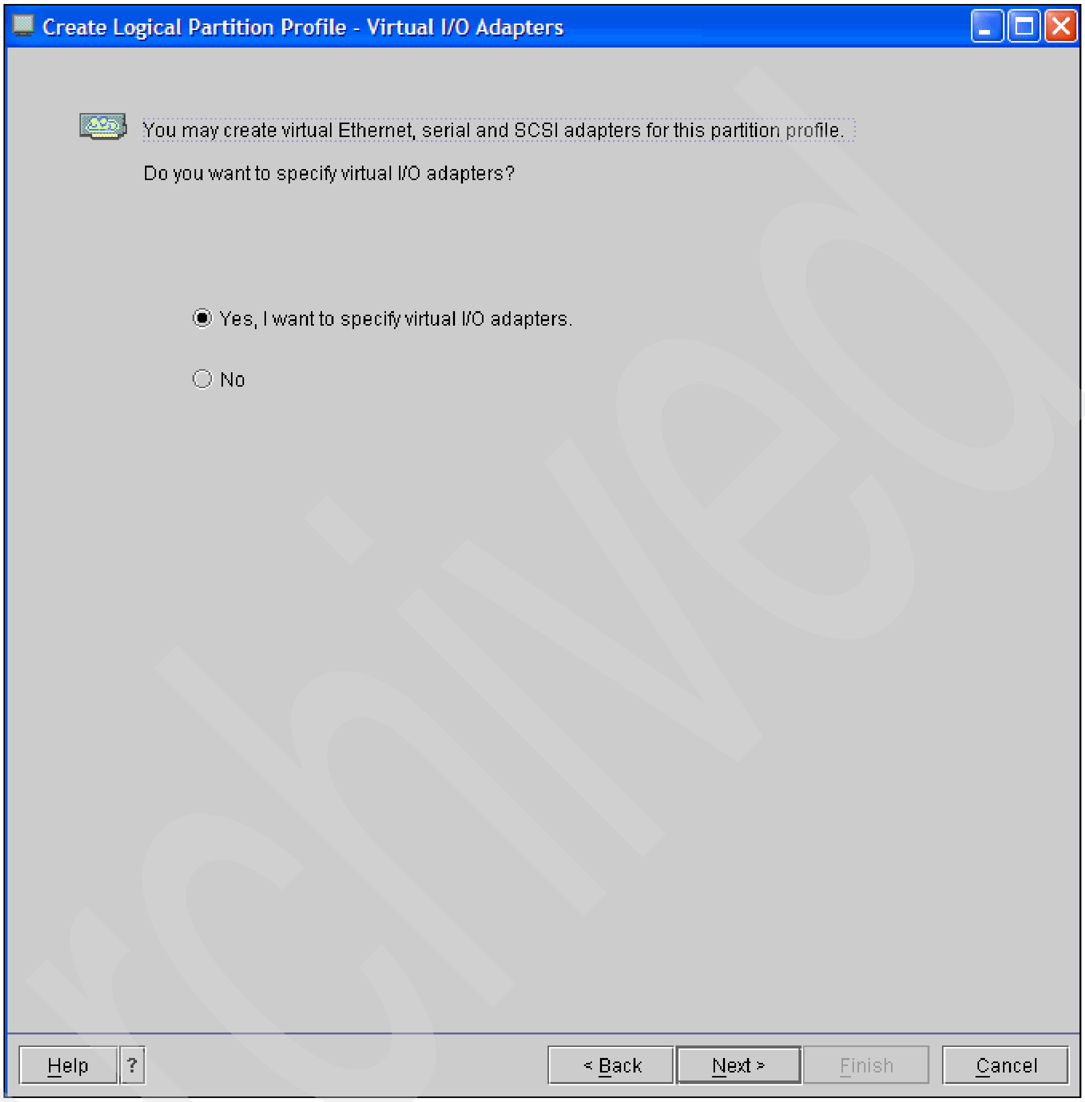

Figure 3-17 Creating a new partition - Virtual I/O Adapters

12. Every logical partition created on the System i platform has two virtual adapters automatically created for it, as shown in Figure 3-18. As we will see later, the two Server Serial adapters are typically used to establish terminal access to the operating system running in the logical partition.

The Virtual Adapters window shows the currently defined adapters in the lower portion of the window and provides for the creation of additional virtual adapters.

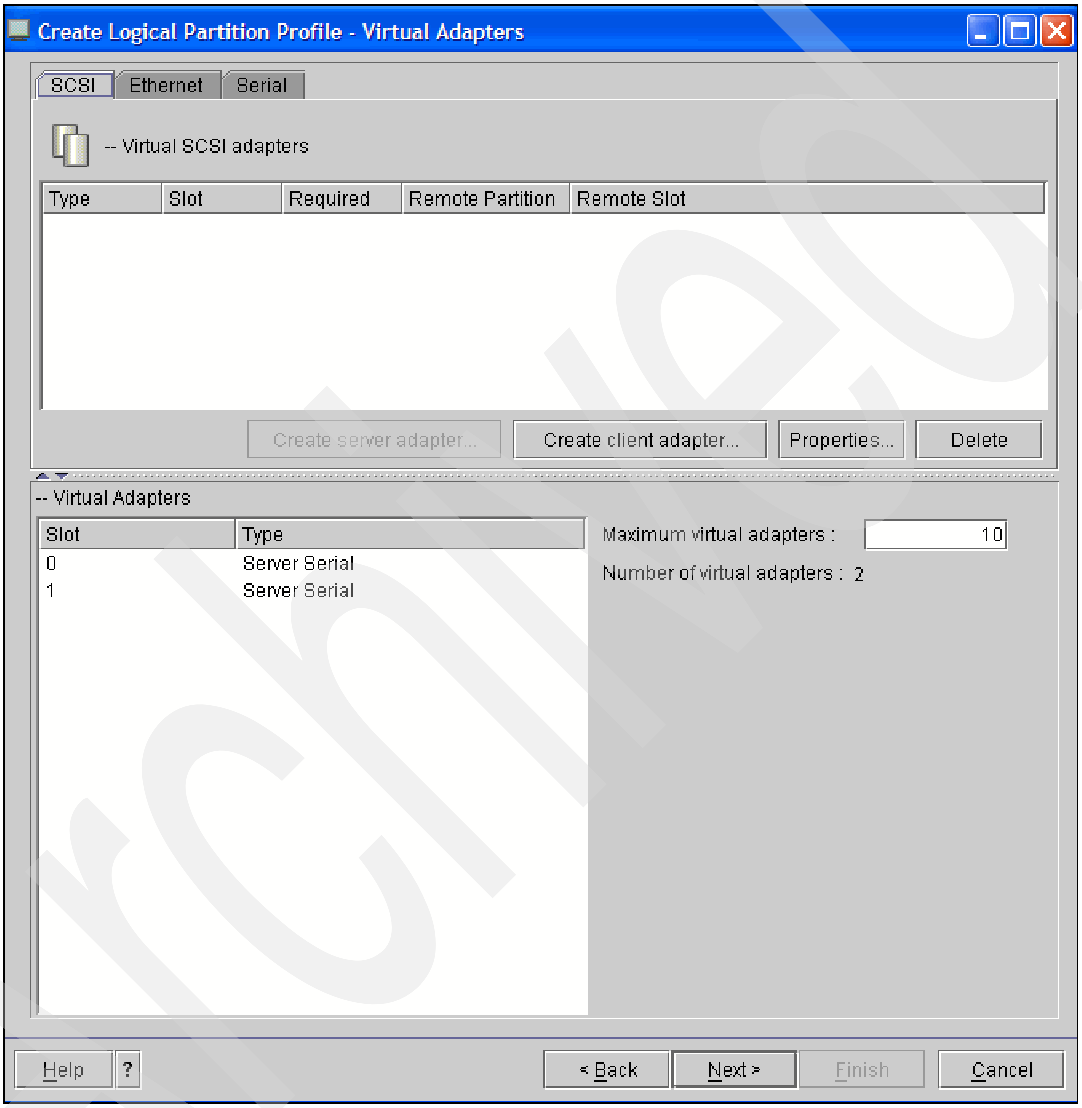

Figure 3-18 Creating a new partition - specifying virtual adapters (SCSI tab)

Documenting the virtual slot definitions as the logical partitions are built can help you to avoid partition configuration problems, and provide the basis for an overall system configuration document. For this example, assume that the managed system has a single i5/OS partition that only has the default virtual I/O adapters shown in Figure 3-19 on page 70.

The virtual I/O configuration diagram will be updated as we continue to build the LPAR environment. For more information, refer to 2.3.5, "I/O adapter allocation" on page 31.

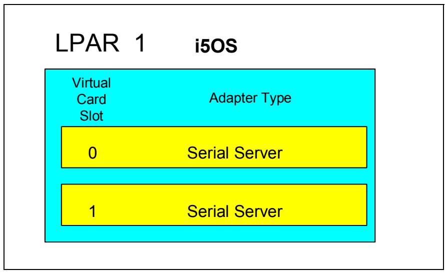

Figure 3-19 Virtual I/O configuration diagram

13. Access to I/O devices hosted by another partition requires the creation of a SCSI adapter pairing between this partition (referred to as the *guest partition*) and the partition that owns the I/O resources (referred to as the *host partition*). We will create the client side of that pairing here. Click the **Create client adapter** button.

14. As shown in Figure 3-20, the definition of the virtual SCSI client adapter consists of three items:

    – The Client slot is the next available virtual slot number for this partition, and is typically left at the system determined value.

    – The Server partition is the name of the i5/OS partition that will host the I/O resources for this partition.

    – The Server partition slot is the virtual slot number in the hosting i5/OS partition where the SCSI Server adapter will be created. Typically, the virtual I/O adapters definition of the i5/OS hosting partition will be reviewed prior to creation of the Linux partition. By reviewing the i5/OS virtual adapter definition, you would have an indication of the adapter slots that have been used and the available slot numbers. For more information about this topic, refer to 2.3.5, “I/O adapter allocation” on page 31.

    Click **OK**.

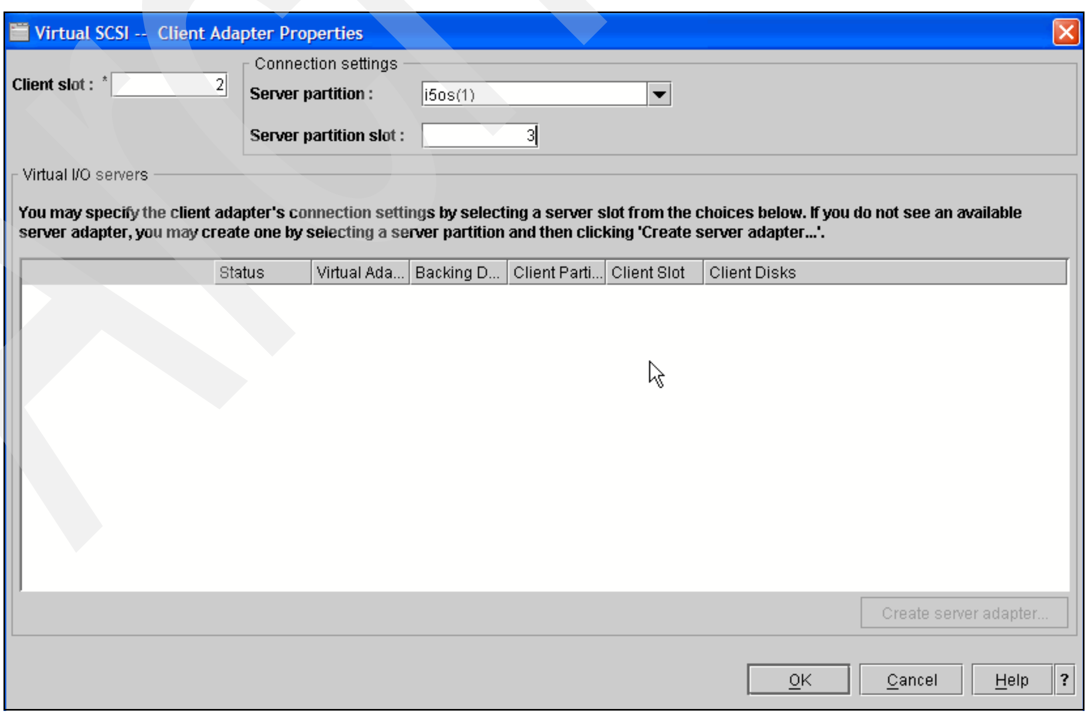

Figure 3-20 Creating a new partition - virtual SCSI adapter

15. In addition to the virtual SCSI client adapter, a virtual Ethernet adapter will also need to be created to support network communications for the partition. Back on the Create Logical Partition Profile - Virtual Adapters window, click the **Ethernet** tab to display the currently defined Ethernet adapters for the partition, as shown in Figure 3-21.

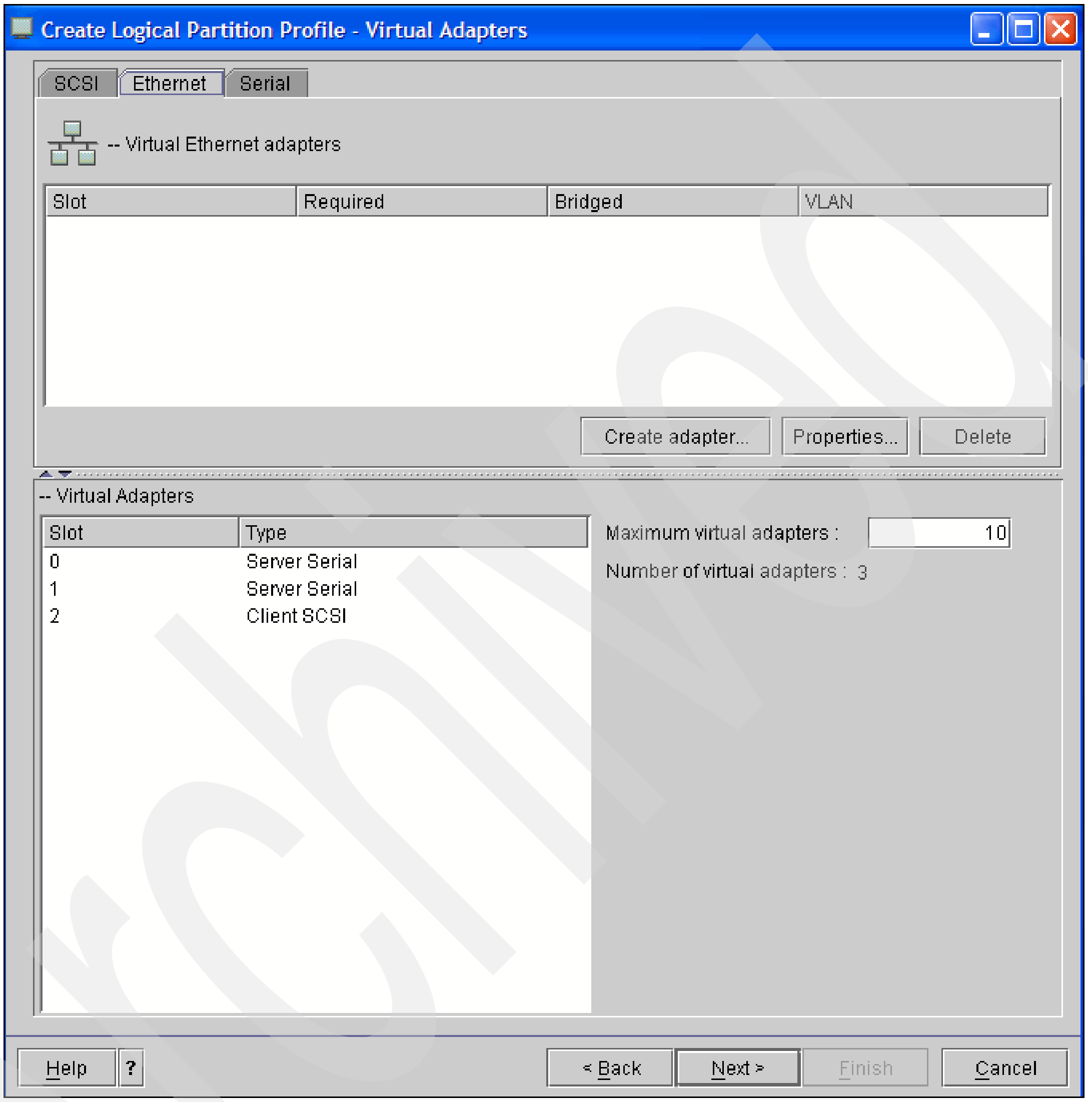

Figure 3-21 Creating a new partition - specifying virtual adapters (Ethernet tab)

16. Click the **Create adapter** button. Depending on your system configuration, an error dialog similar to that shown in Figure 3-22 may be displayed. This error occurs when the System i platform does not have a partition created of type VIO Server. This is a typical condition on the System i platform and the error dialog can be safely ignored.

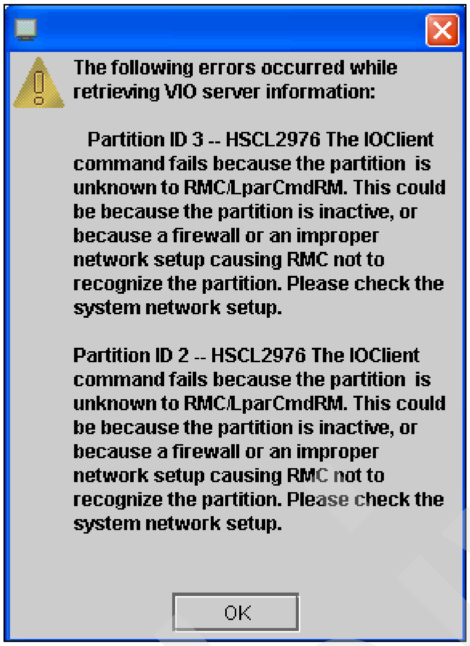

Figure 3-22 Creating a new partition - VIO server error

> **Note:** VIO Server is an AIX-based appliance that can be used to provide virtual I/O resources to guest partitions on System i or System p™ machines. There is an additional feature code that would need to be ordered to enable VIO Server on the system. A description of the functions and configuration of VIO Server is beyond the scope of this book.

17. On the Virtual Ethernet Adapter window, shown in Figure 3-23, specify the following values:

   a. The slot number is the next available slot number as determined by the Create Logical Partition wizard and is usually left as shown.

   b. The virtual LAN ID is the virtual LAN that you want the partition to have an Ethernet adapter connected to. Typically, the virtual LAN ID is the same LAN ID as the i5/OS partition that is going to be used to route network traffic to the partition. (In our example, we are specifying that the partition should have a connection on virtual LAN 1.)

   Click **OK**.

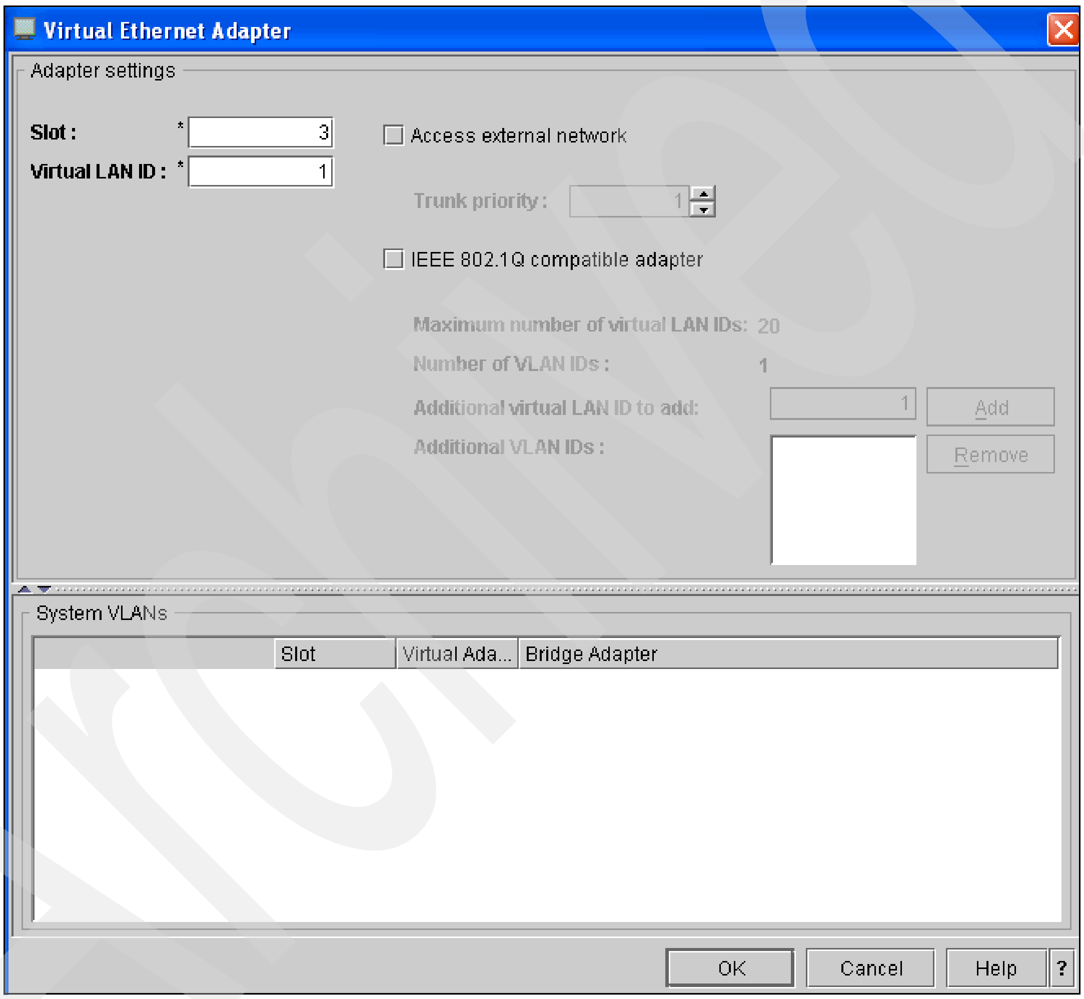

Figure 3-23 Creating a new partition - virtual Ethernet adapter

18. After the virtual Ethernet adapter has been created, click **Next** on the Create Logical Partition Profile - Virtual Adapters window.

Now that the virtual I/O adapters have been created in the Linux partition, the virtual I/O configuration diagram can be updated as shown in Figure 3-24. Although the Server SCSI adapter has not yet been created, it is shown in the diagram as a reminder of the slot definition used in the virtual Client SCSI adapter created in the IP Telephony partition. Later, when the virtual SCSI Server adapter is created in the i5/OS partition, the diagram will be updated again to show the connection between the two adapters.

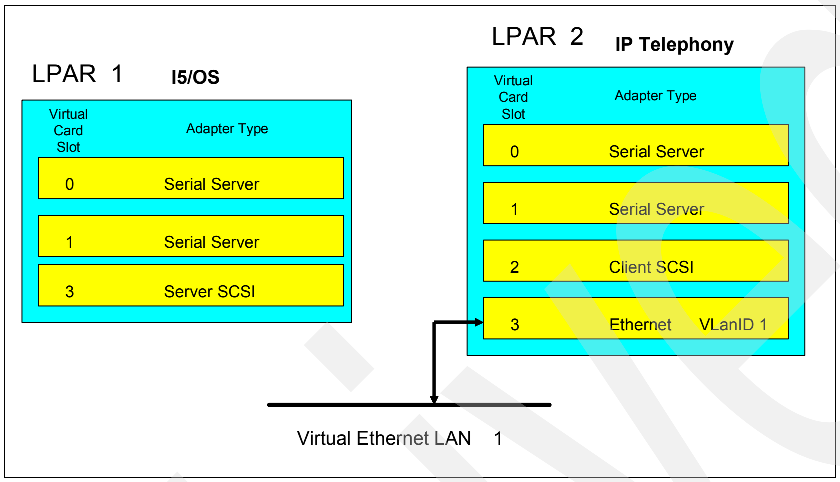

Figure 3-24 Virtual I/O configuration diagram

19. A *power controlling partition* is a partition that is allowed to make power requests (for example, activate or shutdown) for a partition via the Hypervisor; see Figure 3-25. Because the I/O for this partition is being hosted by another i5/OS partition, it is typical to have the i5/OS partition start the partition through a vary on of the Network Server Description (NWSD). (In our example we select the name of the i5/OS hosting partition, click **Add** and then click **Next**.)

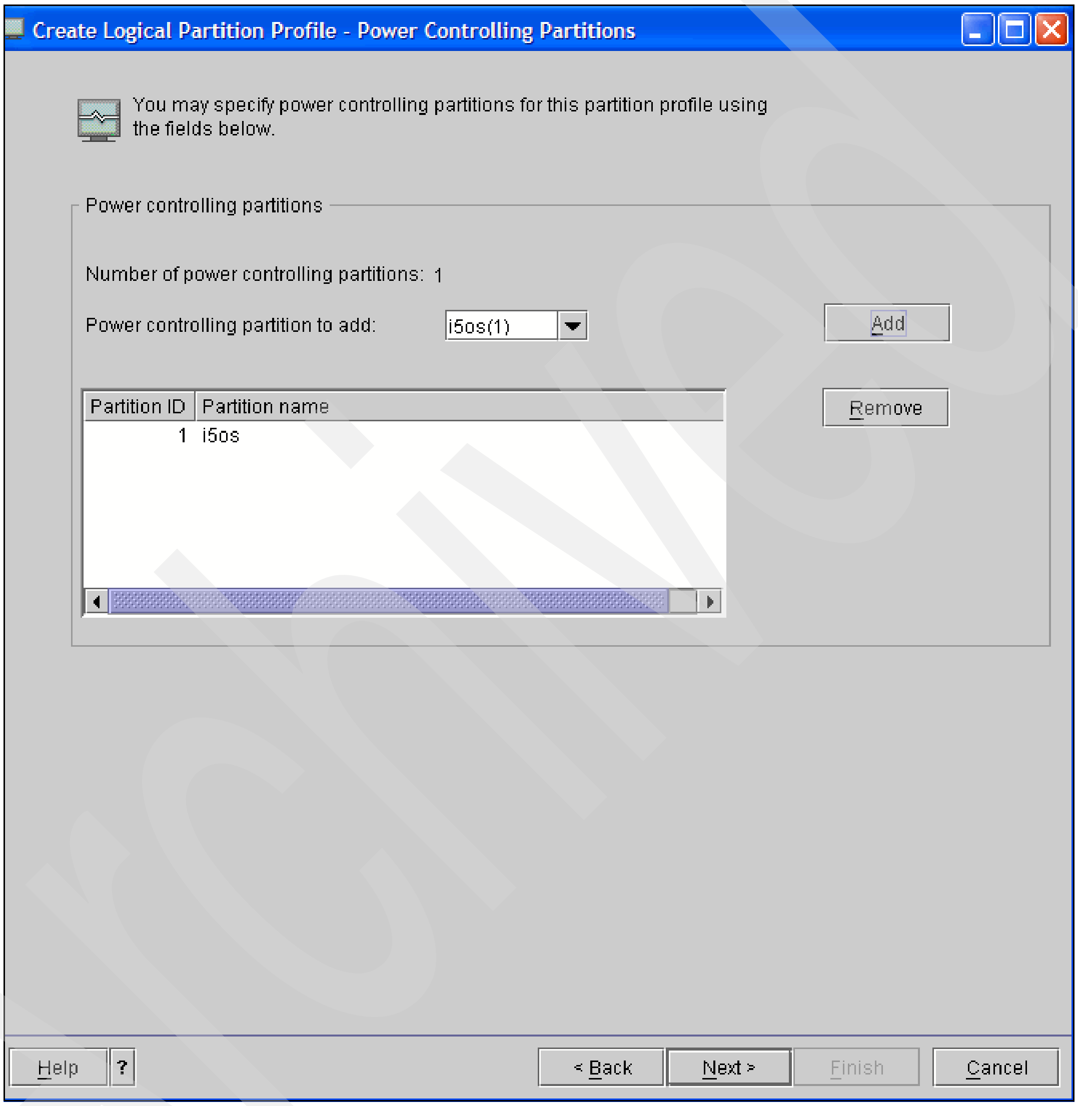

Figure 3-25 Creating a new partition - power controlling partitions

20. Optional settings, such as boot mode, connection monitoring, and automatic activation of the partition when the managed system starts, are shown in Figure 3-26. For IP Telephony partitions that have their I/O hosted by another partition, the settings should be left at Normal for boot mode and the optional settings for connection monitoring and automatic start should not be selected. Click **Next**.

> **Note:** For IP Telephony installation, the System Management Services (SMS) mode will be selected by pressing **1** during the initial boot sequence to be able to select the IP Telephony installation CD as the boot media.

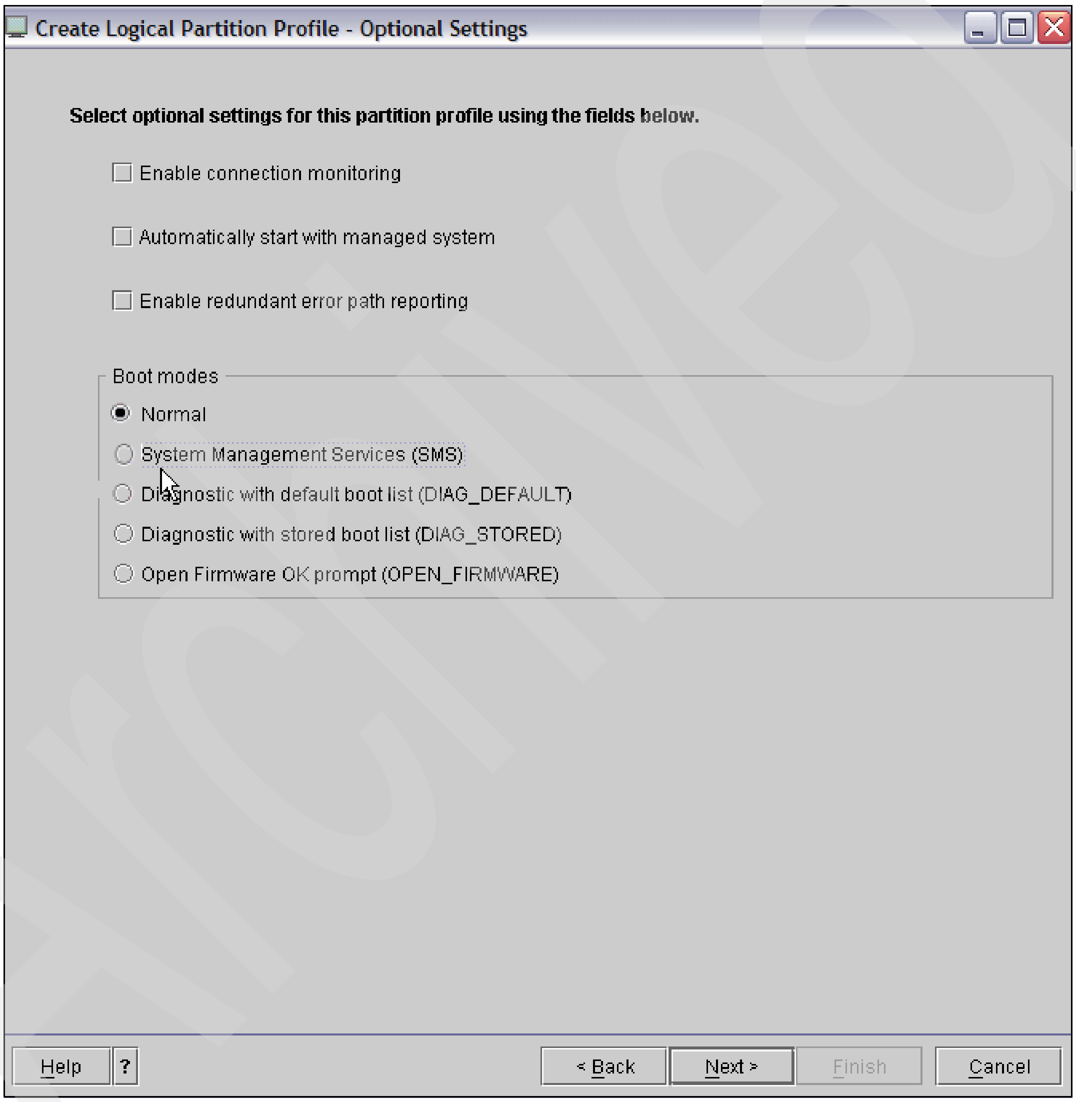

Figure 3-26 Creating a new partition - optional settings

21. At this point the partition definition is complete and a summary of the definition is displayed as shown in Figure 3-27. Click **Finish** to create the partition.

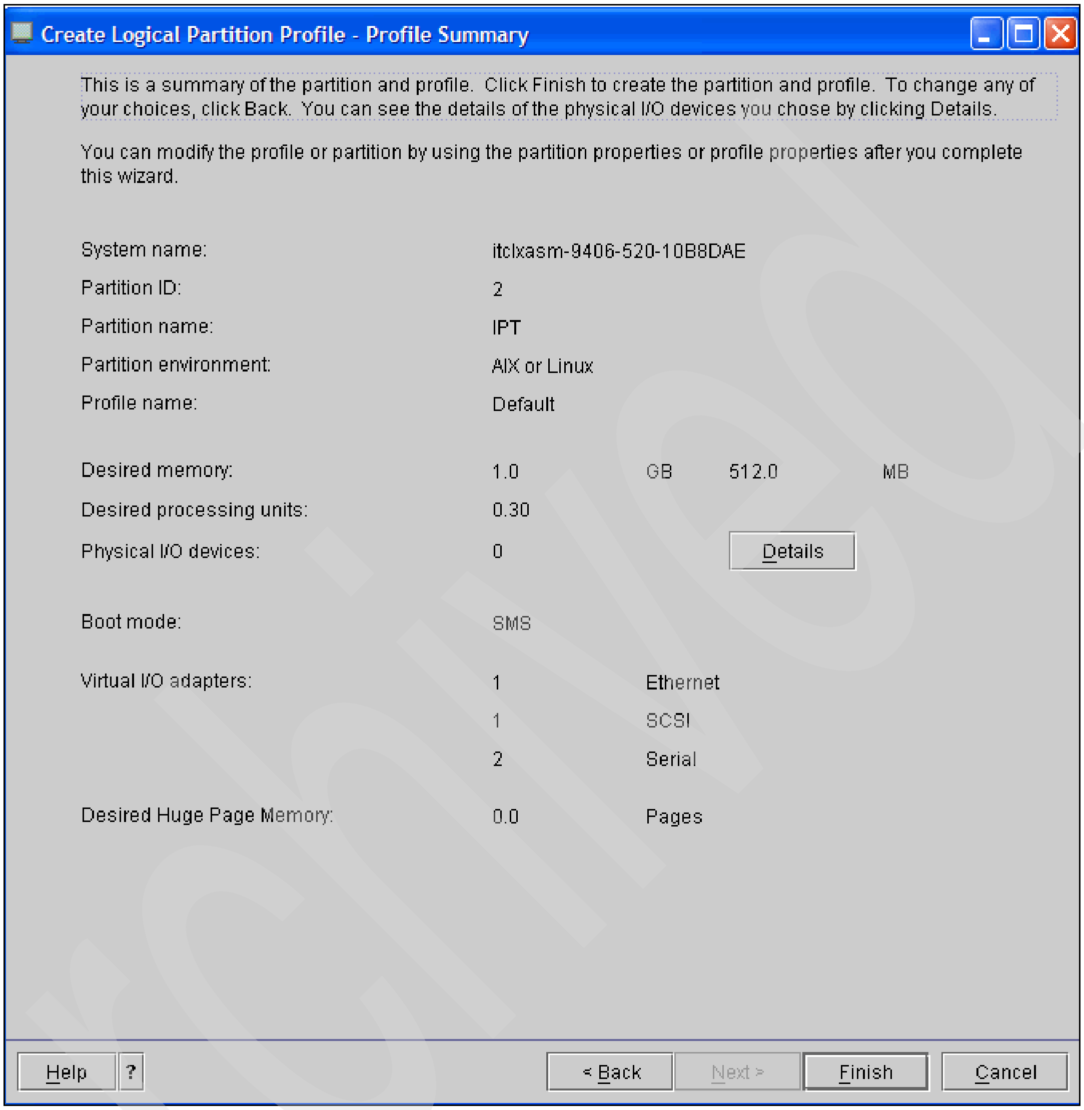

Figure 3-27 Creating a new partition - partition profile summary

22. A Working... dialog box will be displayed, as shown in Figure 3-28.

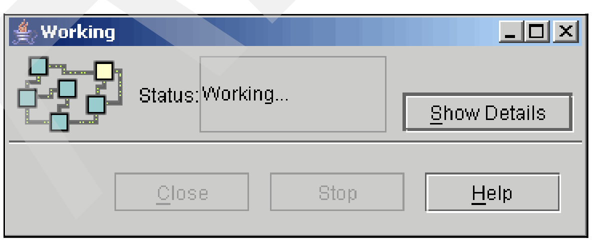

Figure 3-28 Partition being created

3.2.3 Adding virtual adapters to the hosting i5/OS partition

After the IP Telephony partition is created, you need to create virtual adapters in the i5/OS partition to support virtual I/O and, optionally, a virtual console. The virtual adapters must be created in the partition profile of the i5/OS partition, and also need to be added dynamically (via Dynamic LPAR) to the running state of the i5/OS partition.

Note: As mentioned, the adapters to support virtual I/O must be added twice:

- The adapter is added to the partition profile of the i5/OS partition to ensure that the change will be permanent across IPLs of i5/OS and deactivations and reactivations of the logical partition.
- Dynamic LPAR is used to add the virtual I/O adapter to the running state of the i5/OS partition to make the adapter available for immediate use.

Perform the following steps to add a new virtual adapter to the i5/OS partition:

1. From the HMC, right-click the i5/OS partition and select **Properties**. The properties window for the logical partition will displayed (Figure 3-29).

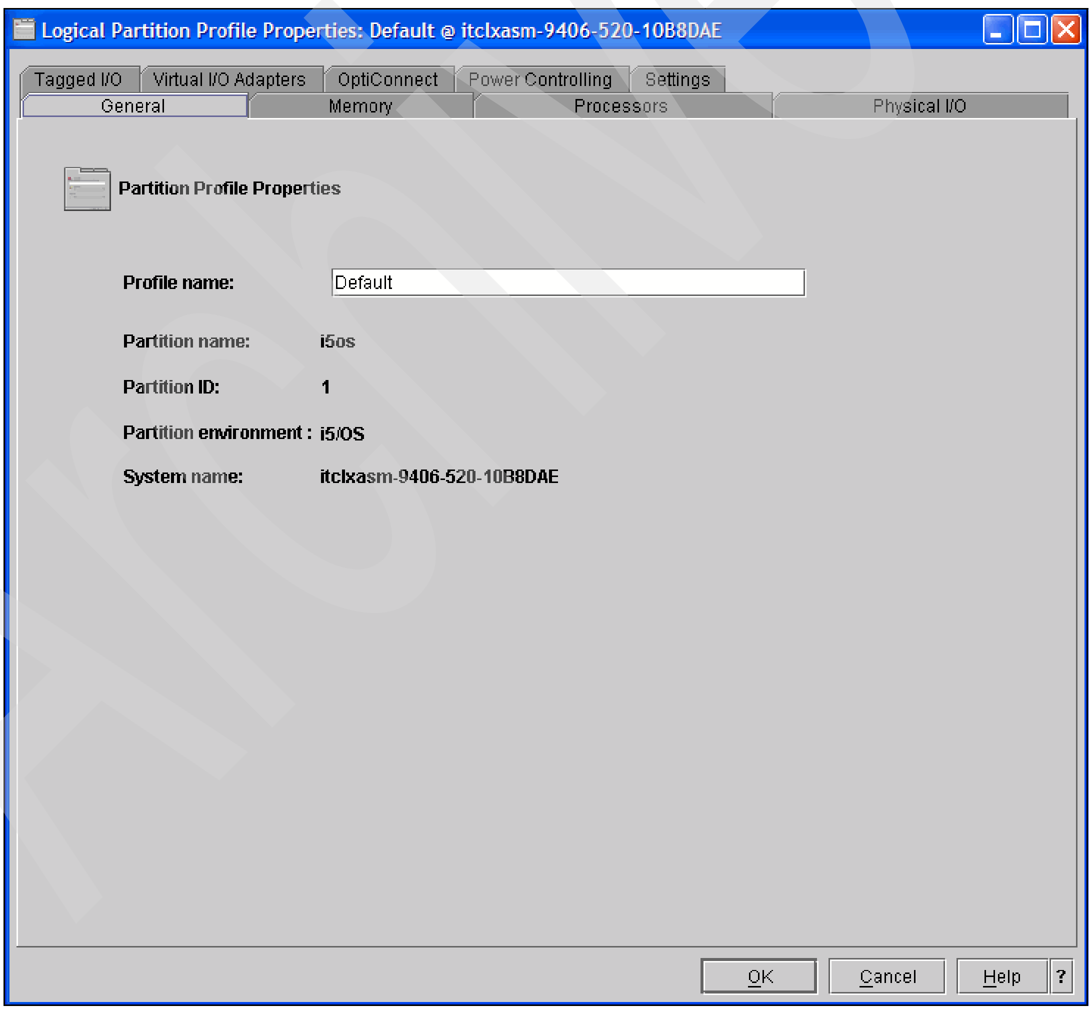

Figure 3-29 Hosting i5/OS partition - partition profile properties

2. Click the **Virtual I/O Adapters** tab to display the virtual I/O adapters that are currently defined in the partition profile. A list of adapters will be displayed (see Figure 3-30).

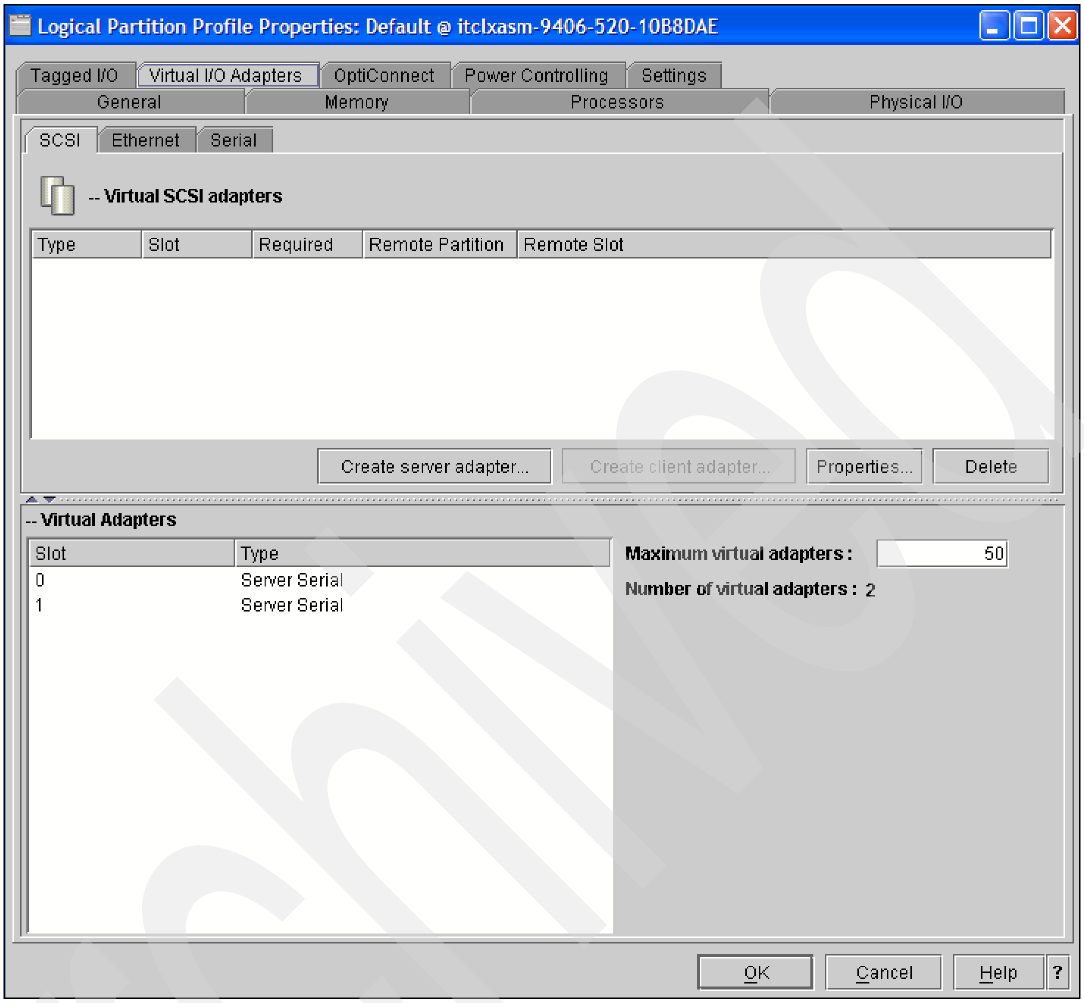

Figure 3-30 Hosting i5/OS partition properties - virtual I/O adapters

3. To create the virtual SCSI Server adapter that will provide the I/O resource to the IP Telephony partition, ensure that the **SCSI** tab is selected and then click the **Create server adapter** button.
4. On the Virtual SCSI - Server Adapter Properties window (see Figure 3-31 on page 80), complete the fields as follows:
   – Server slot: This is the slot number for the adapter being created. This slot number must match the slot number the virtual Client adapter that the IP Telephony partition is pointing to.
   – Slot connection settings: select **Only selected client partition can connect**.
   – Client partition: select the name of the IP Telephony partition from the pull-down list.
   – Client partition slot: The slot number of the virtual SCSI Client adapter in the IP Telephony partition.

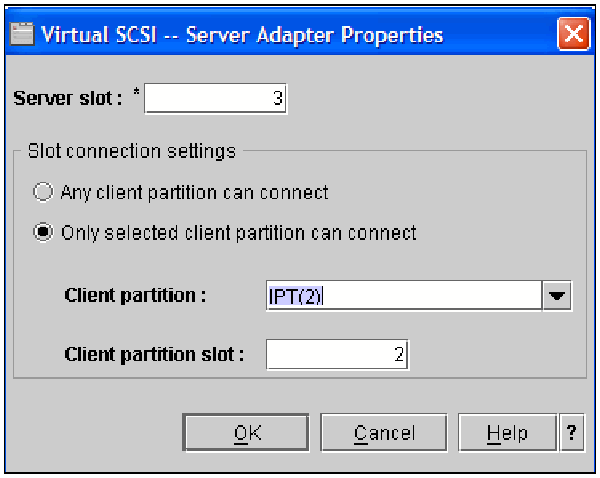

Figure 3-31 Hosting i5/OS partition - Creating a virtual SCSI Server adapter

The virtual SCSI Client adapter in the IP Telephony partition needs to point to the virtual SCSI Server adapter in the hosting i5/OS partition. Likewise, the virtual SCSI Server adapter in the hosting i5/OS partition needs to point to the virtual SCSI Client adapter in the IP Telephony partition.

As an example, Figure 3-32 shows the properties of the virtual SCSI Server adapter from the hosting i5/OS partition and mappings to the properties of the virtual SCSI Client adapter in the IP Telephony partition.

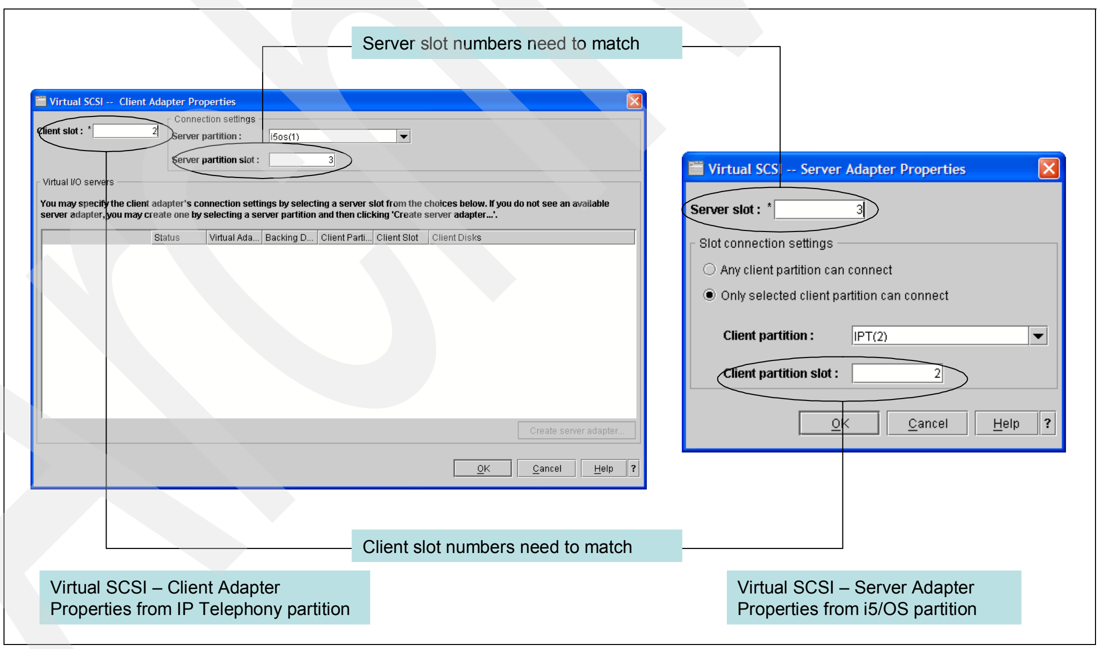

Figure 3-32 Virtual SCSI adapters mapping example

5. After you complete the fields of the Virtual SCSI - Server Adapter Properties, click **OK**. Back on the Logical Partition Profile Properties window, click **OK**.

   At this point the virtual SCSI Server adapter has been added to the profile of the hosting i5/OS partition, which means that the next time the i5/SO partition is started from the HMC, the adapter will be available. To add the adapter to the i5/OS partition without a restart of i5/OS requires that the adapter be added to the running state of the partition through the use of Dynamic LPAR.

The virtual SCSI Server adapter needs to be added twice to ensure that it is available to support virtual I/O to the IP Telephony partition without a restart of i5/OS, as well as to ensure that the adapter is available across restarts of i5/OS.

> **Note:** Two other adapters may be added to the i5/OS partition profile. A virtual Ethernet adapter may be required to support forwarding traffic to the IP Telephony partition and a virtual Client Serial adapter may be added to support access to the IP Telephony console through the i5/OS virtual console support.

6. To add the virtual SCSI Server adapter to the hosting i5/OS partition, right-click the i5/OS partition (not the partition profile) and select **Dynamic Logical Partitioning** → **Virtual Adapter Resources** → **Add / Remove**; see Figure 3-33.

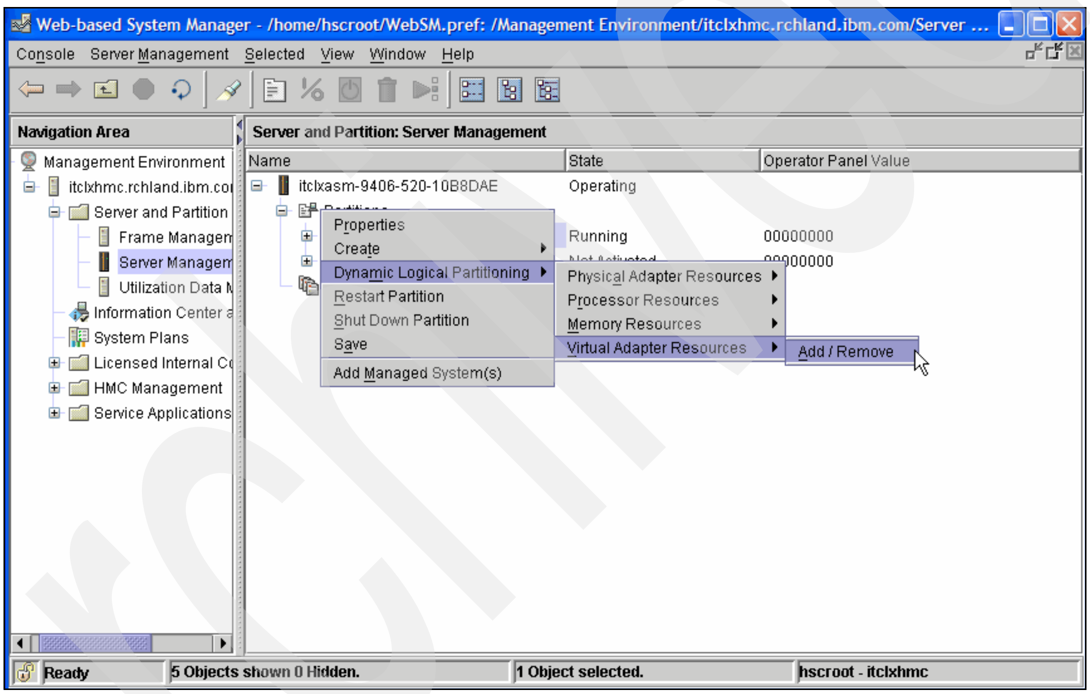

Figure 3-33 Hosting i5/OS partition - starting Dynamic Logical Partitioning

7. On the Dynamic Logical Partitioning - Virtual Adapters window (Figure 3-34), ensure that the **SCSI** tab is selected and then click the **Create server adapter** button.

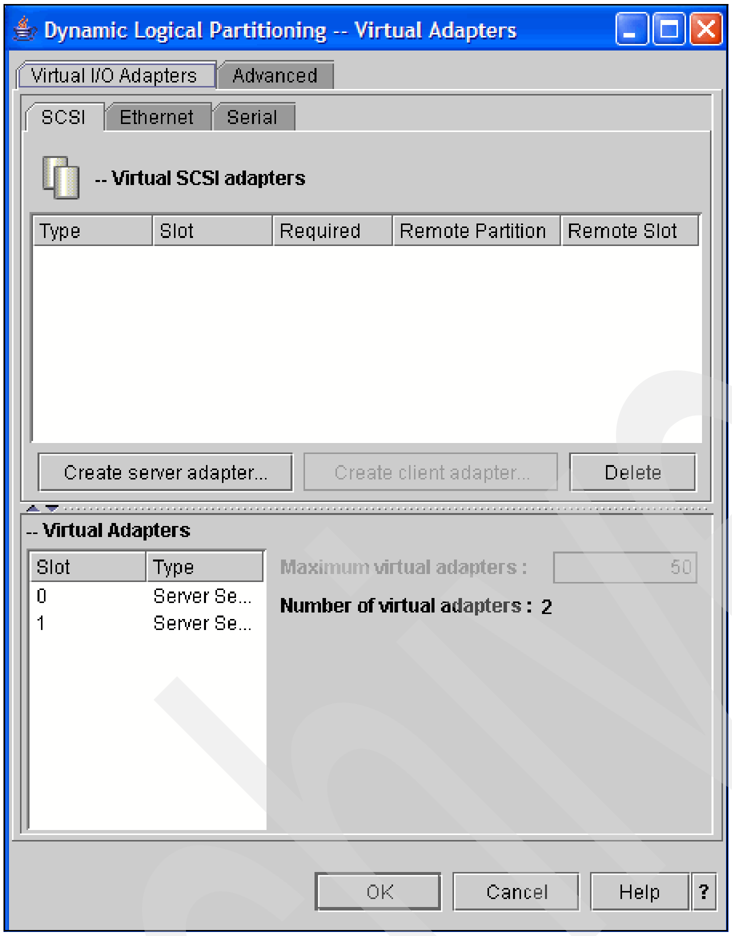

Figure 3-34 Hosting i5/OS partition - Dynamic Logical Partitioning - Virtual Adapters

8. On the Virtual SCSI - Server Adapter Properties window (Figure 3-35 on page 83), enter the following information:
   - Server slot: This is the slot number for the adapter being created. This slot number must match the slot number that the virtual Client Adapter in the IP Telephony partition is pointing to.
   - Slot connection settings: select **Only selected client partition can connect**.
   - Client partition: select the name of the IP Telephony partition from the pull-down list.
   - Client partition slot: The slot number of the virtual SCSI Client adapter in the IP Telephony partition.

   Click **OK**.

> **Note:** The information entered for the adapter should match the information defined for the virtual Server SCSI adapter in the partition profile of the hosting i5/OS partition.

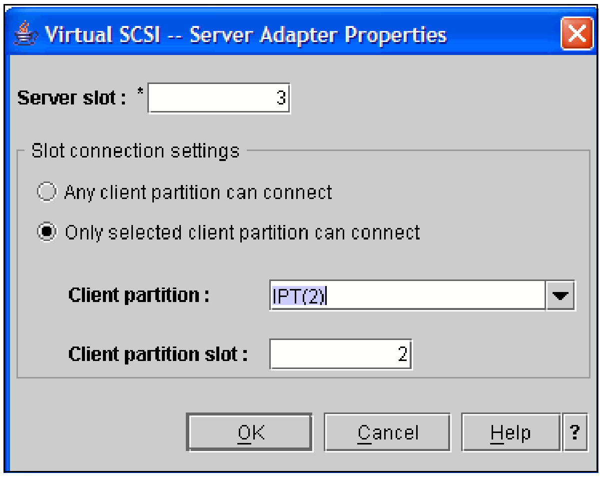

Figure 3-35 Hosting i5/OS partition - Dynamic Logical Partitioning - Server SCSI Adapter Properties

9. Back on the Dynamic Logical Partition - Virtual Adapters window, click **OK**.

 Now that the virtual SCSI Server adapter has been added to the i5/OS partition, the virtual I/O configuration diagram shown in Figure 3-36 can be updated to reflect the attachment of the two virtual SCSI adapters.

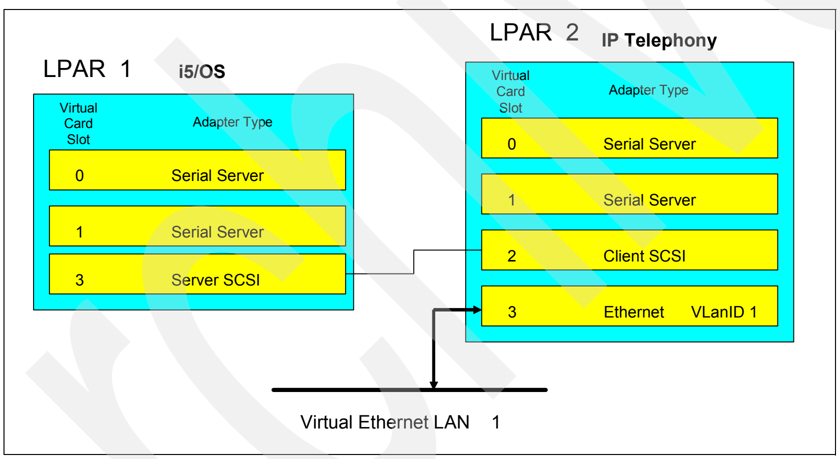

Figure 3-36 Virtual I/O configuration diagram

3.2.4 Registering the IP Telephony partition with the system firmware

At this point the properties of the logical partition for IP Telephony has been defined and the properties of the hosting i5/OS partition have been updated to support virtual I/O for the IP

Telephony partition. The last step in the partition definition is to register the partition definition with the firmware of the System i machine. Perform the following steps:

1. From the HMC, right-click the IP Telephony partition and click **Activate** (Figure 3-37).

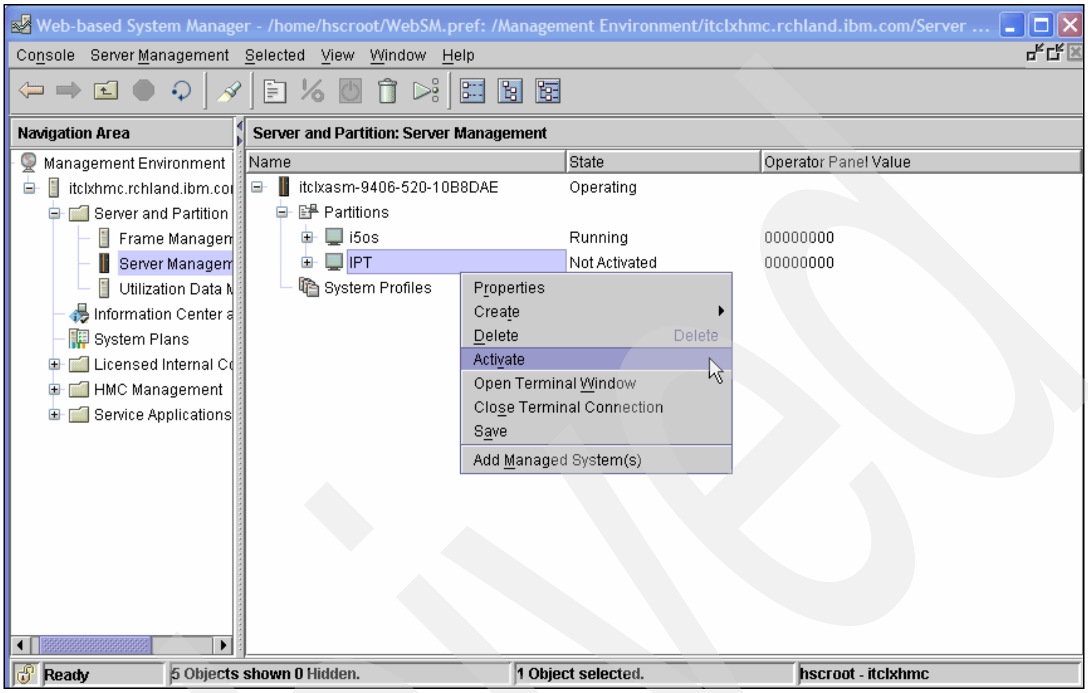

Figure 3-37 Activating the IP Telephony partition

2. From the Activate Logical Partition window (Figure 3-38), select **Open a terminal window or console session** and click **OK**.

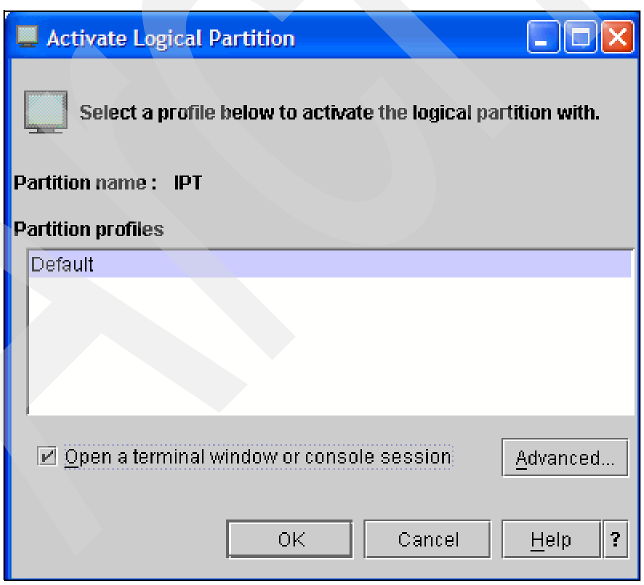

Figure 3-38 Opening a virtual console window

3. A message may be displayed in the virtual console window prompting for console selection; see Figure 3-39. If this message is displayed, press the 0 key.

```
To select this console as the active console press 0
```

Figure 3-39 Specifying to select the console as the active console

4. At this point, the resources defined in the partition profile will be reserved by the Hypervisor and the partition will be started. Because there is no I/O defined yet, the partition will eventually boot into the firmware of the partition; see Figure 3-40.

```
PowerPC Firmware
Version SF240_261
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Main Menu
 1.   Select Language
 2.   Setup Remote IPL (Initial Program Load)
 3.   Change SCSI Settings
 4.   Select Console
 5.   Select Boot Options

-------------------------------------------------------------------------------
 Navigation Keys:

                                             X = eXit System Management
Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key:
```

Figure 3-40 SMS menu

5. Now that the partition has been registered with the firmware of the System i machine, it can be shut down. From the HMC, right-click the IP Telephony partition and select **Shut Down Partition**.

6. A window will be displayed prompting for confirmation of the shutdown; see Figure 3-41. Because there is currently no operating system installed in the partition, select **Immediate** and click **OK**.

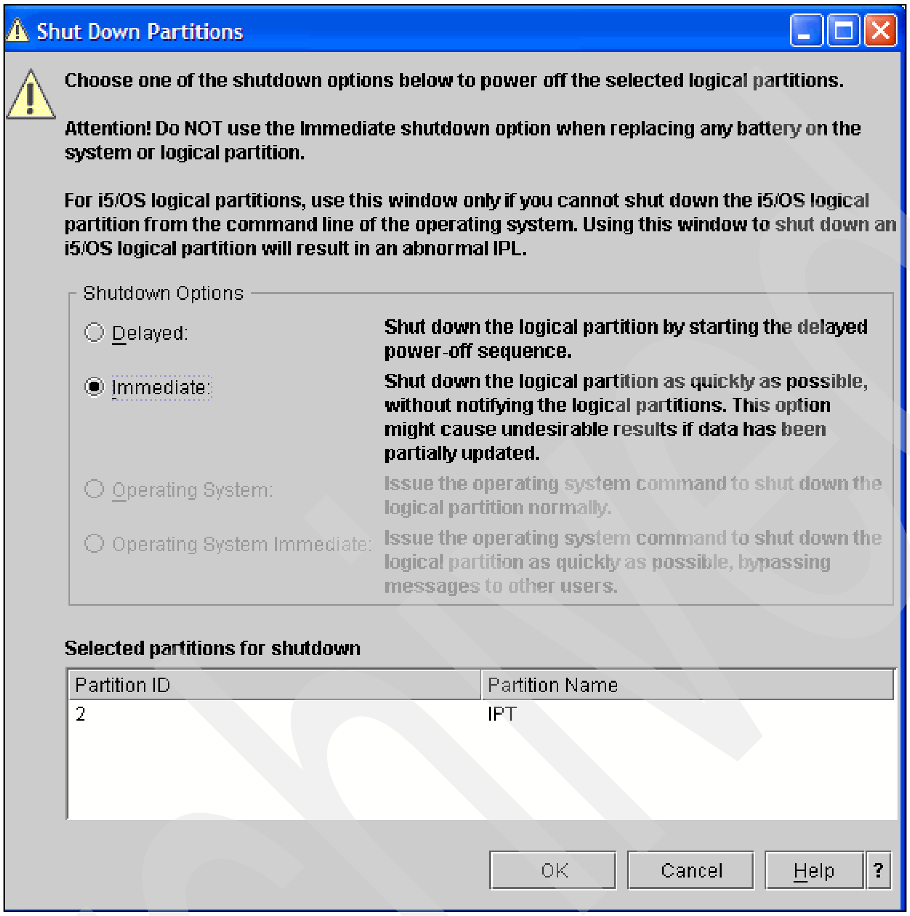

Figure 3-41 Shutting down the partition

7. Because an Immediate shut down was requested, a confirmation screen will be displayed; see Figure 3-42. Click **Yes**.

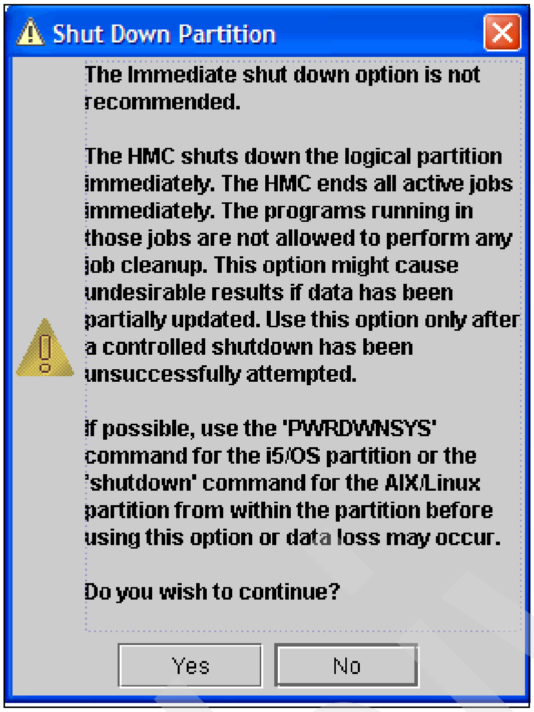

Figure 3-42 Partition Shut Down - immediate shut down confirmation

8. Depending on the version of HMC, an additional warning dialog box may be displayed concerning replacement of a cache battery (Figure 3-43). Click **No** to indicate that a cache battery is not being replaced. At this point, the partition will be shut down.

Figure 3-43 Cache battery replacement message

9. If the virtual terminal or virtual console window for the IP Telephony partition is still displayed, it can be closed by clicking the X in the upper right corner.

Definition of the logical partition for IP Telephony using HMC is now complete. Continue to Chapter 4, “Creating the storage environment” on page 119, for an explanation of how to define the i5/OS components to support virtual I/O.

3.3 Partitioning with all virtual resources via Virtual Partition Manager

Virtual Partition Manager (VPM) provides the capability to create and manage Linux partitions without the use of the Hardware Management Console (HMC). VPM supports the needs of small and medium customers that want to add simple Linux workloads to their System i machine. VPM is included with i5/OS V5R3 or later.

Detailed information about VPM can be found in the IBM Redpaper publication *Virtual Partition Manager: A Guide to Planning and Implementation*, REDP-4013. Information presented in this section is limited to an example of using VPM to create a Linux partition for IP Telephony. This example assumes that all of the system resources are currently owned by the i5/OS partition.

There are some limitations when using VPM:

- Limit of one i5/OS partition
- Limit of four Linux partitions
- Limit of four virtual Ethernet LANs and one virtual SCSI adapter per partition
- Requirement to use all virtual I/O
- No dynamic LPAR (DLPAR) capability

This section provides step-by-step instructions on how you can remove logical resources from the i5/OS partition using VPM in preparation for defining new Linux partitions. By default, the i5/OS partition owns all processor, memory, and I/O resources.

You can invoke VPM either through the Dedicated Service Tools (DST) or System Service Tools (SST) tasks. The advantage of using SST is that you can bring your system to full operational mode rather than having to do your partition definitions in a restricted state, where the rest of the operating system has not started and users are not able to use the system.

We recommend that you manage your Linux partition creation and management through SST tasks, because this enables you to use your i5/OS environment concurrently. After you define the partitions, a system IPL is required to complete the removal of resources from i5/OS.

3.3.1 Removing resources from the i5/OS partition

In a system that is using VPM, the i5/OS partition is the partitioning manager. Resources must be displayed, removed, or allocated using the service tools either via SST or DST. The system service tools can be accessed when i5/OS is active by using the Start System Service Tools (STRSST) CL command. DST is accessed from the systems console during a manual IPL, or by using option 21 from the service panel.

> **Note:** The screen shots in this section are taken from an i5/OS partition running V5R4M0. There are some differences between the menu options when running V5R3MO, although most (if not all) of the differences are insignificant.
>
> Because the IP Telephony solution is supported on V5R3M0 as well, you may want to refer to IBM Redpaper publication *Virtual Partition Manager A Guide to Planning and Implementation*, REDP-4013, or to the IBM publication *Implementing PowerPC Linux on System i Platform*, SG24-6388, if your system displays significantly differ from the screen shots shown here.

Perform the following steps to remove resources from the i5/OS partition:

1. To access the service tools and get to the LPAR configuration utility, enter the CL command `STRSST` from an i5/OS command line and press Enter. The i5/OS user profile that you sign on with must have the authority to use the service tools.

   > **Important:** The service tools QSECOFR profile is a different profile than the QSECOFR profile of the operating system. Often the passwords will be different.

2. Enter a valid service tools user id and password and press Enter; see Figure 3-44.

```
                 Start Service Tools (STRSST) Sign On

                                                  SYSTEM: RCHAS10

 Type choice, press Enter.

   Service tools user ID. . . . HENRYVIII
   Service tools password . . .
```

Figure 3-44 Entering a valid service tools user id and password

3. Type option 5 (Work with system partitions) and press Enter; see Figure 3-45.

```
                        System Service Tools (SST)

 Select one of the following:

      1. Start a service tool
      2. Work with active service tools
      3. Work with disk units
      4. Work with diskette data recovery
      5. Work with system partitions
      6. Work with system capacity
      7. Work with system security
      8. Work with service tools user IDs and Devices
```

Figure 3-45 System Service Tools (SST) menu

4. You will receive one of the following informational displays, depending on whether the system supports VPM. Figure 3-46 is from a system that supports VPM.

   Figure 3-47 on page 90 is from a system that does not support VPM because it has an HMC-connected console.

> **Note:** The message in Figure 3-47 will be displayed if the system has ever been connected to an HMC regardless of whether the HMC is currently present in the system configuration. Enabling a system for VPM that has been previously configured with HMC requires the system to be restored to factory specifications; details of that topic are beyond the scope of this redbook.

```
                   Logical Partitioning Environment Supported
                                                      System:   RCHAS10
 Virtual Partition Manager is supported.  The system is in a
 state that does allow this operating system to partition the
 server.  Refer to the Virtual Partition Manager documentation
 for more information.

 Press Enter to confirm using Virtual Partition Manager to
 partition the server.
```

Figure 3-46 System supports VPM

```
                 Logical Partitioning Environment Not Supported
                                                    System:   RCHAS10
Virtual Partition Manager is not supported and this service
function cannot be started.  The system is in a state that
does not allow this operating system to partition the
server.  Refer to the Virtual Partition Manager documentation
for more information.
```

Figure 3-47 Informational message received when VPM is not enabled

5. After the informational message is displayed, the Work with System Partitions menu is displayed; see Figure 3-48. This is the LPAR configuration menu. Option 1 was removed in V5R4M0, but on an V5R3M0 system it will be displayed but is not usable.

   Type option 3 (Work with partition configuration) and press Enter to display the current configuration and to make changes to it.

```
                          Work with System Partitions
                                                    System:   RCHAS10
Attention:  Incorrect use of this utility can cause damage
to data in this system.  See service documentation.

  Number of partitions  . . . . . . . :  1
  Partition release . . . . . . . . . :  V5R4M0
  Partition identifier  . . . . . . . :  1
  Partition name  . . . . . . . . . . :  10-B8DAE  *

Select one of the following:

     2. Work with partition status
     3. Work with partition configuration
     4. Clear configuration data
     5. Create a new partition

Selection
       3
F3=Exit   F12=Cancel
```

Figure 3-48 Work with Systems Partitions menu

6. A summary of the current configuration is displayed. It indicates that there are no available processors or memory. Observing the partition information, notice that partition ID 1 has all of the resources; therefore, none are available. Partition ID 1 is the i5/OS partition, so this is to be expected.

   Type option `1` (Display) next to the partition and press Enter to show more details; see Figure 3-49.

```
                       Work with Partition Configuration
                                                           System:   RCHAS10
Available processor units . . . . :    0.00
Available memory (MB) . . . . . . :  0
Memory region size (MB) . . . . . :  64

Type option, press Enter.
  1=Display  2=Change  9=Delete

                                                                Virtual
     Partition     ---------Processor----------     Memory       Ethernet ID
Opt  ID  Name      Total   Units  Uncap  Weight       (MB)  WLM  1  2  3  4
 1     1  10-B8DAE      2    2.00    2    None       15680   2   2  2  2  2


F3=Exit   F5=Refresh   F11=Work with partition status   F12=Cancel
```

Figure 3-49 Work with Partition Configuration display

7. The Display Partition Configuration display, shown in Figure 3-50, confirms that all resources are owned by the i5/OS partition and that the minimum and maximums are likewise set for all resources.

```
                        Display Partition Configuration
                                                           System:   RCHAS10
  Partition identifier and name  . . . . . . . :  1    10-B8DAE

  Number of partition processors . . . . . . . :  2
  Minimum / maximum number of processors . . . :  1   / 2
  Use shared processor pool  . . . . . . . . . :  No
  Size of partition memory (MB)  . . . . . . . :  15680
  Minimum / maximum size of memory (MB)  . . . :  320      / 16384
  Enable workload management . . . . . . . . . :  No

  Virtual Ethernet Identifiers (1=Yes, 2=No)
    1   2   3   4
    2   2   2   2
```

Figure 3-50 Displaying the details of the current i5/OS partition configuration

8. After displaying the details, press F12 to return to the previous screen and type option 2 (Change) next to the i5/OS partition, then press Enter. See Figure 3-51.

```
                        Work with Partition Configuration
                                                        System:   RCHAS10
Available processor units . . . . :    0.00
Available memory (MB) . . . . . . :  0
Memory region size (MB) . . . . . :  64

Type option, press Enter.
  1=Display  2=Change  9=Delete

                                                                Virtual
     Partition     ---------Processor----------     Memory       Ethernet ID
Opt  ID  Name      Total   Units  Uncap  Weight       (MB)  WLM  1  2  3  4
 2    1  10-B8DAE      2    2.00    2    None        15680   2   2  2  2  2


F3=Exit   F5=Refresh   F11=Work with partition status   F12=Cancel
```

Figure 3-51 Changing the i5/OS partition configuration

9. On the Change Partition Configuration display, shown in Figure 3-52, you can change the memory and processors allocated, but you will be prompted for these again if you select option 1 for the Use shared processor pool parameter. Specify option 1 for the Use shared processor pool parameter and press Enter.

```
                          Change Partition Configuration
                                                        System:   RCHAS10
Type changes, press Enter.

  Partition identifier and name  . . . . . . . . .  1    10-B8DAE

  Number of available system processors  . . . :  0
  Number of partition processors . . . . . . . .  2
  Minimum / maximum number of processors . . . .  1   / 2
  Use shared processor pool  . . . . . . . . . .  1  1=Yes, 2=No
  Size of available memory (MB)  . . . . . . . :  0
  Size of partition memory (MB)  . . . . . . . .  15680
  Minimum / maximum size of memory (MB)  . . . .  320      / 16384
  Enable workload management . . . . . . . . . .  2  1=Yes, 2=No
  Virtual Ethernet Identifiers (1=Yes, 2=No)
    1   2   3   4
    2   2   2   2
```

Figure 3-52 Selecting to use the shared processor pool

10. On the Change Partition Configuration display, shown in Figure 3-53 on page 93, change the following values based on the values that you have predetermined using the various tools that are noted in 2.9, “Capacity planning” on page 45.

   a. The shared processor pool units we set at 1.0, because this is an i5/OS partition. This leaves a whole processor to split between the Linux partitions. Although we set the minimum shared processor pool units to .2, realistically we should set it to 1.0 and the maximum to 2.0. We specify to use uncapped processing and an uncapped processing weight of 128.

b. We subtract 2048 to remove 2 Gb of memory.

c. We enable virtual Ethernet port 1 for i5/OS.

> **Important:** We do not create virtual adapters anywhere in VPM; these are automatically created by the firmware without user intervention. Thus, for each virtual Ethernet port enabled in the i5/OS, we will see one 268C resource. Virtual Ethernet has a maximum of four ports, and only those adapters that are enabled will have a resource created.
>
> There will be two serial server adapters (6B03), a client serial adapter (6B04) for each IP Telephony partition created, and a virtual SCSI adapter (290B) for each partition created. There is a limit of eight virtual adapters initially, but this gets incremented to a larger number by the firmware when the limit of eight is exceeded—so you only need to be aware of this difference.
>
> Also note that the appropriate adapters get created for the Linux side as well, but you cannot view these from the i5/OS. Use the **WRKHDWRSC *CMN** command to view the resources. Refer to Appendix B, “Identifying virtual hardware” on page 261, for information about identifying virtual adapters.

```
                         Change Partition Configuration
                                                            System:   RCHAS10
Type changes, press Enter.

  Partition identifier and name  . . . . . . . .  1    10-B8DAE

  Number of available system processors  . . . :  0
  Number of partition processors . . . . . . . .  2
  Minimum / maximum number of processors . . . .  1   / 2
  Use shared processor pool  . . . . . . . . . .  1  1=Yes, 2=No
    Shared processor pool units  . . . . . . . .  1   . 0
    Minimum / maximum processor pool units . . .  0   . 2  / 2   . 0
    Uncapped processing  . . . . . . . . . . . .  1  1=Yes, 2=No
      Uncapped processing weight . . . . . . . .  128  0, 64, 128, 255
  Size of available memory (MB)  . . . . . . . :  0
  Size of partition memory (MB)  . . . . . . . .  12608
  Minimum / maximum size of memory (MB)  . . . .  320      / 16384
  Enable workload management . . . . . . . . . .  2  1=Yes, 2=No
  Virtual Ethernet Identifiers (1=Yes, 2=No)
    1   2   3   4
    1   2   2   2

F3=Exit   F12=Cancel
```

Figure 3-53 Changing resource allocation for the i5/OS partition

11. You are asked to confirm the changes made. Verify your changes and press Enter; see Figure 3-54.

```
                          Confirm Changed Partition
                                                            System:   RCHAS10
 Verify information, press Enter.

   Partition identifier and name  . . . . . . . :  1    10-B8DAE

   Number of partition processors . . . . . . . :  2
   Minimum / maximum number of processors . . . :  1   / 2
   Use shared processor pool  . . . . . . . . . :  Yes
     Shared processor pool units  . . . . . . . :    1.00
     Minimum / maximum processor pool units . . :    0.20 /   2.00
     Uncapped processing  . . . . . . . . . . . :  Yes
       Uncapped processing weight . . . . . . . :  Med
   Size of partition memory (MB)  . . . . . . . : 2048
   Minimum / maximum size of memory (MB)  . . . :  320      / 16384
   Enable workload management . . . . . . . . . :  No

   Virtual Ethernet Identifiers (1=Yes, 2=No)
     1   2   3   4
     1   2   2   2
```

Figure 3-54   Confirming i5/OS partition changes

12. The confirmation screen is followed by a screen that displays the message that an IPL may be required; see Figure 3-55. The changes do require an IPL, but this does not need to occur until the IP Telephony partition has been created (which you will do in the next section). Press F12 to return to the Work with System Partitions menu.

```
                       Work with Partition Configuration
                                                            System:   RCHAS10
 Available processor units . . . . :    1.00
 Available memory (MB) . . . . . . :  3072
 Memory region size (MB) . . . . . :  64

 Type option, press Enter.
   1=Display  2=Change  9=Delete

                                                                     Virtual
      Partition     ---------Processor----------     Memory        Ethernet ID
 Opt  ID  Name      Total   Units  Uncap  Weight       (MB)  WLM  1  2  3  4
       1  10-B8DAE      2    1.00    1    Med         12608   2   1  2  2  2  <


 < Indicates partition IPL may be required.
 F3=Exit   F5=Refresh             F10=Display change status
 F11=Work with partition status   F12=Cancel
```

Figure 3-55   Message indicating that the changes to the i5/OS partition require an IPL

3.3.2 Creating the logical partition

Perform the following steps to create a Linux partition for IP Telephony using VPM:

1. From the Work with System Partitions display, type option 5 (Create a new partition) and press Enter. Notice the warning that an IPL may be required since you have just reconfigured the i5/OS partition to free up processor and memory for the IP Telephony partition; see Figure 3-56.

```
                           Work with System Partitions
                                                            System:   RCHAS10
Attention:  Incorrect use of this utility can cause damage
to data in this system.  See service documentation.

  Number of partitions  . . . . . . . :  1
  Partition release . . . . . . . . . :  V5R4M0
  Partition identifier  . . . . . . . :  1
  Partition name  . . . . . . . . . . :  10-B8DAE  *

Select one of the following:
     2. Work with partition status
     3. Work with partition configuration
     4. Clear configuration data
     5. Create a new partition

Selection
     5
F3=Exit   F10=IPL system to activate changes   F12=Cancel
System IPL may be required to activate changes.
```

Figure 3-56 Creating a Linux partition for IP Telephony with VPM

2. The Create New Partition screen (Figure 3-57 on page 96) displays a partition identifier and prompts for a partition name, memory, processor, and virtual Ethernet configuration:
   a. The partition identifier will be 2 in this example, because the i5/OS partition is 1. This number will be incremented for subsequent partitions.
   b. The partition name should be something meaningful.
   c. In our example, we specify that the partition will use shared processors:
      - The pool is given 1.0 processor.
      - The minimum amount is .2 processor.
      - The maximum amount that the partition can utilize is 1.0 processor.
      - Uncapped processors are supported with a weight of 128.
   d. The partition will be given 1 GB of memory of the 3072 available.
   e. We enable virtual Ethernet port 1.

> **Important:** Keep in mind that there is *no* dynamic allocation of resources (DLPAR) support for VPM. As noted earlier, Linux partitions do not support DLPAR of memory in any case.

```
                              Create New Partition
                                                            System:   RCHAS10
 Complete blanks, press Enter.

   Partition identifier and name  . . . . . . . .  2    IPT

   Number of available system processors  . . . :  1
   Number of partition processors . . . . . . . .  1
   Minimum / maximum number of processors . . . .  1   / 1
   Use shared processor pool  . . . . . . . . . .  1  1=Yes, 2=No
     Shared processor pool units  . . . . . . . .  0   . 20
     Minimum / maximum processor pool units . . .  0   . 20 / 1   . 00
     Uncapped processing  . . . . . . . . . . . .  1  1=Yes, 2=No
       Uncapped processing weight . . . . . . . .  128  0, 64, 128, 255
   Size of available memory (MB)  . . . . . . . :  3072
   Size of partition memory (MB)  . . . . . . . .  1024
   Minimum / maximum size of memory (MB)  . . . .  1024     / 2048
   Enable workload management . . . . . . . . . .  2  1=Yes, 2=No
   Virtual Ethernet Identifiers (1=Yes, 2=No)
     1   2   3   4
     1   2   2   2
```

Figure 3-57 Configuring a Linux partition for IP Telephony

3. When you press Enter, you are asked to confirm the values you entered; see Figure 3-58.

```
                              Confirm New Partition
                                                            System:   RCHAS10
 Verify information, press Enter.

   Partition identifier and name  . . . . . . . :  2    IPT

   Number of partition processors . . . . . . . :  1
   Minimum / maximum number of processors . . . :  1   / 1
   Use shared processor pool  . . . . . . . . . :  Yes
     Shared processor pool units  . . . . . . . :    0.20
     Minimum / maximum processor pool units . . :    0.20 /   1.00
     Uncapped processing  . . . . . . . . . . . :  Yes
       Uncapped processing weight . . . . . . . :  Med
   Size of partition memory (MB)  . . . . . . . :  1024
   Minimum / maximum size of memory (MB)  . . . :  1024     / 2048
   Enable workload management . . . . . . . . . :  No

   Virtual Ethernet Identifiers (1=Yes, 2=No)
     1   2   3   4
     1   2   2   2
```

Figure 3-58 Confirming selected values

4. The next screen confirms the successful partition configuration; see Figure 3-59.

```
                         Work with System Partitions
                                                          System:   RCHAS10
Attention:  Incorrect use of this utility can cause damage
to data in this system.  See service documentation.

  Number of partitions  . . . . . . . :  2
  Partition release . . . . . . . . . :  V5R4M0
  Partition identifier  . . . . . . . :  1
  Partition name  . . . . . . . . . . :  10-B8DAE  *

Select one of the following:
     2. Work with partition status
     3. Work with partition configuration
     4. Clear configuration data
     5. Create a new partition

Selection

F3=Exit   F10=IPL system to activate changes   F12=Cancel
Partition 2   create was successful.
```

Figure 3-59   Partition created successfully

5. After defining your partition, you can view the new configuration information using option 3 (Work with partition configuration) of the Work with System Partitions menu to see the display shown in Figure 3-60.

```
                      Work with Partition Configuration
                                                          System:   RCHAS10
Available processor units . . . . :    0.80
Available memory (MB) . . . . . . :  2048
Memory region size (MB) . . . . . :  64

Type option, press Enter.
  1=Display  2=Change  9=Delete

                                                                Virtual
     Partition    ---------Processor----------     Memory       Ethernet ID
Opt  ID  Name      Total   Units  Uncap  Weight      (MB)  WLM  1  2  3  4
      1  10-B8DAE      2    1.00    1    Med        12608   2   1  2  2  2  <
      2  IPT           1    0.20    1    Med         1024   2   1  2  2  2  <


< Indicates partition IPL may be required.
F3=Exit   F5=Refresh            F10=Display change status
F11=Work with partition status   F12=Cancel
```

Figure 3-60   Viewing the new partition

6. When all the partitions you require are created, return to the Work with System Partitions menu and press F10 to IPL the system and activate the changes; see Figure 3-61.

```
                        Work with System Partitions
                                                          System:   RCHAS10
Attention:  Incorrect use of this utility can cause damage
to data in this system.  See service documentation.

  Number of partitions  . . . . . . . :  2
  Partition release . . . . . . . . . :  V5R4M0
  Partition identifier  . . . . . . . :  1
  Partition name  . . . . . . . . . . :  10-B8DAE  *

Select one of the following:
     2. Work with partition status
     3. Work with partition configuration
     4. Clear configuration data
     5. Create a new partition

Selection

F3=Exit   F10=IPL system to activate changes   F12=Cancel
System IPL may be required to activate changes.
```

Figure 3-61 Pressing F10 to IPL the system

Definition of the logical partition for IP Telephony using VPM is now complete. Continue to Chapter 4, "Creating the storage environment" on page 119 for an explanation about how to define the i5/OS components to support virtual I/O.

3.4 Partitioning with virtual disk and physical network via HMC

The configuration of a logical partition for IP Telephony that incorporates both virtual disk and native network is accomplished simply by adding a native network adapter to the logical partition definition. The steps required to create the virtual I/O components within the logical partition are provided in 3.2, "Partitioning with all virtual resources via HMC" on page 51. Here, we explain the additional steps that are required in order to add a native network adapter to the LPAR configuration.

> **Note:** We assume that a logical partition has already been defined that uses all virtual I/O resources; this section only covers the steps necessary to add the native network adapter.

Perform the following steps to add the native network to a logical partition using all virtual I/O resources:

1. From the HMC, right-click the partition profile for the IP Telephony partition and select **Properties**.

2. On the Logical Partition Profile Properties window, click the **Physical I/O** tab; see Figure 3-62.

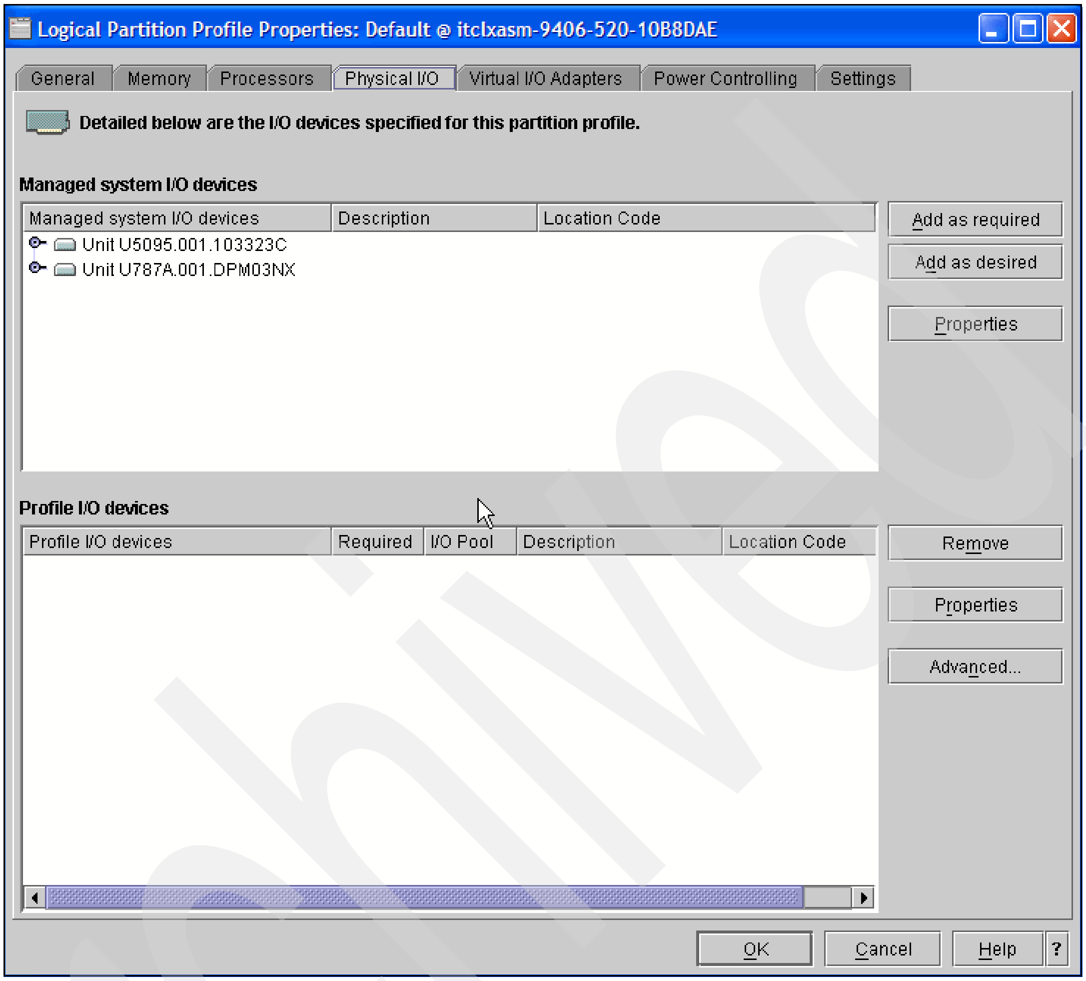

Figure 3-62 Logical Partition Profile Properties - Physical I/O tab

3. The top portion of the window displays all of the physical hardware that is installed on the system. The bottom portion of the window shows all of the physical hardware that is defined within the logical partition profile. Use the top portion to navigate to the physical adapter to allocate to the IP Telephony partition.

   After you locate the network adapter, click it and then click the **Add as required** button. The adapter will be added to the partition profile; see Figure 3-63.

> **Note:** Keep in mind that only I/O Adapters (IOAs) can be assigned to Linux partitions. If the IOA intended for Linux is downstream of an IOP, then you need to make sure that only the IOA is assigned to Linux.
>
> Also note that if the IOA is downstream of an IOP, then it is possible that the partition with the IOP will also allocate the IOA if that partition is started first.

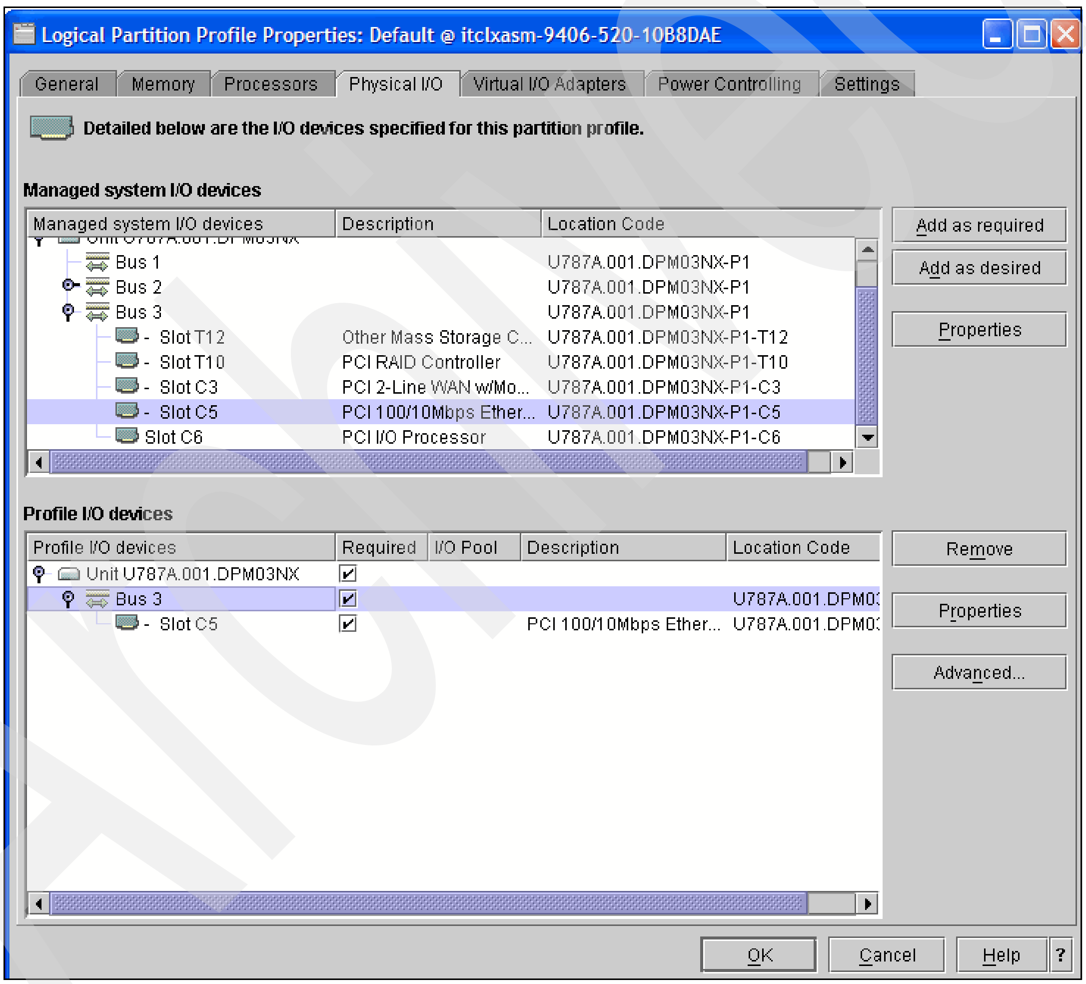

Figure 3-63 Logical Partition Profile Properties - Physical Hardware Assignment

4. After the network adapter has been added to the partition profile, click **OK** to finish the partition profile update.

> **Note:** The partition will need to be shut down and then restarted via the HMC in order to have the partition profile update take effect. Dynamic LPAR can also be used to add the adapter to the running state of the partition.
>
> However, keep in mind that the Dynamic LPAR support packages will need to be installed in the Linux operating system, and the adapter would still need to be added to the partition profile.

3.5 Partitioning with all physical resources via HMC

In addition to supporting virtual resources (that is, resources hosted by another partition), IP Telephony partitions can also be established on the System i platform that has actual physical resources allocated to them. This section explains how to create a logical partition with physical hardware allocations by using the HMC.

> **Note:** Because physical hardware is being allocated to a logical partition, only HMC can be used. VPM does not support the allocation of physical hardware to guest partitions.

A Linux partition on the System i platform is able to work directly with most I/O devices. It is able to communicate directly with System i hardware such as disk units, Ethernet adapters and optical devices such as DVD. In such a scenario, I/O resources dedicated to a Linux partition are owned by, and are under the control of, the Linux partition. It does not depend on an i5/OS partition for any of its resources. This also means that an i5/OS partition cannot use these resources because they are allocated directly to the Linux partition.

The HMC is used to create partitions and partition profiles. Partition profiles are a unique aspect of partitioning on the System i platform. They were not used on the earlier versions of LPAR on iSeries servers. If the LPAR on iSeries servers concept is new to you, or if you are only familiar with a previous version of LPAR on the POWER4 version of the iSeries servers, you will need to become familiar with this new concept. You can refer to *Logical Partitions on IBM PowerPC: A Guide to Working with LPAR on POWER5 for IBM @server i5 Servers*, SG24-8000, for additional information about this topic.

> **Note:** To create a partition or partition profile, you must have administrator or operator privileges in the HMC.

HMC has a wizard for both partition and partition profile creation. The following steps describe how to use this wizard:

1. Logon to the HMC, or use WebSM to connect to the HMC.

2. In the left navigation pane of the HMC, click **Server and Partition** → **Server Management**. In the right-side contents pane, right-click **Partitions** and select **Create** → **Logical Partition**, as shown in Figure 3-64.

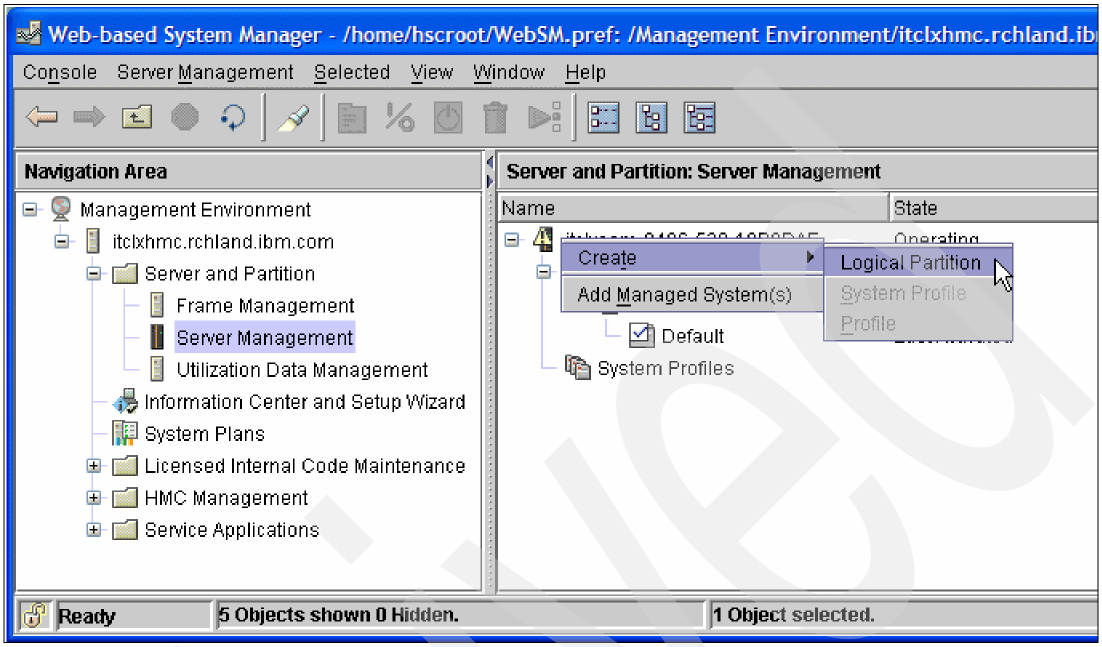

Figure 3-64 Starting the Create Logical Partition Wizard

3. The Create Logical Partition Wizard is started (Figure 3-65):
   a. The Partition ID is an integer number that is used by the system to uniquely identify the partition and typically is left at the default value displayed. The partition ID number must be unique across all of the partitions on the system.
   b. You need to provide the Partition name. (For our example, we specified IPT1 as the partition name.)
   c. Select the partition environment of **AIX or Linux**.

   Click **Next** to continue.

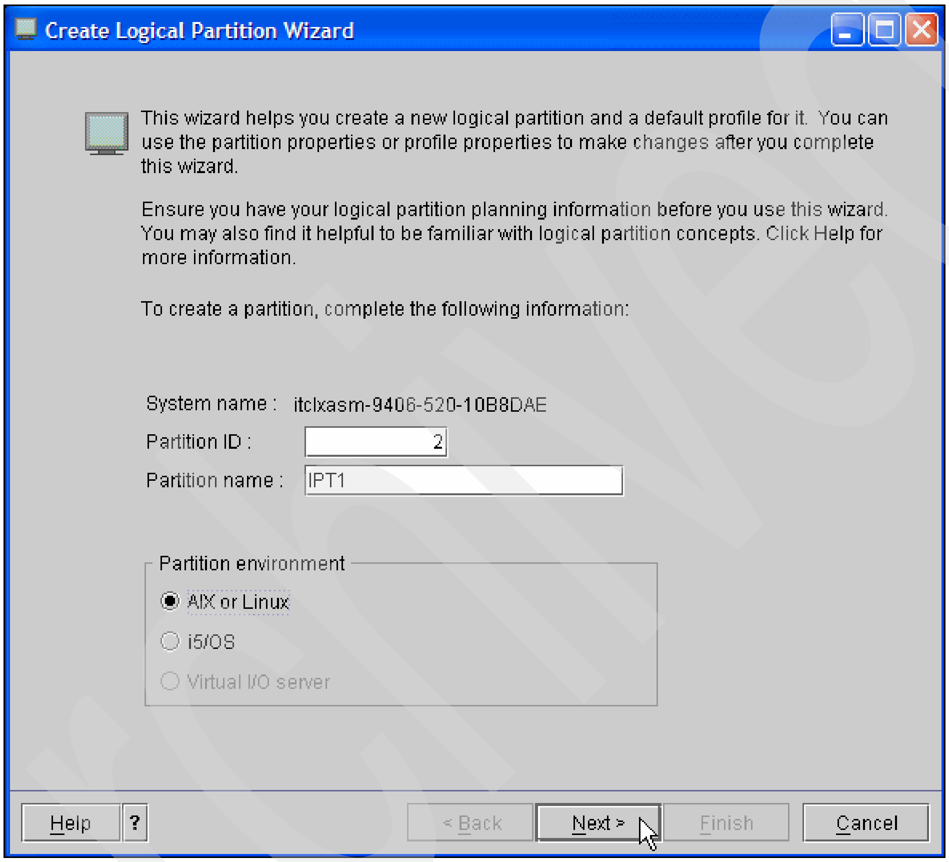

Figure 3-65 Creating a new partition

4. The next window, as shown in Figure 3-66, provides the option for the partition to be part of a group of partitions that can be managed by a workload application. (In our example, we selected **No**.) Click **Next** to continue.

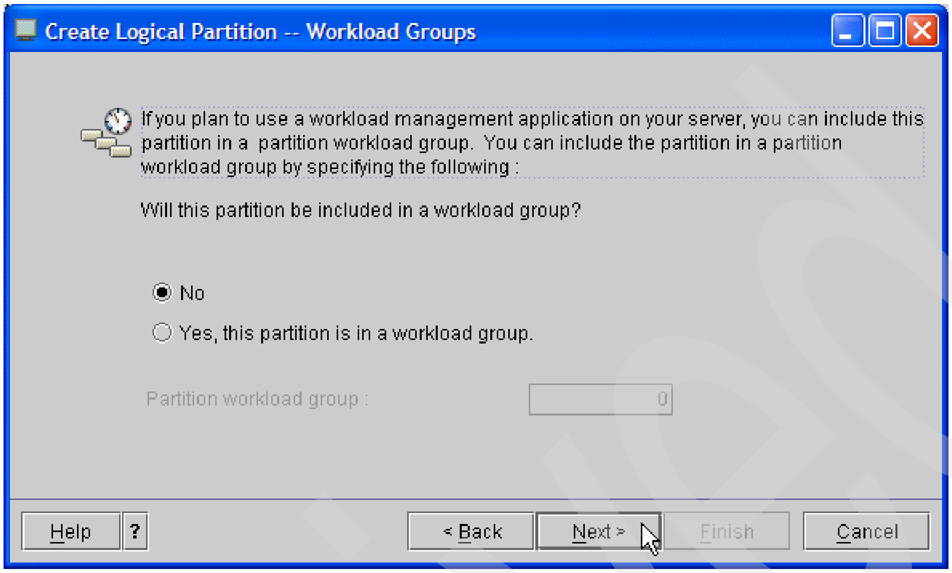

Figure 3-66 Creating a new partition - workload groups

5. Now you create a partition profile. A partition profile specifies characteristics of the partition, such as the memory, processors, physical and virtual adapters. As shown in Figure 3-67, type the name of the profile. (In our example, we type the profile name of Default.) Click **Next** to continue.

> **Note:** Do *not* check the option Use all the resources in the system. If you select this option, the partition that is associated with this profile will try to obtain all of the physical resources in the system when the partition profile is activated. If a partition owns all of the physical resources, then there can only be one active partition on the system.

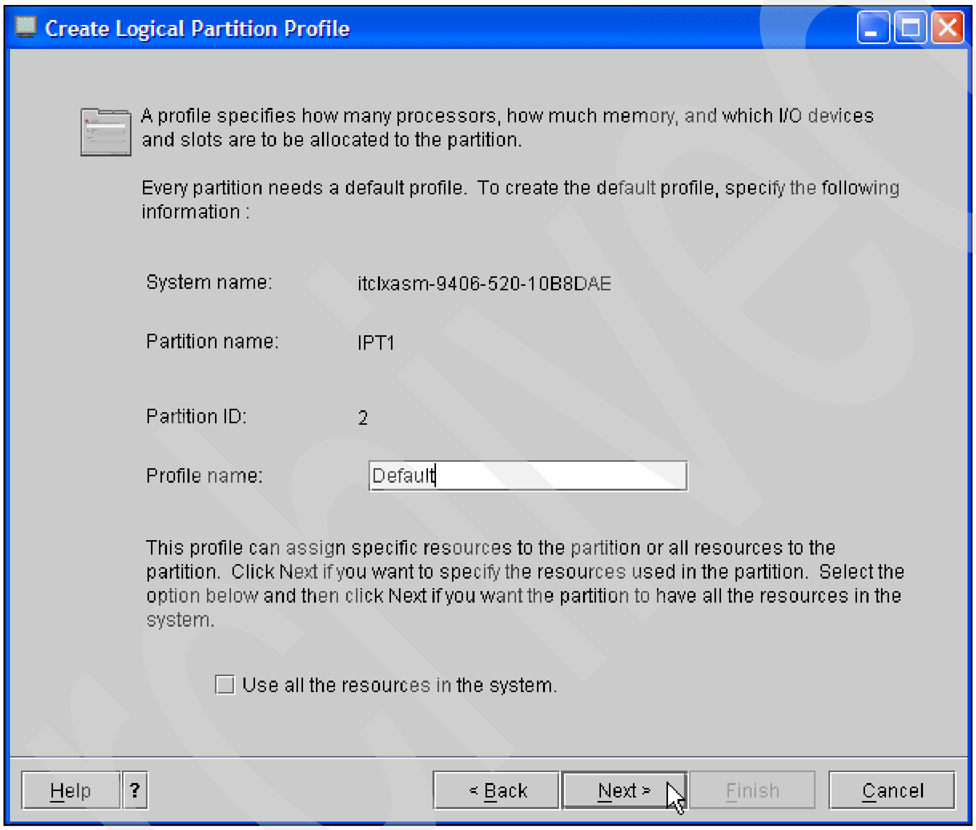

Figure 3-67 Creating a new partition - logical partition profile

6. Next, specify the memory size that the partition profile will manage, as shown in Figure 3-68 on page 106. Use this window to specify the memory management information for this partition profile. You must specify three memory levels:

   – The minimum memory is the minimum amount of memory that the logical partition must have to be activated. If the system cannot allocate this much memory, the activation of this partition will fail.

   – The desired memory is the amount of memory that you want the logical partition to have when you activate the logical partition.

   – The maximum memory is the maximum amount of memory that the logical partition is allowed to have when you dynamically move memory.

   When the partition is activated, an attempt will be made to allocate the desired amount of memory defined for the partition profile. If the desired amount of memory is not available, then an additional check will be made to see if the amount of unallocated memory left on the managed system is more than, or equal to, the minimum amount of memory defined for the partition profile. If the amount of memory is equal to or greater then the minimum defined memory, then it will be allocated to the partition. Otherwise, the partition will fail to activate.

In our example, the minimum quantity of memory that the partition will be activated with is 1 GB, the desired amount of memory is 1.5 GB, and the maximum amount of memory is also 1.5 GB. Click **Next** to continue.

> **Note:** Dynamic memory movement (that is, adding or removing memory from the partition while the Linux operating system is active) is not supported in the Linux kernel currently supported by the IP Telephony solution. Therefore, the ability to dynamically change the memory allocation for an IP Telephony partition is not supported on the System i platform.

For more information about minimum, desired, and maximum memory amounts, see 2.3.4, “Memory allocation” on page 30.

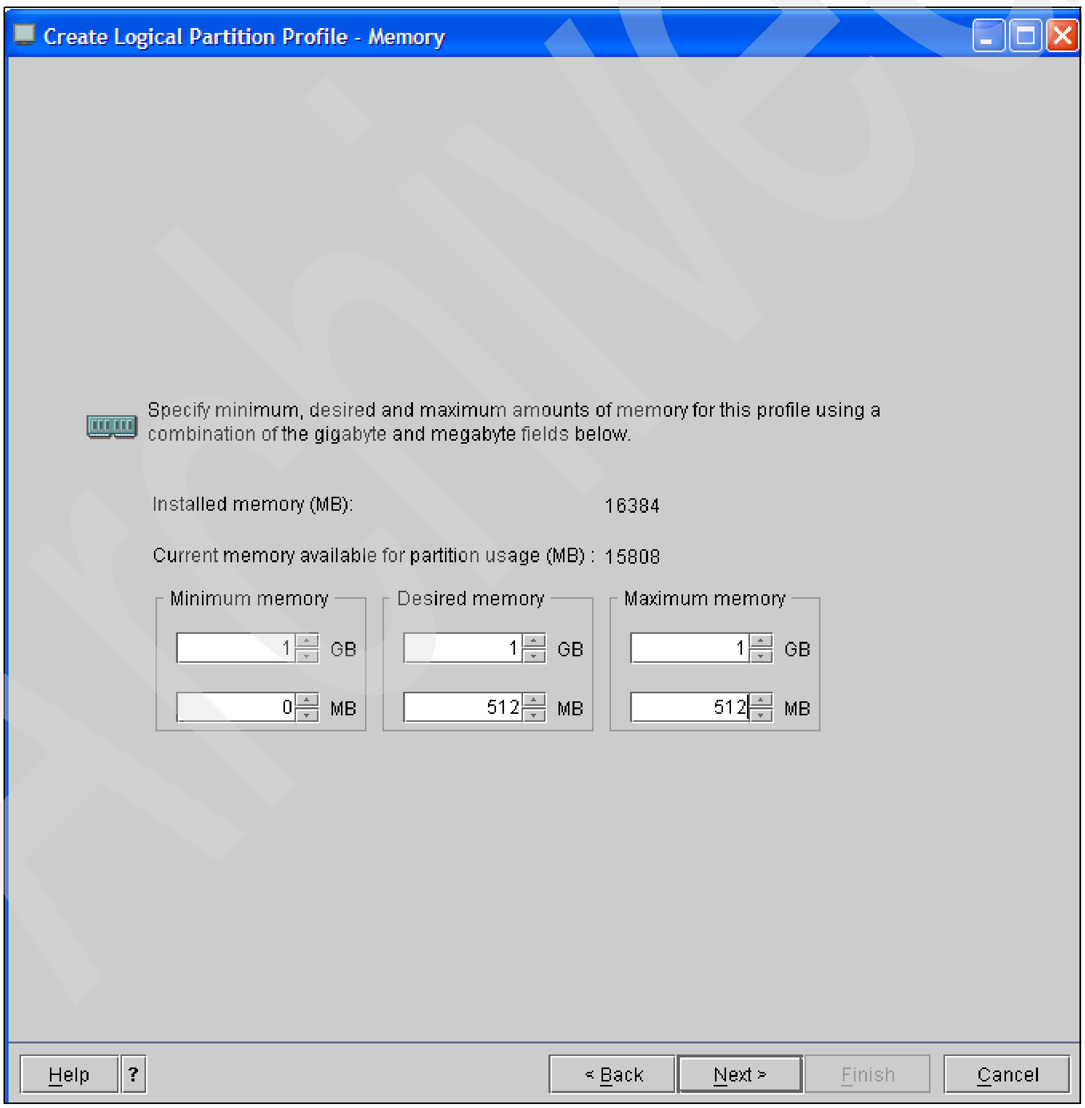

Figure 3-68 Creating a new partition - specifying memory

7. The next step is to choose shared or dedicated processors. Dedicated means you are not sharing the processor with other partitions. With the shared option, you can utilize the subprocessor feature where each partition can run with 0.1 processing unit at a minimum. While the minimum processor (for shared) is .10, the definition can be in the hundredths of processor units (for example, 0.15). This is referred as micro-partitioning.

   For most IP Telephony partitions, you will be using shared processors because using dedicated processors means allocating a whole processor to the partition, regardless of the processing environment. (In our example, we select the **Shared** option as shown in Figure 3-69.)

   For more information about processor allocation, see 2.3.3, “Processor allocation” on page 25.

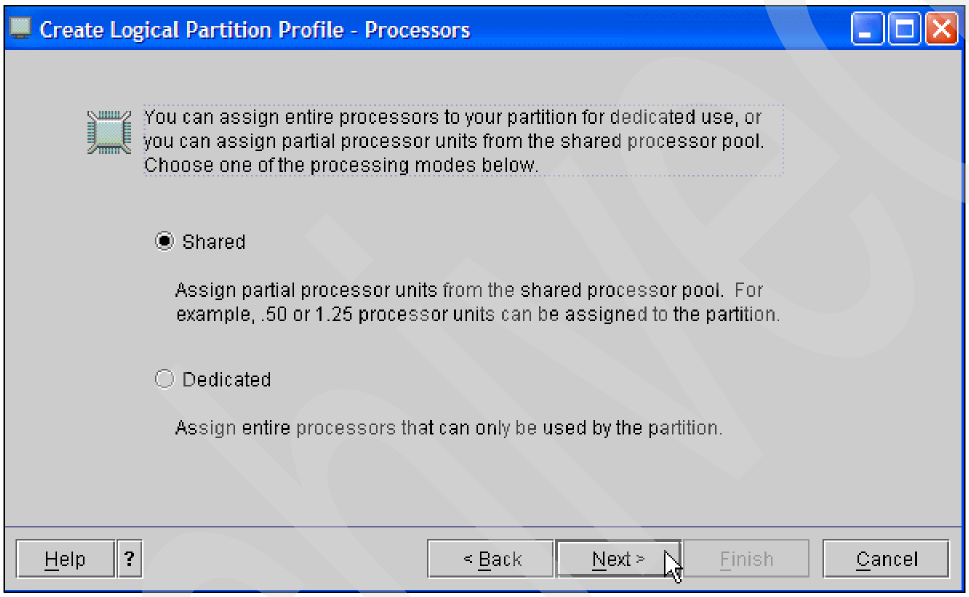

Figure 3-69 Creating a new partition - specifying shared or dedicated processors

8. For the shared processor option, you are prompted to specify the minimum, maximum, and desired processing units for the partition.

   When the partition is activated, an attempt will be made to allocate the desired amount of processors defined for the partition profile. If the amount of desired processors is not available, then an additional check will be made to see if the amount of unallocated processors left on the managed system is more than, or equal to, the minimum amount of processors defined for the partition profile. If the amount of processors is equal to or greater then the minimum defined processors, then it will be allocated to the partition, otherwise the partition will fail to activate.

   (In our example, we define 0.2 units of processor to be our minimum processing units, 0.3 units of processor power as our desired amount, and 0.5 as the maximum processing units; see Figure 3-70.) Click the **Advanced** button.

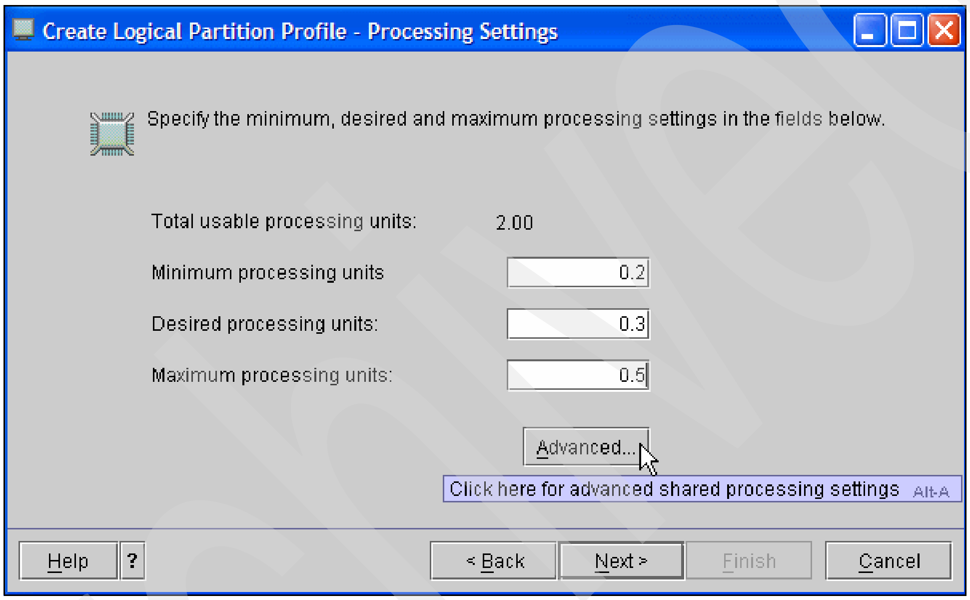

Figure 3-70 Creating a new partition -processing settings

9. When shared processing units are defined in a partition profile, additional settings can be set for the number of virtual processors as well as the capped/uncapped setting. As shown in Figure 3-71 on page 109, the sharing mode can be set to either capped or uncapped.

   An uncapped partition will have the ability to have additional processing units allocated to it by the Hypervisor on an as needed basis, based on the performance of the overall system. Capped partitions will only have access to the processing units allocated to it when first started (or changed through Dynamic LPAR).

   For definition of the terms uncappped processing, weight, and virtual processors see 2.1.3, “Processor concepts” on page 18.

   (In our example, we set the sharing mode of the partition to uncapped with a weight of 128 and set the number of virtual processors to a minimum of 1, desired of 1 and a maximum of 2.) Click **OK** and then click **Next** on the Create Logical Partition Profile - Processing Settings window.

Note: For further information on shared processors and uncapped processors, see the following URL:

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp?topic=/iphat/iphatsharedproc.htm

For additional information on virtual processors see the IBM Systems Hardware Information Center and select **Partitioning the server** → **Concepts for partitioning the server** → **Partitioning tools** → **Hardware Management Console** → **Partition profile**. In this last section, there is a concise discussion of virtual processors:

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp

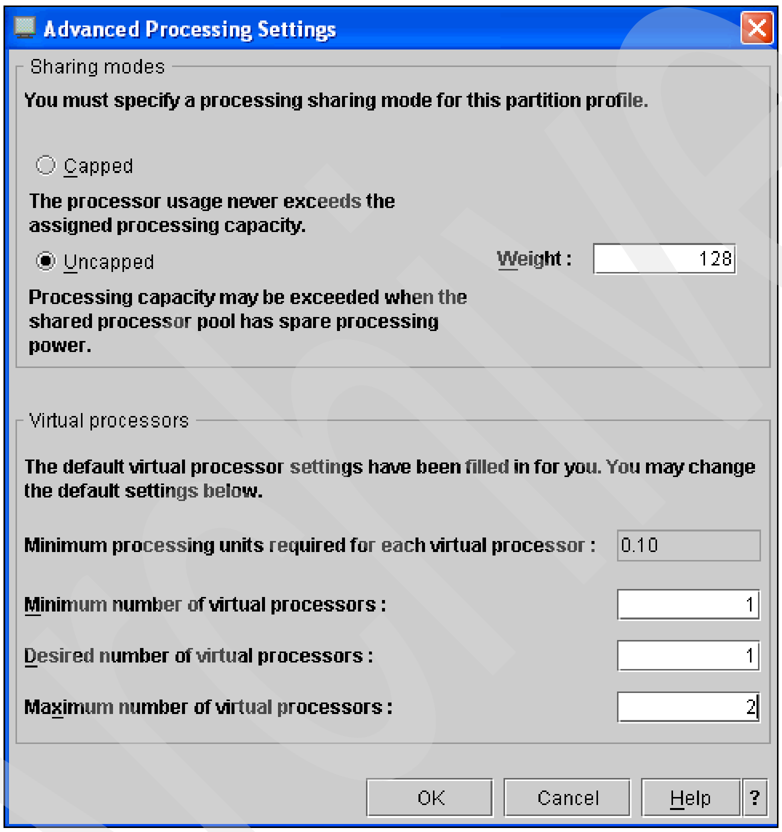

Figure 3-71 Creating a new partition - advanced processing settings

10. The next window displayed is for the allocation of physical hardware resource to the partition. As shown in Figure 3-72, the window displays the hardware installed in the managed system and allows for selection of hardware for the partition profile.

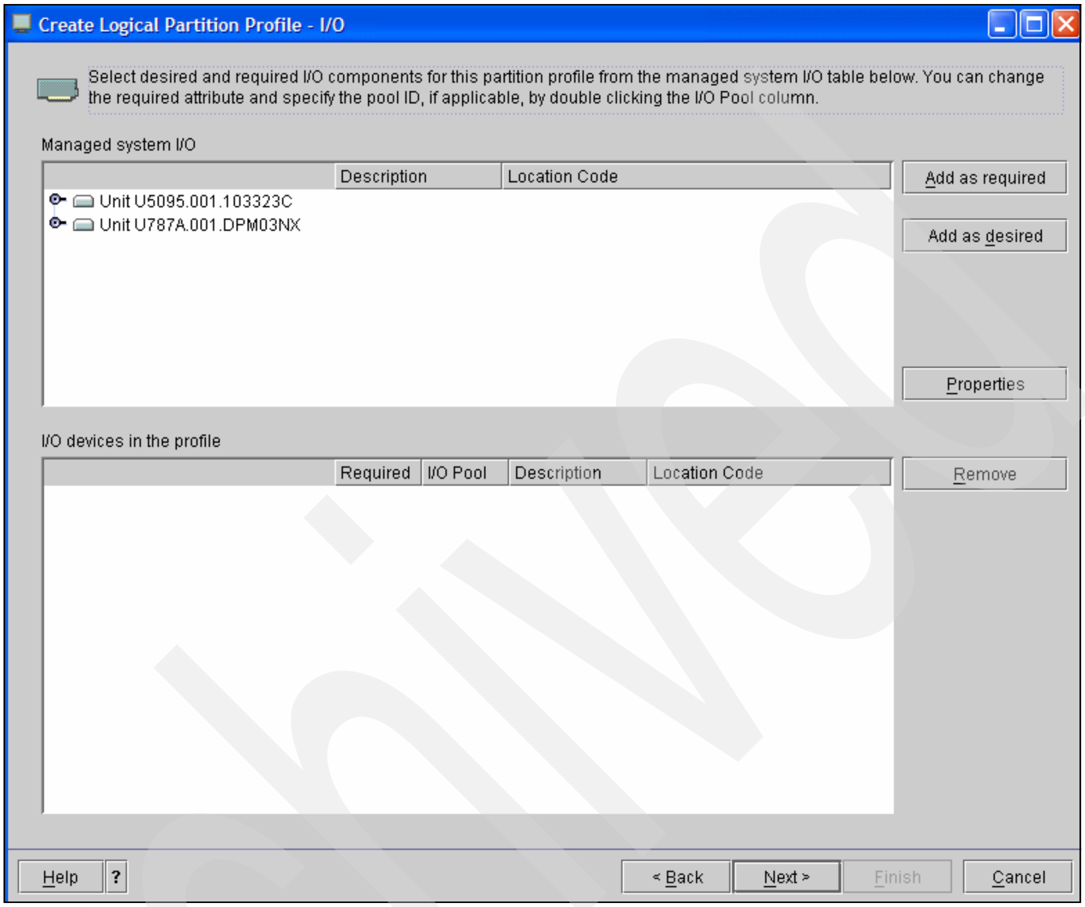

Figure 3-72 Creating a new partition - allocating physical hardware

11. For Linux partitions, I/O Adapters (IOA) can be allocated for direct attached storage devices as well as network adapters. The allocation of the IOA to the partition is accomplished by navigating through the display of system hardware devices in the upper portion of the display and selection of the adapter to allocate to the partition.

    The top portion of the window displays all of the physical hardware installed on the system. The bottom portion shows all of the physical hardware that is defined within the logical partition profile.

    Use the top portion to navigate to the physical adapter to allocate to the Linux partition. After you locate the storage controller, click it and then click the **Add as required** button. The adapter will be added to the partition profile; see Figure 3-73.

> **Important:** Select only hardware resources that you know are not being used by other partitions. Keep in mind that only I/O Adapters (IOAs) can be assigned to Linux partitions. If the IOA intended for Linux is downstream of an IOP, then you need to make sure that only the IOA is assigned to Linux.
>
> Also note that if the IOA is downstream of an IOP, then it is possible that the partition with the IOP will also allocate the IOA if that partition is started first.

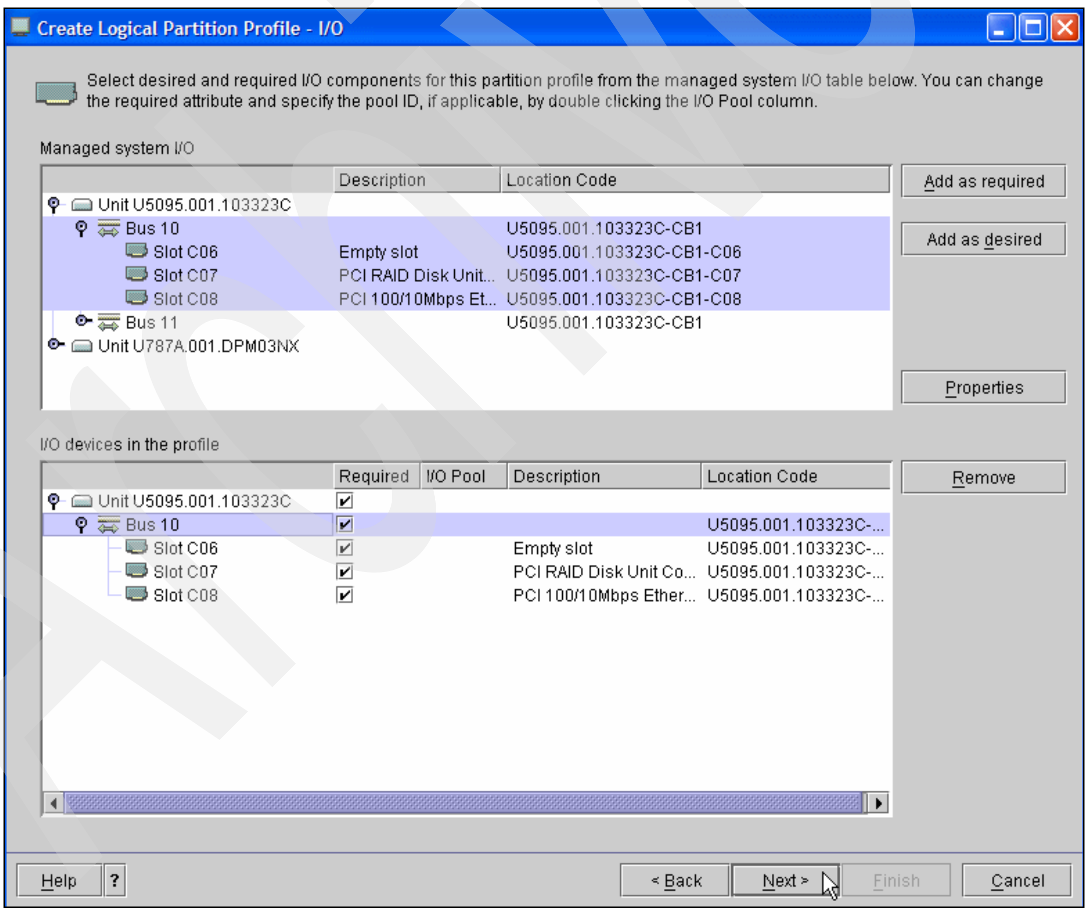

Figure 3-73 Creating a new partition - physical hardware assignment - storage controller

12. In addition to assigning physical storage adapters, physical network adapters may also be allocated to a Linux partition. The allocation of the network adapter is the same as that for the storage adapter; use the top portion to navigate to the physical adapter to allocate to the Linux partition. After you locate the network adapter, click it and then click the **Add as required** button. The adapter will be added to the partition profile; see Figure 3-74.

> **Note:** The allocation of a physical storage adapter does not then require a physical network adapter for communications. The definition of both physical and virtual adapters can be mixed in the same partition profile definition to meet any number of requirements for the IP Telephony partition configuration.

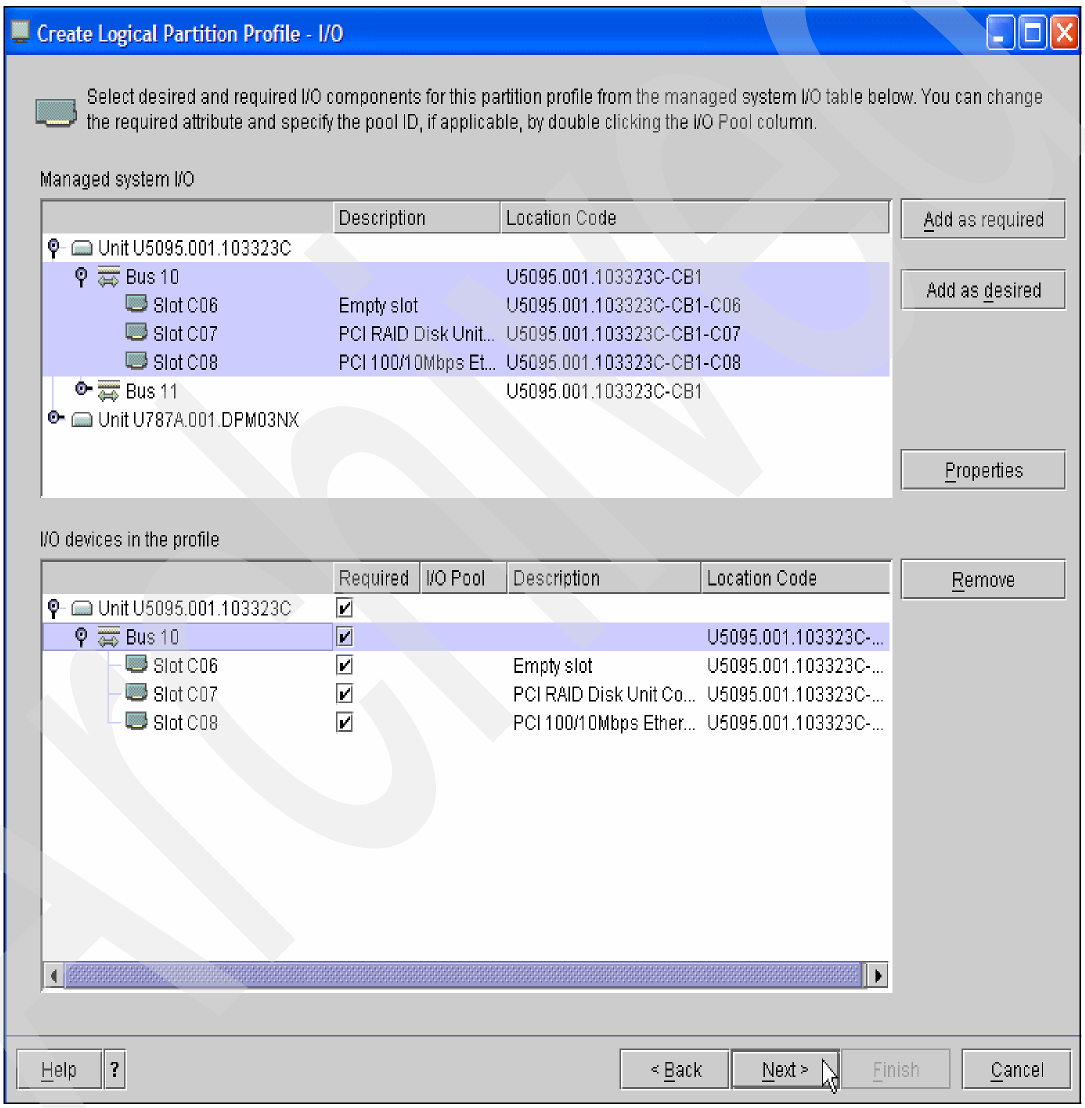

Figure 3-74 Creating a new partition - physical hardware assignment - network adapter

13. After the physical adapters have been added to the partition profile, click **Next**.

14. The next window, shown in Figure 3-75, is for adding I/O pools. Linux partitions do not use I/O pools, so click **Next** to continue.

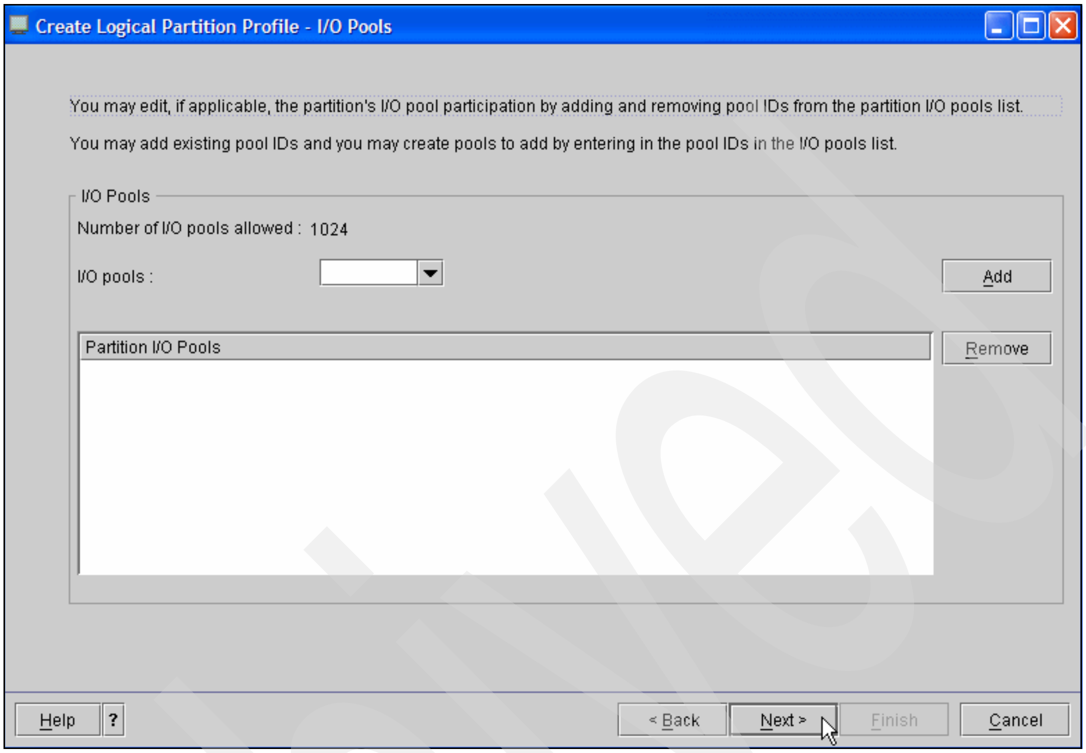

Figure 3-75 Creating a new partition - I/O pools

15. On the Virtual I/O Adapters window, shown in Figure 3-76, because this partition is using physical resources for storage, the allocation of virtual I/O adapters is optional. However, the allocation of virtual adapters is supported. Some examples of configurations that may want to allocate virtual I/O adapters when native storage is being used include:

   – A requirement to be able to access the CD devices in an i5/OS partition (that is, physical storage adapter is for disk only; a physical CD device for installation is not available).
   – A requirement to be able to access the tape devices in an i5/OS partition.
   – Usage of the Linux partition as a firewall between the physical network and partitions on the virtual network.

   For this example, no virtual I/O adapter will be allocated, so select **No** and click **Next**.

   > **Note:** Selecting No for virtual I/O adapters does not prevent the addition of virtual I/O adapters to the profile after it has been created. The No selection at this point in the profile definition simply means that you do not want to specify virtual I/O adapters at this time.
   >
   > The partition profile that results from this creation will have two virtual I/O adapters created (virtual Serial Server), and additional virtual I/O adapters can be created through modification of the partition profile.

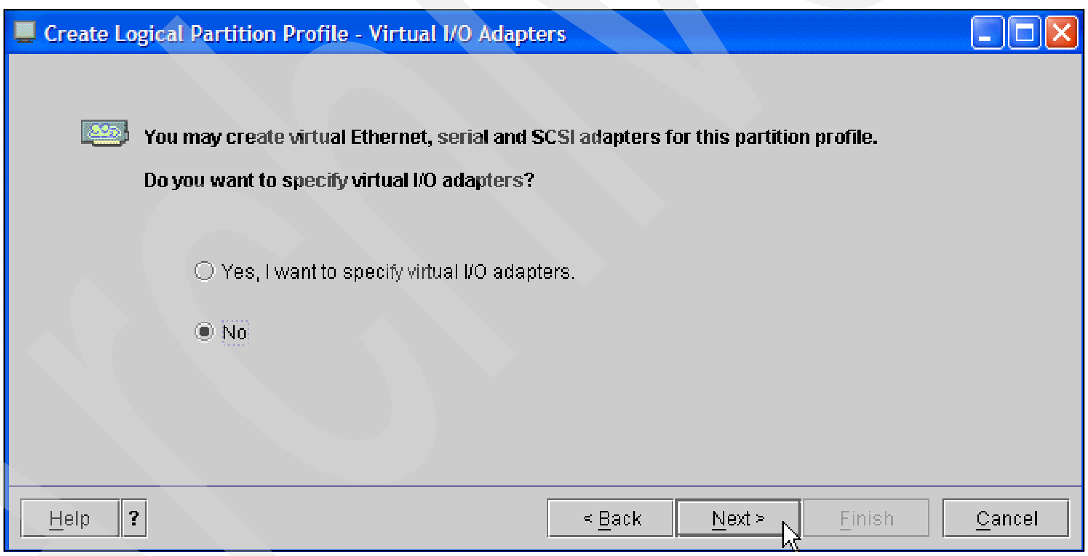

Figure 3-76 Creating a new partition - virtual I/O adapters

16. A power controlling partition is a partition that is allowed to make power requests (for example, activate or shutdown) for a partition via the Hypervisor. Because this partition will have its own I/O and does not rely on an i5/OS partition to be available for storage, a power controlling partition does not need to be defined. So, simply click **Next** without specifying a power controlling partition.

Note: Because a power controlling partition is not specified, all power requests for the partition will be accomplished through the HMC.

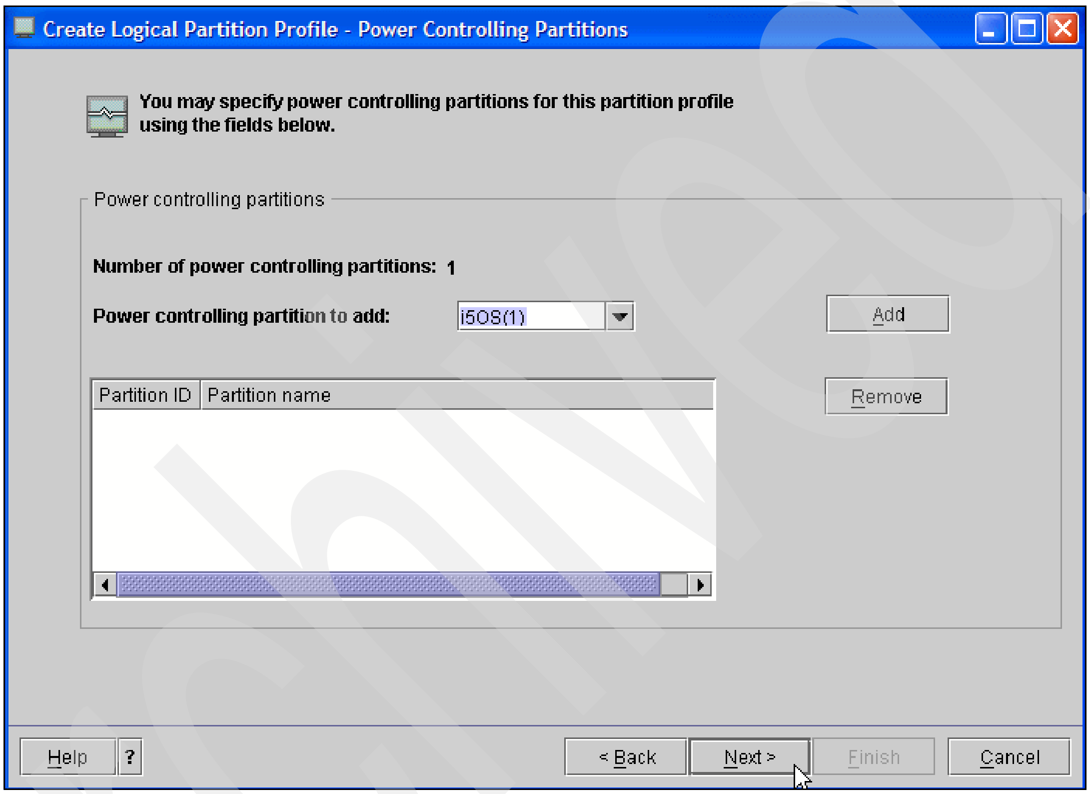

Figure 3-77 Creating a new partition - power controlling partitions

17. Option Settings, as shown in Figure 3-78, allows for the enablement of connection monitoring as well as startup options. Select **Normal** under Boot modes and click **Next**.

Note: For the initial IP Telephony installation, the System Management Services (SMS) mode will be selected by pressing *1* during the initial boot. This will allow for selecting the CD device as the boot device without requiring a change to the partition definition.

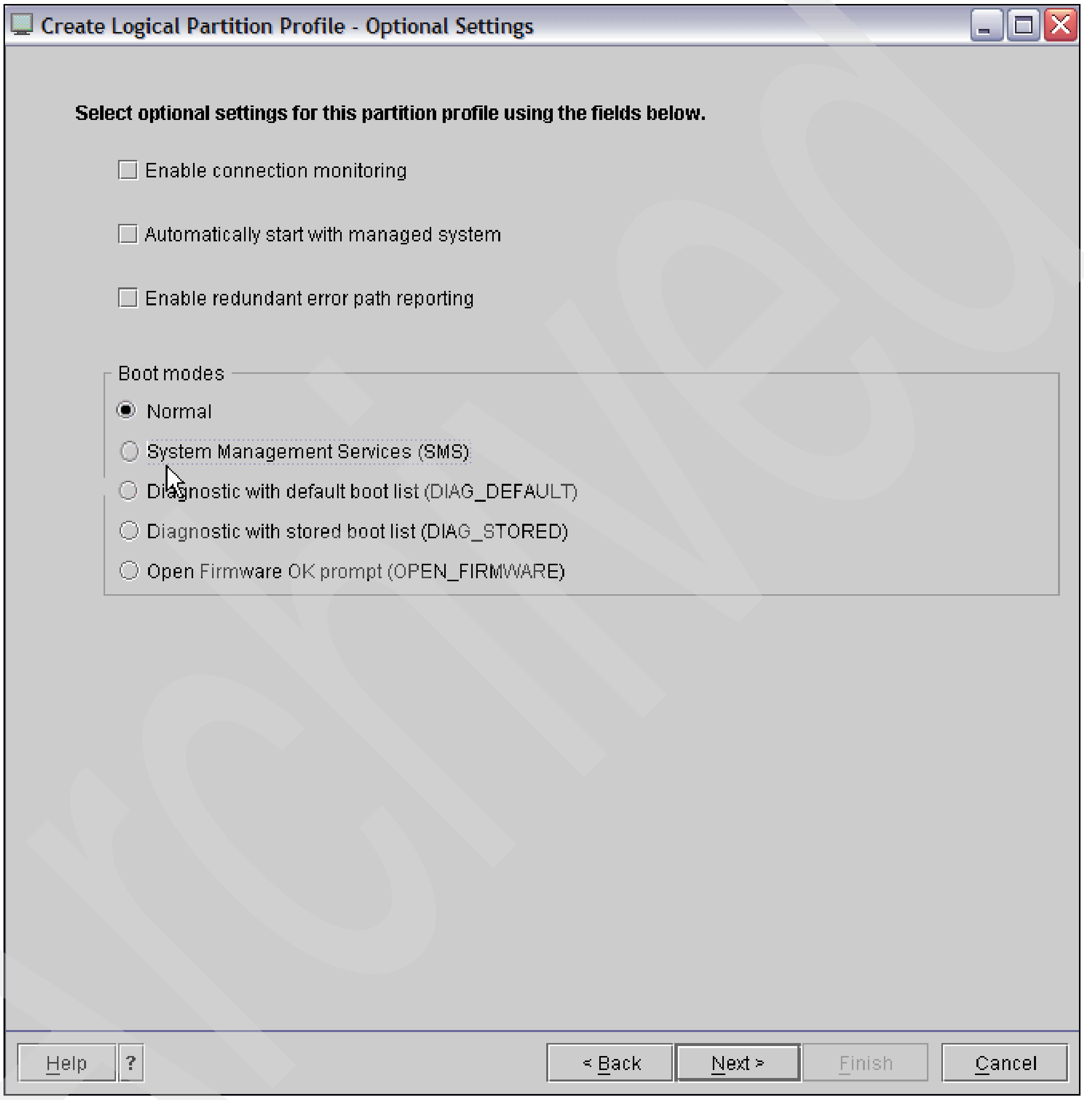

Figure 3-78 Creating a new partition - optional settings

18. At this point the partition definition is complete and a summary of the definition is shown in Figure 3-79. Click **Finish** to create the partition.

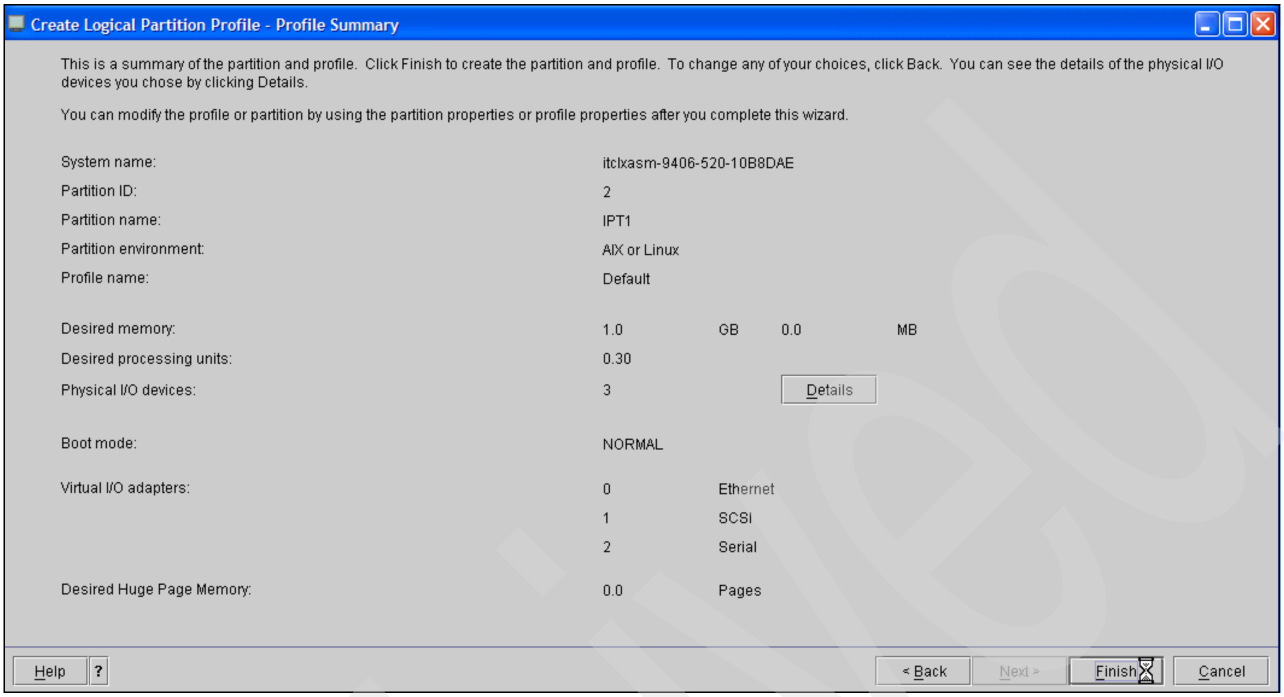

Figure 3-79 Creating a new partition - partition profile summary

19. A Working... dialog box will be displayed; see Figure 3-80.

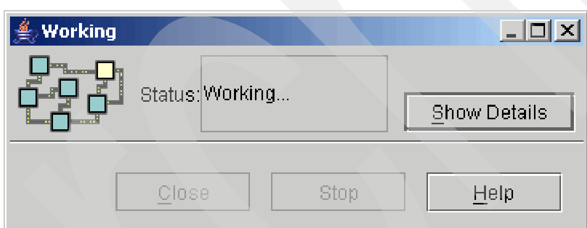

Figure 3-80 Partition being created

This completes the definition of the logical partition using physical hardware. The next step will be the preparation of the native storage devices as described in Chapter 4, “Creating the storage environment” on page 119.

4

Creating the storage environment

This chapter covers creating the storage environment for IP Telephony partitions on the System i platform. Information on the both definition of virtual storage (4.1, “Virtual I/O storage” on page 120) as well as native storage or direct attached storage (4.2, “Native or direct attached storage” on page 127) is discussed.

4.1 Virtual I/O storage

Virtual I/O is the predominate storage solution for IP Telephony on the System i platform. Virtual I/O revolves around storage being hosted by an i5/OS partition and made available to an IP Telephony partition. You should have already created the IP Telephony partition with a virtual SCSI Client adapter that points to a virtual SCSI Server adapter created in the i5/OS partition (see 3.2, “Partitioning with all virtual resources via HMC” on page 51 for details). This section walks you through creating the i5/OS components to support virtual I/O.

In this section you configure the virtual storage for your IP Telephony partition using a 5250 emulation session. This process involves the following steps:

- Creating a Network Server Description (NWSD)
- Creating a Network Server Storage Space (NWSSTG)
- Linking the NWSSTG to the NWSD

4.1.1 Creating the Network Server Description (NWSD)

A Network Server Description (NWSD) describes a single hosted server instance to the i5/OS. It provides specific parameters to find the virtual SCSI Server adapter and makes the i5/OS storage devices available. Additionally it can be configured to power on the partition and tell it where to boot from. It can be thought of as a switch that allows the hosted partition to interface with the i5/OS disk, optical, and tape hardware.

> **Attention:** The NWSD can be managed using iSeries Navigator, but it cannot be created using this interface. You must use the Create Network Server Desc (CRTNWSD) CL command to create an NWSD.

To create an NWSD, perform the following steps:

1. Type the Create Network Server Desc (CRTNWSD) CL command on an i5/OS command line and press Enter. Enter the following parameters:
   - **Network server description**: This is the name of the NWSD, which can be up to 8 characters. This is just the name of the i5/OS object and will not by default be the same as the host name of the IP Telephony partition.
   - **Resource name:** This is the hardware resource for the virtual SCSI Server adapter. This can be set to *AUTO when a single virtual SCSI Server/Client adapter exists for the IP Telephony partition. This is likely to be the case for IP Telephony partitions (and will be the case for a VPM environment).
   - **Network server type:** This the type of operating system the partition will support:
     - **Server connection** = *guest
     - **Server operating system** = *linuxppc

     > **Tip:** Notice that *linuxppc was not displayed. By pressing F4 with the cursor on this line, the full range of possibilities is displayed.

   See Figure 4-1 on page 121. Press Enter

```
                      Create Network Server Desc (CRTNWSD)

 Type choices, press Enter.

 Network server description . . .   iptpart       Name
 Resource name  . . . . . . . . .   *auto         Name, *NONE, *AUTO
 Network server type:
   Server connection  . . . . . .   *guest        *IXSVR, *ISCSI, *GUEST...
   Server operating system  . . .   *linuxppc     *WIN32, *LINUX32...
```

Figure 4-1 Creating a Network Server Description (NWSD)

2. Additional server parameters are now displayed. The display shown in Figure 4-2 will be appended to that of Figure 4-1. The three significant parameters on this display are:
   - **Online at IPL:** Do you want the NWSD to be varied on at IPL time? In many cases the answer is *YES. In the case where your IP Telephony partition is using the disk, it is likely that you will answer yes.
   - **Shutdown timeout:** This is a very important parameter. If you are bringing down the IP Telephony partition using the NWSD for power control (to tell the Linux partition to shutdown), make sure that the default of 15 minutes is long enough. If this timer expires and the Linux operating system in the partition is not shut down, the NWSD will force it down assuming something is hung which may result in hardware-type messages on your i5/OS and corrupted data in the IP Telephony partition.

     If you adjust this to a lower value, be confident that it is an adequate amount of time. This parameter is very important when doing i5/OS operations such as backup via a CL program that shuts down the server programatically or by a submitted job.
   - **Partition:** If you specified *AUTO or *NONE for the Resource name field, this field is required. The Partition parameter is case sensitive with regard to the partition name on an HMC; that is, it has to be the same case as that which is displayed on the HMC console.

     > **Note:** It is recommended for simplicity in understanding the configuration that the partition name be specified rather than the partition ID in this field.

   Press the PageDown key.

```
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Vary on wait . . . . . . . . . .   *NOWAIT       *NOWAIT, 1-15 minutes
 Shutdown timeout . . . . . . . .   15            2-45 minutes
 Partition  . . . . . . . . . . . > IPT

 Partition number . . . . . . . .   *NONE         Number, *NONE
 Code page  . . . . . . . . . . .   *LNGVER       *LNGVER, 437, 850, 852,857...
 Server message queue . . . . . .   *JOBLOG       Name, *JOBLOG, *NONE
   Library  . . . . . . . . . . .                 Name, *LIBL, *CURLIB

                                                                      More...
```

Figure 4-2 Additional parameters for CRTNWSD command

3. Paging down displays the TCP/IP configuration parameters as shown in Figure 4-3. There is no reason to change any of these parameters. Press the PageDown key again.

```
                      Create Network Server Desc (CRTNWSD)

 Type choices, press Enter.

 TCP/IP port configuration:
   Port . . . . . . . . . . . . .   *NONE         *NONE, 1, 2, 3, 4...
   Internet address . . . . . . .
   Subnet mask  . . . . . . . . .
   Maximum transmission unit  . .                 Number
   Gateway address  . . . . . . .
                + for more values
 TCP/IP route configuration:
   Route destination  . . . . . .   *NONE
   Subnet mask  . . . . . . . . .
   Next hop . . . . . . . . . . .
                + for more values
 TCP/IP local host name . . . . .   *NWSD

                                                                    More...
```

Figure 4-3 TCP/IP parameters in the CRTNWSD command

4. Paging down again to the next screen (Figure 4-4 on page 123) displays additional TCP/IP parameters and parameters to restrict device access and to boot the server.

   – **Restricted device resources:** This parameter is of interest to users who do not want to make all i5/OS tape or optical devices available to Linux. It can be used to restrict all optical or all tape devices, or all of both or one or more devices by name. You can list multiple devices by entering a plus (+) sign on the second field.

   > **Note:** An NWSD does not have to be utilized with a virtual disk on an HMC-managed system if that partition is using direct attached storage. An NWSD could be used to make a tape or optical device available to that partition.

   – **IPL source**: Only two parameters are used for IP Telephony partitions:

     • The *PANEL value is used to access the System Management Services (SMS) menu for the initial install. This menu allows you to select the boot/install device in order to boot from the optical media, which could be a DVD drive or the i5/OS image catalog.

     • The *NWSSTG value is used to tell the partition to boot from the virtual disk after the install.

   – **Power control:** This parameter determines whether the NWSD will start the partition IPLing, which in this case means to boot the kernel and start the Linux initialization process. This parameter must be combined with a parameter in the partition profile that defines a power controlling partition for the Linux partition on the HMC.

   > **Note:** Power control is required for a VPM managed system, so there is no other possibility for the NWSD in that environment. However, this parameter is optional for a HMC-managed system. The power control system is defined on the Power Controlling tab of the partition profile.

You will note that the text `More...` is shown at the bottom of this screen, indicating that you can display more parameters—but the only field it displays is to allow you to enter a text description. For your awareness, a text description may be important for identifying the object to system administration, but it has no relationship to the functionality of the object.

Press Enter to complete the NWSD creation.

```
Restricted device resources  . .   *NONE         Name, *NONE, *ALL...
               + for more values
Synchronize date and time  . . .   *TYPE         *TYPE, *YES, *NO
IPL source . . . . . . . . . . .   *NWSSTG       *NWSSTG, *PANEL, *STMF, A...
IPL stream file  . . . . . . . .   *NONE

IPL parameters . . . . . . . . .   *NONE
Power control  . . . . . . . . .   *YES          *YES, *NO
Authority  . . . . . . . . . . .   *CHANGE       Name, *CHANGE, *ALL, *USE...
```

Figure 4-4 IPL parameters in the CRTNWSD command

5. The following completion message for the creation of the NWSD is displayed:

   `Network server description IPTPART created.`

6. The NWSD can be displayed using either of two CL commands:
   - Work with Network Server Descriptions (WRKNWSD). This command displays all the network server descriptions. To display a specific network server description, prompt with F4 and enter the network server description name.
   - Work with Configuration Status (WRKCFGSTS *NWS) will also display all the network server descriptions. As with the WRKNWSD command, prompting the command with F4 allows you to specify a specific network server description rather than all of them.

4.1.2 Creating the Network Server Storage Space (NWSSTG)

The Network Server Storage Space (NWSSTG), also referred to as a *virtual disk*, provides the disk resource for the Linux partition. The NWSSTG is an object within the i5/OS integrated file system that is abstracted to the Linux partition such that it appears, and is used, as an actual disk drive.

To create an NWSSTG, perform the following steps:

1. From an i5/OS command line, type the Work with Network Server Storage Spaces (WRKNWSSTG) CL command and press Enter.

2. From the Work with Network Server Storage Spaces display (Figure 4-5), type option 1 (Create) and enter a name for the Network Server Storage Space (NWSSTG) in the Name field. Press Enter. This option executes a Create NWS Storage Space (CRTNWSSTG) CL command.

```
                    Work with Network Server Storage Spaces
                                                           System:   RCHAS10
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
  11=Remove link

                              Link          Stg
Opt  Name        Server    Seq   Type  Access   Path
1    IPTPART
```

Figure 4-5 Work with Network Server Storage Spaces display

3. On the Create NWS Storage Space (CRTNWSSTG) display (Figure 4-6), the following parameters must be entered. Press Enter twice when they are filled in. This operation can take some time depending on the size you create.
   - **Network server storage space:** Enter a meaningful name for the NWSSTG. Typically the name will indicate the function that the NWSSTG is providing.
   - **Size:** Specify the size of the NWSSTG in megabytes. In our example, we entered 30000, which is approximately 30 GB. This is a value that you will get from the 3Com recommendations. See 2.3.1, “Minimum requirements” on page 22 for details.
   - **From storage space:** For an initial install, this parameter is meaningless. It might be useful if you are going to clone an image, or it can be used to extend the NWSSTG if the space is too small. It will copy the data into the new extended space, but the extension will not be usable without additional operations in Linux. See 7.3, “Extending storage space for IP Telephony partition” on page 211 for more information about extending a storage space.
   - **Format:** This parameter needs to be *OPEN for a IP Telephony partition. The other parameters are for different NWSD configurations.
   - **Auxiliary storage pool ID** and **ASP device:** These parameters are significant if you want to create the data to be stored in a secondary ASP or an independent ASP. By default, the data is stored in the system ASP. If you choose to install the data into another ASP, be aware that there are save and restore ramifications.

```
                    Create NWS Storage Space (CRTNWSSTG)

Type choices, press Enter.

Network server storage space . . >  IPTPART         Name
Size . . . . . . . . . . . . . .   30000         *CALC, 1-1024000 megabytes
From storage space . . . . . . .   *NONE         Name, *NONE
Format . . . . . . . . . . . . .   *open         *NTFS, *FAT, *FAT32, *OPEN...
Auxiliary storage pool ID  . . .   1             1-255
ASP device . . . . . . . . . . .                 Name
```

Figure 4-6 Creating a NWSSTG

4. The screen will go input inhibited and display the message shown in Figure 4-7 until the NWSSTG is created. The byte count will increment as the space is being allocated. This can take several minutes and for larger sizes such as the maximum of 1 TB, it could take quite a while and may impact the system performance to some degree.

Tip: You may want to use the Submit Job (SBMJOB) CL command to submit the creation of the NWSSTG as a batch request to minimize the impact of the process on the interactive capacity of the system.

.

```
                    Create NWS Storage Space (CRTNWSSTG)

 Type choices, press Enter.

 Network server storage space . . >  IPTPART        Name
 Size . . . . . . . . . . . . . . > 30000        *CALC, 1-1024000 megabytes
 From storage space . . . . . . .   *NONE        Name, *NONE
 Format . . . . . . . . . . . . . > *OPEN        *NTFS, *FAT, *FAT32, *OPEN...
 Auxiliary storage pool ID  . . .   1            1-255
 ASP device . . . . . . . . . . .                Name
 Text 'description' . . . . . . .   *BLANK



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
 Creating NWS storage space IPTPART1: 832 of 30004 megabytes complete.
```

Figure 4-7 Creating a NWS Storage Space (NWSSTG), progress message

5. The storage space can then be displayed using the Work with Network Server Storage Spaces (WRKNWSSTG) CL command. See Figure 4-8. Notice the new NWSSTG does not have the columns to the right filled in. This is because it is not yet linked to a NWSD.

```
                   Work with Network Server Storage Spaces
                                                            System:   RCHAS10
 Type options, press Enter.
   1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
   11=Remove link

                                  Link          Stg
 Opt  Name        Server    Seq   Type  Access   Path

      IPTPART
```

Figure 4-8 Verifying the new Network Server Storage Space (NWSSTG)

4.1.3 Linking the NWSSTG to the NWSD

Perform the following steps to link the NWSSTG to the NWSD:

1. From the Work with Network Server Storage Spaces display (Figure 4-9), type option `10` (Add link) in front of the unlinked NWSSTG and press Enter. This runs the Add Server Storage Link (ADDNWSSTGL) CL command.

```
                    Work with Network Server Storage Spaces
                                                            System:   RCHAS10
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
  11=Remove link

                                 Link          Stg
Opt  Name        Server    Seq   Type  Access   Path

10   IPTPART
```

Figure 4-9 Linking the NWSSTG

2. On the Add Server Storage Link (ADDNWSSTGL) display (Figure 4-10), you are prompted for the Network server description (NWSD) name that you want to link the disk to and whether the link should be dynamic. Leave the Dynamic storage link with the defaulted of *NO and press Enter.

```
                      Add Server Storage Link (ADDNWSSTGL)

Type choices, press Enter.

Network server storage space . . > IPTPART       Name
Network server description . . . > IPT           Name
Dynamic storage link . . . . . .   *NO           *NO, *YES
```

Figure 4-10 Add Server Storage Link (ADDNWSSTGL) command

3. The NWSSTG link is added as shown in Figure 4-11.

```
                    Work with Network Server Storage Spaces
                                                            System:   RCHAS10
 Type options, press Enter.
   1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
   11=Remove link

                                 Link          Stg
 Opt  Name        Server    Seq  Type  Access   Path

      IPTPART     IPT         1  *DYN  *UPDATE
                                                                         More...
 Parameters or command
 ===>
 F3=Exit   F4=Prompt       F5=Refresh   F6=Print list   F9=Retrieve
 F11=Display disk status   F12=Cancel   F17=Position to
 Network server storage space link added.
```

Figure 4-11 NWSSTG link added

4.2 Native or direct attached storage

The Hardware Management Console (HMC) must be used to start the IP Telephony partition when it is using native or direct attached storage.

> **Note:** When installing IP Telephony to direct attached storage, it is possible to still use the virtual I/O support for, among other things, access to the installation source. If a CD drive (or virtual CD library) from an i5/OS partition is going to be used for the installation source, then ensure that the following values are set in the associated Network Server Description (NWSD):
>
> - IPL source =*PANEL
>
>   The *PANEL value for IPL source indicates that the boot settings of the partition should be used to determine the IPL source.
> - IPL stream file =*NONE
>
>   The *NONE value for IPL stream file indicates that there is no stream file in the i5/OS integrated file system to boot from.
> - Power control =*NO
>
>   The *NO value for Power control indicates that power requests should not be sent to the Hypervisor (to power on or power off the logical partition) when a corresponding vary operation is performed on the Network Server Description (NWSD).

Perform the following steps:

1. From the HMC, right-click the IP Telephony partition and select **Activate**.
2. On the Activate Logical Partition window (Figure 4-12), click **Advanced**.

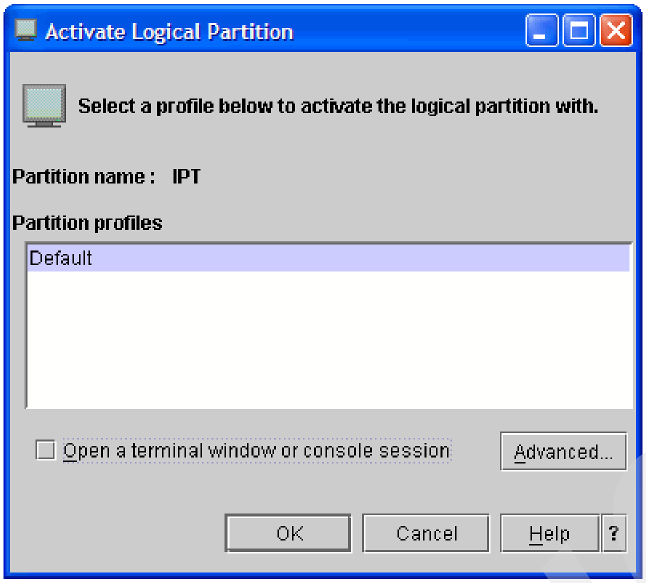

Figure 4-12 Activating the IP Telephony partition

3. On the Activate Logical Partition - Advanced window (Figure 4-13), select **SMS** from the Boot mode drop-down list and then click **OK**.

Figure 4-13 Activate Logical Partition - Advanced

4. Back on the Activate Logical Partition window, if you have not previously accessed the IP Telephony console, then select the checkbox for **Open a terminal window or console session**. Click **OK**. At this point the partition will be started and the System Management Services (SMS) menu is displayed (Figure 4-14).

> **Note:** If a virtual SCSI client/server pairing is being used to provide access to the CD/DVD drive in i5/OS, then the associated NWSD should be varied on prior to activation of the partition.

5. Type option 5 (Select Boot Options) and press Enter.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Main Menu
 1.   Select Language
 2.   Setup Remote IPL (Initial Program Load)
 3.   Change SCSI Settings
 4.   Select Console
 5.   Select Boot Options

-------------------------------------------------------------------------------
 Navigation Keys:
X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 5
```

Figure 4-14 SMS menu

6. On the Multiboot menu (Figure 4-15), type option 1 (Select Install/Boot Device) and press Enter.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Multiboot
 1.   Select Install/Boot Device
 2.   Configure Boot Device Order
 3.   Multiboot Startup <OFF>

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen         X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 1
```

Figure 4-15 Multiboot menu

7. On the Select Device Type menu (Figure 4-16), type option 3 (CD/DVD) and press Enter.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Select Device Type
 1.   Diskette
 2.   Tape
 3.   CD/DVD
 4.   IDE
 5.   Hard Drive
 6.   Network
 7.   List all Devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen         X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 3
```

Figure 4-16   Select Device Type menu

8. On the Select Media Type menu (Figure 4-17), type option 1 (SCSI) and press Enter.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Select Media Type
 1.   SCSI
 2.   SSA
 3.   SAN
 4.   IDE
 5.   ISA
 6.   List All Devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen         X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 1
```

Figure 4-17   Select Media Type menu

9. A list of the possible SCSI devices to boot from is displayed (Figure 4-18). The number of devices displayed is dependent on the number of SCSI devices available to the partition.

> **Note:** If virtual I/O is being used to access the installation source from an i5/OS CD device, then the media adapter to select will have a `/vdevice/v-scsi` indication.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Media Adapter
1. U9406.520.10B8DAE-V2-C2-T1   /vdevice/v-scsi@30000002
2. U5095.001.103323C-CB1-C07-T1/pci@800000200000a/pci@2,2/pci1069,b166@1/scsi@0
3. List all devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen         X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key:
```

Figure 4-18 Select Media Adapter menu

10. Type the number of the appropriate SCSI adapter (you may need to try several times to get the right one) and press Enter.

> **Note:** When a client/server SCSI relationship exists between Linux and i5/OS partitions and a Network Server Description has been created against the server SCSI adapter, all i5/OS CD/DVD resources (as well as tape and any linked network storage spaces) are placed on the resulting SCSI bus and made known to Linux. Each of the CD/DVD (for example OPTxx) devices in i5/OS will show up as optical devices in Linux.
>
> Therefore, it is possible that you will need to go through the preceding process of selecting the CD device several times until the correct one is selected.

11. From the list of SCSI devices (Figure 4-19), type the number of one that represents the CD/DVD drive that the IP Telephony installation media has been mounted on and press Enter.

> **Note:** Make sure you have loaded the correct DVD into the DVD drive. Depending on what you plan to install, select the appropriate volume:
>
> - 3Com IP Telephony and IP Messaging for IBM System i - Version 7.2
> - 3Com IP Conferencing for IBM System i - Version 7.2

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Select Device
 Device  Current  Device
 Number  Position  Name
 1.        1      SCSI CD-ROM
                  ( loc=U9406.520.10B8DAE-V2-C2-T1-W8020000000000000-L0 )
 2.        -      SCSI CD-ROM
                  ( loc=U9406.520.10B8DAE-V2-C2-T1-W8120000000000000-L0 )

-------------------------------------------------------------------------------
 Navigation keys:
 M = return to Main Menu
 ESC key = return to previous screen         X = eXit System Management
Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 1
```

Figure 4-19 Select Device menu

12. On the Select Task menu (Figure 4-20), type option 2 (Normal Mode Boot) and press Enter.

```
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Select Task

SCSI CD-ROM
    ( loc=U9406.520.10B8DAE-V2-C2-T1-W8020000000000000-L0 )

 1.   Information
 2.   Normal Mode Boot
 3.   Service Mode Boot

-------------------------------------------------------------------------------
 Navigation keys:
M = return to Main Menu
ESC key = return to previous screen         X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 2
```

Figure 4-20 Select Task menu

13. When prompted to exit (Figure 4-21), type option 1 (Yes) and press Enter.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Are you sure you want to exit System Management Services?
 1.   Yes
 2.   No

-------------------------------------------------------------------------------
 Navigation Keys:

X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 1
```

Figure 4-21 Exit menu

> **Note:** If you did not select the correct device or if you have not loaded the correct DVD, the following message is shown when you boot the partition:
>
> `No Operating Systems Installed`
>
> If this happens, go back and select another device or load the correct DVD.

14. The installation process starts with a boot from the DVD to install Linux. You first notice the display shown in Figure 4-22 scroll by.

```
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM                             IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM     STARTING SOFTWARE       IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM        PLEASE WAIT...       IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM                             IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
```

Figure 4-22 Starting the IP Telephony installation program

15. When you see the text `Welcome to the 3Com VCX for System i installation disc.` scroll by (as shown in Figure 4-23), you know installation is started.

```
Elapsed time since release of system processors: 1414 mins 26 secs

Config file read, 789 bytes
*************************************************************************
Welcome to the 3Com VCX for System i installation disc.

This disc supports installation of the VCX Linux operating system and
VCX applications to the IBM System i family of servers.

When the system boots, type 'install' to begin.

The default kernel will boot shortly.  Press <tab> to show alternatives.
*************************************************************************
Welcome to yaboot version 1.3.12
Enter "help" to get some basic usage information
boot: ibmpower-hvc0
Please wait, loading kernel...
   Elf64 kernel loaded...
Loading ramdisk...
ramdisk loaded at 02600000, size: 1376 Kbytes
OF stdout device is: /vdevice/vty@30000000
Hypertas detected, assuming LPAR !
```

Figure 4-23 Booting from DVD and Linux installation

Linux is now installed on a temporary RAM disk. If you are using direct I/O, configure the disk by formatting the disks and building the RAID set as covered in the next two sections.

4.2.1 Formatting the disks

Perform the following steps to format the disks:

1. The IBM Power RAID Configuration Utility (iprconfig utility) is used to prepare the physical disks for use by Linux. Preparation of the disks involves formatting of the disk to a format recognized by Linux and the building of a RAID set. When the IBM Power RAID Configuration Utility menu is displayed (Figure 4-24), type option `6` (Work with disk configuration) and press Enter to display the current disk configuration.

```
 IBM Power RAID Configuration Utility

Select one of the following:
    1. Display hardware status
    2. Work with disk arrays
    3. Work with disk unit recovery
    4. Work with SCSI bus configuration
    5. Work with driver configuration
    6. Work with disk configuration
    7. Download microcode
    8. Analyze log

Selection: 6
e=Exit
```

Figure 4-24 IBM Power RAID Configuration Utility main menu

2. The Change Disk Configuration screen (Figure 4-25) displays the current configuration of the disks. Disks with a status of R/W Protected are disks that have a format unrecognizable to Linux. These disks have to be reformatted before they can be used.

> **Note:** Disks that have been formatted for use by i5/OS will have a format that is unrecognizable to Linux. Those disks will have to reformatted following the process given here.

```
 Change Disk Configuration

Type option, press Enter.
  1=Change Disk Configuration

OPT Name   PCI/SCSI Location          Description              Status
--- ------ -------------------------- ------------------------ ---------------
           0000:c8:01.0/0:0:4:0       Advanced Function Disk    R/W Protected
           0000:c8:01.0/0:0:5:0       Advanced Function Disk    R/W Protected
           0000:c8:01.0/0:0:6:0       Advanced Function Disk    R/W Protected
e=Exit   q=Cancel   r=Refresh   t=Toggle
```

Figure 4-25 Change Disk Configuration menu

3. Press e (Exit) to return to the main menu of the IBM Power RAID Configuration Utility menu.
4. To format the disks for use in Linux, type option 3 (Work with disk unit recovery) and press Enter.

5. On the Work with Disk Unit Recovery menu (Figure 4-26), type an option 3 (Initialize and format disk) and press Enter.

```
 Work with Disk Unit Recovery


Select one of the following:

    1. Concurrent add device
    2. Concurrent remove device
    3. Initialize and format disk
    4. Reclaim IOA cache storage
    5. Rebuild disk unit data
    6. Force RAID Consistency Check
    7. Work with resources containing cache battery packs


Selection: 3
e=Exit   q=Cancel
```

Figure 4-26 Work with Disk Unit Recovery menu

6. A list of disks is displayed (Figure 4-27). Enter option 1 (Select) next to each disk unit to be formatted (this will probably be all of the disk units displayed). Press Enter.

```
 Select Disks for Initialize and Format

Type option, press Enter.
  1=Select

OPT Name   PCI/SCSI Location          Vendor   Product ID       Status
--- ------ -------------------------- -------- ---------------- ---------------
1         0000:c8:01.0/0:0:4:0       IBMAS400 XCPR036          R/W Protected
1         0000:c8:01.0/0:0:5:0       IBMAS400 XCPR036          R/W Protected
1         0000:c8:01.0/0:0:6:0       IBMAS400 XCPR036          R/W Protected
e=Exit   q=Cancel   t=Toggle
```

Figure 4-27 Selecting disks for initialize and format

7. A prompt is displayed to confirm the format (Figure 4-28). Press c (Confirm) to confirm the format.

```
 Confirm Initialize and Format Disks

Press 'c' to confirm your choice for 1=Initialize and format.
  q=Return to change your choice.

OPT Name   PCI/SCSI Location          Vendor   Product ID       Status
--- ------ -------------------------- -------- ---------------- ---------------
 1         0000:c8:01.0/0:0:4:0       IBMAS400 XCPR036          R/W Protected
 1         0000:c8:01.0/0:0:5:0       IBMAS400 XCPR036          R/W Protected
 1         0000:c8:01.0/0:0:6:0       IBMAS400 XCPR036          R/W Protected

c=Confirm   q=Cancel   t=Toggle
```

Figure 4-28 Confirming the initialize and format

8. At this point the formatting begins and a status screen is displayed (Figure 4-29). The amount of time the format takes is dependent on the number of disk units and the capacity of each disk.

```
 Initialize and Format Status

You selected to initialize and format a disk

                                    5% Complete
```

Figure 4-29 Initialize and disk format progress

9. After the disk formatting is complete, the Work with Disk Unit Recovery menu will be redisplayed. Type `e` to exit.
10. To verify that the disks are now usable by Linux, type `6` (Work with disk configuration) on the IBM Power RAID Configuration Utility menu and press Enter.
11. On the Change Disk Configuration display (Figure 4-30), note that the status of the disks now shows Zeroed, which indicates that the disks are formatted and ready for use by Linux.

```
 Change Disk Configuration

Type option, press Enter.
  1=Change Disk Configuration

OPT Name   PCI/SCSI Location          Description               Status
--- ------ -------------------------- ------------------------- ---------------
           0000:c8:01.0/0:0:4:0       Advanced Function Disk    Zeroed
           0000:c8:01.0/0:0:5:0       Advanced Function Disk    Zeroed
           0000:c8:01.0/0:0:6:0       Advanced Function Disk    Zeroed

e=Exit   q=Cancel   r=Refresh   t=Toggle
```

Figure 4-30 Change Disk Configuration menu

12. Type e (Exit) to return to the IBM Power RAID Configuration Utility menu.

4.2.2 Building the RAID set

At this point, the disks are formatted and you could exit the iprconfig utility. However, typically most installations that use physical disk for a Linux partition will build a RAID set across the disks to facilitate data protection and improve I/O throughput.

The following steps establish a RAID set across the disks formatted in the previous section:

1. On the IBM Power RAID Configuration Utility menu, type option 2 (Work with disk arrays) and press Enter.
2. On the Work with Disk Arrays menu (Figure 4-31), type option 1 (Display disk array status) and press Enter to display any disk arrays that are currently configured against the storage adapters allocated to the Linux partition.

```
 Work with Disk Arrays

Select one of the following:

    1. Display disk array status
    2. Create a disk array
    3. Delete a disk array
    4. Add a device to a disk array
    5. Format device for RAID function
    6. Format device for JBOD function (512)
    7. Create a hot spare
    8. Delete a hot spare
    9. Force RAID Consistency Check

Selection: 1

e=Exit   q=Cancel
```

Figure 4-31 Work with Disk Arrays menu

3. On the Display Disk Array Status menu (Figure 4-32), notice there are currently no disk arrays configured. A disk array will be built using this process. Press e (Exit) to exit the display and return to the Work with Disk Arrays menu.

```
 Display Disk Array Status

Type option, press Enter.
  1=Display hardware resource information details

OPT Name   PCI/SCSI Location          Description              Status
--- ------ -------------------------- ------------------------ ---------------
No devices found

e=Exit   q=Cancel   r=Refresh   t=Toggle
```

Figure 4-32 Display Disk Array Status display

4. Back on the Work with Disk Arrays menu, type option 2 (Create a disk array) and press Enter.
5. The Create a Disk Array display is shown (Figure 4-33). A list of storage adapters that can have Linux RAID sets built on them is displayed. Type option 1 (create a disk array) next to the storage adapter and press Enter.

```
 Create a Disk Array

Select the adapter.

Type choice, press Enter.
  1=create a disk array

OPT Name   PCI/SCSI Location          Vendor   Product ID       Status
--- ------ -------------------------- -------- --------------   ---------------
 1         0000:c8:01.0/0:            IBM      5703001          Operational

e=Exit   q=Cancel   t=Toggle
```

Figure 4-33 Create a Disk Array display

6. The Select Disk Units for Disk Array menu is displayed (Figure 4-34). This display lists all of the disks that are attached to the storage controller that have a format that is known to Linux. Type option 1 (Select) next to each disk that you want in the RAID set (this will probably be all of the disks listed) and press Enter.

```
 Select Disk Units for Disk Array

Type option, press Enter.
  1=Select

OPT Name   PCI/SCSI Location          Vendor   Product ID       Status
--- ------ -------------------------- -------- ---------------- ---------------
1         0000:c8:01.0/0:0:4:0       IBMAS400 XCPR036          Active
1         0000:c8:01.0/0:0:5:0       IBMAS400 XCPR036          Active
1         0000:c8:01.0/0:0:6:0       IBMAS400 XCPR036          Active

e=Exit   q=Cancel   t=Toggle
```

Figure 4-34 Select Disk Units for Disk Array display

7. The Select Protection Level and Stripe Size display (Figure 4-35) allows for the specification of the parameters of the RAID set. Typically these settings are left at the default. After the parameters have been set, press Enter.

```
 Select Protection Level and Stripe Size

 Default array configurations are shown.  To change
 setting hit "c" for options menu.  Highlight desired
 option then hit Enter

 c=Change Setting

Protection Level . . . . . . . . . . . . :  RAID 5
Stripe Size  . . . . . . . . . . . . . . :  64 k
Queue Depth (default =  12). . . . . . . :  12

Press Enter to Continue

e=Exit   q=Cancel
```

Figure 4-35 RAID set parameters

8. A confirmation screen is displayed (Figure 4-36) that lists the RAID controllers as well as the selected disks. Review the devices listed and if correct, press Enter to confirm the creation of the disk array.

```
 Confirm Create Disk Array

Press Enter to continue.
  q=Cancel to return and change your choice.

OPT Name   PCI/SCSI Location          Vendor   Product ID       Status
--- ------ -------------------------- -------- ---------------- ---------------
 1         0000:c8:01.0/0:            IBM      5703001          Operational
 1         0000:c8:01.0/0:0:4:0       IBMAS400 XCPR036          Active
 1         0000:c8:01.0/0:0:5:0       IBMAS400 XCPR036          Active
 1         0000:c8:01.0/0:0:6:0       IBMAS400 XCPR036          Active

q=Cancel   t=Toggle
```

Figure 4-36 Create Disk Array confirmation display

9. At this point, the system builds the RAID set and a status of progress is displayed (Figure 4-37). The amount of time it takes to build the RAID set is dependent on the number and capacity of the disks in the RAID set.

```
 Create Disk Array Status

You selected to create a disk array

                                    2% Complete

  e=Exit   Return to menu, current operations will continue.
```

Figure 4-37 Create Disk Array Status display

10. After the build of the RAID set is complete, the Work with Disk Arrays menu is redisplayed. Type option `1` (Display disk array status) and press Enter to verify the build of the disk array. Note that a disk array is now displayed as shown in Figure 4-38.

    The `sdb` listed in the Name column is the Linux device name given to the RAID set. This is the device that the Linux installer will create and format file systems on. Press e (Exit) to return to the Work with Disk Arrays menu.

```
 Display Disk Array Status

Type option, press Enter.
  1=Display hardware resource information details

OPT Name   PCI/SCSI Location          Description               Status
--- ------ -------------------------- ------------------------- ---------------
    sdb    0000:c8:01.0/0:255:0:0     RAID 5 Disk Array         Active
           0000:c8:01.0/0:0:4:0         RAID 5 Array Member     Active
           0000:c8:01.0/0:0:5:0         RAID 5 Array Member     Active
           0000:c8:01.0/0:0:6:0         RAID 5 Array Member     Active

e=Exit   q=Cancel   r=Refresh   t=Toggle
```

Figure 4-38 Display Disk Array Status

11. Press e (Exit) to return to the IBM Power RAID Configuration Utility menu.
12. Press e (Exit) to exit the IBM Power Raid Configuration Utility menu.

5

Creating the network support

This chapter presents information about the configuration of networking for IP Telephony on the System i platform. The method for establishing networking for an IP Telephony partition varies, based upon whether the partition has a physical or virtual network card configured.

5.1 Networking with physical interfaces

As discussed earlier in this book, direct attached (or native) network adapters can be allocated to the logical partition and used by the Linux operating system in support of IP Telephony. Configuration of networking in such an environment is simply a case of providing the necessary network parameters (TCP/IP address, subnet mask, gateway/router) during the installation or post-installation via administration tools provided by the IP Telephony application.

5.2 Networking with virtual interfaces

This section describes the steps for configuring support in the i5/OS partition for exposing the virtual LAN connections of the IP Telephony partition to an external network via a physical network connection in the i5/OS partition.

There are several methods available for forwarding traffic between a virtual and physical network. However, only the Proxy ARP method is discussed here because it is the method supported in the IP Telephony environment.

5.2.1 Adding a virtual Ethernet adapter to an i5/OS partition

The use of Proxy ARP to forward traffic between a virtual and physical network requires that a virtual LAN connection be established for the i5/OS partition that will be forwarding the network traffic

> **Note:** The following instructions are provided in the event that a virtual network adapter has not previously been created for the i5/OS partition. If the virtual network adapter *has* been created, then this section can be skipped and you can continue with 5.2.2, "Creating the Ethernet line description in i5/OS" on page 151.

Adding a virtual Ethernet adapter to an i5/OS partition profile

Perform the following steps to add a virtual Ethernet adapter to an i5/OS partition profile:

1. From the HMC, right-click the i5/OS partition profile and select **Properties**.

2. On the Logical Partition Profile Properties window (Figure 5-1), click the **Virtual I/O Adapters** tab.

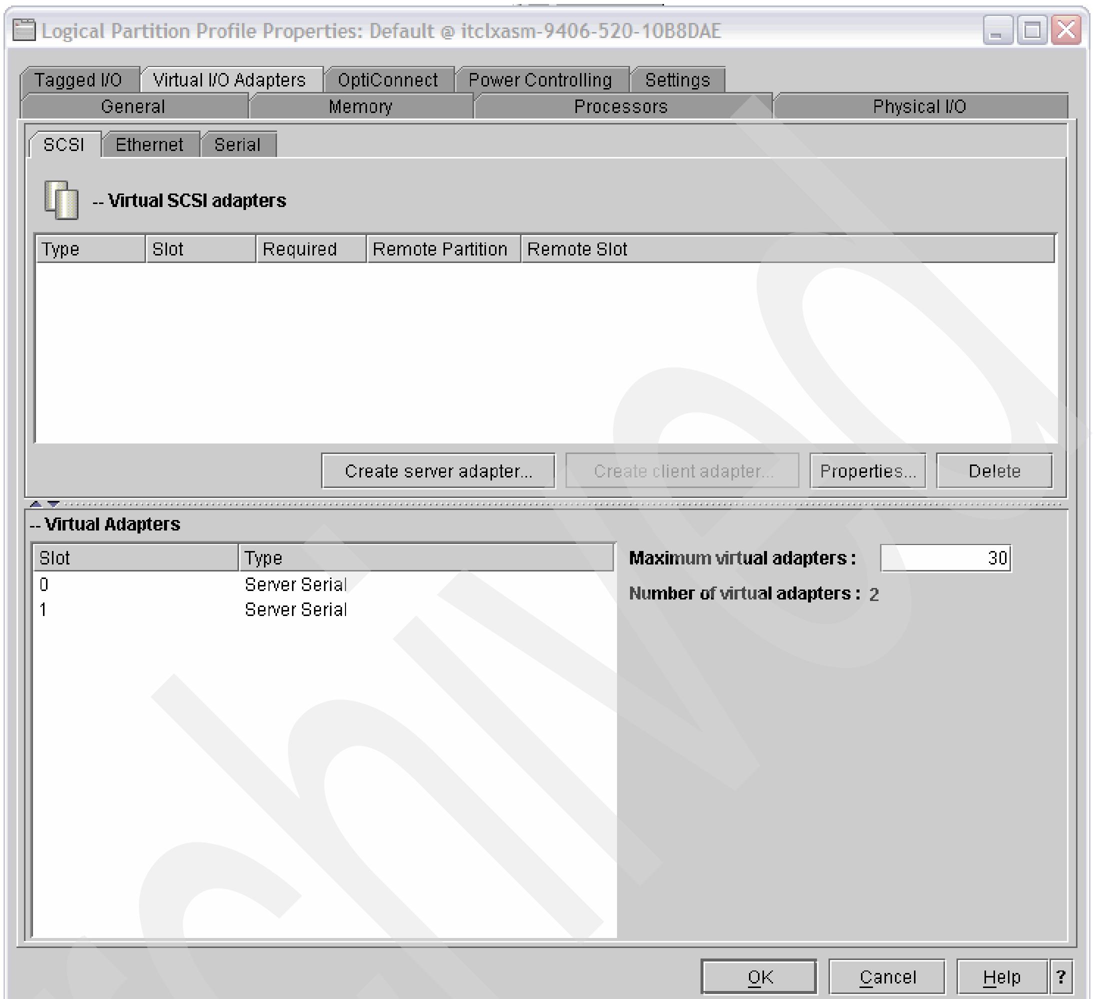

Figure 5-1 Logical Partition Profile Properties, Virtual I/O Adapters tab

3. Click the **Ethernet** sub-tab to display a list of the already configured Ethernet adapters (Figure 5-2).

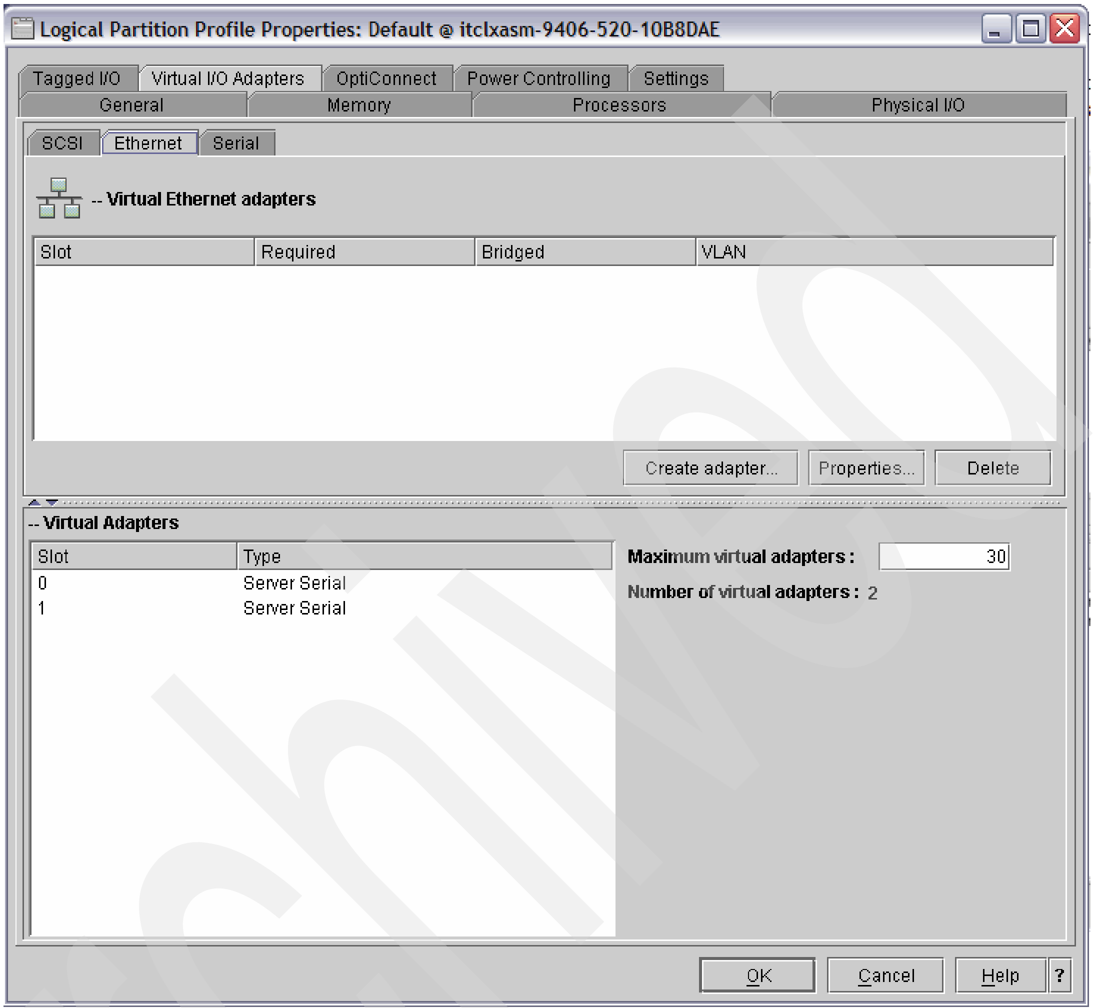

Figure 5-2 Logical Partition Profile Properties, Virtual I/O Adapters tab, Ethernet sub-tab

4. To create a new virtual Ethernet adapter, click the **Create adapter** button.

5. On the Virtual Ethernet Adapter window (Figure 5-3), leave the slot number as provided and enter the Virtual LAN ID number that corresponds to the virtual LAN that the i5/OS partition should have a connection to. This should be the same virtual LAN that the partitions that need to have their traffic forwarded to have a virtual LAN connection configured for. Click **OK**.

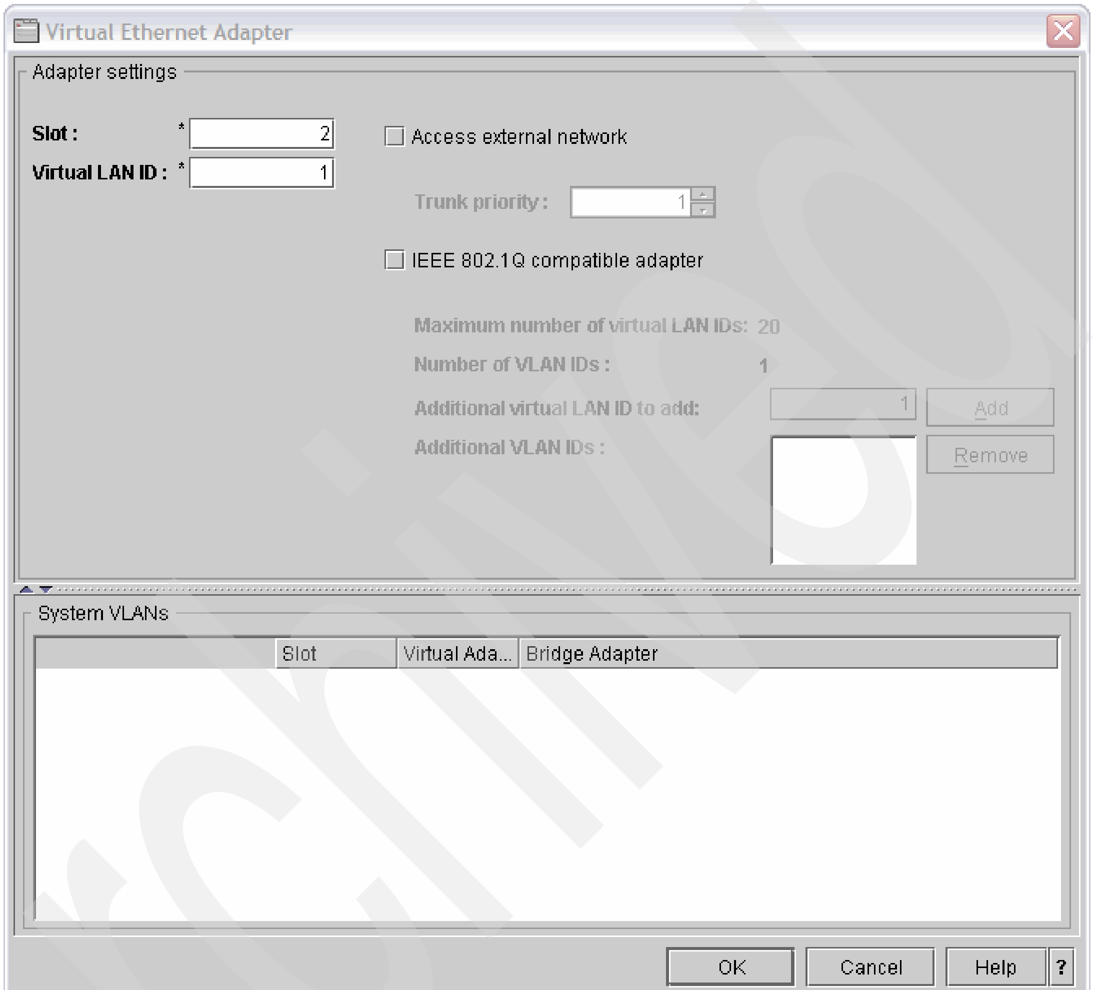

Figure 5-3 Adding a virtual Ethernet adapter

6. At this point, the virtual Ethernet adapter has been created in the partition profile and the Logical Partition Profile Properties window is redisplayed, reflecting the new adapter; see Figure 5-4. Click **OK**.

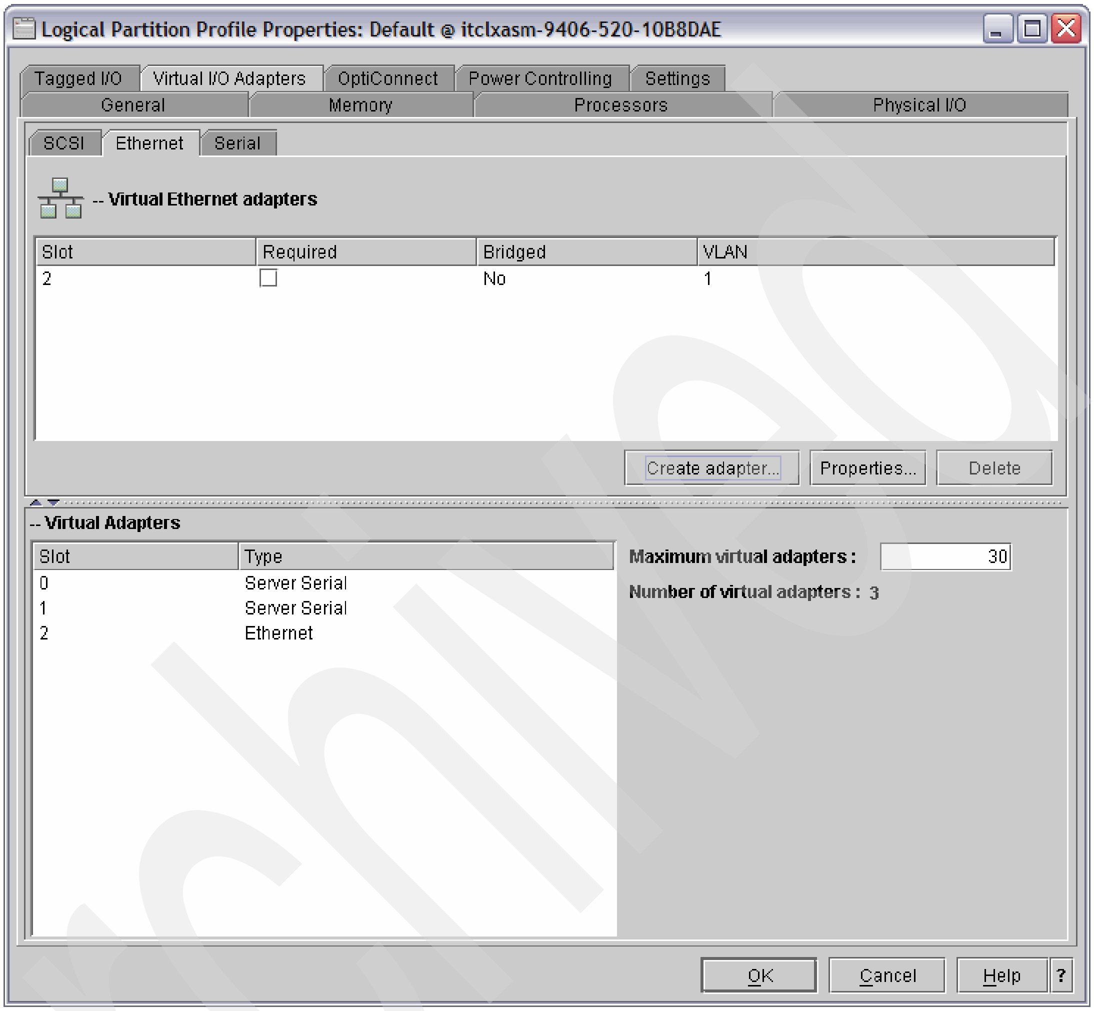

Figure 5-4 Logical Partition Profile Properties - Virtual I/O Adapters - virtual Ethernet adapter added

Dynamically adding the virtual Ethernet adapter to the i5/OS partition

Adding the virtual Ethernet adapter to the i5/OS partition profile means that the next time the partition is activated from the HMC, it will have the newly configured adapter. To use the adapter now, it also needs to be added to the i5/OS partition through the use of Dynamic Logical Partitioning (DLPAR). Perform the following steps:

1. From the HMC, right click the i5/OS partition (not the partition profile) and select **Dynamic Logical Partitioning** → **Virtual Adapter Resources** → **Add/Remove**.

2. On the Dynamic Logical Partitioning window (Figure 5-5), click the **Ethernet** tab and then click the **Create Adapter** button.

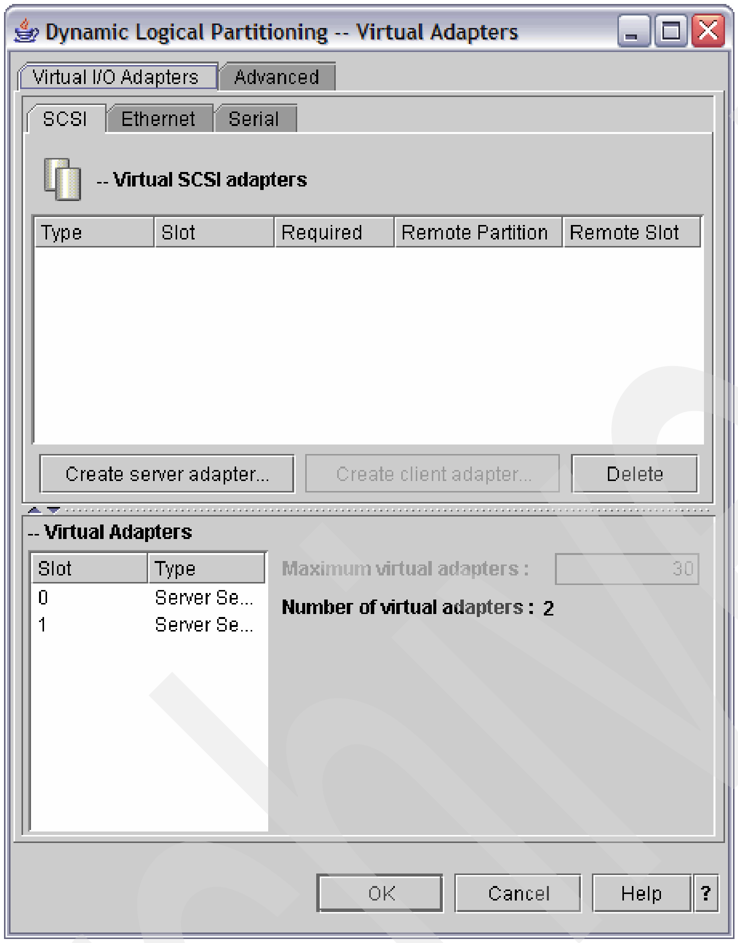

Figure 5-5 Dynamic Logical Partitioning - Virtual Adapters

3. On the Virtual Ethernet Adapter window (Figure 5-6), leave the slot number as provided and enter the Virtual LAN ID number that corresponds to the virtual LAN that the i5/OS partition should have a connection to. This should be the same virtual LAN that the partitions that need to have their traffic forwarded to have a virtual LAN connection configured for. Click **OK**.

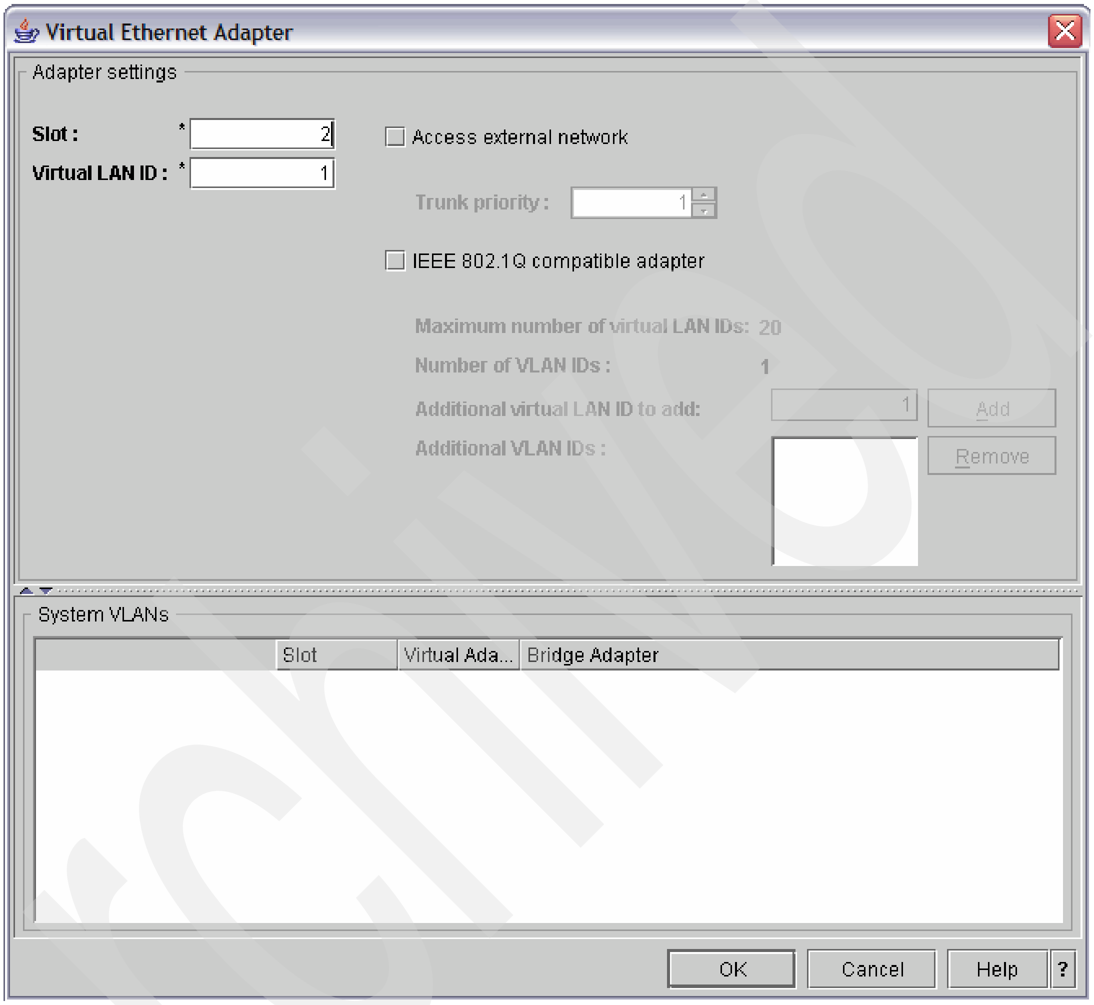

Figure 5-6 Adding the virtual Ethernet adapter

4. The Virtual Ethernet adapter is now displayed in the list of adapters for the i5/OS partition as shown in Figure 5-7. Click **OK** to update the partition.

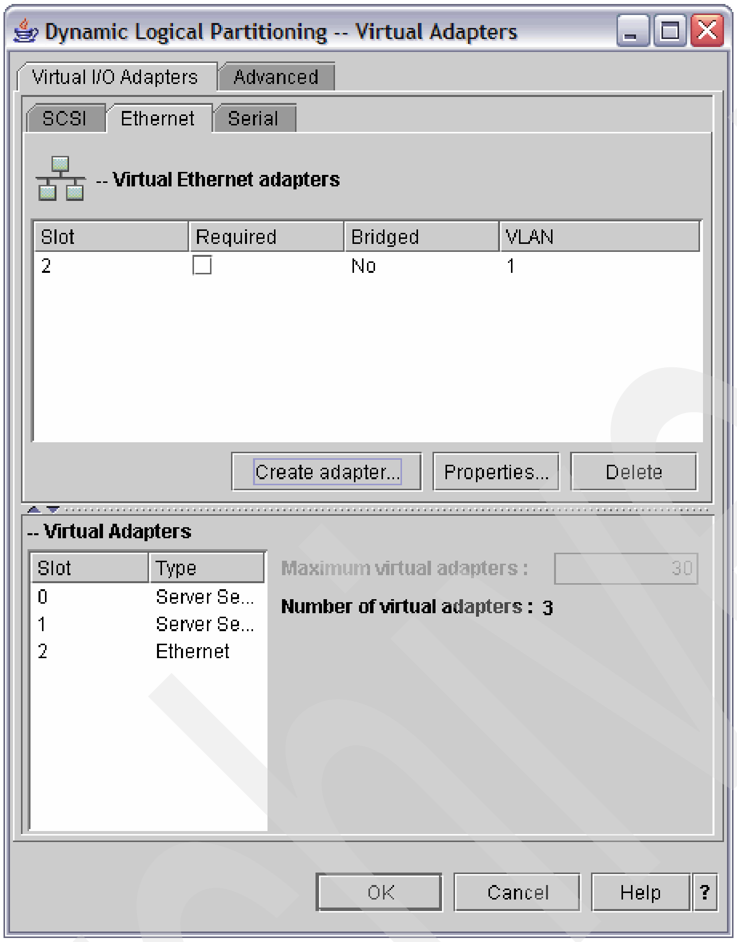

Figure 5-7 Dynamic Logical Partitioning - Virtual Adapters - virtual Ethernet adapter added

5. At this point, a Working dialog window (Figure 5-8) is displayed and the virtual Ethernet adapter is added to the running i5/OS partition.

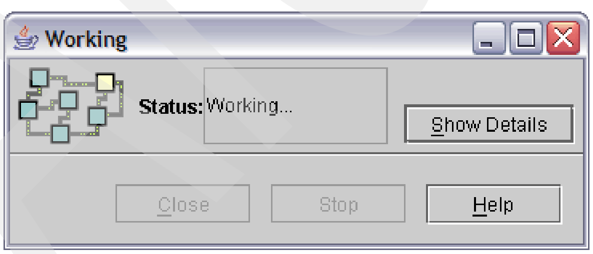

Figure 5-8 Dynamic Logical Partitioning - Working dialog box

5.2.2 Creating the Ethernet line description in i5/OS

After the virtual Ethernet adapter has been added to the i5/OS partition, an Ethernet line description must be created in i5/OS. A review of the communication hardware resources will help to identify the resource for the line description.

Perform the following steps:

1. From a 5250 emulation session, issue the following Work with Hardware Resources (WRKHDWRSC) CL command to review the communication resources:

   ```
   WRKHDWRSC *CMN
   ```

2. On the Work with Communication Resources display (Figure 5-9), a list of the communication resources allocated to the i5/OS partition is displayed. The virtual Ethernet adapter will be a CMNxx resource with a type of 268C.
3. To identify the specific resource, type option 7 (Display resource detail) and press Enter next to the resources that meet the preceding criteria.

```
                     Work with Communication Resources
                                                         System:   S10B8DAE
Type options, press Enter.
  5=Work with configuration descriptions   7=Display resource detail

Opt  Resource        Type  Status                Text
     CMB01           2844  Operational           Combined function IOP
       LIN14         2793  Operational           Comm Adapter
         CMN23       2793  Operational           Comm Port
         CMN24       2793  Operational           Comm Port
       LIN01         2849  Operational           LAN Adapter
         CMN01       2849  Operational           Ethernet Port
     CMB03           268C  Operational           Combined function IOP
       LIN02         6B03  Operational           Comm Adapter
         CMN02       6B03  Operational           Comm Port
       LIN03         6B03  Operational           Comm Adapter
         CMN03       6B03  Operational           Comm Port
       LIN04         268C  Operational           LAN Adapter
 7       CMN36       268C  Operational           Ethernet Port
     CMB02           2844  Operational           Combined function IOP
       LIN15         2849  Operational           LAN Adapter
                                                                    More...
F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure 5-9 Work with Communication Resources display

4. On the Display Resource Detail panel (Figure 5-10), the details for the selected resource are shown. The Location field indicates the mapping of the i5/OS resource to the LPAR resource. In this example, V1 indicates the partition number (1) and C2 indicates the slot number (2) of the virtual Ethernet adapter.

```
                        Display Resource Detail
                                                    System:   S10B8DAE
Resource name  . . . . . . . :   CMN36
Text . . . . . . . . . . . . :   Ethernet Port
Type-model . . . . . . . . . :   268C-001
Serial number  . . . . . . . :   00-00000
Part number  . . . . . . . . :

Location:   U9406.520.10B8DAE-V1-C2-T1

Logical address:
 SPD bus:
  System bus                      255
  System board                    0
  System card                     0
                                                               More...
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure 5-10 Displaying resource detail

5. After the resource has been identified, the Ethernet line description can be created. Enter the Create Line Description (Ethernet) CL command, CRTLINETH, and press F4 to prompt the command.
6. On the Create Line Desc (Ethernet) (CRTLINETH) display (Figure 5-11), enter the following values:
   - **Line description:** It is recommended that the line description name reflect that this is a virtual Ethernet adapter as well as the virtual LAN number. As an example, for a virtual LAN adapter on virtual LAN 1, a name like VRTETH01 might be appropriate.
   - **Resource name:** Enter the communication resource (CMNxx) identified as the resource that maps to the virtual Ethernet adapter.

   Press Enter.

```
                  Create Line Desc (Ethernet) (CRTLINETH)

Type choices, press Enter.

Line description . . . . . . . . VRTETH01        Name
Resource name  . . . . . . . . .  CMN36          Name, *NWID, *NWSD



                                                                Bottom
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 5-11 Create Line Description (Ethernet) (CRTLINETH) display

7. Additional fields are now displayed (Figure 5-12); enter the following values:
   - **Line speed:** The setting of the line speed is dependent on the line speed of the physical interface. The line speed should be set to match the line speed of any associated physical interface to avoid fragmentation of the network packets.
   - **Duplex:** This setting is typically set to *FULL.

   Press Enter.

```
                   Create Line Desc (Ethernet) (CRTLINETH)

 Type choices, press Enter.

 Line description . . . . . . . . > VRTETH01      Name
 Resource name  . . . . . . . . . > CMN36         Name, *NWID, *NWSD
 Online at IPL  . . . . . . . . .   *YES          *YES, *NO
 Vary on wait . . . . . . . . . .   *NOWAIT       *NOWAIT, 15-180 seconds
 Local adapter address  . . . . .   *ADPT         020000000000-FEFFFFFFFFFF...
 Exchange identifier  . . . . . .   *SYSGEN       05600000-056FFFFF, *SYSGEN
 Ethernet standard  . . . . . . .   *ALL          *ETHV2, *IEEE8023, *ALL
 Line speed . . . . . . . . . . .   10M           10M, 100M, 1G, *AUTO
 Duplex . . . . . . . . . . . . .   *FULL         *HALF, *FULL, *AUTO



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 5-12 Create Line Description (Ethernet) (CRTLINETH) display - additional fields

8. Additional fields will be displayed. Press Enter again to complete the creation of the Ethernet line description.
9. After the Ethernet line description has been created, vary it on by issuing the following Vary Configuration (VRYCFG) CL command:

```
VRYCFG CFGOBJ(VRTETH01) CFGTYPE(*LIN) STATUS(*ON)
```

5.2.3 Enabling datagram forwarding

For Proxy ARP, the TCP/IP attribute datagram forwarding must be enabled. Datagram forwarding allows network packets to be forwarded between network interfaces on the system.

To ensure that datagram forwarding is enabled, issue the following Change TCP/IP Attributes (CHGTCPA) CL command:

```
CHGTCPA IPDTGFWD(*YES)
```

5.2.4 Implementing proxy ARP on i5/OS

Proxy ARP is a method for forwarding traffic between virtual and external (or physical) Ethernet networks. It is a built-in function of TCP/IP and uses transparent subnetting to associate a logical partition's virtual interface with an external interface. Essentially, i5/OS becomes a router for a subnet of addresses that will be assigned to the virtual LAN. Proxy ARP is the recommended method to use for virtual Ethernet configurations.

Figure 5-13 shows an example of proxy ARP. A subnet is established that ranges from 10.1.1.25 to 10.1.1.30. This range of addresses is assigned to the virtual LAN and is associated with an interface on the physical LAN (in this case, 10.1.1.3) to act as the router for the subnet. The range of addresses for the subnet is determined by an address on the network along with the subnet mask.

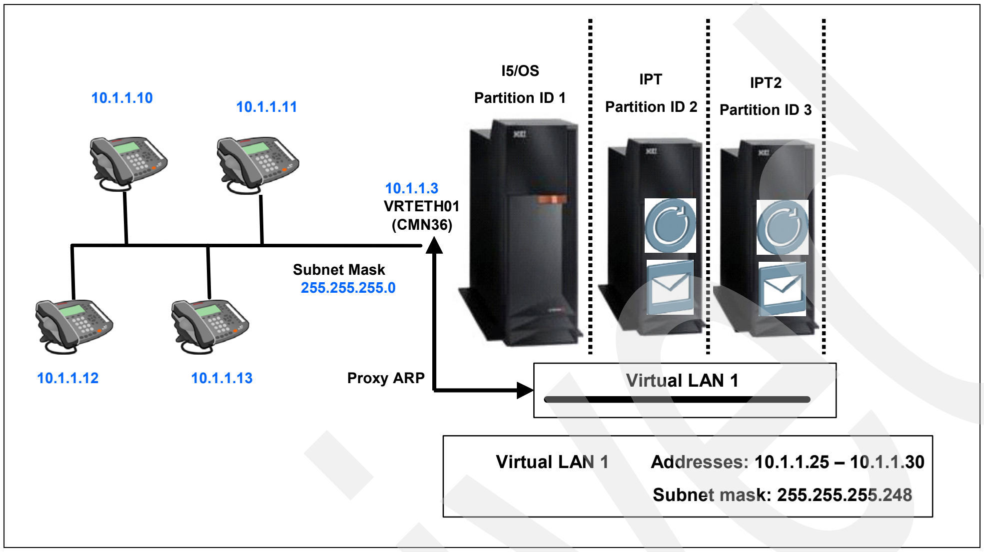

Figure 5-13 Proxy ARP example

There are a number of rules that the subnet must meet:

- The size of the subnet must be a power of 2.
- The first address of the subnet cannot be assigned to a partition. The first address is the network address.
- The last address of the subnet cannot be assigned to partition. The last address is the broadcast address.
- The subnet must be contained wholly within the overall network that the associated i5/OS physical network is attached to.

> **Note:** A range of eight IP addresses for proxy ARP is recommended for System i IP Telephony.

Highlights of the proxy ARP environment can be summarized as follows:

- Traffic intended for partitions on the virtual LAN is routed to the i5/OS physical network interface.
- Traffic is then re-broadcast on the virtual LAN via the i5/OS connection on that LAN.
- The Linux operating system running in the IP Telephony partition sees the network traffic just like in any other network structure.
- DNS entries point to the address on the virtual LAN.
- The virtual LAN address range must be a subset of the physical LAN addresses.
- The virtual LAN MTU (frame size) should be equal to or less than that of the physical LAN.

The following steps walk through the setup of the components in i5/OS to support proxy ARP.

> **Note:** These steps assume that the i5/OS partition and IP Telephony partition have already been defined with virtual Ethernet adapters on the same virtual LAN, and that the Ethernet line description has been created and varied on.

Determining the range of addresses for proxy ARP

As indicated earlier, proxy ARP is the establishment of a range of addresses that will be associated with a single physical interface. An IP subnet calculator is a useful tool to help determine a range of addresses for the subnet. One free example is the IP subnet calculator that is available from Wild Packets, located at the following Web site:

http://www.wildpackets.com/products/free_utilities/ipsubnetcalc/overview

Using the example in Figure 5-13 on page 155, an IP subnet calculator could be used to establish the range of addresses. In Figure 5-14, an address was specified that should fall within the range of addresses for the subnet. Then the subnet mask was used to indicate the size of the subnet (for example, 255.255.255.248 indicates a subnet of eight addresses.) By using the values in Figure 5-14, a subnet is defined with the following values:

- Network address = 10.1.1.24
- Range of usable addresses = 10.1.1.25 - 10.1.1.30
- Broadcast address= 10.1.1.31

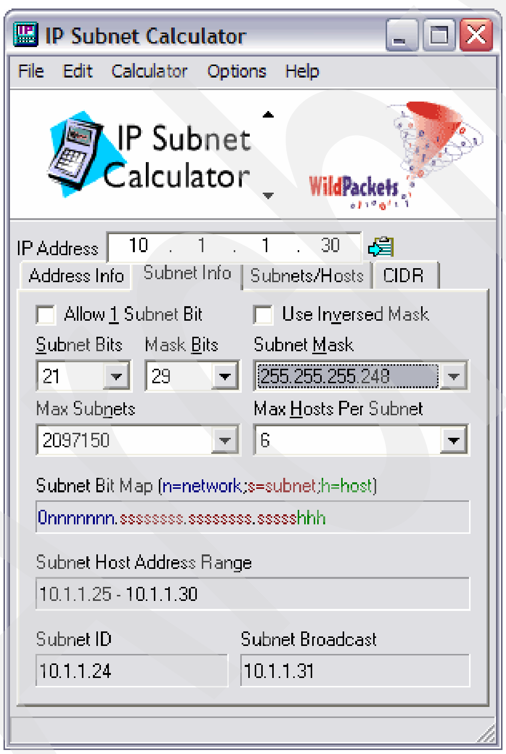

Figure 5-14 IP Subnet Calculator

Now that the subnet range has been defined, the next step is to create the TCP/IP interface for i5/OS on the virtual LAN.

Creating the TCP/IP interface for the virtual LAN adapter

After the Ethernet line description has been created and the subnet defined, you are ready to define the TCP/IP interface for i5/OS on the virtual LAN. Perform the following steps:

Note: Typically i5/OS will be assigned the first usable address in the subnet.

1. From an i5/OS command line, issue the following Add TCP/IP Interface (ADDTCPIFC) CL command to create the TCP/IP interface:

   ```
   ADDTCPIFC INTNETADR('10.1.1.25') LIND(VRTETH01) SUBNETMASK('255.255.255.248')
   LCLIFC('10.1.1.3')
   ```

   Where:

   – INTNETADR is the address of the i5/OS interface on the virtual LAN.

   – LIND is the name of the Ethernet line description for the virtual LAN.

   – SUBNETMASK is the size of the subne.t

   – LCLIFC is the address of the physical network interface in i5/OS that will forward traffic to the virtual LAN.

   You can also prompt the ADDTCPIFC CL command by pressing F4 and complete the fields as shown in Figure 5-15.

```
                      Add TCP/IP Interface (ADDTCPIFC)

Type choices, press Enter.

Internet address . . . . . . . .   10.1.1.25
Line description . . . . . . . .   VRTETH01      Name, *LOOPBACK...
Subnet mask  . . . . . . . . . .   255.255.255.248
Alias name . . . . . . . . . . .   *NONE
Associated local interface . . .   10.1.1.3
Type of service  . . . . . . . .   *NORMAL       *MINDELAY, *MAXTHRPUT...
Maximum transmission unit  . . .   *LIND         576-16388, *LIND
Autostart  . . . . . . . . . . .   *YES          *YES, *NO
PVC logical channel identifier                   001-FFF
               + for more values
X.25 idle circuit timeout  . . .   60            1-600
X.25 maximum virtual circuits  .   64            0-64
X.25 DDN interface . . . . . . .   *NO           *YES, *NO
TRLAN bit sequencing . . . . . .   *MSB          *MSB, *LSB


                                                                     Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 5-15 Add TCP/IP Interface (ADDTCPIFC) display

2. After the TCP/IP interface has been created, it can be varied on with the following Start TCP/IP Interface (STRTCP) CL command:

   ```
   STRTCPIFC INTNETADR('10.1.1.25')
   ```

At this point, the i5/OS setup to support proxy ARP is complete.

6

Installing IP Telephony, IP Messaging and IP Conferencing

This chapter describes the installation of IP Telephony, IP Messaging, and IP Conferencing. Installing on virtual I/O and direct attached (native) I/O is covered.

> **Important:** Before performing these tasks, ensure that your IP Telephony partition is created and that you have loaded the correct DVD in the DVD drive, or that the correct DVD image is mounted in the image catalog.

6.1 Activating the IP Telephony partition with virtual I/O

To install the 3Com IP Telephony software, you must first activate the IP Telephony partition. Regardless of whether the logical partition was created with VPM or the HMC, if virtual I/O resources are being used, then the environment must be started from a vary on operation of the Network Server Description (NWSD).

Based on information presented earlier in this book, your Network Server Description should already be configured with the Power Control parameter set to *YES; refer to 4.1.1, "Creating the Network Server Description (NWSD)" on page 120.

> **Note:** The console for the IP Telephony partition should be displayed prior to performing a vary on of the Network Server Description (NWSD) for the IP Telephony environment.

Perform the following steps:

1. From the i5/OS command line, vary on the Network Server Description (NWSD):

   ```
   VRYCFG CFGOBJ(IPT1) CFGTYPE(*NWS) STATUS(*ON)
   ```

2. The startup menu shown in Figure 6-1 will be displayed. Press 1 to start the SMS menu.

```
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM

     1 = SMS Menu                          5 = Default Boot List
     8 = Open Firmware Prompt              6 = Stored Boot List

Memory      Keyboard     Network     SCSI     Speaker
```

Figure 6-1 Activating the IP Telephony partition

> **Note:** If IP Telephony is being installed on a partition with physical (native) disk resources, the partition will have already been started to format the disks; see 4.2, "Native or direct attached storage" on page 127.

6.2 SMS menu

When the IP Telephony partition is activated, the System Management Services (SMS) menu appears in the virtual terminal window. Perform the following steps:

1. From the SMS menu in the virtual terminal window (Figure 6-2), type option `5` (Select Boot Options) and press Enter.

```
Version SF240_219
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Main Menu
1.   Select Language
2.   Setup Remote IPL (Initial Program Load)
3.   Change SCSI Settings
4.   Select Console
5.   Select Boot Options

-------------------------------------------------------------------------------
Navigation Keys:

                                            X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 5
```

Figure 6-2 SMS menu

2. On the Multiboot menu (Figure 6-3), type option `1` (Select Install/Boot Device) and press Enter.

```
Version SF240_219
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Multiboot
1.   Select Install/Boot Device
2.   Configure Boot Device Order
3.   Multiboot Startup <OFF>

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen         X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 1
```

Figure 6-3 Multiboot menu

3. On the Select Device Type menu (Figure 6-4), type option 3 (CD/DVD) and press Enter.

```
Version SF240_219
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Device Type
1.   Diskette
2.   Tape
3.   CD/DVD
4.   IDE
5.   Hard Drive
6.   Network
7.   List all Devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 3
```

Figure 6-4 Select Device Type menu

4. On the Select Media Type menu (Figure 6-5), type option 1 (SCSI) and press Enter.

```
Version SF240_219
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Media Type
1.   SCSI
2.   SSA
3.   SAN
4.   IDE
5.   ISA
6.   List All Devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 1
```

Figure 6-5 Select Media Type menu

5. When the list of the possible media adapters to boot from is displayed (Figure 6-6), specify the option for the appropriate media adapter and press Enter.

> **Note:** If virtual I/O is being used to access the installation source from an i5/OS CD/DVD device, the media adapter to select will have a `/vdevice/v-scsi` indication.

```
Version SF240_261
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Media Adapter
1.   U9406.520.108A36C-V5-C2-T1   /vdevice/v-scsi@30000002
2.   List all devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 1
```

Figure 6-6 Selecting the media adapter

6. From the list of SCSI devices displayed (Figure 6-7), type the option that represents the CD/DVD drive that the installation media has been mounted on and press Enter.

> **Note:** Make sure you have loaded the correct DVD into the DVD drive. Depending on what you plan to install, select the appropriate volume:
>
> - 3Com IP Telephony and IP Messaging for IBM System i - Version 7.2
> - 3Com IP Conferencing for IBM System i - Version 7.2

```
Version SF240_219
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Device
Device  Current  Device
Number  Position  Name
1.        1      SCSI CD-ROM
                 ( loc=U9406.520.10B8DAE-V2-C2-T1-W8020000000000000-L0 )
2.        -      SCSI CD-ROM
                 ( loc=U9406.520.10B8DAE-V2-C2-T1-W8120000000000000-L0 )

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 1
```

Figure 6-7 Select Device menu

7. On the Select Task menu (Figure 6-8), type option 2 (Normal Mode Boot) and press Enter.

```
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Select Task

SCSI CD-ROM
    ( loc=U9406.520.10B8DAE-V2-C2-T1-W8020000000000000-L0 )

 1.   Information
 2.   Normal Mode Boot
 3.   Service Mode Boot

-------------------------------------------------------------------------------
 Navigation keys:
 M = return to Main Menu
 ESC key = return to previous screen         X = eXit System Management
Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 2
```

Figure 6-8 Select Task menu

8. When prompted to exit (Figure 6-9), type option 1 (Yes) and press Enter.

```
 Version SF240_219
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Are you sure you want to exit System Management Services?
 1.   Yes
 2.   No

-------------------------------------------------------------------------------
 Navigation Keys:

                                             X = eXit System Management
Services
-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 1
```

Figure 6-9 Exit menu

> **Note:** If you did not select the correct device or if you have not loaded the correct DVD, the following message is displayed when you boot the partition:
>
> `No Operating Systems Installed`
>
> If this happens, go back and select another device or load the correct DVD.

9. The installation process starts with a boot from the DVD to install Linux. You first see the display shown in Figure 6-10 scroll by.

```
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM                             IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM     STARTING SOFTWARE       IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM        PLEASE WAIT...       IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM                             IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM IBM
```

Figure 6-10 Starting the IP Telephony installation program

10. When you see the text `Welcome to the 3Com VCX for System i installation disc.` scroll by (as shown in Figure 6-11), you know installation is started; see Figure 6-11.

```
Elapsed time since release of system processors: 1414 mins 26 secs

Config file read, 789 bytes
***************************************************************************
Welcome to the 3Com VCX for System i installation disc.

This disc supports installation of the VCX Linux operating system and
VCX applications to the IBM System i family of servers.

When the system boots, type 'install' to begin.

The default kernel will boot shortly.  Press <tab> to show alternatives.
***************************************************************************
Welcome to yaboot version 1.3.12
Enter "help" to get some basic usage information
boot: ibmpower-hvc0
Please wait, loading kernel...
   Elf64 kernel loaded...
Loading ramdisk...
ramdisk loaded at 02600000, size: 1376 Kbytes
OF stdout device is: /vdevice/vty@30000000
Hypertas detected, assuming LPAR !
```

Figure 6-11 Booting from DVD and Linux installation

Linux is now installed on a temporary RAM disk.

6.3 Installing IP Telephony, Messaging and Conferencing

> **Note:** The installation shown in this section was captured during the installation of IP Telephony and IP Messaging. However, the steps shown can also be used to cover installation of IP Conferencing. There are a few differences, which are marked.

The IP Telephony installation process is mostly automated. The only interactions are to start the installation, confirm the End User License Agreement and to confirm `yes` to accept to continue a few times, including a reboot as the final part of the installation.

Perform the following steps to install the IP Telephony and Messaging code:

1. From the IP Telephony partition console, type `install` and press Enter to start the installation process; see Figure 6-12.

```
Welcome to the 3Com VCX for System i Installation Disc!

Type 'install' to begin the VCX installation.
livecd root # install
```

Figure 6-12 Starting the installation

2. Type `yes` to start the installation, as shown in Figure 6-13.

```
**********************************************************************
*                         3Com Corporation                           *
*                  VCX for IBM System i Installer                    *
**********************************************************************

This tool installs the VCX operating system and applications.

The installation process will irreversably reconfigure the disk storage
for this LPAR.

Enter 'yes' to install, or anything else to exit: yes
```

Figure 6-13 Confirming the installation

3. Press Enter to view the 3Com End User License Agreement; see Figure 6-14.

```
In order to install the VCX software, you must view the 3Com End User
License Agreement and agree to its terms.  Press Enter to display the EULA.
```

Figure 6-14 Viewing the End User License Agreement

4. Read and understand the agreement, press the space bar to continue to the next page, and do this until you reach the end of the text. When the text `/opt/3com/EULA.txt lines 166-188/188 (END)` appears on the screen, press Enter or the space bar to exit the agreement.

5. Accept the agreement, shown in Figure 6-15, by typing `yes` and pressing Enter.

```
IMPORTANT:  READ BEFORE YOU DOWNLOAD, INSTALL, OR USE THIS SOFTWARE

3COM END-USER SOFTWARE LICENSE AGREEMENT

YOU SHOULD CAREFULLY READ THE FOLLOWING TERMS AND CONDITIONS BEFORE
DOWNLOADING, INSTALLING, AND/OR USING THIS SOFTWARE, THE USE OF WHICH IS
.......
.......
.......
.......
By Entering 'yes' below, you acknowledge having read and agreed
to the terms of the 3Com End User License Agreement.
If you do not agree with these terms, Enter anything else to
terminate the installation.

“/opt/3com/EULA.txt lines 166-188/188 (END)”

Do you agree to the terms of the EULA? : yes
```

Figure 6-15 Accepting the End User License Agreement

6. If you type `yes`, the installation continues. Typing anything else will terminate the installation and you will get the `Livecd root #` prompt again. At the prompt can you restart installation again by typing `install`.
7. As shown in Figure 6-16, you see the disk storage is being prepared.

```
Installing VCX on device /dev/sda

Partitioning the disk storage on device /dev/sda
SCSI device sda: 137330688 512-byte hdwr sectors (70313 MB)
sda: cache data unavailable
sda: assuming drive cache: write through
SCSI device sda: 137330688 512-byte hdwr sectors (70313 MB)
sda: cache data unavailable
sda: assuming drive cache: write through

.......
.......
.......
.......

Labelling partitions

Installing boot loader

Configuring partition to boot from Hard Disk by default

Launching VCX application installation
```

Figure 6-16 Disk storage being prepared

8. At this point, there is a difference between installing IP Telephony and IP Messaging and installing IP Conferencing.

   Figure 6-17 shows installing IP Telephony and IP Messaging; the screen scrolls by without any interaction.

```
---------------------------- Confirm Selection ----------------------------

You have chosen to install:
  Version 7_2_5_5  / All configuration types (selectable) (all)
```

Figure 6-17 Automatic confirmation when installing IP Telephony and Messaging

   Figure 6-18 shows that when installing IP Conferencing, you need to confirm your selection by typing `yes` and pressing Enter.

```
---------------------------- Confirm Selection ----------------------------

You have chosen to install:
  Version 7.2.49  / All configuration types (selectable) (all)

*** WARNING *** Once you confirm this selection, you cannot change it.

Are you absolutely certain that you wish to configure this system as listed
above?  If you answer 'no' here the utility will exit without making any
changes.

Confirm your selection and configure the disk? [no]: yes
```

Figure 6-18 Manual confirmation when installing IP Conferencing

9. The installation starts, as shown in Figure 6-19.

```
-------------------------- Software Installation --------------------------
Software installation will now be performed.  This process may take a
number of minutes, during which there may be long pauses with no output.

*** DO NOT INTERRUPT OR POWER OFF SYSTEM WHILE INSTALLATION IS IN PROGRESS ***

Installing RPM /opt/3com/release-files/7_2_5_5/pre/vcx-users-2.0.1-1.noarch.rpm
Preparing...              ########################################### [100%]
   1:vcx-users            ########################################### [100%]
Changing password for user oracle.
passwd: all authentication tokens updated successfully.
Changing password for user tomcat.
passwd: all authentication tokens updated successfully.
Changing password for user cworks.
passwd: all authentication tokens updated successfully.
Changing password for user vcx.
passwd: all authentication tokens updated successfully.
Changing password for user app.
passwd: all authentication tokens updated successfully.
vcx-install of /opt/3com/release-files/7_2_5_5/pre/vcx-users-2.0.1-1.noarch.rpm
succeeded
Installing RPM /opt/3com/release-files/7_2_5_5/pre/oracle-10.2.0.1-1.ppc64.rpm
Preparing...              ########################################### [100%]
   1:oracle               ########################################### [100%]
vcx-install of /opt/3com/release-files/7_2_5_5/pre/oracle-10.2.0.1-1.ppc64.rpm
succeeded
Installing selected version using install-upgrade
```

Figure 6-19 Installation starting

10. The OEM selection (Figure 6-20) only shows when installing IP Conferencing; type option 1 (3Com OEM Package) and press Enter.

```
------------------------- Pre-Installation Checks -------------------------
Checking that required files are present...

Multiple OEM packages were detected. A single package must be chosen
for installation, which will determine the system's OEM identity.
If you are building a master disk for customer use, be especially careful
that the correct OEM package is selected.  Available options:

  1. oem-a-7.2.5-1 : 3Com OEM Package
  2. oem-b-7.2.5-1 : Huawei-3Com OEM Package

Your choice? : 1
```

Figure 6-20 Selecting the OEM package when installing IP Conferencing

11. When the installation completes, type `yes` and press Enter to perform a reboot; see Figure 6-21.

```
------------------- Installation Completed Successfully -------------------
------------------ VCX version 7_2_5_5 is now available -------------------
Version installation succeeded.

System configuration was successful.
Installation is complete.
Next you must reboot.

Enter 'yes' to reboot, anything else to exit: yes
```

Figure 6-21 Installation complete

12. The partition reboots to complete the IP Telephony installation; see Figure 6-22.

```
INIT: Switching to runlevel: 6
INIT: Sending processes the TERM signal
INIT: Sending processes the KILL signal
 * Stopping local ...                                                    [ok]
 * Stopping syslog-ng ...                                                [ok]
 * Stopping lo
 *   Shutting down lo ...                                                [ok]
 * Stopping pwgen ...                                                    [ok]
 * Unmounting filesystems ...                                            [ok]
 * Shutting down the Logical Volume Manager
  Locking type 1 initialisation failed.
  Locking type 1 initialisation failed.
 * Finished Shutting down the Logical Volume Manager
 * Shutting down RAID devices (mdadm) ...                                [ok]
 * Remounting remaining filesystems readonly ...                         [ok]
```

Figure 6-22 Rebooting the IP Telephony partition

13. During reboot, it starts Kudzu (the hardware detection and configuration tool). Press any key to continue; see Figure 6-23.

```
Hardware Discovery Utility 1.1.95.15                     (C) 2003 Red Hat, Inc.

         lqqqqqqqqqqqqqqqqqqqqu Welcome to Kudzu tqqqqqqqqqqqqqqqqqqqqqk
         x                                                             x
         x Welcome to Kudzu, the Red Hat Linux hardware detection      x
         x and configuration tool.                                     x
         x                                                             x
         x On the following screens you will be able to configure      x
         x any new or removed hardware for your computer.              x
         x                                                             x
         x                Press any key to continue.                   x
         x                                                             x
         x         Normal bootup will continue in 17 seconds.          x
         x                                                             x
         mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj

 <Tab>/<Alt-Tab> between elements   |   <Space> selects  |   <F12> next screen
```

Figure 6-23 Kudzu hardware detection and configuration tool

14. If Kudzu detects hardware (new or first time usage), it will display the Hardware Added window shown in Figure 6-24. To configure resources such as Ethernet cards (physical or virtual), press F2 (Configure) to configure the detected hardware.

> **Note:** This will only occur the first time you boot the IP Telephony partition, or if you change the hardware configuration; for example, if you replace a Network Interface Card (NIC). Replacing a NIC will affect the VCX machine-id, which is the basis for the license keys. This means that if you replace a network card, you must also get a new license key for your IP Telephony environment to function.
>
> For virtual I/O, if you use virtual Ethernet and change the VLAN ID or slot numbers, you then need to get a new license key as well; see 2.10, “IP Telephony licenses” on page 48.

```
Hardware Discovery Utility 1.1.95.15                 (C) 2003 Red Hat, Inc.

      +-----------------------¦ Hardware Added +-------------------------+
      ¦                                                                  ¦
      ¦ The following network card has been added to your system:        ¦
      ¦         Advanced Micro Devices [AMD] 79c970 [PCnet32 LANCE]      ¦
      ¦                                                                  ¦
      ¦ You can choose to:                                               ¦
      ¦                                                                  ¦
      ¦ 1) Configure the device.                                         ¦
      ¦ 2) Ignore the device. No configuration will be added, but you    ¦
      ¦ will not be prompted if the device is detected on subsequent     ¦
      ¦ reboots.                                                         ¦
      ¦ 3) Do nothing. No configuration will be added, and the device    ¦
      ¦ will show up as new if it is detected on subsequent reboots.     ¦
      ¦                                                                  ¦
      ¦            +-----------+  +--------+  +------------+             ¦
      ¦            ¦ Configure ¦  ¦ Ignore ¦  ¦ Do Nothing ¦             ¦
      ¦            +-----------+  +--------+  +------------+             ¦
      +------------------------------------------------------------------+

 <F2> Configure / Unconfigure All  |  <F3> Ignore / Keep All  |  <F4> Cancel
```

Figure 6-24 Hardware Discovery Utility

15. Installation completes (Figure 6-25). At this point you should be working with 3Com or an accredited 3Com Business Partner for the VCX configuration.

```
---------------------------------------------------------------------------
------- ALERT: VCX Configuration Required; VCX Services Not Started -------
---------------------------------------------------------------------------

One or more VCX components in the currently selected VCX version require
initial configuration.  No VCX services can be started until this
configuration is completed.

To perform this configuration, log in as root and run 'vcx-setup'.
VCX Linux release 6.2.1
Kernel 2.6.9-42.ELvcx on an ppc64

vcxhost login:
```

Figure 6-25 VCX installation completed

VCX configuration and license keys are now needed to get phones, gateways, and connection to PSTN to function.

If you are using HMC and virtual I/O, continue with 6.4, “Changing the Network Server Description after install” on page 173.

If you are using VPM and virtual I/O, continue with 6.5, “Configuring the VCX network to test network functions” on page 176.

If you are using HMC and direct I/O, continue with 6.5, “Configuring the VCX network to test network functions” on page 176.

6.4 Changing the Network Server Description after install

> **Important:** The information in this section only applies for an HMC-managed system using virtual I/O.
>
> For an HMC-managed system using direct I/O or a VPM-managed system using virtual I/O, go to 6.5, “Configuring the VCX network to test network functions” on page 176.

Perform the following steps to change the Network Server Description (NWSD):

1. From the HMC, right-click the IP Telephony partition and select **Shut Down Partition**; see Figure 6-26.

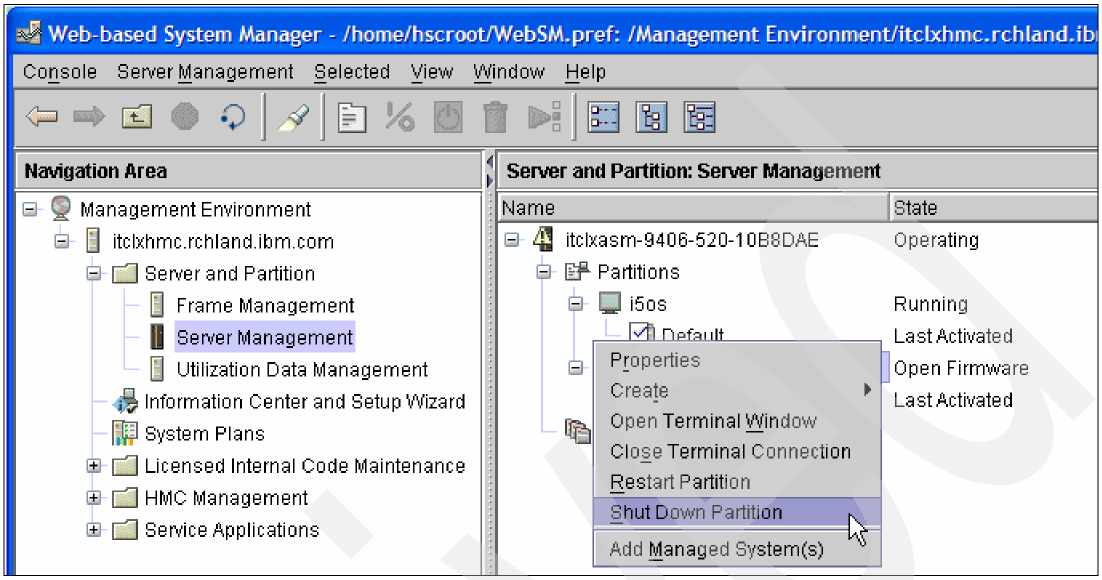

Figure 6-26 Shutting down the IP Telephony partition

2. When you get the Shut Down Partition window (Figure 6-27), select **Immediate** and click **OK** to shut down the IP Telephony partition without any delays.

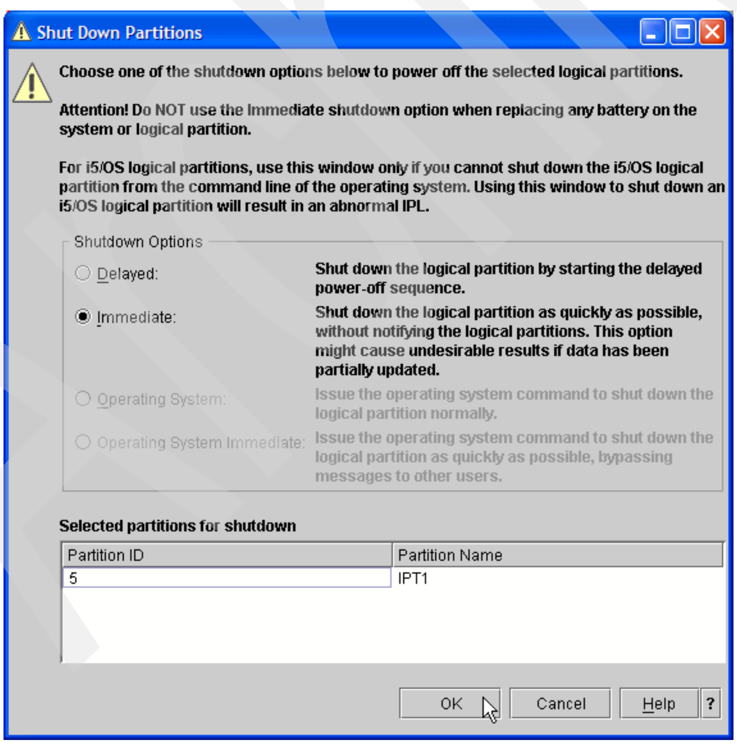

Figure 6-27 Shutting down the IP Telephony partition immediately

3. On the Shut Down Partition confirmation window (Figure 6-28), click **Yes** to proceed.

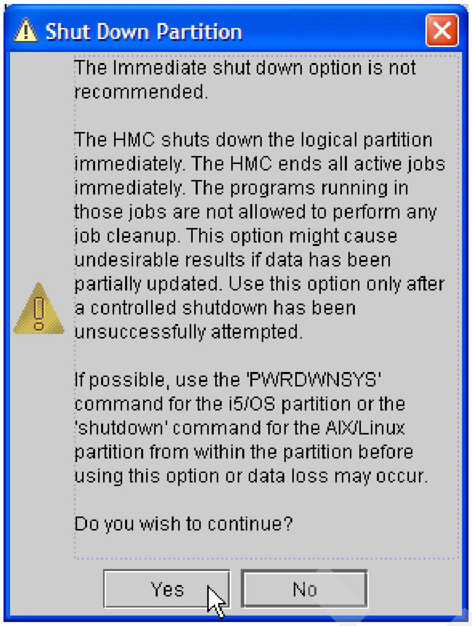

Figure 6-28 Shutting down the IP Telephony partition confirmation

4. If (depending on HMC version) you get the replace cache battery confirmation window shown in Figure 6-29, click **No** to proceed with system shutdown.

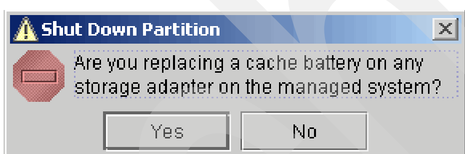

Figure 6-29 Replace cache battery confirmation message

5. The partition should now be shut down. Perform the following steps to change the Network Server Description:

   a. Vary off the Network Server Description

      `VRYCFG CFGOBJ(IPT1) CFGTYPE(*NWS) STATUS(*OFF)`

   b. Change the Network Server Description

      `CHGNWSD NWSD(IPT1) IPLSRC(*NWSSTG) PWRCTL(*YES)`

   c. Vary on the Network Server Description

      `VRYCFG CFGOBJ(IPT1) CFGTYPE(*NWS) STATUS(*ON)`

6. The partition should now start; you can use the HMC to verify that the partition is started. Right-click the IP Telephony partition and select **Open Terminal Window** (Figure 6-30), or use PuTTY.

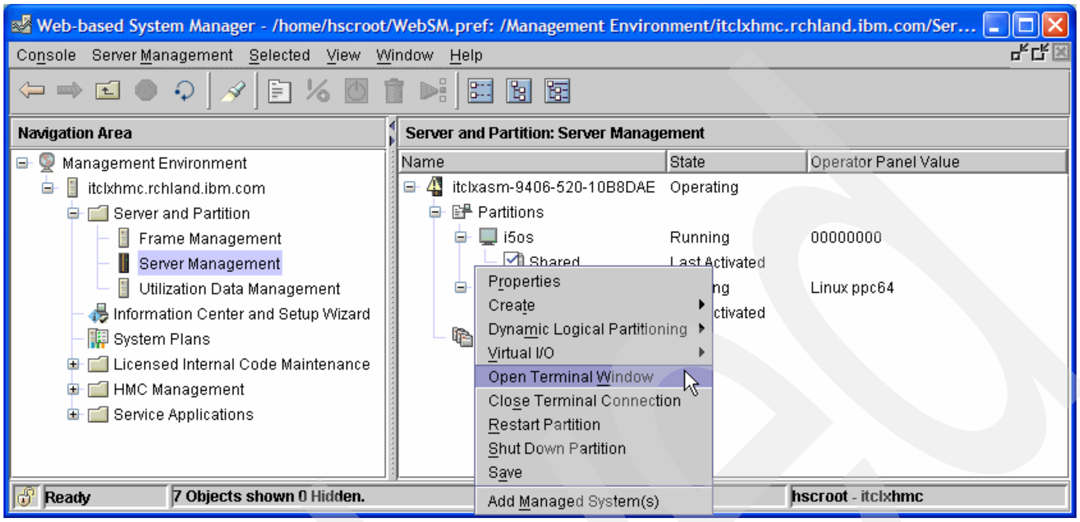

Figure 6-30 Opening a terminal window to the IP Telephony partition from HMC

6.5 Configuring the VCX network to test network functions

Before you configure the VCX network, review the information in 2.8, “Network planning” on page 43 and Chapter 5, “Creating the network support” on page 143. Make sure you know which IP address, subnet mask, default gateway, hostname, NTP-server and DNS-servers you plan to use.

> **Note:** If you do not have all this information at this point, you can change the configuration later. However, in order to make sure the network settings work, you need at least the IP address, subnet mask and default gateway, and you need to decide which hostname to use.

Perform the following steps to configure the VCX network to test your network functions:

1. Start your virtual terminal session from HMC or use your virtual terminal emulator of your choice (for example, PuTTY).
2. Log on as root and use the default password of pvadmin; see Figure 6-31.

```
Kernel 2.6.9-34.ELvcx on an ppc64

vcxhost login: root
Password: pvadmin

-bash-3.00#
```

Figure 6-31 Logging on to the IP Telephony server

3. At the command prompt, type `vcx-config-network --wizard` and press Enter to configure your network settings. The wizard prompts for the network settings; see Figure 6-32.

```
-bash-3.00# vcx-config-network --wizard
Warning: Host IP address '192.168.1.100' not found in /etc/hosts.
---------------------------------------------------------------------------
------------- Welcome to the VCX Network Configuration Wizard -------------
---------------------------------------------------------------------------

This wizard sets up networking and related services.

Configure networking now? [yes] : yes

-------------------------- Configuring Hostname ---------------------------
Enter system hostname    : ipt1

--------------------- Configuring IP Interface 'eth0' ---------------------
IP Address               : 192.168.9.250
Network Subnet Mask      : 255.255.255.248
Default Gateway Address  : 192.168.9.99
```

Figure 6-32 Configuring the network settings

4. Continue with specifying the DNS and NTP servers. Use 0.0.0.0 if you do not know the address to use; see Figure 6-33.

```
------------------------- Configuring DNS Servers -------------------------
Enter DNS servers one at a time.
When done, enter 0.0.0.0 to stop.

Primary DNS Server       : 0.0.0.0

----------------------- Configuring DNS Search Path -----------------------
Press Enter to leave the current path unchanged, or specify
a new search path, with spaces separating each entry.

DNS Search Path : localdomain

-------------------- Configuring Network Time Protocol --------------------
Enter NTP servers one at a time.
When done, enter 0.0.0.0 to stop.

Primary NTP Server       : 0.0.0.0
```

Figure 6-33 Specifying the DNS and NTP servers

5. To select a time zone, start with selecting the geographic location (Figure 6-34).

```
------------------------- Configuring Time Zone -------------------------

Please select a geographic location from the following list:
  1. Africa
  2. Americas
  3. Antarctica
  4. Arctic Ocean
  5. Asia
  6. Atlantic Ocean
  7. Australia
  8. Europe
  9. Indian Ocean
 10. Pacific Ocean
Enter continent [2] : 2
```

Figure 6-34 Selecting the geographical location

6. The list of countries displayed is based on the geographical location you selected; see Figure 6-35.

```
Please select a country from the following list:
  1. Antigua & Barbuda     18. Ecuador             35. Panama
  2. Anguilla              19. Grenada             36. Peru
  3. Netherlands Antilles  20. French Guiana       37. St Pierre & Miquelon
  4. Argentina             21. Greenland           38. Puerto Rico
  5. Aruba                 22. Guadeloupe          39. Paraguay
  6. Barbados              23. Guatemala           40. Suriname
  7. Bolivia               24. Guyana              41. El Salvador
  8. Brazil                25. Honduras            42. Turks & Caicos Is
  9. Bahamas               26. Haiti               43. Trinidad & Tobago
 10. Belize                27. Jamaica             44. United States
 11. Canada                28. St Kitts & Nevis    45. Uruguay
 12. Chile                 29. Cayman Islands      46. St Vincent
 13. Colombia              30. St Lucia            47. Venezuela
 14. Costa Rica            31. Martinique          48. Virgin Islands (UK)
 15. Cuba                  32. Montserrat          49. Virgin Islands (US)
 16. Dominica              33. Mexico
 17. Dominican Republic    34. Nicaragua
Enter country [ ] : 44
```

Figure 6-35 Selecting a country

7. Select a time zone from with in your selected country; see Figure 6-36.

```
Please select a time zone from the following list:
  1. Alaska Time
  2. Alaska Time - Alaska panhandle
  3. Alaska Time - Alaska panhandle neck
  4. Alaska Time - west Alaska
  5. Aleutian Islands
  6. Central Time
  7. Central Time - Indiana - Daviess, Dubois, Knox, Martin, Perry & Pulaski
  8. Central Time - Indiana - Pike County
  9. Central Time - Michigan - Dickinson, Gogebic, Iron & Menominee Counties
 10. Central Time - North Dakota - Morton County (except Mandan area)
 11. Central Time - North Dakota - Oliver County
 12. Eastern Time
 13. Eastern Time - Indiana - Crawford County
 14. Eastern Time - Indiana - Starke County
 15. Eastern Time - Indiana - Switzerland County
 16. Eastern Time - Indiana - most locations
 17. Eastern Time - Kentucky - Louisville area
 18. Eastern Time - Kentucky - Wayne County
 19. Eastern Time - Michigan - most locations
 20. Hawaii
 21. Mountain Standard Time - Arizona
 22. Mountain Time
_23. Mountain Time - Navajo
 24. Mountain Time - south Idaho & east Oregon
 25. Pacific Time
Enter zone [12] : 6
Selected Time Zone:      America/Chicago
```

Figure 6-36 Selecting the time zone

8. Type yes, if the configuration is correct as shown in Figure 6-37.

```
-------------------------- CONFIGURATION SUMMARY --------------------------
Hostname:       ipt1

IP Interfaces:  Device     IP Address      Network Mask    Default Gateway
                eth0       192.168.9.250   255.255.255.248 192.168.9.99

DNS Servers:    No DNS servers currently defined.
Search Domains: localdomain

NTP Servers:    No NTP servers currently defined.

Time Zone:      America/Chicago
---------------------------------------------------------------------------

Is all of the above information correct? [yes] : yes
```

Figure 6-37 Confirming the network configuration

9. The configuration is saved and the network interface is restarted (Figure 6-38).

```
---------------------------------------------------------------------------
Please wait while the wizard completes.
Saving configuration...Done.
Restarting network services to apply changes...
Shutting down interface eth0:  [  OK  ]
Shutting down loopback interface:  [  OK  ]
Setting network parameters:  [  OK  ]
Bringing up loopback interface:  [  OK  ]
Bringing up interface bond0:  [  OK  ]
Bringing up interface eth0:  [  OK  ]
Shutting down ntpd: [  OK  ]
Starting ntpd: [  OK  ]
Generating new SSL certificate: [  OK  ]
Starting httpd: (no active VCX version - not started)
```

Figure 6-38 Saving the configuration and restarting the network interface

10. You can now test the network configuration using functions such as ping, SSH from a client, and LFTP from the VCX server to an FTP server (you cannot use incoming FTP).

    You could, for example, ping your new IP Telephony server from an i5/OS partition; see Figure 6-39.

```
                                 Command Entry                       RCHAS10
                                                         Request level:   1
 Type command, press Enter.
 ===> ping '192.168.9.250'



 F3=Exit   F4=Prompt         F9=Retrieve   F11=Display partial   F12=Cancel
 F13=Information Assistant   F16=System main menu
 Verifying connection to host system 192.168.9.250.
 PING reply 1 from 192.168.9.250 took 10 ms. 256 bytes. TTL 64.           +
```

Figure 6-39 Pinging the IP Telephony server from the i5/OS partition

11. Another useful test you can perform to verify that the installation is correct is to use the **vcx-sysinfo --all** command; see Figure 6-40. This command shows useful information like the IP address, model, and memory.

> **Notes:**
>
> - For an IP Telephony/IP Telephony Messaging partition, the example in Figure 6-40 shows two error messages `Error running vcx-listversions` and `Error running vcx-showversion`. This is normal before the **vcx-setup** command has been completed.
> - For an IP Telephony Conferencing partition, the same two errors plus an additional error message of `Error running vcx-showmachineid` are shown. This is also normal before the **vcx-setup** command has been completed.

```
-bash-3.00# vcx-sysinfo --all
no-of-cpus                    : 2
cpu0-speed                    : 1654.344000 MHz
cpu1-speed                    : 1654.344000 MHz
DiskSpace [/]                 : 2.9G
DiskSpace [/] [free]          : 2.2G
DiskSpace [/opt]              : 8.7G
DiskSpace [/opt] [free]       : 2.7G
DiskSpace [/altroot]          : 2.9G
DiskSpace [/altroot] [free]   : 2.7G
hostname                      : ipt1
number-of-interfaces          : 1
IP-address [ eth0 ]           : 192.168.9.250
MAC-address [ eth0 ]          : f6:64:40:00:50:03
Speed [ eth0 ]                : 1000Mb/s
Duplex [ eth0 ]               : Full
Auto-negotiation [ eth0 ]     : on
Link-detected [ eth0 ]        : yes
Processing-Units [current]    : 0.3
Shared-Processor-Mode         : YES
Uncapped-Processor-Mode       : YES
Shared-Processor-Weight       : 128
machine-id                    : vrkG-ksKz-5Ph1-ZJbj-S9cK-ahh0
MemTotal [Kb]                 : 1014528
MemFree [Kb]                  : 969632
model-name                    : IBM,9406-520
serial-number                 : 108A36C
config-type                   : not-selected : 3 available
vcx-active-os                 : 6.3.0
vcx-inactive-os               : not-installed
RAID                          : not-supported-on-this-platform

Encountered 2 error[s]
Error running vcx-listversions
Error running vcx-showversion
```

Figure 6-40 vcx-sysinfo --all command

7

System maintenance

This chapter discusses some of the system maintenance activities an administrator would have to do after the System i IP Telephony environment has been successfully installed and configured.

This chapter covers the following:

- Backup and recovery methods for the System i IP Telephony environment
- Enterprise Management Suite
- Adding more storage space to a System i IP Telephony guest partition
- Moving a System i IP Telephony guest partition
- Guidelines for troubleshooting IP Telephony partition problems

For maintaining IP Telephony on the System i platform, it is suggested that you use the recommendations and procedures given in this chapter along with the details provided in the IP Telephony Application Maintenance Guide available from 3Com. See 1.5.1, "3Com reference material" on page 12 for details about how to access this guide.

7.1 Backup and recovery

There are several options available to back up the IP Telephony application on the System i platform. Some of the options are discussed in detail, with examples provided later in this section. Based on these examples, you could further customize or develop a backup procedure that best suits your needs.

On the System i platform, an IP Telephony partition is just another LPAR. All the IP Telephony objects in that partition fall into one network server storage space (NWSSTG) created for that LPAR, except for the case of a partition with direct attached storage. Therefore, it is possible to take a complete NWSSTG backup covering all the IP Telephony objects in that partition. Also, individual backup files can be generated within the IP Telephony application and can be moved or copied to other systems to make those part of the production System i backup of your environment.

A detailed discussion on a complete system save and recovery of a System i machine is not included here. If you are new to the System i backup concepts and procedures, go to the iSeries Information Center at the following URL and click **iSeries Information Center, Version 5 Release 4** → **Systems Management** → **Backup and Recovery** for details about saving or restoring a complete system, and on saving backups to external medias like tape or movable disk.

http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp

7.1.1 Defining a backup strategy for System i IP Telephony

There is no single best backup strategy or approach that meets all the requirements of every enterprise. Therefore, a best fit approach based on your requirements needs to be derived by considering and evaluating the options discussed in this section.

IP Telephony is a critical application that cannot be shut down for running backup procedures. However, the IP Telephony environment is typically hosted with primary and secondary servers for high availability. Complete backups (if required to external media) can be taken from the secondary servers (maybe during low usage time periods). But if your enterprise wants to take online backups from the primary server, a suitable option need to be custom built.

As a result, the best fit solution option can be chosen only after understanding the detailed requirements of the enterprise. Ensure that you consider the following points when determining your backup requirements:

- Timeline of backup
- Backup data maintenance methods followed by your enterprise
- Know what is required and when
- High availability options
- Feasibility of adding the IP Telephony application to your existing System i backup strategy
- Availability of defined recovery process
- Which methodology was used to create the IP Telephony partitions

After you arrive at an adequate understanding of your backup needs, the backup options provided in this chapter can serve as the basis for implementing robust solutions for your enterprise. Also keep in mind that your recovery options depend on how you backed up your system, as well as what you need to recover.

Refer to 2.6, “Typical IP Telephony implementation scenarios” on page 41 for details about different ways of configuring partitions and hosting IP Telephony on the System i platform.

Important: If your IP Telephony partition is created as a direct attach partition, you can only perform the file level backup from the IP Telephony environment. Even though IP Telephony on the System i platform is Linux-based, it does not support backing up to external media directly. You would need to use sftp or scp to transfer the backup files to a system (i5/OS) that is capable of writing to external media.

IP Telephony on the System i platform is best designed with a built-in high availability option with two partitions running the primary and secondary IP Telephony application servers. This configuration replicates all the IP Telephony data from the primary server to the secondary server instantaneously. It is suggested to then run the backup procedure from the secondary server, leaving the primary server for production use.

Consider the following recommendations when defining a backup and recovery strategy for your enterprise:

- Frequency of backup

  Considering the critical nature of the IP Telephony application, performing frequent full system backups is not a feasible approach. Also, the configuration files and the data files within the application would have all necessary and latest IP Telephony information at any given point in time.

  Therefore, performing a monthly full system backup and daily configuration and data files backup is recommended, unless you have other, special considerations for your enterprise. In case of any special requirements in backup frequency, consider that as part of your backup strategy and derive an optimal frequency for backups.

  As per the general recommendation, the monthly full backup will involve backing up the NWSSTG and daily backups will involve file backups of IP Telephony configuration and data files.

- Considerations for IP Telephony application releases

  Any new release of the IP Telephony application would be applied to your system as an upgrade to the existing application. You can perform this operation from the IP Telephony application environment. Refer to 1.5.1, “3Com reference material” on page 12 for detailed documentation on upgrading your IP Telephony application. However, it is recommended to perform a complete partition backup before any such upgrades.

- Backing up multiple IP Telephony region data

  If you have more than one IP Telephony partition configured to support an extensive number of users or for other reasons, you would have to follow the same procedures (repeat the same steps) explained in this section for backing up or restoring the respective IP Telephony partition or application files. If you are performing the application files backup from the IP Telephony environment, note that the IP Telephony application generates the backup files with a site id that is unique for a partition.

7.1.2 Backup methods for System i IP Telephony application

The options for backing up the IP Telephony application on System i platform are discussed in this section. Considering the IP Telephony environment as just another application running on System i machine, and because the System i platform has reliable backup utilities, you can take advantage of these for backing up the IP Telephony partition or individual files.

Following are the basic options to back up the IP Telephony application on the System i platform:

- Performing a full system backup from the hosting i5/OS partition

- Using Backup Recovery and Media Services (BRMS)
- Using Tivoli® Storage Manager
- Performing a full backup of the entire IP Telephony partition
- Backing up individual IP Telephony files and directories
- Using Enterprise Management Suite

Note: It does not matter whether you are using your own customized backup method or procedure, but ensure that the ultimate goal is for the IP Telephony backup objects to become part of the production backup system or strategy of your enterprise.

Full system backup

A full system backup covers all of the strategic components of the system by saving all the pieces that are be needed for backup. It is the basis to start from for a backup strategy, and something to build upon. Of course, a full system backup requires more downtime and backup time to accomplish. It saves all the configuration objects and data that you need.

For detailed information about performing a full system backup using the SAVE options of i5/OS as shown in Figure 7-1, go to the iSeries Information Center at the following URL and click **iSeries Information Center, Version 5 Release 4** → **Systems Management** → **Backup and Recovery**.

http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp

```
SAVE                                  Save
                                                          System:   RCHAS10
Select one of the following:

  Save Data
     1. Files
     2. Libraries
     3. Documents and folders
     4. Programs
     5. Other objects
     6. Changed objects only
     7. Licensed programs
     8. Security data
     9. Storage
    10. Configuration
    11. Objects in directories

                                                                    More...
Selection or command
===>

F3=Exit   F4=Prompt   F9=Retrieve   F12=Cancel   F13=Information Assistant
F16=System Main menu
(C) COPYRIGHT IBM CORP. 1980, 2005.
```

Figure 7-1 i5/OS Save menu

Backup Recovery and Media Services (BRMS)

BRMS is a comprehensive tool for managing the backup, archive, and recovery environment for one or more systems in a site, or across a network in which data exchange by tape is required.

BRMS lets you simplify and automate backups, as well as manage your tape inventory. It keeps track of what you have saved, when you saved it, and where it is saved, so that when recovery is necessary, BRMS restores the correct information from the correct tapes, in the correct sequence.

For more information about BRMS, refer to the following Web site:

http://www.ibm.com/servers/eserver/iseries/service/brms/

Tivoli Storage Manager

You can use Tivoli Storage Manager if you have an IT infrastructure involving heterogeneous platforms. Tivoli Storage Manager provides:

- Centralized administration for data and storage management
- Fully automated data protection
- Efficient management of information growth
- High-speed automated server recovery
- Full compatibility with hundreds of storage devices, as well as LAN, WAN, and SAN infrastructures
- Optional customized backup solutions for major groupware, enterprise resource planning (ERP) applications, and database products

For more information on Tivoli Storage Manager concepts, refer to the IBM Redbooks publication *IBM Tivoli Storage Management Concepts*, SG24-4877. For more information about using Tivoli Storage Manager for backup and restore procedures, go to the Tivoli Web site at:

http://www-306.ibm.com/software/tivoli/solutions/backup/

Full IP Telephony partition backup

By using standard i5/OS commands, the complete IP Telephony partition can be backed up. This can be achieved by backing up the entire network server storage space (NWSSTG). This process requires the IP Telephony partition to be shut down while the NWSSTG is saved to a save file.

The advantage of this method is that the IP Telephony application needs to be shut down only for the period of running the save process. By using this approach, the entire IP Telephony application installation, configuration and data is saved as a single object in i5/OS.

Refer to 7.1.3, "Backing up the entire IP Telephony guest partition" on page 188 for more details.

Backing up individual IP Telephony files and directories

Because the IP Telephony application is hosted on its own Linux-based operating system, it has the capability to run Linux commands and thus could run backup scripts within the application. But for storing the backup files to a different media (for example, disk or tape) that is part of the production backup, those backup files need to be sent via secure FTP to other systems.

The objective of a file-level backup is to ensure that the incremental changes made to the IP Telephony application and the daily telephony data are safely copied to a different system that is part of a production backup. If the same production System i machine is used for hosting the IP Telephony application, that system should have enough disk space to store (at least temporarily before writing to external media) the backup files from the IP Telephony environment.

Refer to 7.1.4, “Backing up individual IP Telephony files and directories” on page 196 for more details.

Enterprise Management Suite

Enterprise Management Suite is a tool which you may need to procure as part of the IP Telephony application. It has user-friendly features available for backing up IP Telephony configuration and data files. Refer to 7.2, “Enterprise Management Suite” on page 209 for details. This tool, in combination with the i5/OS backup and restore utilities, can function as an excellent base for your IP Telephony backup strategy.

7.1.3 Backing up the entire IP Telephony guest partition

This method is for backing up the entire IP Telephony partition by saving the network storage space (NWSSTG) associated with a particular IP Telephony partition.

The procedure outlined in this section explains the backup option using a save file on i5/OS. Optionally, you could save the partition to tape or external disks. For detailed information about how to save backups from i5/OS to external media, go to the iSeries Information Center at the following URL and click **iSeries Information Center, Version 5 Release 4** → **Systems Management** → **Backup and Recovery**:

http://publib.boulder.ibm.com/infocenter/iseries/v5r4/index.jsp

i5/OS disk storage is allocated to the IP Telephony server by creating an object called a *network server storage space* (also referred to as NWSSTG, or simply a *storage space*), which resides in the system auxiliary storage pool (ASP) or a user ASP. For more information on the NWSSTG, see 4.1.2, “Creating the Network Server Storage Space (NWSSTG)” on page 123.

> **Note:** Depending on the kind of ASP allocated for your IP Telephony partition, the backup procedure would slightly vary. That is, if you have configured a user ASP, you may need to include some additional objects in the save step (step 3.) in the following list.

The following is a high level outline of the steps to perform to save an entire IP Telephony partition:

1. Shut down the IP Telephony partition.
2. Create a save file for saving the NWSSTG.
3. Save the entire IP Telephony partition (NWSSTG) to the save file.
4. Vary on the Network Server Description (NWSD). If the NWSD power control is set to *YES, it automatically activates the IP Telephony partition; otherwise, you must manually activate the IP Telephony partition.
5. Move the save file to the production backup space (or external media).

> **Note:** Most of the examples shown in this section are using save file as the save media. Alternatively, you could save the objects directly to tape.

Perform the following steps to do a a full partition backup:

1. From an i5/OS command line, type `WRKCFGSTS *NWS` and press Enter.

2. On the Work with Configuration Status display (Figure 7-2), type option 2 (Vary off) next to the NWSD that is associated with the IP Telephony partition. In our example, we vary off an NWSD called IPT2.

   Alternatively, you could type the following Vary Configuration (VRYCFG) CL command to vary off the NWSD:

   ```
   VRYCFG CFGOBJ(IPT2) CFGTYPE(*NWS) STATUS(*OFF)
   ```

```
                          Work with Configuration Status            RCHAS10
                                                            11/30/06  15:27:01
 Position to  . . . . .               Starting characters

 Type options, press Enter.
   1=Vary on   2=Vary off   5=Work with job   8=Work with description
   9=Display mode status    13=Work with APPN status...

 Opt  Description       Status               -------------Job--------------
      IPT1              VARIED OFF
 2    IPT2              ACTIVE
      IPT3              VARIED OFF

                                                                       Bottom
 Parameters or command
 ===>
F3=Exit F4=Prompt F12=Cancel F23=More options F24=More keys
```

Figure 7-2 Varying off the NWSD

3. To see the network server storage space (NWSSTG), input the command **WRKLNK QFPNWSSTG** and press Enter.
4. On the Work with Object Links (Figure 7-3) display, you can type option 5 (Display) next to your NWSSTG. This, however, shows only as blank since it is only an object link to the NWSD.

```
                             Work with Object Links

 Directory  . . . . :   /QFPNWSSTG

 Type options, press Enter.
   2=Edit   3=Copy   4=Remove   5=Display   7=Rename   8=Display attributes
   11=Change current directory ...

 Opt   Object link            Type     Attribute    Text
       IPT1                   DIR
  5    IPT2                   DIR
       IPT3                   DIR

                                                                        Bottom
 Parameters or command
 ===>
 F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
 F22=Display entire field          F23=More options
```

Figure 7-3 Work with Object Links for QFPNWSSTG

5. Create a save file using the Create Save File (CRTSAVF) CL command; for example:

   `CRTSAVF FILE(QGPL/IPT2SAVF)`

6. Input the **`Save (SAV) CL`** command and press F4 to prompt the command. In our example, we enter the following parameters:

   – Device = `'/qsys.lib/qgpl.lib/IPT2SAVF.FILE'`
   – Objects Name = `'QFPNWSSTG/IPT2'`

   See Figure 7-4. Press the Page Down key to see additional parameters.

```
                              Save Object (SAV)

 Type choices, press Enter.

 Device . . . . . . . . . . . . . . > '/qsys.lib/qgpl.lib/IPT2SAVF.FILE'
                + for more values
 Objects:
   Name . . . . . . . . . . . . . . > 'QFPNWSSTG/IPT2'
   Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
               + for more values
 Name pattern:
   Pattern  . . . . . . . . . . .   '*'
   Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
               + for more values
 Directory subtree  . . . . . . .   *ALL          *ALL, *DIR, *NONE, *OBJ, *STG
 Save active  . . . . . . . . . .   *NO           *NO, *YES, *SYNC
                                                                     More...
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 7-4 Saving the NWSSTG to a save file

7. Specify the OUTPUT parameter if information about the saved object is to be directed to a spooled file, stream file, or a user space that already exists; see Figure 7-5. Press F10 to see additional parameters.

```
                              Save Object (SAV)

 Type choices, press Enter.

Output . . . . . . . . . . . . . .   '\home\johnc\ipt2sav'
Volume identifier . . . . . . . .    *MOUNTED
               + for more values
 Label  . . . . . . . . . . . . .   *GEN
 Optical file . . . . . . . . . .   '*'
 Sequence number  . . . . . . . .   *END          1-16777215, *END
 File expiration date . . . . . .   *PERM         Date, *PERM
 End of media option  . . . . . .   *REWIND       *REWIND, *LEAVE, *UNLOAD
 Use optimum block  . . . . . . .   *YES          *YES, *NO


                                                                      Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 7-5 Output redirection to a stream file

8. Set a compression option for the Data compression parameter as shown in Figure 7-6. Press Enter.

> **Note:** It is recommended that you use the Data compress parameter to reduce the storage size of the save file. Set this parameter to *HIGH if you are not writing to tape.

```
                              Save Object (SAV)

Type choices, press Enter.

Time period for last change:
  Start date . . . . . . . . . .   *ALL          Date, *ALL, *LASTSAVE
  Start time . . . . . . . . . .   *ALL          Time, *ALL
  End date . . . . . . . . . . .   *ALL          Date, *ALL
  End time . . . . . . . . . . .   *ALL          Time, *ALL
Object pre-check . . . . . . . .   *NO           *NO, *YES
Target release . . . . . . . . .   *CURRENT      *CURRENT, *PRV, V5R2M0...
Update history . . . . . . . . .   *NO           *NO, *YES, *SYS, *PC

Clear  . . . . . . . . . . . . .   *NONE         *NONE, *ALL, *AFTER, *REPLACE
Data compression . . . . . . . .   *HIGH         *YES, *NO, *DEV, *LOW...
Data compaction  . . . . . . . .   *DEV          *DEV, *NO
ASP device . . . . . . . . . . .   *DFT          Name, *DFT, *ALLAVL, *...
Scan objects:
  Scan during save . . . . . . .   *NO           *NO, *YES
  Save failed objects  . . . . .   *NOSAVFAILED  *NOSAVFAILED, *SAVFAILED
                                                                      Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 7-6 Specifying the Data compression parameter

9. If you created your NWSSTG in a user ASP or an independent ASP (IASP), there are additional considerations for saving and restoring of the NWSSTG.

> **Attention:** If you created your NWSSTG in an ASP other than the system ASP, the data does not reside in QFPNWSSTG. You must follow the procedure in this step to save an additional file.
>
> Also, if you have created the NWSSTG in another ASP, it *cannot* be restored to the user ASP.

   a. To determine whether your NWSSTG is created in a secondary ASP, you can use the **WRKNWSSTG *NWS CL** command to display all of your virtual disks. There could be virtual disks from other hosted partitions or integrated servers, so en sure that you look at the correct one.

      Press F11 (Display disk status) to see the ASP that each virtual disk is created in. In Figure 7-7 on page 192, a 1 shown in the ASP column indicates the virtual disk is created in the system ASP. Any other number indicates a different ASP.

```
                    Work with Network Server Storage Spaces
                                                           System:   GARAGE
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
  11=Remove link

                  %                              ASP
Opt  Name        Used   Size    Format      ASP  Device

     CS4BLADE1     0     10244  *NTFS         1
     CS4BLADE2     0      1024  *FAT          1
     LINUXONI5     0      8000  *OPEN         2
     IPT1          0     15006  *OPEN         1
     IPT2          0     35840  *OPEN         1
     IPT3          0     25600  *OPEN         1
     VCXLINUX      0      8001  *OPEN         2
                                                                      Bottom

   Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F6=Print list   F9=Retrieve
F11=Display text      F12=Cancel   F17=Position to
```

Figure 7-7 Displaying the ASP for an NWSSTG

b. The data portion of the NWSSTG actually gets saved as a user-defined file system (UDFS). The object in QFPNWSSTG only saves the QFPCONTROL file, which is the information that associates the disk with an NWSD and a mount point which is only seen when the NWSD is varied on; see Figure 7-8.

```
                             Work with Object Links

Directory  . . . . :   /QFPNWSSTG/VCXLINUX

Type options, press Enter.
  2=Edit   3=Copy   4=Remove   5=Display   7=Rename   8=Display attributes
  11=Change current directory ...

Opt     Object link
        .
        ..
        MOUNT
        QFPCONTROL
```

Figure 7-8 NWSSTG in user ASP contains the mount point for the data in a UDFS

c. To view the UDFS, you must use the **WRKLNK** command as follows:

```
wrklnk '/dev/qasp02/vcxlinux.udfs'
```

Where vcxlinux.udfs would be the name of the NWSSTG that you want to save; see Figure 7-9 on page 193. This is the additional object you must save.

Note: The qasp02 is the directory for user ASP number two. This could be a different number depending on the number and type of user and independent ASPs available, and in which the NWSSTG was created.

```
                             Work with Object Links

Directory . . . . :   /dev/qasp02

Type options, press Enter.
  2=Edit   3=Copy   4=Remove   5=Display   7=Rename   8=Display attributes
  11=Change current directory ...

Opt     Object link
        vcxlinux.udfs
```

Figure 7-9 The UDFS object for the vcxlinux NWSSTG

d. The **Save (Sav) CL** command then will be the same as previous step, except that you will type a plus (+) sign on the Objects parameter and press Enter; see Figure 7-10.

Note: This Save example shown is for writing directly to a tape. Alternatively, you could save the storage space to a save file.

```
                                Save Object (SAV)

Type choices, press Enter.

Device . . . . . . . . . . . . .   /qsys.lib/qgpl.lib/tap01.devd
                + for more values
Objects:                         +
  Name . . . . . . . . . . . . .   /qfpnwsstg/vcxlinux
```

Figure 7-10 Prompting to save the UDFS as well as the file in QFPNWSSTG

e. Fill in the UDFS and press Enter; see Figure 7-11.

```
                     Specify More Values for Parameter OBJ

Type choices, press Enter.

Objects:
  Name . . . . . . . . . . . . . > '/qfpnwsstg/vcxlinux'

  Include or omit . . . . . . .   *INCLUDE      *INCLUDE, *OMIT

  Name . . . . . . . . . . . . .   /dev/qasp02/vcxlinux.udfs
```

Figure 7-11 Specifying more values for the Objects parameter

10. After the Save command completes successfully, you can see the saved objects. From the i5/OS command line, type the command **DSPSAVF QGPL/IPT2SAVF** and press Enter.
11. On the Display Saved Objects - Save File display (Figure 7-12), type option 5 (Display objects in subdirectory) next to the save file and press Enter.

```
                        Display Saved Objects - Save File

 Display level . . . . . :   1
 Directory . . . . . . . :     /QFPNWSSTG

Type options, press Enter.
   5=Display objects in subdirectory   8=Display object specific information

 Opt  Object             Type        Owner              Size  Data
  5   IPT2               *DIR        JOHNC              8192  Yes




                                                                      Bottom
 F3=Exit   F11=View 2   F12=Cancel   F16=Display header
 F22=Display entire field
 3 objects saved on media file.
```

Figure 7-12 Displaying saved objects - save files

12. The NWSSTG, with its storage object name allocated by the system, is listed; see Figure 7-13.

> **Note:** There would be more objects listed if you saved the user ASP object in the save file.

```
                        Display Saved Objects - Save File

 Display level . . . . . :   2
 Directory . . . . . . . :     /QFPNWSSTG/IPT2

 Type options, press Enter.
   5=Display objects in subdirectory   8=Display object specific information

 Opt  Object             Type        Owner              Size  Data
      QFPCLTSTG1         *STMF       JOHNC       16117661696  Yes
      QFPCONTROL         *STMF       JOHNC              8192  Yes




                                                                      Bottom
 F3=Exit   F11=View 2   F12=Cancel   F16=Display header
F22=Display entire field
```

Figure 7-13 Displaying the objects in the save file

13. Vary on the Network Server Description (NWSD) by typing the **WRKCFGSTS *NWS CL** command and pressing Enter.

14. On the Work with Configuration Status display (Figure 7-14), type option 1 (Vary on) next to the NWSD and press Enter. Alternatively, you could execute the following Vary Configuration (VRYCFG) CL command:

```
VRYCFG CFGOBJ(IPT2) CFGTYPE(*NWS) STATUS(*ON)
```

```
                          Work with Configuration Status              RCHAS10
                                                            11/30/06  15:29:30
 Position to  . . . . .                Starting characters

 Type options, press Enter.
   1=Vary on   2=Vary off   5=Work with job   8=Work with description
   9=Display mode status    13=Work with APPN status...

 Opt  Description      Status                  -------------Job--------------
      IPT1             VARIED OFF
 1    IPT2             VARIED OFF
      IPT3             VARIED OFF
      IPT4             VARIED OFF

                                                                        Bottom
 Parameters or command
 ===>
F3=Exit F4=Prompt F12=Cancel F23=More options F24=More keys
```

Figure 7-14 Varying on the NWSD

15. If the NWSD Power control parameter was set to *YES, then the IP Telephony partition will start with the varying on of the NWSD. You can check this by displaying the NWSD and reviewing what the Power control parameter is set to. For example, the DSPNWSD IPT2 command displays the screen shown in Figure 7-15.

```
                           Display Network Server Desc                RCHAS10
                                                            12/11/06  09:36:45
 Network server description . . . . :   IPT2
 Option . . . . . . . . . . . . . . :   *BASIC

 Synchronize date and time  . . . . :   *NO
 IPL source . . . . . . . . . . . . :   *PANEL
 IPL stream file  . . . . . . . . . :   *NONE

 IPL parameters . . . . . . . . . . :   *NONE

 Power control  . . . . . . . . . . :   *NO
 Text . . . . . . . . . . . . . . . :   *BLANK

                                                                        Bottom
 Press Enter to continue.

 F3=Exit   F11=Display keywords   F12=Cancel
```

Figure 7-15 Displaying the Network Server Description (NWSD)

16. If you want to set the Power control parameter to *YES, then vary off the NWSD, type the command **`CHGNWSD <nwsd_name>`** on an i5/OS command line, and press F4 to prompt the command. You can then modify the NWSD parameters. After changing the NWSD, vary on the NWSD.

17. Otherwise, you can activate the IP Telephony partition from the HMC. To do this, right-click your IP Telephony partition profile name and select **Activate**; see Figure 7-16.

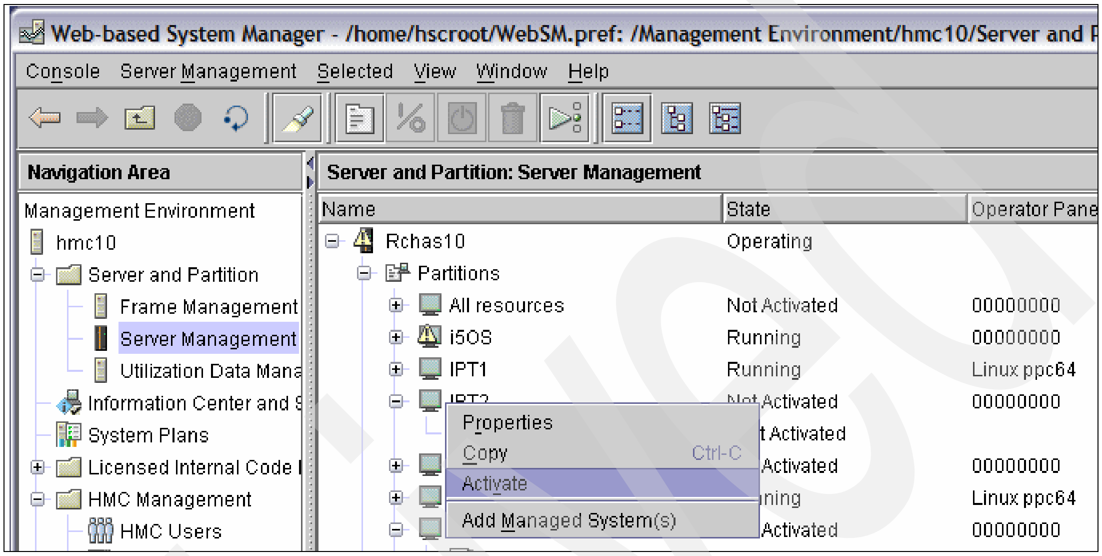

Figure 7-16 Activating a partition from the HMC

7.1.4 Backing up individual IP Telephony files and directories

Backing up individual IP Telephony files and directories basically requires the backup files to be generated within the IP Telephony environment and then transferred to a system that is capable of saving those files to system storage or an external media.

Note: Backup files generated from IP Telephony application environment cannot be written directly to tape or other media. They need to be sent to i5/OS to be included as part of the production system backup solution.

The System i IP Telephony environment is capable of securely (using either sftp or scp over SSH) transferring the backup files to other systems. To take advantage of this, i5/OS needs to be prepared for SSH support. There is an OpenSSH product (free of charge) available for implementation on the System i platform (IBM Portable Utilities for i5/OS, 5733-SC1). For more information about this product, refer to the following Web site:

http://www.ibm.com/servers/enable/site/porting/tools/openssh.html

Also refer to the IBM Redpaper *Securing Communications with OpenSSH on IBM i5/OS*, REDP-4163, for details about how to implement this product on i5/OS. After this is implemented, i5/OS is ready for securely transferring the backup files from the IP Telephony environment to an i5/OS environment.

The file-level backup of an IP Telephony application on the System i platform involves the following steps.

- Setting up and starting the sshd daemon on i5/OS (if not already running).

- Generating periodic IP Telephony backup files in the IP Telephony environment. Scripts for generating the backup files are available in the IP Telephony application environment.
- Opening an SSH session to the i5/OS partition and transferring (using sftp or scp) the IP Telephony backup files to the i5/OS partition. These files would be in a TGZ format.
- From the i5/OS partition, generating a save file or save to an external media.

Refer to the IP Telephony application maintenance guide (see 1.5.1, “3Com reference material” on page 12) for details about this backup procedure in the IP Telephony environment. The backup script could be scheduled to run automatically at a given time each day by adding it to a CRON job, which is a Linux scheduler for executing jobs in a timely manner.

If the IBM Portable Utilities for i5/OS, 5733-SC1, product is not installed and configured on your system, you need to do this before backing up individual IP Telephony files. For details, refer to the IBM Redpaper *Securing Communications with OpenSSH on IBM i5/OS*, REDP-4163.

This paper also explains the step-by-step procedure to set up and start an SSH daemon in an i5/OS environment; therefore, the detailed descriptions related to setting up sshd on i5/OS are not included in this book. However, sample screen captures are shown here for your reference.

Perform the following steps to back up individual IP Telephony files:

> **Note:** Steps 1 and 2 need to be performed only once.

1. Create an i5/OS integrated file system home directory if one does not exist. For example, from an i5/OS command line, type the command **`CRTDIR DIR('/home/johnc')`** on i5/OS and press Enter (replace ‘johnc’ with your user profile name that would be used for transferring files). This creates a home directory with your user profile name.
2. Again from the i5/OS command line, type the command **`CALL QP2TERM`**.
3. In the shell window command line, type the following commands to generate the public and private key pairs for your user profile on i5/OS:

   ```
   cd /QOpenSys/QIBM/UserData/SC1/OpenSSH/openssh-3.5p1/etc
   ssh-keygen -t rsa1 -b 2048 -f ssh_host_key -N ''
   ssh-keygen -t dsa -b 2048 -f ssh_host_dsa_key -N ''
   ssh-keygen -t rsa -b 2048 -f ssh_host_rsa_key -N ''
   ```

   After you execute all the preceding commands, the display would look similar to the screen shown in Figure 7-17 on page 198.

```
                          /QOpenSys/usr/bin/-sh

   $
 > cd /QOpenSys/QIBM/UserData/SC1/OpenSSH/openssh-3.5p1/etc
   $
 > ssh-keygen -t rsa1 -b 2048 -f ssh_host_key -N ''
   Generating public/private rsa1 key pair.
   Your identification has been saved in ssh_host_key.
   Your public key has been saved in ssh_host_key.pub.
   The key fingerprint is:
   b5:b4:91:76:db:45:d6:af:e8:53:d5:47:b7:e6:25:6c
johnc@RCHAS10.RCHLAND.IBM.COM
   $
 > ssh-keygen -t dsa -b 2048 -f ssh_host_dsa_key -N ''
   Generating public/private dsa key pair.
   Your identification has been saved in ssh_host_dsa_key.
   Your public key has been saved in ssh_host_dsa_key.pub.
   The key fingerprint is:
   2f:27:8d:ee:b0:aa:7d:a9:9d:b8:ef:fb:20:31:57:15
johnc@RCHAS10.RCHLAND.IBM.COM
   $
 > ssh-keygen -t rsa -b 2048 -f ssh_host_rsa_key -N ''
   Generating public/private rsa key pair.
   Your identification has been saved in ssh_host_rsa_key.
   Your public key has been saved in ssh_host_rsa_key.pub.
   The key fingerprint is:
   02:ed:38:93:8c:17:78:6a:01:74:af:9e:f1:0f:10:64
johnc@RCHAS10.RCHLAND.IBM.COM
   $
 ===>
 F3=Exit     F6=Print   F9=Retrieve   F11=Truncate/Wrap
 F13=Clear   F17=Top    F18=Bottom    F21=CL command entry
```

Figure 7-17 Generating public and private key pairs

4. Start the sshd daemon. On i5/OS command line, type the following command:

   `SBMJOB CMD(CALL PGM(QP2SHELL) PARM('/QOpenSys/usr/sbin/sshd'))`

5. If you want to check whether the sshd daemon is started, type the **Work with Active Jobs (WRKACTJOB) CL** command and press Enter.
6. On the Work with Active Jobs display, you should see the sshd daemon in the QINTER subsystem, as shown in Figure 7-18 on page 199.

> **Tip:** You can also start the sshd daemon in a different subsystem. Refer to the IBM Redpaper, *Securing Communications with OpenSSH on IBM i5/OS*, REDP-4163, for more information about this topic.

```
                             Work with Active Jobs                    RCHAS10
                                                            12/12/06  15:52:44
CPU %:     4.5     Elapsed time:   02:23:30     Active jobs:   360

Type options, press Enter.
  2=Change   3=Hold   4=End   5=Work with   6=Release   7=Display message
  8=Work with spooled files   13=Disconnect ...
                 Current
Opt  Subsystem/Job  User        Type  CPU %  Function        Status
       ITSOWSE06    QTMHHTTP    BCI      .0  PGM-QZSRHTTP     DEQW
     QINTER         QSYS        SBS      .0                   DEQW
       QPADEV0003   JOHNNY      INT      .0  CMD-WRKIMGCLG    DSPW
       QPADEV0007   JOHNC       BCI      .0  PGM-sshd         SELW
       QPADEV0007   JOHNC       INT      .0  CMD-WRKACTJOB    RUN
     QSERVER        QSYS        SBS      .0                   DEQW
       QPWFSERVSD   QUSER       BCH      .0                   SELW
       QPWFSERVSO   QSECOFR     PJ       .0                   DEQW
       QPWFSERVSO   FRODE       PJ       .0                   DEQW
                                                                       More...
Parameters or command
===>
F3=Exit   F5=Refresh       F7=Find      F10=Restart statistics
F11=Display elapsed data   F12=Cancel   F23=More options   F24=More keys
```

Figure 7-18 Using the Work with Active Jobs display to see if the sshd daemon is started

7. Now you are ready to generate backup files and transfer them from the IP Telephony environment to an i5/OS integrate file system directory. The backup files for IP Messaging and IP Telephony need to be generated separately. To generate IP Messaging backup files, perform the following steps:

   a. Login to IP Messaging via a system console or ssh as user app (the default password is nice). In our example, we use PuTTY which is a free, Linux-based terminal tool to connect and login to the IP Telephony partition.

   b. To connect using PuTTY and login to the IP Telephony partition, start the PuTTY client from your desktop and provide the IP address of the IP Telephony partition, as shown in Figure 7-19 on page 200.

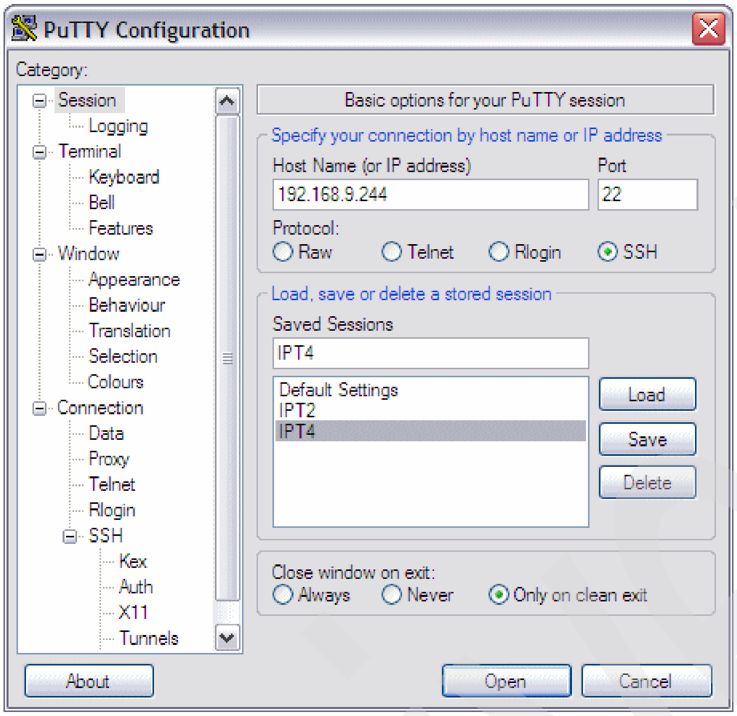

Figure 7-19 Logging on to the IP Telephony partition using PuTTY

c. After the terminal is connected to the IP Telephony partition, in the PuTTY command window, log in as app (the default password is nice) and type the following commands:

```
cd gen
./backupums
```

This script produces a set of TGZ files in the /opt/3comdata/umsdata/DATE/ directory, where DATE is the date the backup script is run in the format mm_dd_yy. The data included in the set of TGZ files includes all system data, class of service, subscriber profile, subscriber messages, table data (for inter-IP Messaging communications), CDRs, reports, and logs.

Make a note of the directory in which the backup files are generated. In this example, it is /opt/3comdata/umsdata/backup/20061212161337; see Figure 7-20 on page 201.

```
login as: app
app@192.168.9.244's password:
Last login: Wed Dec  6 04:25:52 2006 from 192.168.9.135
ipt4:/usr/app>
ipt4:/usr/app>cd gen
ipt4:/usr/app/gen>./backupums
Backup Started Tue Dec 12 16:13:37 CST 2006
Backup will be saved in the directory
/opt/3comdata/umsdata/backup/20061212161337
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
Connection closed by foreign host.
Please wait while Data is being backed up.
This may take from a few seconds to a few minutes
Depending upon the amount of data that is being backed up
Table Save Complete Tue Dec 12 16:13:47 CST 2006
*****************
Tar Complete Tue Dec 12 16:13:59 CST 2006
Backup files stored in: /opt/3comdata/umsdata/backup/20061212161337
Backup completed
ipt4:/usr/app/gen>
```

Figure 7-20 Logging on to the IP Telephony partition

d. We can now transfer the IP Messaging backup files to the i5/OS integrated file system directory. If you want to specify a different directory in the i5/OS integrated file system directory, then you need to create that directory on i5/OS before you transfer the files.

   For our example, separate backup directories for IP Messaging and IP Telephony are created in the i5/OS integrated file system directory as IPMbackup and IPTbackup. (Refer to step 1 in this section, which explains how to create an i5/OS integrated file system directory.) Also this will help while trying to transfer back the files during a restore operation.

e. Type `sftp <your user profile on i5/OS>@<IP address of i5/OS system>`. For example:

   `sftp johnc@192.168.9.99`

   Login by typing your password. If this is your first time logging in, you are asked for a confirmation for accepting the keys, so select **yes**.

f. Type `put <backupdirectory name in IP Telephony environment> <i5/OS integrated file system directory>`. For example:

   `put /opt/3comdata/umsdata/backup/20061212161337/*.* IPMbackup ‘`

   In the example shown in Figure 7-21 on page 202, we have logged onto `/home/johnc`, and `IPMbackup` was the directory created under that. You may send your files to a different directory, as needed.

```
ipt4:/usr/app/gen>sftp johnc@192.168.9.99
Connecting to 192.168.9.99...
johnc@192.168.9.99's password:
sftp>
sftp> put /opt/3comdata/umsdata/backup/20061212161337/*.* IPMbackup
Uploading /opt/3comdata/umsdata/backup/20061212161337/doc.tgz to
/home/johnc/IPMbackup/doc.tgz
/opt/3comdata/umsdata/backup/20061212161337/d 100%   14KB  13.5KB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/msgm0.tgz to
/home/johnc/IPMbackup/msgm0.tgz
/opt/3comdata/umsdata/backup/20061212161337/m 100%   14MB  13.5MB/s   00:01
Uploading /opt/3comdata/umsdata/backup/20061212161337/msgm1.tgz to
/home/johnc/IPMbackup/msgm1.tgz

THIS STEPS WILL BE REPEATED FOR FILES msgm0.tgz through msgm9.tgz

/opt/3comdata/umsdata/backup/20061212161337/m 100% 2042KB   2.0MB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/msgm9.tgz to
/home/johnc/IPMbackup/msgm9.tgz
/opt/3comdata/umsdata/backup/20061212161337/m 100% 2425KB   2.4MB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/pg.tgz to
/home/johnc/IPMbackup/pg.tgz
/opt/3comdata/umsdata/backup/20061212161337/p 100%   41KB  41.2KB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/speak.vox.tgz to
/home/johnc/IPMbackup/speak.vox.tgz
/opt/3comdata/umsdata/backup/20061212161337/s 100% 1301KB   1.3MB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/table.tgz to
/home/johnc/IPMbackup/table.tgz
/opt/3comdata/umsdata/backup/20061212161337/t 100%   64KB  64.2KB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/vmcdr.tgz to
/home/johnc/IPMbackup/vmcdr.tgz
/opt/3comdata/umsdata/backup/20061212161337/v 100% 1504     1.5KB/s   00:00
Uploading /opt/3comdata/umsdata/backup/20061212161337/vmlog.tgz to
/home/johnc/IPMbackup/vmlog.tgz
/opt/3comdata/umsdata/backup/20061212161337/v 100% 7055     6.9KB/s   00:00
sftp>
```

Figure 7-21 Transferring IP Messaging backup files to the i5/OS integrated file system directory

g. The IP Messaging backup files are now available in the i5/OS integrated file system directory. To see these files, use the **WRKLNK CL** command. For example, on the i5/OS command line, type the following:

   `WRKLNK '/home/johnc/IPMbackup'`

   From the Work with Object Links display, type option 5 (Display) to see the files located in this directory; see Figure 7-22 on page 203.

```
                            Work with Object Links

Directory  . . . . :   /home/johnc/IPMbackup

Type options, press Enter.
  2=Edit   3=Copy   4=Remove   5=Display   7=Rename   8=Display attributes
  11=Change current directory ...

Opt   Object link            Type     Attribute    Text
      doc.tgz                STMF
      msgm0.tgz              STMF
      msgm1.tgz              STMF
      msgm2.tgz              STMF
      msgm3.tgz              STMF
      msgm4.tgz              STMF
      msgm5.tgz              STMF
      msgm6.tgz              STMF
      msgm7.tgz              STMF
                                                                       More...
Parameters or command
===>
F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
F22=Display entire field           F23=More options
Already at top of area.
```

Figure 7-22 IP Messaging backup files transferred to i5/OS integrated file system

8. For generating IP Telephony backup files, you need to stop the IP Telephony services. Perform the following steps for stopping the IP Telephony services and backing up the IP Telephony data:
   a. Perform the following steps to stop the IP Telephony services:
      i. From the PuTTY console, change the user login to cworks by typing `su - cworks` (the default password is cworks).
      ii. Type `su - tomcat` (the default password is tomcat).
      iii. Type `cd /opt/3com/VCX/scripts/rc3.d`.
      iv. Type `./S70tomcat stop`, followed by the password (the default is tomcat).
      v. Type `exit` (to get back to cworks login).
      vi. Type `cd /opt/3com/VCX/scripts/rc3.d`.
      vii. Type `./S20vcxdata stop`.

      See Figure 7-23 on page 204.

```
ipt4:/usr/app/gen>su - tomcat
Password:
[tomcat@ipt4 ~]$ cd /opt/3com/VCX/scripts/rc3.d
[tomcat@ipt4 rc3.d]$ ./S70tomcat stop
Shutting down tomcat: Password:
Using CATALINA_BASE:   /opt/3com/VCX/tomcat
Using CATALINA_HOME:   /opt/3com/VCX/tomcat
Using CATALINA_TMPDIR: /opt/3com/VCX/tomcat/temp
Using JRE_HOME:       /opt/3com/VCX/j2sdk
done.
[tomcat@ipt4 rc3.d]$ su - cworks
Password:
[cworks@ipt4 ~]$ cd /opt/3com/VCX/scripts/rc3.d
[cworks@ipt4 rc3.d]$ ./S20vcxdata stop
Copyright (C) 2006 3Com Corporation, All rights reserved.
[cworks@ipt4 rc3.d]$
```

Figure 7-23 Stopping the IP Telephony services

b. After the IP Telephony services are stopped, you can run the IT Telephony data backup script. Perform the following steps:

   i. Type `cd /opt/3com/VCX/vcxdata/bin`.

   ii. Type `./backupVcxdata`.

   iii. Type `y` to confirm that tomcat and vcxdata have been stopped.

   iv. Type `1` for site ID (or whatever value you are using for VCX site ID).

   A backup file called vcxdata<site ID>backup.<version number>.tgz is generated and saved in the /opt/3com/VCX/vcxdata/db/export/ directory.

   See Figure 7-24.

```
[cworks@ipt4 rc3.d]$ cd /opt/3com/VCX/vcxdata/bin
[cworks@ipt4 bin]$ ./backupVcxdata

Copyright (C) 2006 3Com Corporation, All rights reserved.

Backup VCXDATA Server...

VCXDATA Server Application and TOMCAT need to be STOPPED

Have you stopped the VCXDATA Server Application and TOMCAT ? [n/y]:y

Using ORACLE_HOME=/opt/3com/VCX/oracle/product/10.2.0

Enter the VCX Site Identification i.e. Site Id: ?? []:1
<<MANY MESSAGES ARE DISPLAYED HERE>>

Backup VCXDATA Server Complete

Backup File: /opt/3com/VCX/vcxdata/db/export/vcxdata1backup.7.2.8.tg
```

Figure 7-24 Running the IP Telephony backup script

c. Restart the IP Telephony services as shown in Figure 7-25:

   i. Type `su - tomcat`, followed by the password (tomcat).

   ii. Type `cd /opt/3com/VCX/scripts/rc3.d`.

   iii. Type `./S70tomcat start`, followed by password (`tomcat`).

   iv. Type `exit` (to get back to cworks login).

   v. Type `cd /opt/3com/VCX/scripts/rc3.d`.

   vi. Type `./S20vcxdata start`.

```
[cworks@ipt4 bin]$ su - tomcat
Password:
[tomcat@ipt4 ~]$ cd /opt/3com/VCX/scripts/rc3.d
[tomcat@ipt4 rc3.d]$ ./S70tomcat start
Starting tomcat: Password:
Using CATALINA_BASE:   /opt/3com/VCX/tomcat
Using CATALINA_HOME:   /opt/3com/VCX/tomcat
Using CATALINA_TMPDIR: /opt/3com/VCX/tomcat/temp
Using JRE_HOME:       /opt/3com/VCX/j2sdk
done.
[tomcat@ipt4 rc3.d]$ exit
[cworks@ipt4 ~]$ cd /opt/3com/VCX/scripts/rc3.d
[cworks@ipt4 rc3.d]$ ./S20vcxdata start
Copyright (C) 2006 3Com Corporation, All rights reserved.
Using Server Configuration File: ../conf/vcxdataconfig.xml
Creating PROCMON Client Socket with cw_vcxdata
Starting Up as a Daemon
Server PID: 18608
[cworks@ipt4 rc3.d]$
```

Figure 7-25 Starting the IP Telephony services

d. Transfer the IP Telephony backup files to the i5/OS integrated file system directory. Follow step d on page 201 through step f on page 201, but with the following differences:

   - The IP Telephony data backup file is generated in the /opt/3com/VCX/vcxdata/db/export/ directory.
   - In our example, the i5/OS integrated file system directory created for IP Telephony backup was called IPTbackup.

   Thus, step f on page 201 would be:

```
put /opt/3com/VCX/vcxdata/db/export/vcxdata<siteID>backup.<version_number>.tgz
IPTbackup
```

9. Now you can save the IP Telephony backup files in a similar fashion as in the save steps explained in 7.1.3, “Backing up the entire IP Telephony guest partition” on page 188, or by using the i5/OS backup procedures and tools available at your enterprise. Also, cross-check to ensure that the IP Telephony application backup files are included as part of the regular System i production backup.

7.1.5 Recovering an IP Telephony guest partition

To recover an entire IP Telephony partition, restore the complete partition from the latest save file or media on which the respective IP Telephony partition was saved, the following steps must be performed:

- Vary off the corresponding network server description (NWSD) for which the restore operation is performed. Or if you are recovering the partition after a disaster, check if a NWSD is available for your partition; otherwise, you must create one.
- Identify the desired backup file from the production backup storage. The restore can either be done from an external storage device, or from a save file in an i5/OS library or integrated file system directory in which the backup file is present.
- Restore the network server storage space (NWSSTG).
- Vary on the NWSD.

To restore the IP Telephony guest partition from a save file, perform the following steps:

1. Vary off the NWSD; refer to 7.1.3, "Backing up the entire IP Telephony guest partition" on page 188 for details.
2. On an i5/OS command line, type `RST` and press F4 to prompt the command.
3. On the Restore Object display (Figure 7-26), enter your save file name in the Device parameter and press Enter.

```
                              Restore Object (RST)

 Type choices, press Enter.

 Device . . . . . . . . . . . . .   /qsys.lib/qgpl.lib/IPT2SAVF.FILE
                + for more values
 Objects:
   Name . . . . . . . . . . . . . .   '*'
   Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
   New object name  . . . . . . .   *SAME
               + for more values
 Name pattern:
   Pattern   . . . . . . . . . . .   '*'
   Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
               + for more values
                                                                    More...
 F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
 F13=How to use this display        F24=More keys
```

Figure 7-26 Restoring the IP Telephony partition

4. The RST command shown in this example specifies an asterisk (*) against the objects to be restored. This restores all the objects in the save file. This could restore the user ASP objects as well.

   However, if you have saved the user ASP and wish to provide the name of objects to be restored in the Restore Object (RST) CL command, you would need to specify the additional objects as shown in Figure 7-27 on page 207.

```
                        Specify More Values for Parameter OBJ

 Type choices, press Enter.

 Objects:
   Name . . . . . . . . . . . . . . > '/qfpnwsstg/vcxlinux'
    Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
    New object name  . . . . . . .   *SAME

   Name . . . . . . . . . . . . . . > '/dev/qasp02/vcxlinux.udfs'
    Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
    New object name  . . . . . . .   *SAME

                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 7-27 Specifying more objects for restoring a user ASP

5. After the restore operation is complete, vary on the NWSD and activate the IP Telephony partition. Refer to 7.1.3, "Backing up the entire IP Telephony guest partition" on page 188 for details.

7.1.6 Recovering individual IP Telephony files and directories

If you need to restore the IP Telephony configuration or data backup files, identify and restore the desired backup file (either from the backup media, i5/OS library or integrated file system directory) to, preferably, an i5/OS integrated file system directory. You can then send the IP Telephony configuration or data backup files to the respective directory in IP Telephony environment from which the restore would be performed using IP Telephony restore scripts.

Even though the transfer operation from i5/OS to the IP Telephony environment can be done in many ways, the suggested way is to transfer via sftp or scp using the OpenSSH. Refer to 7.1.4, "Backing up individual IP Telephony files and directories" on page 196 for the details about OpenSSH configuration.

Recovering individual IP Telephony files and directories typically involves the following steps:

- Restoring the respective objects from the appropriate save file or restore from external media to the i5/OS integrated file system directory.
- Transferring the backup files to the IP Telephony environment via sftp or scp. For performing this step, you many want to establish an SSH session as explained in 7.1.4, "Backing up individual IP Telephony files and directories" on page 196.
- Running the restore scripts in the IP Telephony environment.

For detailed information on the recovery procedure within the IP Telephony environment, refer to the Maintenance guide under 3Com documentation. See 1.5.1, "3Com reference material" on page 12 for details about obtaining this guide.

To recover individual IP Telephony files and directories, perform the following steps:

1. If the IP Messaging and IP Telephony backup files are saved to save files or tape, then you need to restore the same back to the respective i5/OS integrated file system directories.
2. Using PuTTY, login as app (the default password is nice) to the IP Telephony environment.

3. Create a directory in the IP Telephony environment to receive the IP Messaging backup files from the i5/OS integrated file system directory. Refer to step 1 on page 197 through step 5 on page 198 of section 7.1.4, “Backing up individual IP Telephony files and directories” on page 196. Then establish a sftp session to the i5/OS (over ssh).

> **Note:** You could skip the preceding steps if the latest backup file is available in the IP Telephony environment and you want to restore from it.

4. To restore the IP Messaging data, perform the following steps:
   a. Type get </directory name/filename> /<directory name>. For this example, the earlier backup directory named is used:

      ```
      get /home/johnc/IPMbackup/*.* /opt/3comdata/umsdata/backup/20061212161337
      ```

   b. Type `cd gen`.
   c. Type ./restoreums <directory>. For this example:

      ```
      ./restoreums /opt/3comdata/umsdata/backup/20061212161337
      ```

   d. To restart the IP Messaging services after the restore operation, type `startmon start`.
5. To restore the IP Telephony data, perform the following steps:
   a. Get the backup file from the i5/OS integrated file system directory to the /opt/3com/VCX/vcxdata/db/import directory. For example:

      ```
      get IPTbackup/*.* /opt/3com/VCX/vcxdata/db/import
      ```

   b. Stop the IP Telephony services:
      i. Type `su - tomcat`, followed by password (tomcat).
      ii. Type `cd /opt/3com/VCX/scripts/rc3.d`.
      iii. Type `./S70tomcat stop`, followed by password (tomcat).
      iv. Type `exit`.
      v. Type `cd /opt/3com/VCX/scripts/rc3.d`.
      vi. Type `./S20vcxdata stop`.
   c. Restore the IP Telephony data:
      i. Type `cd /opt/3com/VCX/vcxdata/bin`.
      ii. Type `./restoreVcxdata`.
      iii. Type `y` to confirm that tomcat and vcxdata have been stopped.
      iv. Type `1` for site ID (or whatever value you are using for the VCX site ID).

      The vcxdata<site ID>backup.<version number>.tgz backup file located in /opt/3com/VCX/auth/db/import/ would be restored to the VCX authentication and directory database.
6. Restart the IP Telephony services:
      i. Type `su - tomcat`, followed by password (tomcat).
      ii. Type `cd /opt/3com/VCX/scripts/rc3.d`.
      iii. Type `./S70tomcat start`, followed by password (tomcat).
      iv. Type `exit`.
      v. Type `cd /opt/3com/VCX/scripts/rc3.d`.
      vi. Type `./S20vcxdata start`.

7.1.7 HMC configuration backup and recovery

Most of the partition configurations for System i IP Telephony are normally done via HMC. Even though HMC failures are rare, it is advisable to keep the HMC configuration backed up as a safety measure. Backing up HMC configuration does not save all your partition information, but only the HMC configuration information. That means that all the configuration changes you made (after the initial install) to the HMC would be saved to a movable disk.

Also, the recovery CD supplied with the HMC could be used to recover the HMC (or for a scratch installation) and then you can use your HMC configuration backup disk for reverting back to all your saved HMC configuration information.

For more details on the HMC configuration back up and recovery, refer to the Software Knowledge Base (Figure 7-28) at the following Web site, and click **Hardware Management Console (HMC)**:

`http://www-912.ibm.com/s_dir/slkbase.nsf/slkbase`

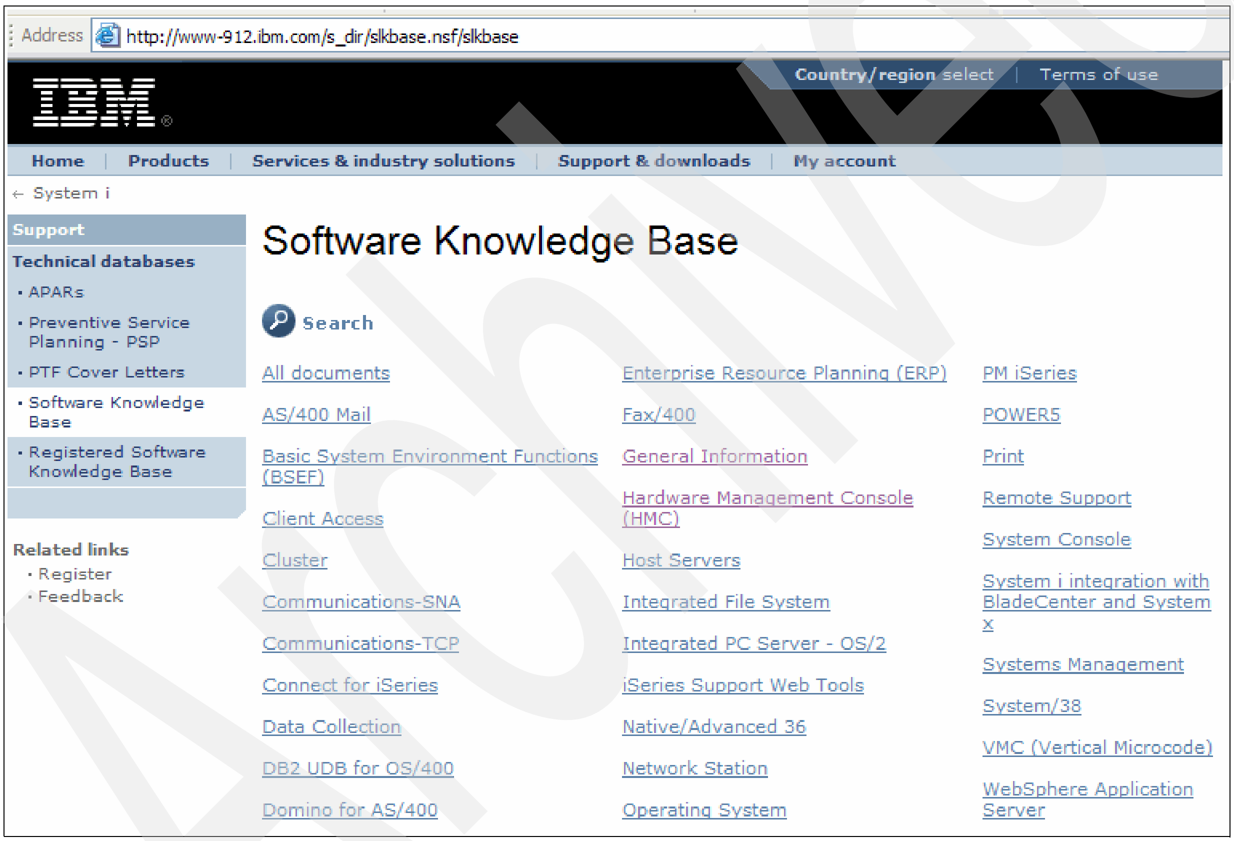

Figure 7-28 Software Knowledge Base

7.2 Enterprise Management Suite

The Enterprise Management Suite (EMS) provides a flexible management solution with comprehensive integration abilities and advanced value-added features to provide industry-leading management capabilities. Using EMS, the System i IP Telephony users would have an added advantage for maintaining the IP Telephony environment on the System i platform. EMS provides sophisticated GUIs for a variety of services for managing the IP Telephony server.

As an optional component of the IP Convergence Applications Suite, the 3Com Enterprise Management Suite (EMS) provides tools that enhance the manageability of the VCX IP Telephony and IP Messaging platforms. Based on open standards, the supports the ability to integrate with other management tools, such as Tivoli.

As shown in Figure 7-29, the EMS client provides an organized view into the voice (and data) network infrastructure, using right clicks to hone in on context-sensitive attributes and operations.

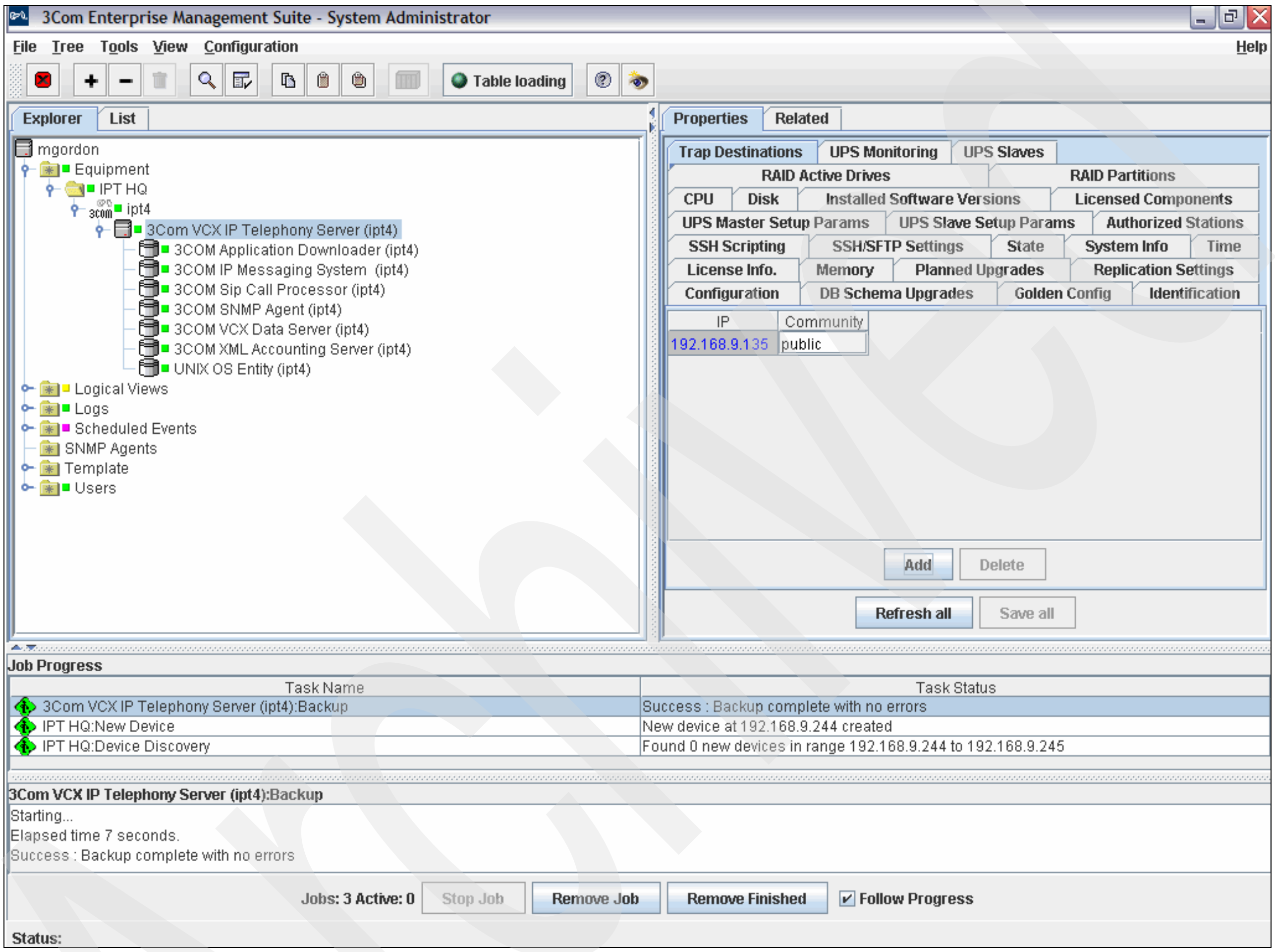

Figure 7-29 Enterprise Management Suite

7.2.1 Benefits

The management operations that can be performed using the 3Com EMS application include:

- Creation and use of logical views IP Telephony servers and gateways
- System security
- Monitor system health
- SNMP Traps
- System Configuration
- Planned Software Upgrades
- Configuration Backup
- Application-specific management and operations
- Media Gateways, EMS can discover the V7111, V7122 and V6000 SIP gateways
- Integration available with EMS for IP Convergence Applications

The requirements for the EMS server include:

- Windows 2003, Linux, or Sun server
- Pentium® 4 processor or similar
- 2 GB RAM
- 533 Mhz Front Side Bus
- 30 GB Hard Disk

The requirements for the EMS client include:

- Windows XP
- Pentium 4 processor or similar

Refer to the EMS Getting Started Guide from 3Com (see 1.5.1, "3Com reference material" on page 12) for detailed steps to install and set up EMS on a PC workstation or server.

Note: Installing EMS on the System i platform is planned for a future release.

7.3 Extending storage space for IP Telephony partition

After the IP Telephony environment has been up and running for a while, you may encounter a situation in which the storage allocated for the partition has been consumed. You may need to add more storage space to the IP Telephony partition to handle this situation. Currently, there is no documented way to extend the disk space by adding another virtual disk and using LVM to make them look like one drive.

i5/OS provides different ways for extending storage spaces. Extending the virtual disk, however, does not make the additional space available to Linux without additional work. The space is added as a separate partition which cannot be used by the existing disk without deleting and recreating the last partition and then resizing the file system on the enlarged partition. The server has to be brought down to extend the disk and then restarted to edit the partition table and restarted again for the changes to the partition table to take effect.

Important: Before extending a storage space that has been in use, you should save the entire storage space. See 7.1.3, "Backing up the entire IP Telephony guest partition" on page 188 for details. Extending the storage space involves changing the partition table in Linux, and this could irretrievably damage the disk if it is not done correctly. Therefore, take a full backup before extending the storage space.

You may want to verify that you actually need to extend the disk. It may be that some application or process is looping and filling the disk.

Also note that this process only enlarges the last partition on the disk and subsequently resizes the file system on that partition. It might not work in all cases.

This section discusses three methods for extending the storage space:

- Creating a new, larger space using the **`CRTNWSSTG CL`** command, specifying that it be created from the filled disk and specifying to make it a larger disk. See 7.3.1, "Extending the storage space using CRTNWSSTG" on page 212.
- In i5/OS V5R4, using the **`CHGNWSSTG CL`** command to add space without creating a second disk. See 7.3.2, "Extending the storage space using CHGNWSSTG (i5/OS V5R4 only)" on page 214 for further details.

- Using iSeries Navigator at V5R4 to extend the space without creating a new disk. See 7.3.3, "Extending the storage space using iSeries Navigator (i5/OS V5R4 only)" on page 215 for further details.

After the disk has been extended, it will need to be accessed from Linux, the partition recreated to include the extent, and the file system resized. See 7.3.4, "Completing the extending storage task from IP Telephony environment" on page 218, for more details.

Note: All of the three methods discussed here require that the NWSD be varied off.

7.3.1 Extending the storage space using CRTNWSSTG

This method is the only method available for i5/OS V5R3. It can also be used in V5R4, but it has several disadvantages:

- It consumes more disk space, because a second enlarged disk is created.
- It has a different name than the first disk, so would need to be renamed for consistency.
- The second disk needs to be added as a second drive, thus potentially causing confusion when doing the disk operations in Linux.

The following steps walk you through extending the storage space using the CRTNWSSTG CL command:

Note: Editing the partition table, and resizing the disk are the same operation as the other methods of extending the storage space, except for the additional steps to make the second disk available and replace the disk later. The actual operations in Linux are the same.

1. A copy of the existing storage space will be made, which requires that the network server description (NWSD) be varied off. Type the command **WRKCFGSTS *NWS** and press Enter.
2. On the Work with Configuration Status display (Figure 7-30), type option 2 (Vary off) next to the NWSD and press Enter.

```
                         Work with Configuration Status                RCHAS10
                                                             11/30/06  15:27:01
Position to  . . . . .                Starting characters

Type options, press Enter.
  1=Vary on   2=Vary off   5=Work with job   8=Work with description
  9=Display mode status    13=Work with APPN status...

Opt  Description       Status               -------------Job--------------
     IPT1              VARIED OFF
2    IPT2              ACTIVE
     IPT3              VARIED OFF
     IPT4              VARIED OFF

                                                                        Bottom
Parameters or command
===>
F3=Exit   F4=Prompt   F12=Cancel   F23=More options   F24=More keys
```

Figure 7-30 Varying off the NWSD

3. Type the command **WRKNWSSTG** and press Enter.
4. On the Work with Network Server Storage Spaces display (Figure 7-31), type option 3 (Copy) next to the network server storage space (NWSSTG) to be copied and press Enter.

```
                     Work with Network Server Storage Spaces
                                                            System:   RCHAS10
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
  11=Remove link

                                 Link           Stg
Opt  Name        Server    Seq   Type  Access   Path

     IPT1        IPT1        1   *DYN  *UPDATE
 3   IPT2        IPT2        1   *DYN  *UPDATE
     IPT3        IPT3        1   *DYN  *UPDATE
     IPT4        IPT4        1   *DYN  *UPDATE
                                                                      Bottom
Parameters or command
===>
F3=Exit   F4=Prompt       F5=Refresh   F6=Print list   F9=Retrieve
F11=Display disk status   F12=Cancel   F17=Position to
```

Figure 7-31 Copying the NWSSTG

5. On the Create NWS Storage Space display (Figure 7-32 on page 213), enter the following information:
   a. Network server storage space: Name for the new network server storage space.
   b. Size: Size of the storage space. This size should reflect the size of the existing storage space plus the additional space to be added. In this example, the storage space being copied is only 25GB, but the new space is being created with 35GB.
   c. Text ‘description’: Description for the new storage space.

   Press Enter. The existing storage space is copied into the new storage space.

> **Note:** Copying an existing storage space can be a time-consuming task.

```
                       Create NWS Storage Space (CRTNWSSTG)

Type choices, press Enter.

Network server storage space . . > IPT6          Name
Size . . . . . . . . . . . . . . > 35840         *CALC, 1-1024000 megabytes
From storage space . . . . . . . > IPT2          Name, *NONE
Format . . . . . . . . . . . . .   *NTFS         *NTFS, *FAT, *FAT32, *OPEN...
Auxiliary storage pool ID  . . .   1             1-255
ASP device . . . . . . . . . . .                 Name
Text 'description' . . . . . . . > 'CREATING A COPY OF NETWORK STG SPACE'
```

Figure 7-32 CRTNWSSTG command

6. When the copy of the storage space is completed, from the Work with Network Server Storage Spaces display, type option 10 (Link) next to the new NWSSTG and press Enter.
7. On the Add Server Storage Link (ADDNWSSTGL) display (Figure 7-33), type the name of the network server description (NWSD) in the Network server storage space field. Leave the remaining fields at their default values and press Enter.

```
                       Add Server Storage Link (ADDNWSSTGL)

 Type choices, press Enter.

 Network server storage space . . > IPT6          Name
 Network server description . . . > IPT2          Name
 Dynamic storage link . . . . . .   *NO           *NO, *YES
 Access . . . . . . . . . . . . .   *UPDATE       *UPDATE, *READ, *SHRUPD
 Drive sequence number  . . . . .   *CALC         1-64, *CALC, *QR
 Storage path number  . . . . . .   *DFTSTGPTH    1-4, *DFTSTGPTH, *MLTPTHGRP



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
 Function key not allowed.
```

Figure 7-33 Adding the network server storage link

8. From the Work with Configuration Status window (Figure 7-30 on page 212), type option 1 (Vary on) next to the NWSD and press Enter.
9. Go to "Completing the extending storage task from IP Telephony environment" on page 218.

7.3.2 Extending the storage space using CHGNWSSTG (i5/OS V5R4 only)

This method is only available for i5/OS V5R4. The following steps walk you through extending the storage space using the CHGNWSSTG command:

1. With the NWSD varied off, enter the Change NWS Storage Space (CHGNWSSTG) command and press Enter. The only parameter required is the Size parameter; see Figure 7-34 on page 214.

```
                       Change NWS Storage Space (CHGNWSSTG)

 Type choices, press Enter.

 Network server storage space . . > IPT2          Name
 Size . . . . . . . . . . . . . .   35840         *CALC, 1-1024000 megabytes
 Text 'description' . . . . . . .



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 7-34 Changing the NWSSTG

2. Vary on the NWSD.
3. Go to “Completing the extending storage task from IP Telephony environment” on page 218.

7.3.3 Extending the storage space using iSeries Navigator (i5/OS V5R4 only)

This method is only available for i5/OS V5R4. The following steps walk you through extending the storage space using iSeries Navigator:

1. Start iSeries Navigator and expand **My Connections** → **Integrated Server Administration** to list all the NWSD objects on the system, as shown in Figure 7-35.

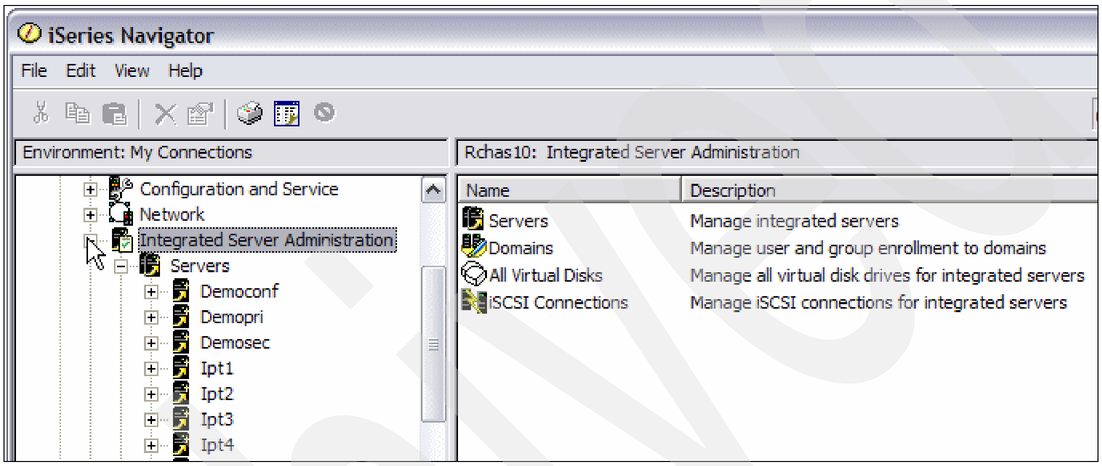

Figure 7-35 iSeries Navigator, Integrated Server Administration

2. Select the NWSD for which the storage space needs to be extended; see Figure 7-36 on page 215.

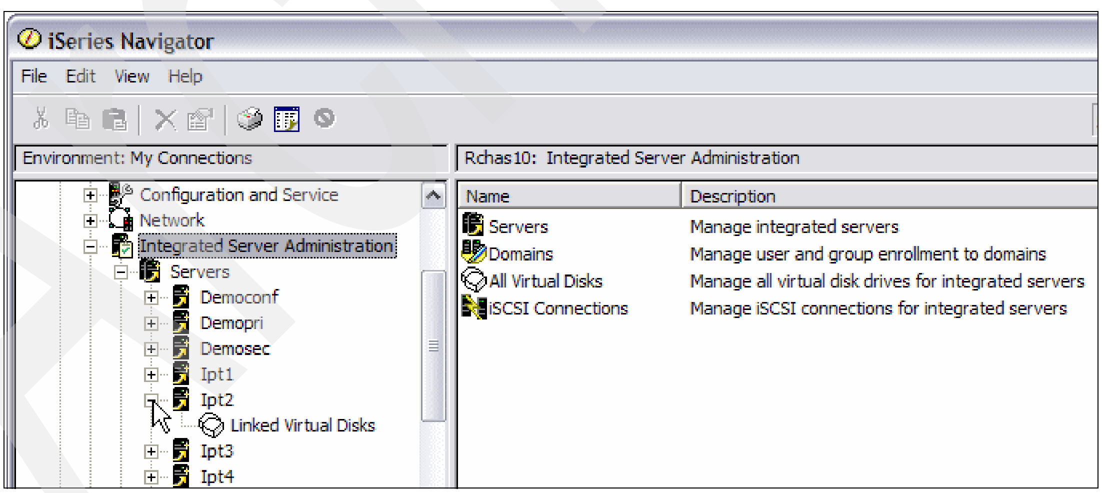

Figure 7-36 Selecting the NWSD

3. In the right panel of the window displayed, right-click he NWSSTG name and select **Properties**, as shown in Figure 7-37.

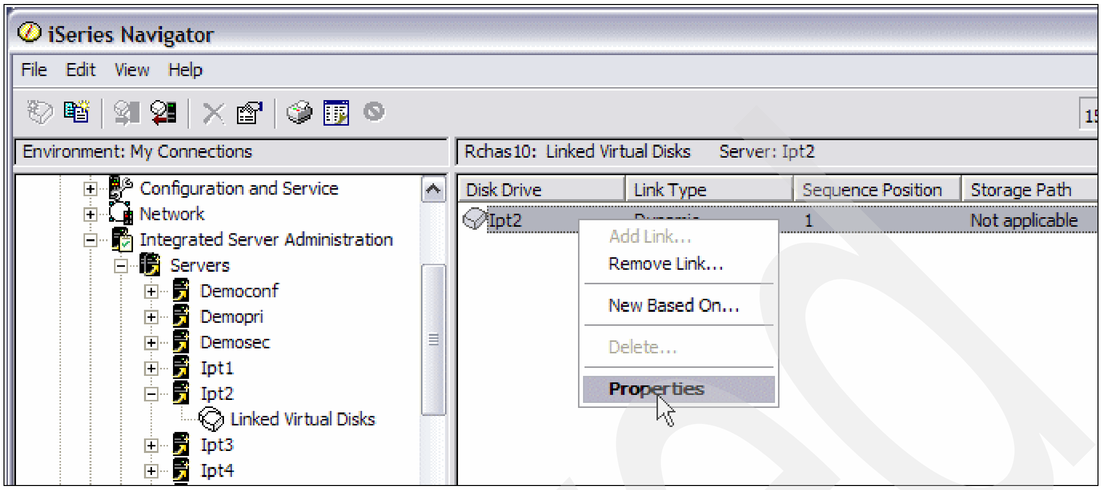

Figure 7-37 Selecting the NWSSTG properties from iSeries Navigator

4. On the Properties window (Figure 7-38 on page 216), click the **Capacity** tab.

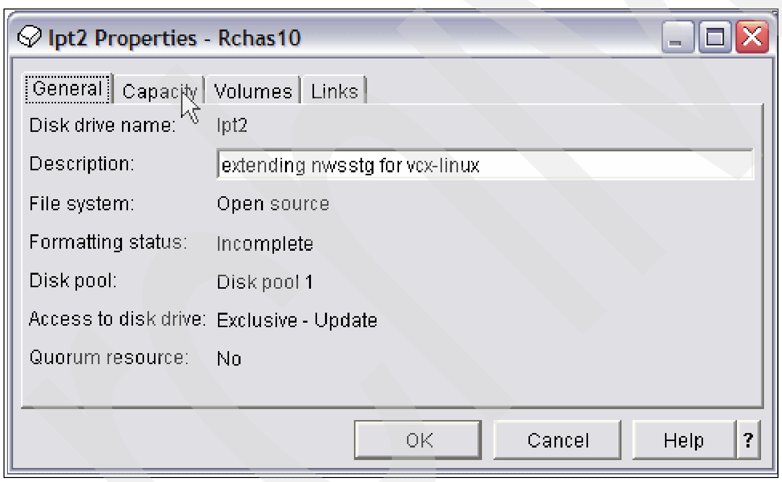

Figure 7-38 NWSSTG properties

5. Change the capacity from the current value displayed in the New Capacity field and enter the larger amount as shown in Figure 7-39. Click **OK**.

> **Note:** In our example, Figure 7-39 shows the free space as 25 GB because the IP Telephony application installed in this partition did not consume considerable storage space.

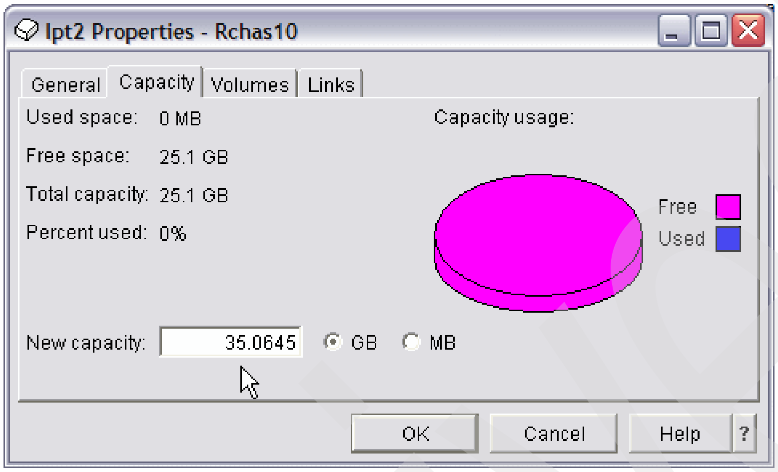

Figure 7-39 Entering a larger value in the New capacity field

6. The window shown in Figure 7-40 on page 217 is displayed while it is working.

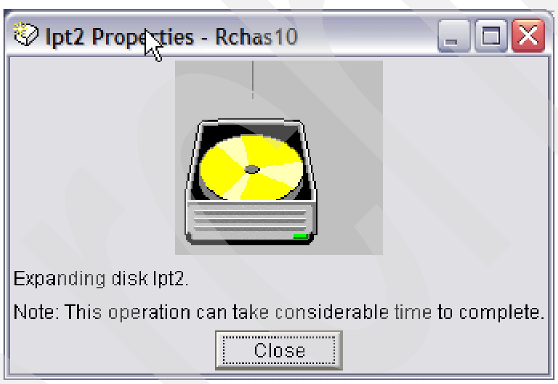

Figure 7-40 Expanding the disk

7. Verify that the disk was expanded by viewing the properties of the storage space; see Figure 7-41.

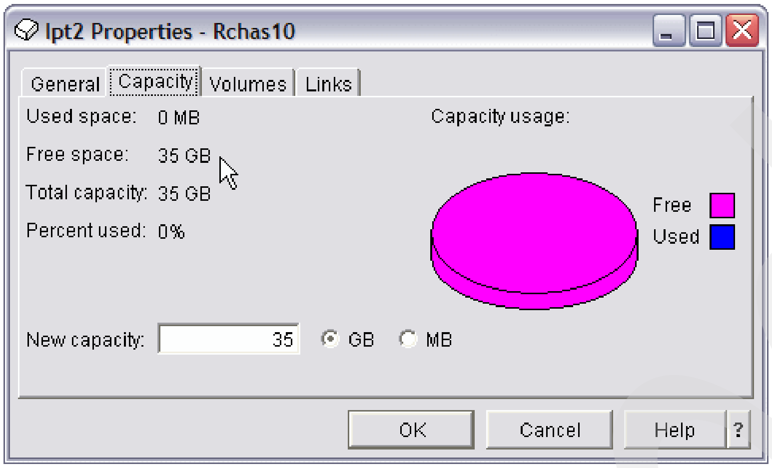

Figure 7-41 Verify the disk expanded.

8. At this point, you are done with extending the disk with iSeries Navigator. Continue with 7.3.4, “Completing the extending storage task from IP Telephony environment” on page 218.

7.3.4 Completing the extending storage task from IP Telephony environment

Perform the steps in this section to complete the process of extending the storage for your IP Telephony partition.

Booting from the install media

In order to do the following procedures, the IP Telephony partition needs to be booted up on the install media. This causes all of the partitions be unmounted. In order to run the commands required to resize the file system, the partitions must be unmounted. There may be other ways to run unmounted successfully, but booting from the install media seems to be the safest and easiest method.

Perform the following steps to boot from the install media:

1. For HMC-managed partitions, verify that the partition boot mode is set to SMS. To verify this, right-click the partition profile and select **Properties**; see Figure 7-42.

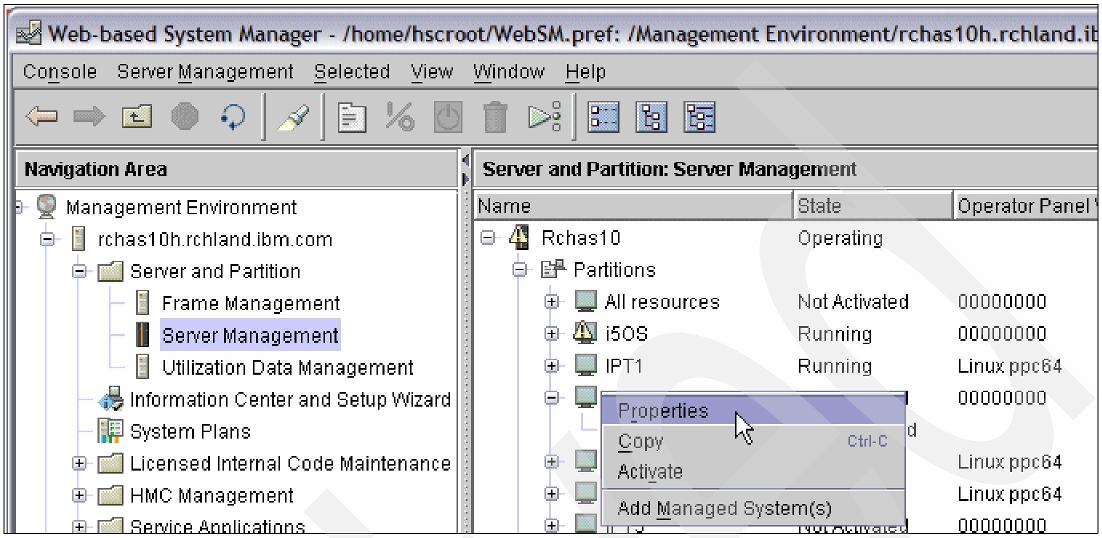

Figure 7-42 Selecting properties of the partition profile

2. On the Logical Partition Profile Properties window (Figure 7-43), select the **Settings** tab and set the boot mode to **System Management Services (SMS)** if it is not already selected. Click **OK**.

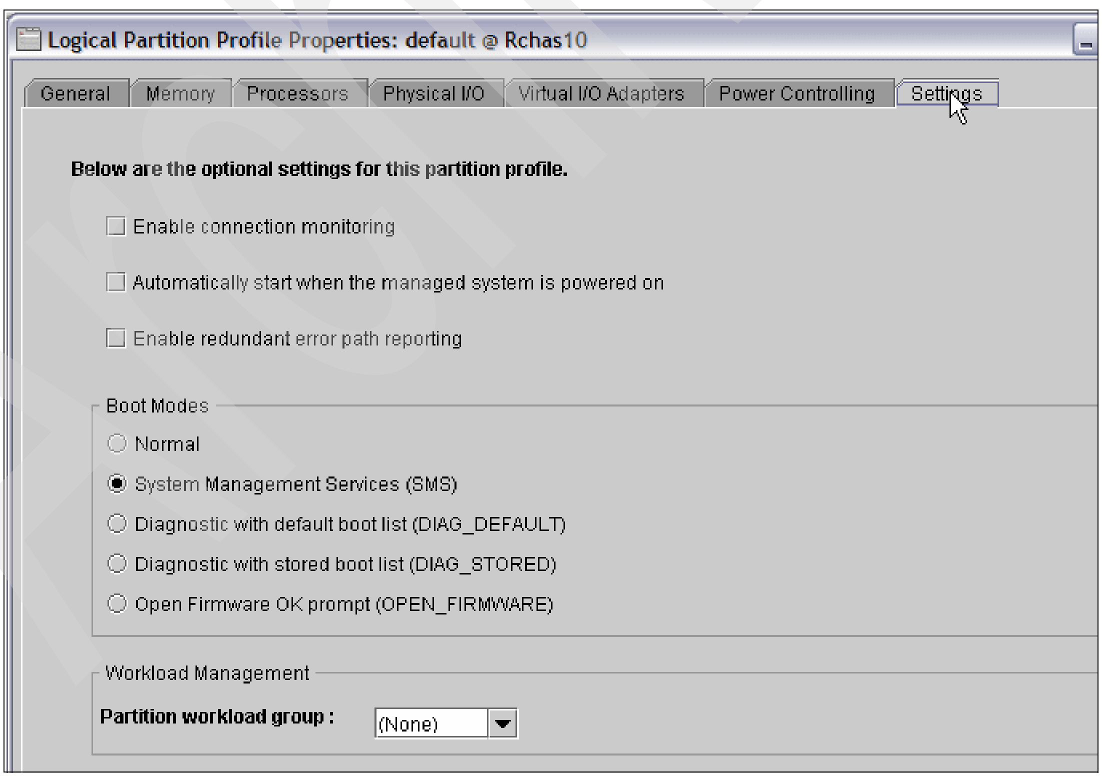

Figure 7-43 Verifying the partition boot mode

3. Display the NWSD and verify that the IPL source is set to *PANEL. If it is not, change it (which requires the NWSD to be varied off); see Figure 7-44.

> **Note:** This step is the only step necessary in a VPM-managed system prior to activating, to boot into SMS.

```
                         Display Network Server Desc                RCHAS10
                                                           12/12/06  22:21:03
 Network server description . . . . :   IPT2
 Option . . . . . . . . . . . . . . :   *BASIC
 Synchronize date and time  . . . . :   *NO
 IPL source . . . . . . . . . . . . :   *PANEL
 IPL stream file  . . . . . . . . . :   *NONE

 IPL parameters . . . . . . . . . . :   *NONE

Power control  . . . . . . . . . . :   *YES
 Text . . . . . . . . . . . . . . . :   *BLANK
                                                                       Bottom
 Press Enter to continue.
```

Figure 7-44   Displaying the Network Server Description

4. With the install media in the DVD drive or the ISO in the image catalog and your console connected, boot the partition.
5. On the SMS menu (Figure 7-45), type option 5 (Select Boot Options) and press Enter.

```
 Version SF240_261
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Main Menu
 1.   Select Language
 2.   Setup Remote IPL (Initial Program Load)
 3.   Change SCSI Settings
 4.   Select Console
 5.   Select Boot Options

-------------------------------------------------------------------------------
 Navigation Keys:

                                           X = eXit System Management Services
-------------------------------------------------------------------------------
```

Figure 7-45   SMS menu

6. On the Multiboot menu (Figure 7-46), type option 1 (Select Install/Boot Device) and press Enter.

```
Version SF240_261
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Multiboot
1.   Select Install/Boot Device
2.   Configure Boot Device Order
3. Multiboot Startup <OFF>

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 1
```

Figure 7-46   Multiboot menu

7. On the Select Device Type menu (Figure 7-47), type option 7 (List all devices) and press Enter.

```
Version SF240_261
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Device Type
1.   Diskette
2.   Tape
3.   CD/DVD
4.   IDE
5.   Hard Drive
6.   Network
7.   List all Devices

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 7
```

Figure 7-47   Select Device Type menu

8. On the Select Device menu (Figure 7-48), select the SCSI CD-ROM. If there are more than one, you may have to try each until you get the correct device.

> **Tip:** To avoid confusion with multiple SCSI devices, you can restrict which devices are made available to the NWSD.

```
Version SF240_261
SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
Select Device
Device  Current  Device
Number  Position  Name
1.        -      Virtual Ethernet
                 ( loc=U9406.520.108A36C-V4-C3-T1 )
2.        -      Virtual Ethernet
                 ( loc=U9406.520.108A36C-V4-C4-T1 )
3.        1      SCSI 37581 MB Harddisk, part=1 ()
                 ( loc=U9406.520.108A36C-V4-C2-T1-W8000000000000000-L0 )
4.        -      SCSI CD-ROM
                 ( loc=U9406.520.108A36C-V4-C2-T1-W8020000000000000-L0 )
5.        -      SCSI Tape
                 ( loc=U9406.520.108A36C-V4-C2-T1-W8040000000000000-L0 )

-------------------------------------------------------------------------------
Navigation keys:
M = return to Main Menu
ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
Type menu item number and press Enter or select Navigation key: 4
```

Figure 7-48 Select Device menu

9. On the Select Task menu (Figure 7-49), type option 2 (Choose Normal Boot) and press Enter.

```
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Select Task

SCSI CD-ROM
    ( loc=U9406.520.108A36C-V4-C2-T1-W8020000000000000-L0 )

 1.   Information
 2.   Normal Mode Boot
 3.   Service Mode Boot

-------------------------------------------------------------------------------
 Navigation keys:
 M = return to Main Menu
 ESC key = return to previous screen        X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 2
```

Figure 7-49 Select Task menu

10. Type option 1 (Yes) and press Enter, to exit the SMS menu; see Figure 7-50.

```
 Version SF240_261
 SMS 1.6 (c) Copyright IBM Corp. 2000,2005 All rights reserved.
-------------------------------------------------------------------------------
 Are you sure you want to exit System Management Services?
 1.   Yes
 2.   No


------------------------------------------------------------------------------
 Navigation Keys:

                                            X = eXit System Management Services

-------------------------------------------------------------------------------
 Type menu item number and press Enter or select Navigation key: 1
```

Figure 7-50 Exiting the SMS menu

11. You will see the IBM splash screen and the install media boot. This stops at the screen where the install should commence. You are now booted from the install media.

Deleting and recreating the last partition

Perform the following steps to delete and recreate the last partition:

1. The previous steps stopped at the screen shown in Figure 7-51.

```
 * Initializing random number generator ... [ ok ]
INIT: Entering runlevel: 3 [ ok ]
 * Starting syslog-ng ... [ ok ]
 * Hardware detection started ...
 * Processor 0 is
Processor 1 is [ ok ]
 * Not Loading APM Bios support ...
 * Not Loading ACPI support ...
 * Coldplugging input devices ... [ ok ]
 * Coldplugging isapnp devices ... [ ok ]
 * Coldplugging pci devices ... [ ok ]
 * Coldplugging pnp devices ... [ ok ]
 * Coldplugging usb devices ... [ ok ]
 * No Network device auto detected ...
 * Auto-scrambling root password for security ... [ ok ]
 * Starting local ... [ ok ]

Welcome to the 3Com VCX for System i Installation Disc!

Type 'install' to begin the VCX installation.
livecd root #
```

Figure 7-51 Booting from the install media

2. Type `clear` to clear the screen of the VCX install information.
3. From the Linux command line, type `fdisk -l` to display a list of the disk partitions. Output similar to Figure 7-52 will display the partitions on the drive.

```
livecd root # fdisk -l

Disk /dev/sda: 37.5 GB, 37581304320 bytes
64 heads, 32 sectors/track, 35840 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1           8        8191+  41  PPC PReP Boot
/dev/sda2               9        3008     3072000   83  Linux
/dev/sda3            3009        6008     3072000   83  Linux
/dev/sda4            6009       25666    20129792   83  Linux
livecd root #
```

Figure 7-52 Listing the disk partitions

4. Type the command **`fdisk /dev/sda`** and press Enter. Then type `p` and press Enter; see Figure 7-53.

```
livecd root # fdisk /dev/sda

The number of cylinders for this disk is set to 35840.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
1) software that runs at boot time (e.g., old versions of LILO)
2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p
```

Figure 7-53 Displaying the partition table

5. Note the size of 35 GB and the end cylinder of 20129792, indicating that the disk extends beyond the last cylinder. However, we are interested in the beginning cylinder of /dev/sda4. Make a note of this value (it is 6009, in this example); see Figure 7-54.

```
Disk /dev/sda: 37.5 GB, 37581304320 bytes
64 heads, 32 sectors/track, 35840 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1           8        8191+  41  PPC PReP Boot
/dev/sda2               9        3008     3072000   83  Linux
/dev/sda3            3009        6008     3072000   83  Linux
/dev/sda4            6009       25666    20129792   83  Linux

Command (m for help):
```

Figure 7-54 Noting the boundaries of /dev/sda4

6. At this point you are going to delete the last disk partition. Type `d` and press Enter; see Figure 7-55.

```
Disk /dev/sda: 37.5 GB, 37581304320 bytes
64 heads, 32 sectors/track, 35840 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1           8        8191+  41  PPC PReP Boot
/dev/sda2               9        3008     3072000   83  Linux
/dev/sda3            3009        6008     3072000   83  Linux
/dev/sda4            6009       25666    20129792   83  Linux

Command (m for help): d
```

Figure 7-55 Deleting the last partition

7. A prompt will be displayed for the partition number (Figure 7-56). Type the number of the partition (in our example, the partition number is 4 as indicated by the 4 in the device name) and press Enter.

```
Partition number (1-4): Partition number (1-4): 4
```

Figure 7-56 Entering the partition number to delete

8. Now that the last partition has been deleted, it can be recreated. Type `n` and press Enter; see Figure 7-57.

```
Command (m for help): n
Command action
   e   extended
   p   primary partition (1-4)
```

Figure 7-57 Creating a new partition

9. When prompted for the partition type, type `p` for primary partition and press Enter. When prompted for the partition number, enter the same number as the partition that was deleted and press Enter; see Figure 7-58.

```
p
Selected partition 4
First cylinder (6009-35840, default 6009):
```

Figure 7-58 Creating a primary partition

10. When prompted for the first cylinder, enter the value of the first cylinder that was recorded earlier (this was 6009, in our example). When prompted for the last cylinder, the default will be the last cylinder on the disk (which is what we want), so just press Enter; see Figure 7-59.

```
Selected partition 4
First cylinder (6009-35840, default 6009): 6009
Last cylinder or +size or +sizeM or +sizeK (6009-35840, default 35840):
Using default value 35840
```

Figure 7-59 Specifying the first and last cylinder

11. After the new partition has been created, type `w` and press Enter to cause the disk partition to be written; see Figure 7-60.

```
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
SCSI device sda: 73400985 512-byte hdwr sectors (37581 MB)
SCSI device sda: drive cache: none
SCSI device sda: 73400985 512-byte hdwr sectors (37581 MB)
SCSI device sda: drive cache: none
Syncing disks.
livecd root #
```

Figure 7-60 Partition altered

12. The extent has been removed and the partition has the full size of the disk now available.

Creating the file system and resizing the file system

Perform the following steps to create the file system and then resize it:

1. The file system for VCX-Linux is ext3. The command to resize it is **`resize2fs`**, but if you run that command first, you get the message shown in Figure 7-61.

```
livecd root # resize2fs /dev/sda4
resize2fs 1.38 (30-Jun-2005)
Please run 'e2fsck -f /dev/sda4' first.
```

Figure 7-61 Results of running resize2fs command first

2. Therefore, run the recommended command of **`e2fsck - f /dev/sda`**, which gives the result shown in Figure 7-62.

```
livecd root # e2fsck -f /dev/sda4
e2fsck 1.38 (30-Jun-2005)
/opt: recovering journal
Clearing orphaned inode 846748 (uid=500, gid=500, mode=0100660, size=0)
Clearing orphaned inode 615313 (uid=0, gid=0, mode=0100644, size=0)
Pass 1: Checking inodes, blocks, and sizes
Pass 2: Checking directory structure
Pass 3: Checking directory connectivity
Pass 4: Checking reference counts
Pass 5: Checking group summary information

/opt: ***** FILE SYSTEM WAS MODIFIED *****
/opt: 30829/1198208 files (0.6% non-contiguous), 1522480/2395648 blocks
```

Figure 7-62 Running e2fsck prior to resize2fs

3. Now run the **resize2fs /dev/sda4** command; see Figure 7-63.

```
livecd root # resize2fs /dev/sda4
resize2fs 1.38 (30-Jun-2005)
Resizing the filesystem on /dev/sda4 to 7636992 (4k) blocks.
The filesystem on /dev/sda4 is now 7636992 blocks long.
```

Figure 7-63 Resizing the file system

4. The file system is resized. If we rerun the **fdisk /dev/sda** command and type p to display the partition table, the result is shown in Figure 7-64.

```
livecd root # fdisk /dev/sda

The number of cylinders for this disk is set to 35840.
There is nothing wrong with that, but this is larger than 1024,
and could in certain setups cause problems with:
1) software that runs at boot time (e.g., old versions of LILO)
2) booting and partitioning software from other OSs
   (e.g., DOS FDISK, OS/2 FDISK)

Command (m for help): p

Disk /dev/sda: 37.5 GB, 37581304320 bytes
64 heads, 32 sectors/track, 35840 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes

   Device Boot      Start         End      Blocks   Id  System
/dev/sda1   *           1           8        8191+  41  PPC PReP Boot
/dev/sda2               9        3008     3072000   83  Linux
/dev/sda3            3009        6008     3072000   83  Linux
/dev/sda4            6009       35840    30547968   83  Linux

Command (m for help):
```

Figure 7-64 Verifying the resize

5. Enter the command **e2fsck -f -a /dev/sda4** to verify the size of the new file system; see Figure 7-65.

```
livecd root # e2fsck -f -a /dev/sda4
/opt: 30829/3788928 files (0.6% non-contiguous), 1603775/7636992 blocks
```

Figure 7-65 Verifying the size of the new file system

6. Now you can shut down the server and, for an HMC system, set the boot mode to normal and for either HMC or VPM, change the NWSD to boot from *NWSSTG.

Additional steps when using CRTNWSSTG

After the disk has been resized and the NWSD set to boot from disk, you must unlink the old space and relink the new one as described in the following steps:

1. Back in i5/OS, type the command **WRKNWSSTG** and press Enter.

2. On the Work with Network Server Storage Spaces display (Figure 7-66), type option 11 (Remove link) next to the original storage space and press Enter.

```
                    Work with Network Server Storage Spaces
                                                            System:   RCHAS10
Type options, press Enter.
  1=Create   2=Change   3=Copy   4=Delete   5=Display   6=Print   10=Add link
  11=Remove link

                                 Link          Stg
Opt  Name        Server    Seq   Type  Access   Path

     IPT1        IPT1        1   *DYN  *UPDATE
     IPT2        IPT2        1   *DYN  *UPDATE
     IPT3        IPT3        1   *DYN  *UPDATE
11   IPT4        IPT4        1   *DYN  *UPDATE
     IPT6        IPT6        1   *DYN  *UPDATE
                                                                       More...
Parameters or command
===>
F3=Exit   F4=Prompt      F5=Refresh   F6=Print list   F9=Retrieve
F11=Display disk status   F12=Cancel   F17=Position to
```

Figure 7-66 Work with Network Server Storage Space display

3. On the Remove Server Storage Link window (Figure 7-67), change the value of the Renumber link field to *YES. This will cause the new storage space to assume the link value of this storage space, which will cause it to assume the same Linux device name. Press Enter to remove the link.

```
                     Remove Server Storage Link (RMVNWSSTGL)

Type choices, press Enter.

Network server storage space . . > IPT2          Name
Network server description . . . > IPT2          Name
Renumber link  . . . . . . . . .   *YES          *NO, *YES




                                                                        Bottom
F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
F24=More keys
```

Figure 7-67 Removing the storage link for the original space

4. On the Work with Network Server Storage Spaces display (Figure 7-66), type option 10 (Add link) next to the new storage space and press Enter.

5. On the Add Server Storage Link (ADDNWSSTG) window (Figure 7-68), press Enter.

```
                     Add Server Storage Link (ADDNWSSTGL)

 Type choices, press Enter.

 Network server storage space . . > IPT6          Name
 Network server description . . . > IPT2          Name
 Dynamic storage link . . . . . .   *NO           *NO, *YES
 Access . . . . . . . . . . . . .   *UPDATE       *UPDATE, *READ, *SHRUPD
 Drive sequence number  . . . . .   *CALC         1-64, *CALC, *QR
 Storage path number  . . . . . .   *DFTSTGPTH    1-4, *DFTSTGPTH, *MLTPTHGRP



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 7-68 Adding the link to the new storage space

6. Vary the NWSD back on to start Linux. After Linux has been started, verify that the resized file system has additional space available.
7. After you are satisfied that the disk has been successfully resized, the original storage space can be deleted.

7.4 Moving an IP Telephony partition

Moving an IP Telephony partition basically allows you to move a complete IP Telephony partition from one System i machine to a different one. This is based on the advantage that System i treats an LPAR as one object (or more objects, if you have a user-defined ASP) in i5/OS. Therefore, this object can be saved and moved to different systems.

After moving the partition, and the new network details are provided, activating the IP Telephony partition would start the IP Telephony application working the same way as before without having to perform any IP Telephony configuration on the new system.

You may want to move an IP Telephony partition to a different system due to one or more of the following reasons:

- Allowing the IP Telephony application to run on a different machine with a higher configuration.
- Allowing the present System i machine to be used for another application.
- Strategic decision to change IT infrastructure.
- Creating demonstration kits.

> **Note:** The System i IP Telephony partition can be moved whenever you need to move the full application and latest data files to run on a different system.

The following description outlines the procedure to move an entire IP Telephony partition, including all the latest configuration and data available within the IP Telephony environment, to a different system. Many of the steps required for performing the save and restore operations are explained in the previous sections of this chapter.

Therefore, you should read this section with reference to 7.1.3, “Backing up the entire IP Telephony guest partition” on page 188 and 7.1.5, “Recovering an IP Telephony guest partition” on page 206.

- Shut down the IP Telephony partition and vary off the network server description (NWSD) that the virtual disk is attached to.
- Remove the NWSD link to the network server storage space (NWSSTG). This is done to ensure that the storage space does not get automatically linked to any existing NWSD during the restore operation.
- Create a save file for saving the NWSSTG. (Optionally, you could save the partition to an external storage media.)
- Save the NWSSTG.
- Move the save file to your desired system (possibly via ftp, if you have saved the partition to a save file). Otherwise, load the backup file from the external media.
- On the new system, create a partition to host the restored instance of the NWSSTG. Refer to Chapter 3, “Creating logical partitions for IP Telephony” on page 49 for details about how to create a new partition.
- Restore the save file onto the new system.
- Create a NWSD on the new system.
- Link the storage file to the NWSD.
- Ensure that the SCSI adapters created in i5/OS partition for the LPAR involving the IP Telephony application and the virtual SCSI adapters created within the partition point to the same slot id.
- Vary on the NWSD and activate the IP Telephony partition).

Perform the following steps to move an IP Telephony partition using a save file:

1. Vary off the NWSD. For details, see 7.1.3, “Backing up the entire IP Telephony guest partition” on page 188.
2. Remove the link between the NWSSTG and NWSD. Type the command **RMVNWSSTGL** and press F4 to prompt the command. Enter the Network server storage space and Network server description fields; see Figure 7-69. Press Enter.

```
                     Remove Server Storage Link (RMVNWSSTGL)

 Type choices, press Enter.

 Network server storage space . .   IPT2          Name
 Network server description . . .   IPT2          Name
 Renumber link  . . . . . . . . .   *NO           *NO, *YES



                                                                         Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 7-69 Removing the network server storage link

3. After the link between NWSD and NWSSTG is removed, you are ready to save the network storage space. Create a save file for saving the storage space.

4. Save the NWSSTG. For details, refer to 7.1.3, “Backing up the entire IP Telephony guest partition” on page 188.
5. Move the save file to the new system.
6. On the new system, create a partition to host the restored instance of the NWSSTG. Refer to Chapter 3, “Creating logical partitions for IP Telephony” on page 49 for details on how to create a new partition.
7. Restore the partition onto the new system.

> **Optional:** To restore the partition with a new name, you need to restore the save file with a different object name that would be used as the new partition name, as shown in Figure 7-70. On the RST command prompt, type the new object name in the New object name parameter.

```
                              Restore Object (RST)

Type choices, press Enter.

Device . . . . . . . . . . . . .   /qsys.lib/qgpl.lib/IPT2SAVF.FILE
                 + for more values
Objects:
  Name . . . . . . . . . . . . .   '*'
  Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
  New object name  . . . . . . .   IPT6
               + for more values
Name pattern:
  Pattern  . . . . . . . . . . .   '*'
  Include or omit  . . . . . . .   *INCLUDE      *INCLUDE, *OMIT
               + for more values
                                                                     More...
F3=Exit   F4=Prompt   F5=Refresh   F10=Additional parameters   F12=Cancel
F13=How to use this display        F24=More keys
```

Figure 7-70 Restoring a saved partition with a different object name

8. Create a NWSD on the new system. For details, refer to Chapter 4, “Creating the storage environment” on page 119.

9. Add a NWSSTG link to the NWSD. Type the **ADDNWSSTGL** command and press F4 to prompt the command. Specify the Network server storage space and Network server description fields; see Figure 7-71. Press Enter.

```
                       Add Server Storage Link (ADDNWSSTGL)

 Type choices, press Enter.

 Network server storage space . . > IPT2          Name
 Network server description . . . > IPT2          Name
 Dynamic storage link . . . . . .   *NO           *NO, *YES
 Access . . . . . . . . . . . . .   *UPDATE       *UPDATE, *READ, *SHRUPD
 Drive sequence number  . . . . .   *CALC         1-64, *CALC, *QR
 Storage path number  . . . . . .   *DFTSTGPTH    1-4, *DFTSTGPTH, *MLTPTHGRP



                                                                        Bottom
 F3=Exit   F4=Prompt   F5=Refresh   F12=Cancel   F13=How to use this display
 F24=More keys
```

Figure 7-71 Adding the network server storage link

10. The virtual SCSI adapter slot id of the NWSD saved from one IP Telephony partition on an i5/OS system would differ from another system. Therefore, ensure that you allocate a virtual SCSI slot from the i5/OS of the new system, and that it matches with the SCSI slot defined for the new IP Telephony guest partition.

    To check the slot id of the virtual SCSI adapter on i5/OS, from the HMC Server management view, right-click the i5/OS partition and select **Properties**.

11. On the Partition Properties window, click the **Virtual Adapters** tab and then click the **SCSI** sub-tab; see Figure 7-72. Note the slot id (in this example, it is 13). Click **OK**.

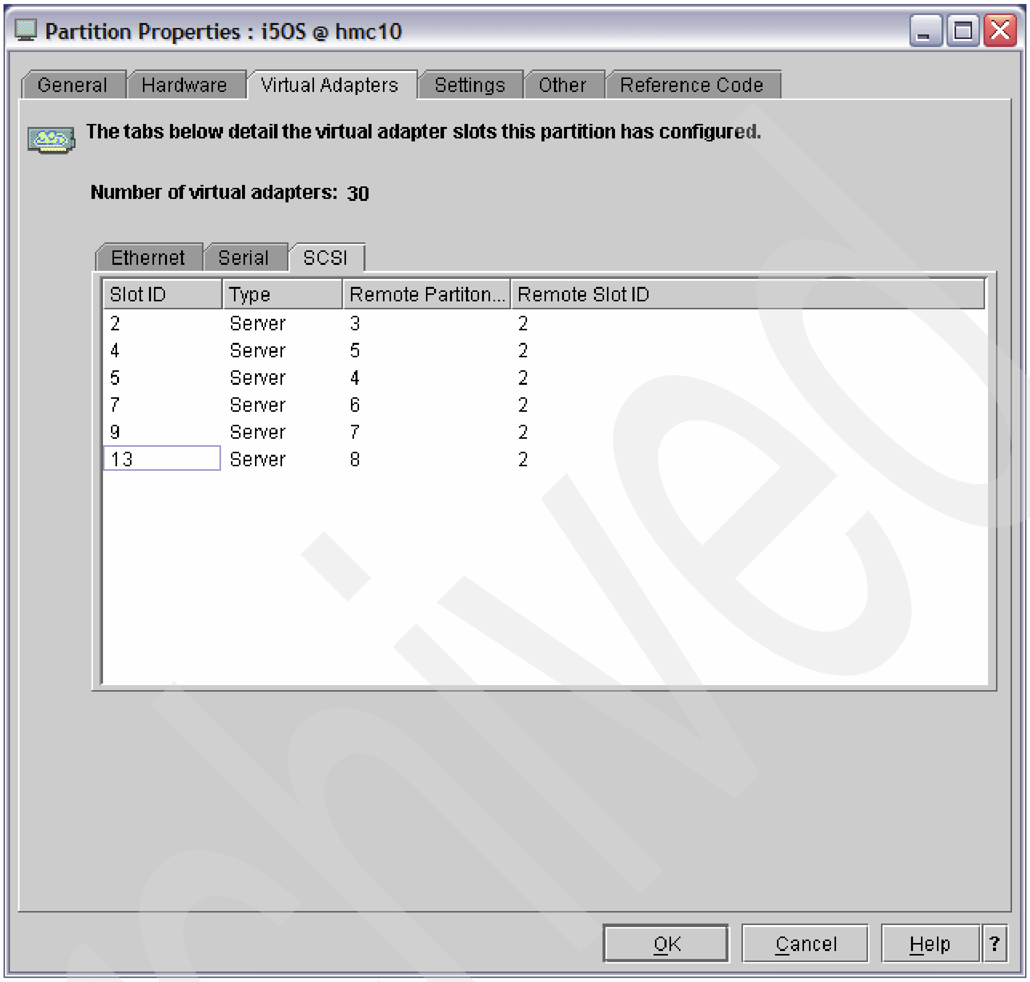

Figure 7-72 Checking the slot id of the virtual SCSI adapter on i5/OS

12. Right-click the partition name (the new partition you created) and select **Properties**. Click the **SCSI** tab and look for the slot id (it should be 13); see Figure 7-73. Click **OK**.

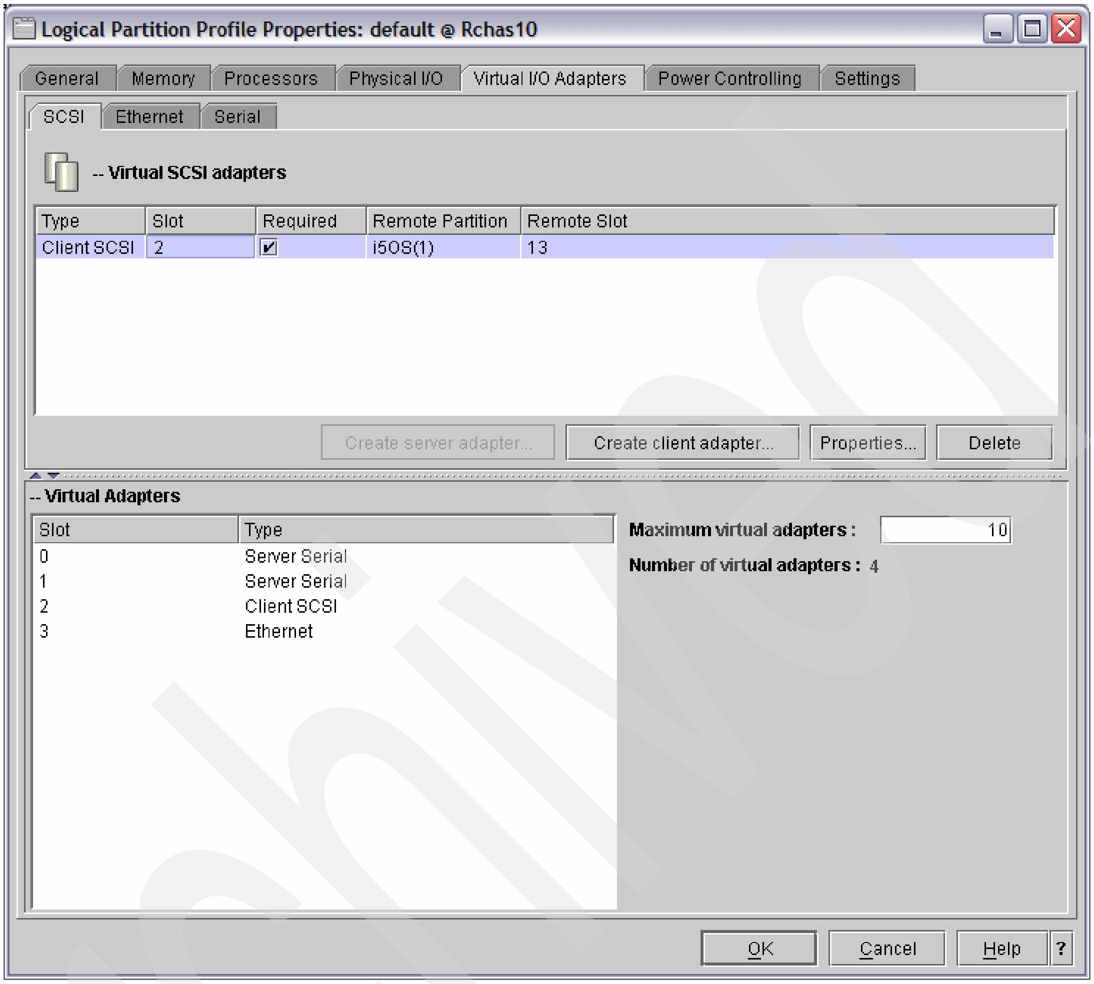

Figure 7-73 Checking the slot id of virtual SCSI adapter on the new IP Telephony partition

13. If the slot ids do not match, then you must change the slot id of the virtual SCSI adapter created for the IP Telephony partition. Click the **Properties** button and change the slot id.

14. At this point, you are ready to vary on the NWSD of the new IP Telephony partition and to activate the partition.

15. The changes which are required after a movement of an IP Telephony partition to make the configuration and data to function on the new system are as follows:

    a. The IP addresses for the new IP Telephony partition must be applied. After the partition is active, you could run the **`vcx-config-network`** command in the IP Telephony application, either using the virtual partition console window from HMC, or a connection to the partition using PuTTY or similar Linux-based tools. Refer to the 3Com documentation for this step; see 1.5.1, "3Com reference material" on page 12.

    b. The IP Telephony application license keys need to be applied for the new partition. Refer to 2.10, "IP Telephony licenses" on page 48 for more information about obtaining new license keys.

    c. End points need to be updated for the new IP Telephony environment; refer to the 3Com maintenance guide.

d. Primary and secondary call processors in phone profiles need to be changed; refer to the 3Com maintenance guide for detailed information about this topic.

7.5 IP Telephony environment upgrades

> **Important:** The VCX Linux kernel updates are only available from 3Com with IP Telephony maintenance and minor or major releases. Because the VCX Linux is specifically intended only for IP Telephony use, do not attempt to update VCX Linux with generic Linux distributions.

The IP Telephony solution is architected so that security patch management is simple, and recovery is always enabled from failed operating system upgrades. 3Com monitors kernel security issues. If there is a critical security encroachment, then the operating system is modified, qualified, and released as an operating system maintenance upgrade. If there is a less severe security issue, then the patch is incorporated in the next minor or major release.

The operating system upgrade will always be done in a partition (a partition within the LPAR) that is different from the current active partition. This ensures that the customer always has a backed-up operating system in case an error occurs when installing the updated operating system. There is no automatic upgrade operating system process (the equivalent of Red Hat Network or Windows Update), because it is more desirable to have tight control over what is released to make sure it is fully qualified and installed in a controlled manner.

For more details about this topic, refer the vcx-security.pdf file supplied with the IP Telephony software; see 1.5.1, “3Com reference material” on page 12.

7.6 Troubleshooting

This section addresses some issues that you might encounter while maintaining an IP Telephony environment on the System i platform. The actual problems may vary for different configurations, and therefore feasible ways to track down some possible issues are discussed.

7.6.1 Guidelines for troubleshooting a System i IP Telephony environment

In this section we provide a brief checklist that you can refer to if you encounter issues with the IP Telephony environment on the System i platform. You can also use it to determine where you may have gone wrong while modifying any of your IP Telephony configurations. Primarily, troubleshooting can focus on two different configuration levels:

- Configuring the IP Telephony environment on the System i platform
- Configuring the IP Telephony application

Note that the steps discussed here are simply intended to give you an idea of the major areas that you might want to analyze if you encounter an issue. They will help you determine the problem area and to investigate further by referring to the appropriate chapters in this book, or to report the problem with specific details.

1. Are you setting up IP Telephony environment on System i for the first time?

   If yes, then refer Chapter 2, “Planning” on page 13 for the correct procedure to follow in order to set up the environment correctly.

2. Was your IP Telephony environment working earlier?

   If not, return to Chapter 2, “Planning” on page 13 and refer to the appropriate sections based on the type of partition you configured for IP Telephony, to verify that you have performed all the configuration steps correctly.

3. Is your Network server active? (WRKCFGSTS - and verify that your NWSD is varied on.)

   If not, try to vary on the NWSD. If it fails, refer to 7.6.4, “Network Server Description - vary on failure” on page 243 for guidance about this topic.

   If the NWSD is varied on, then verify that the NWSD Power control parameter was set to *YES or that the partition is activated.

4. Check the HMC panel or VPM Service tools for SRC/URC codes.

   Refer to IBM Infocenter. If you cannot find a resolution in Infocenter, then contact IBM support.

5. Is the IP Telephony environment accessible? Or is it unresponsive? Is there any indication of kernel panic or other systematic Linux problems?

   Contact 3Com support. If the environment is accessible (that is, if there are no visible Linux or kernel issues), then continue with the next step in this checklist; otherwise, skip to step 10.

6. Ping the gateway IP address of the i5/OS virtual Ethernet interface.

   If it is working, then proceed with the next step in this checklist. If it is not working, check the proxy ARP configuration.

7. Ping the physical IP address of i5/OS.

   If it is working, then proceed with the next step in this checklist. If it is not working, check the proxy ARP configuration.

8. Check the i5/OS TCP/IP configuration. If it is correct, then proceed with the next step in this checklist.

   Otherwise, configure TCP/IP on i5/OS by referring to 2.8, “Network planning” on page 43.

9. Ping some IP address outside the i5/OS.

   If this works, then proceed with the next step in this checklist. Otherwise, contact IBM support.

10. Login to the IP Telephony environment as root, and type `ifconfig` to verify whether your client side configuration is correct and that the interface is active.

    If the interface is active, then there is probably a problem within the IP Telephony environment. Refer to 7.6.2, “Checking the status of the IP Telephony environment” on page 237 for information about your IP Telephony server.

11. For help regarding IP Telephony application configuration, refer to 1.5.1, “3Com reference material” on page 12 or contact 3Com support.

7.6.2 Checking the status of the IP Telephony environment

Perform the following steps to check the status of the IP Telephony environment.

> **Note:** The following examples are provided as a quick reference.
>
> Refer to 1.5.1, “3Com reference material” on page 12 for information about obtaining the 3Com guide to get more detailed information about these topics.

1. Login as root to the IP Telephony environment (from ssh or system console).
2. Type the **vcx-os-query** command and press Enter. Verify that one of the operating system partitions is active, as shown in Figure 7-74.

```
bash-3.00# vcx-os-query
OS  Version    Partition          Label           Status
A   6.3.0      /dev/sda2          /A              active
B   -          /dev/sda3          /B              not installed
bash-3.00#
```

Figure 7-74 Results of the vcx-os-query command

3. Type the **vcx-showversion** command and press Enter; see Figure 7-75.

```
bash-3.00# vcx-showversion
7.2.2c
bash-3.00#
```

Figure 7-75 Results of the vcx-showversion command

4. Type the **vcx-showphonesoftwareversion** command and press Enter; see Figure 7-76.

```
bash-3.00# vcx-showphonesoftwareversion
boot: 6_0_0_C
app:  7.2.3.3
bash-3.00#
```

Figure 7-76 Results of the vcx-showphonesoftwareversion command

5. Type the **vcx-showconfigtype** command and press Enter; see Figure 7-77.

```
bash-3.00# vcx-showconfigtype
all
bash-3.00#
```

Figure 7-77 Results of the vcx-showconfigtype command

6. Type the **vcx-showcomponents** command and press Enter; see Figure 7-78.

```
bash-3.00# vcx-showcomponents
ACE                        5.5.0
STLport                    4.6.1
UMS                        7.2.008.009
acctxml                    7.2.8
adhoc                      7.2.12
bssxml                     7.2.8
callprocessor              7.2.8
commagent                  1.1.0.71
devapp                     7.2.3.3
devboot                    6_0_0_C
devdnldsvr                 07.02.05.05
j2sdk                      5.0.0_00
oem                        7.2.5
oracle                     10.2.0.1
tomcat                     5.5.16.2
vcx-firewall               1.6.2
vcx-license                0.5.0
vcxcentral                 7.2.6.1
vcxdata                    7.2.8
vcxprov                    7.2.6.1
xerces                     c1_5_1
bash-3.00#
```

Figure 7-78 Results of the vcx-showcomponents command

7. Type the **vcx-listversions** command and press Enter; see Figure 7-79.

```
bash-3.00# vcx-listversions
7.2.2c             2006-12-07   active
bash-3.00#
```

Figure 7-79 Results of the vcx-listversions command

8. Type the **`vcx-config-services –show >services.txt`** command and press Enter. Then type the **`vi services.txt`** command to review the services configuration; see Figure 7-80.

```
bash-3.00# vcx-config-services -show >services.txt
bash-3.00# vi services.txt

---------------------- Displaying Common Parameters -----------------------
Configuration Type                                        : all_sing
Site Identifier                                           : 1
Site Name                                                 : HQ
Customer Name                                             : 3Com Customer
European Date Order                                       : N
Global Messaging In Use                                   : N
Enable Adhoc Conference Service                           : Y
SIP Default Dialing Domain                                : 1.1.1.1
Primary Media Gateway                                     : 192.168.9.161
Secondary Media Gateway                                   : (none)
Enable Call Records Service                               : Y

---------------------- Displaying Accounting Service ----------------------
Local IP Address                                          : 192.168.9.244
Site Type                                                 : rocsa

------------------- Displaying Adhoc Conference Service -------------------
Enable Adhoc Conference Service                           : Y
Adhoc IP Address                                          : 192.168.9.244
Port reservation per conference                           : 4
Maximum number of conference ports                        : 30
"services.txt" 205L, 11558C
```

Figure 7-80 Services list

9. Type the **vcx-sysinfo --all** command and press Enter; see Figure 7-81.

```
bash-3.00# vcx-sysinfo --all
no-of-cpus                    : 2
cpu0-speed                    : 1654.344000 MHz
cpu1-speed                    : 1654.344000 MHz
DiskSpace [/]                 : 2.9G
DiskSpace [/] [free]          : 2.2G
DiskSpace [/opt]              : 9.0G
DiskSpace [/opt] [free]       : 2.9G
DiskSpace [/altroot]          : 2.9G
DiskSpace [/altroot] [free]   : 2.7G
hostname                      : ipt4
number-of-interfaces          : 1
IP-address [ eth0 ]           : 192.168.9.244
MAC-address [ eth0 ]          : f6:64:40:00:30:03
Speed [ eth0 ]                : 1000Mb/s
Duplex [ eth0 ]               : Full
Auto-negotiation [ eth0 ]     : on
Link-detected [ eth0 ]        : yes
Virtual-Processors [current]  : 1
Virtual-Processors [max]      : 2
Processing-Units [current]    : 0.3
Shared-Processor-Mode         : YES
Uncapped-Processor-Mode       : YES
Shared-Processor-Weight       : 128
machine-id                    : vrkG-kqKz-5PgY-IQkQ-6abX-cgJb
MemTotal [Kb]                 : 1014452
MemFree [Kb]                  : 524764
model-name                    : IBM,9406-520
serial-number                 : 108A36C
config-type                   : all
vcx-active-os                 : 6.3.0
vcx-inactive-os               : not-installed
RAID                          : not-supported-on-this-platform
vcx-version                   : 7.2.2c
bash-3.00#
```

Figure 7-81 Results of the vcx-sysinfo command

10. Type the **vcx-licensequery –all** command and press Enter. Verify that a license is installed, and check the expiration date to determine whether the license is still valid. Also verify that the release is 7.0 or 7.1; see Figure 7-82.

```
bash-3.00# vcx-licensequery -all
basic_phone
2
standard_phone
4
messaging_vmail
4
messaging_email
2
conferencing_audio_clients
0
conferencing_audio_session
0
conferencing_video_clients
0
conferencing_video_session
0
conferencing_data_clients
0
conferencing_data_session
0
basic_phone
2
standard_phone
4
messaging_vmail
4
messaging_email
2
conferencing_audio_clients
0
conferencing_audio_session
0
conferencing_video_clients
0
conferencing_video_session
0
conferencing_data_clients
0
conferencing_data_session
0
bash-3.00#
```

Figure 7-82 Results of the vcx-licensequery command

7.6.3 Locating IP Telephony application log files

The IP Telephony log files are generated only after the hosting IP Telephony partition is created and activated successfully. These log files are useful reference points in case you experience problems when configuring and working with the IP Telephony application on the System i platform.

Refer to the IP Telephony application maintenance guide (see 1.5.1, “3Com reference material” on page 12) for details about how to locate and analyze IP Telephony application log files.

7.6.4 Network Server Description - vary on failure

This section discusses some issues that you might encounter when creating the network server storage space (NWSSTG), linking it to the network server description (NWSD).

1. Varying on the NWSD results in a Failed status, as shown in Figure 7-83.

```
                          Work with Configuration Status                RCHAS10
                                                             11/30/06  16:09:00
 Position to  . . . . .               Starting characters

 Type options, press Enter.
   1=Vary on   2=Vary off   5=Work with job   8=Work with description
   9=Display mode status    13=Work with APPN status...

 Opt  Description       Status                -------------Job--------------
      IPT1              VARIED OFF
      IPT2              FAILED
      IPT3              VARIED OFF
      IPT4              VARIED OFF

                                                                         Bottom
 Parameters or command
 ===>
F3=Exit F4=Prompt F12=Cancel F23=More options F24=More keys
```

Figure 7-83 Varying on an NWSD - failed status

2. Any vary on failure results in a CPDB1AD error.

   To locate this error and to check the details, type **DSPMSG QSYSOPR** from an i5/OS command line and press Enter; see Figure 7-84 on page 244.

```
                              Display Messages
                                                      System:   RCHAS10
Queue . . . . . :   QSYSOPR              Program . . . . :   *DSPMSG
  Library . . . :     QSYS                 Library . . . :
Severity  . . . :   70                   Delivery  . . . :   *HOLD

Type reply (if required), press Enter.
  From  . . . :   DHQB           12/01/06   05:00:00
  ==> PST       PW changed with CHGSYSSEC on 06/12/01 at 05:00:00 by DHQB
  From  . . . :   DHQB           12/01/06   05:00:00
  ==> PST INLPGM and ATNPGM changed to QSYS/QCMD by CHGSYSSEC command
  From  . . . :   DHQB           12/01/06   05:00:00
  ==> DHQB      PW changed with CHGSYSSEC on 06/12/01 at 05:00:00 by DHQB
  From  . . . :   DHQB           12/01/06   05:00:00
  ==> DHQB INLPGM and ATNPGM changed to QSYS/QCMD by CHGSYSSEC command
  Job 170323/DHQB/CHGSYSSEC completed normally on 12/01/06 at 05:00:00.
  Job 170325/DHQB/ANZDFTPWD1 submitted for job schedule entry ANZDFTPWD1
    number 001267.
  Job 170325/DHQB/ANZDFTPWD1 completed normally on 12/01/06 at 06:00:00.
  Network server IPT2 vary on failed.
                                                                     Bottom
F3=Exit             F11=Remove a message                 F12=Cancel
F13=Remove all      F16=Remove all except unanswered     F24=More keys
```

Figure 7-84 Displaying the messages for QSYSOPR

3. Place your cursor on the error message and press F1 to view the details of the error message, as shown in Figure 7-85.

```
                        Additional Message Information

Message ID . . . . . . :   CPDB1AD      Severity . . . . . . . :   40
Message type . . . . . :   Information
Date sent  . . . . . . :   12/01/06     Time sent  . . . . . . :   09:52:21

Message . . . . :   Network server IPT2 vary on failed.
Cause . . . . . :   The network server failed to vary on with reason code
  00000012. Reason codes and their meanings follow:
--0001:  Storage space  not found.
--0002:  Partition not found.
--0003:  Partition not correct type.
--0004:  Server already varied on for partition.
--0005:  Partition already active.
--0006:  A file system error occurred accessing the IPL stream file.
--0007:  IPL source not valid.
--0008:  IPL of partition failed.
--0009:  A host partition is not configured for this partition.
                                                                    More...
Press Enter to continue.

F3=Exit   F6=Print   F9=Display message details   F12=Cancel
F21=Select assistance level
```

Figure 7-85 Additional information on the error message

4. Press the Page Down key to find the error description for reason code 12; see Figure 7-86.

   This reason code indicates an inability to identify the resource name provided in the NWSD. To fix this problem, correct the resource name. Also check the slot ids as explained in 7.4, “Moving an IP Telephony partition” on page 230.

   > **Note:** The partition name given while creating the NWSD has to match the actual partition name. Also, it is case sensitive.

```
                         Additional Message Information

Message ID . . . . . . :   CPDB1AD       Severity . . . . . . . :   40
Message type . . . . . :   Information

--0010:  A network server storage space linked to this network server is
  damaged.
--0012:  Invalid resource name.
--0013:  Resource name does not match partition.
--0014:  Unable to determine partition for resource name.
--0015:  Unknown error occured.
--0016:  The virtual Ethernet configuration for the *ISCSI type NWSD is
  invalid. The associated port resource name (ASSOCPORT) parameter in one of
  the line descriptions attached to this NWSD is invalid or an invalid type.
--0017:  There are duplicate remote IP addresses for the same iSCSI network
  server host adapter hardware resource.
--0018:  A network server host adapter hardware resource used in a storage
  path of an *ISCSI type NWSD is not operational or in a bad state.
                                                                     More...
Press Enter to continue.

F3=Exit   F6=Print   F9=Display message details   F12=Cancel
F21=Select assistance level
```

Figure 7-86 Additional information on the error message - continued

7.6.5 IP Telephony code installation failure

This section explains some issues that you might encounter when installing the IP Telephony software, where the VCXInstaller DVD is not detected by the IP Telephony guest partition. Perform the following steps:

1. Check whether the installer DVD is detected by i5/OS by using WRKLNK '\QOPT', option 5 (Display); see Figure 7-87.

```
                            Work with Object Links

 Directory  . . . . :   /qopt

 Type options, press Enter.
   2=Edit   3=Copy   4=Remove   5=Display   7=Rename   8=Display attributes
   11=Change current directory ...

 Opt   Object link           Type     Attribute    Text
       VCXINSTALLER          DDIR



                                                                        Bottom
 Parameters or command
 ===>
 F3=Exit   F4=Prompt   F5=Refresh   F9=Retrieve   F12=Cancel   F17=Position to
F22=Display entire field    F23=More options
```

Figure 7-87 Checking whether VCXinstaller CD is detected by i5/OS

2. If the VCXInstaller DVD *is* detected by i5/OS, then check the following:
   - When creating the virtual SCSI adapter for the partition, the SCSI slot numbers for the guest partition and the i5/OS virtual SCSI adapter available for that partition need to match.
   - Refer to 7.4, "Moving an IP Telephony partition" on page 230 for the steps to follow in order to compare the slot ids allocated for virtual adapters on i5/OS and the IP Telephony partition.

A

Setting up a new system with Operations Console

This chapter describes how to prepare a new System i machine for the 3Com IP Telephony solution. Information covered in this chapter includes:

- Installing iSeries Access for Windows
- Configuration of the Operations Console

> **Note:** Explaining the initial configuration of the i5/OS operating system is beyond the scope of this book. The service provider should ensure that they have system setup documentation provided with the system in order to complete the setup tasks.

iSeries Access for Windows

There are a number of console options supported on the System i platform including the Hardware Management Console (HMC), thin console, twinax attached console, and so on. For purposes of this appendix, Operations Console will be used.

Operations Console is a component of the iSeries Access product that supports connection to a System i machine through a LAN connection or serial connection. The serial connection is a separate hardware adapter and cable that may or may not be included in the system order. The LAN connection supports connectivity through one of the embedded or standard Ethernet adapters, and is the option that will be used in the example shown in this appendix.

iSeries Access for Windows must be installed on the client system that will serve as the console device. The installation CD for iSeries Access for Windows typically ships with the system.

Note: It is recommended that service providers who will be installing systems on a regular basis have iSeries Access for Windows installed on the client system that they will be traveling to customer locations with.

The following steps walk through the installation of iSeries Access for Windows.

1. Start the iSeries Access for Windows installation program. When the installation program is started, an initial welcome screen (Figure A-1) is displayed. Click **Next**.

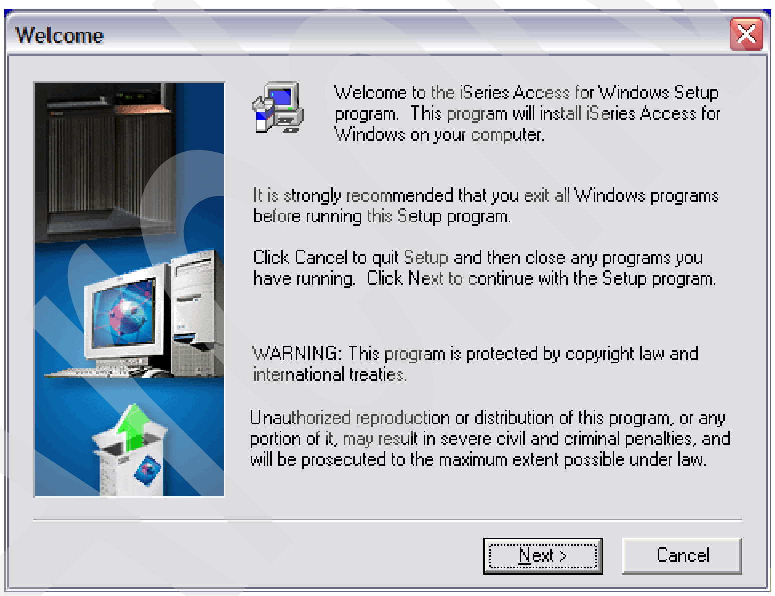

Figure A-1 iSeries Access for Windows installation - Welcome

2. On the iSeries Access for Windows License Information window (Figure A-2), read the license agreement and click **Yes**.

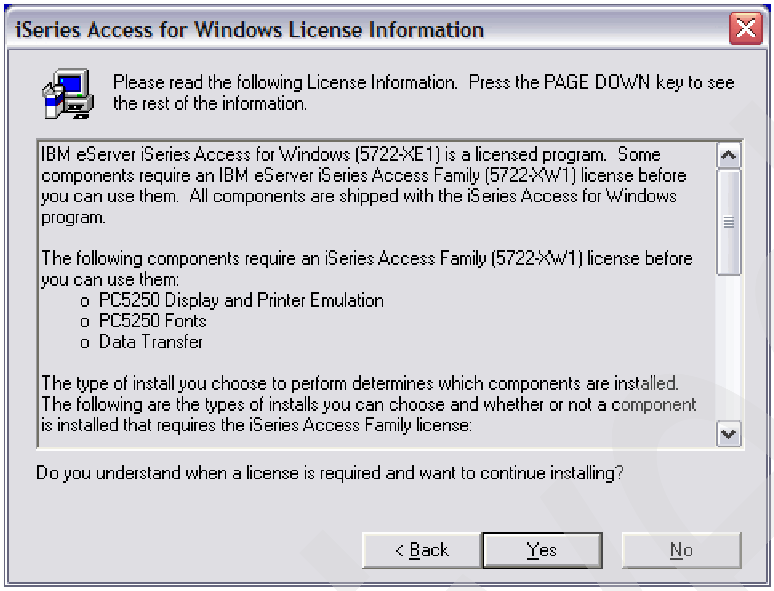

Figure A-2 iSeries Access for Windows installation - License Agreement

3. The Type of Installation window (Figure A-3) is displayed. Operations Console is not part of the typical install, so click either **Full** to perform a full installation, or click **Custom** to pick specific functions and options to install. In our example, we click **Custom**.

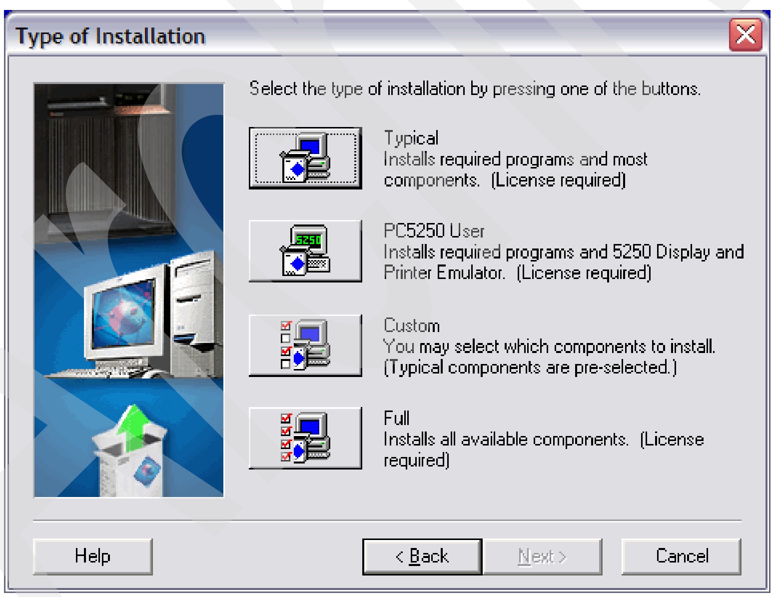

Figure A-3 iSeries Access for Windows - Type of Installation

4. iSeries Access for Window includes a 5250 emulator. If a 5250 emulator is already installed, a dialog will be displayed as shown in Figure A-4 indicating that the emulator portion of iSeries Access for Windows will not be installed. Click **Next**.

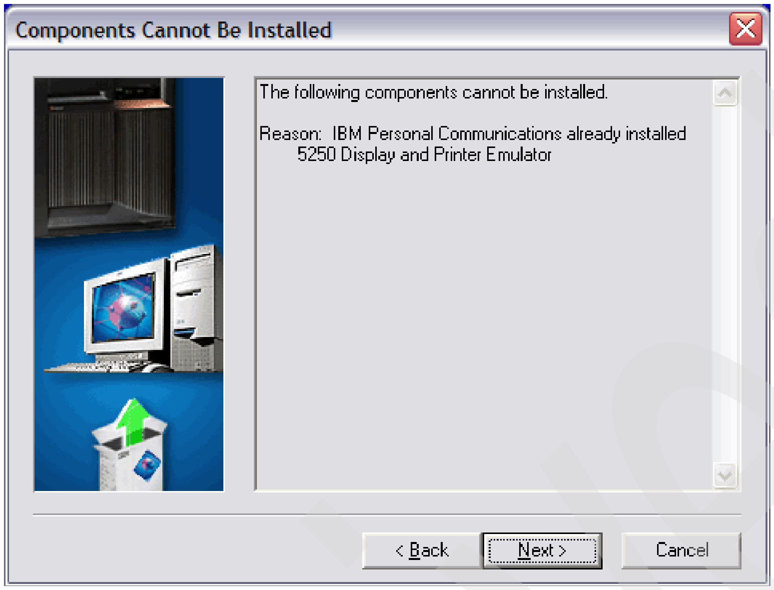

Figure A-4 iSeries Access for Windows installation - Components Cannot Be Installed

5. The Select Destination Directory window (Figure A-5) indicates the default directory for the product installation. If desired, change the destination directory for the product installation by clicking **Browse**. Otherwise, click **Next** to accept the default destination directory.

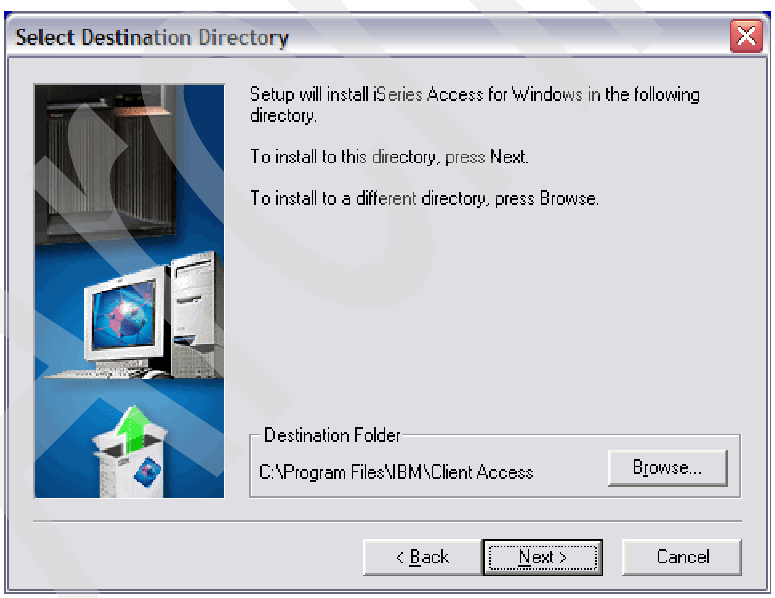

Figure A-5 iSeries Access for Windows installation - Select Destination Directory

6. On the Component Selection window (Figure A-6), scroll down the component list displayed until Operations Console is displayed. Select **Operations Console** and click **Next**.

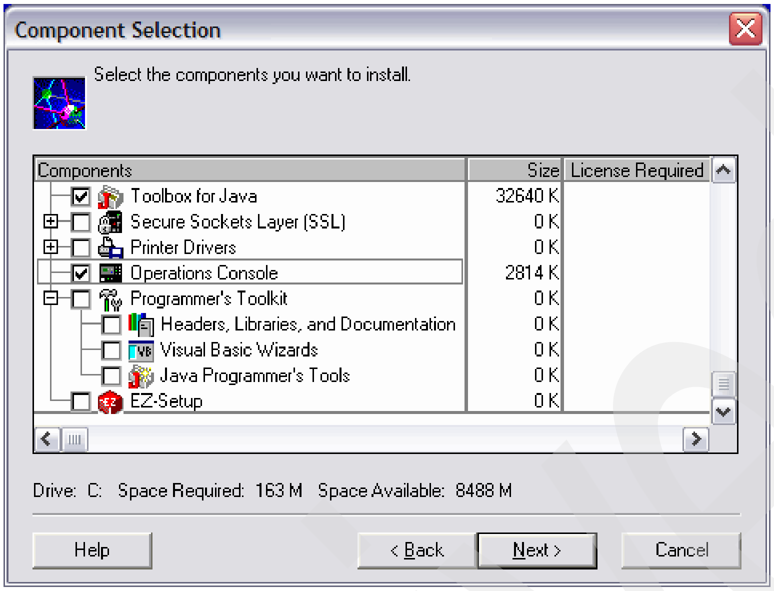

Figure A-6 iSeries Access for Windows installation - Component Selection

7. On the Specify Programs Menu Shortcut window (Figure A-7), accept the name of the program shortcut and click **Next**.

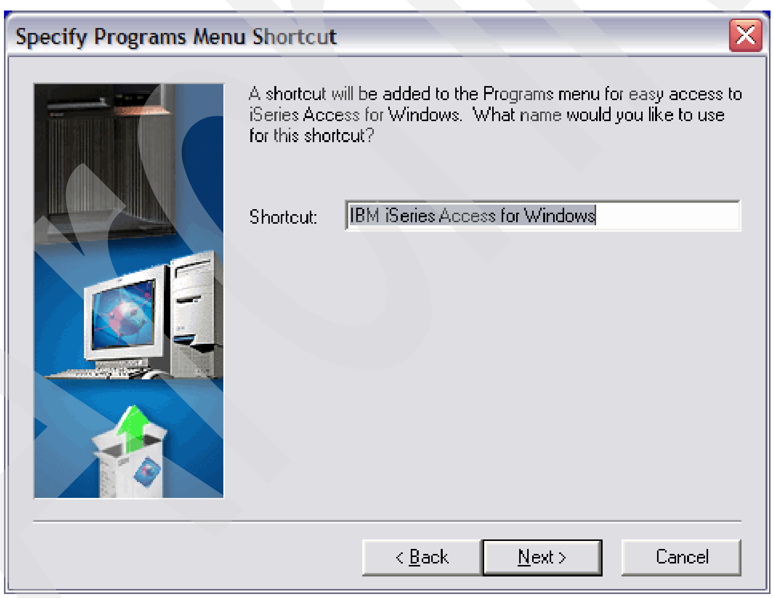

Figure A-7 iSeries Access for Windows installation - Specify Programs Menu Shortcut

8. On the Start Copying Files window (Figure A-8), a summary of the installation settings is displayed. Click **Next** to accept the installation settings and to start installing iSeries Access for Windows files on your client system.

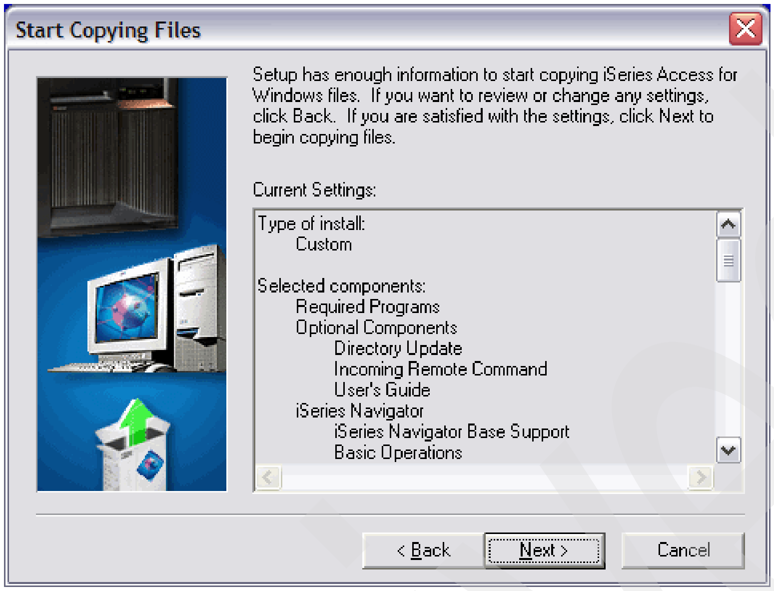

Figure A-8 iSeries Access for Windows installation - Start Copying Files

9. A status screen is displayed showing progress of the installation. After the installation is complete, you will be prompted to reboot the system.

Setting up the Operations Console

This section steps you through setting up the Operations Console using a LAN connection.

Network connectivity

For purposes of the initial system setup, a private network environment must be established between the PC client system that has iSeries Access for Windows installed and the System i machine. It is recommended that a switch (hub) be used to connect the two systems together. No other systems should be plugged into the switch or hub for this exercise. Perform the following steps:

1. The PC client system should be plugged into the hub via the client's standard Ethernet port. Configure the PC with a static IP address. Keep track of the IP address and the subnet mask used for the PC configuration, because that information will be needed in a later step.

> **Important:** Ensure that there are no firewalls (such as the Check Point Integrity client) running on the PC client system.

2. The System i should be plugged into the hub via the T5 embedded Ethernet port on the back of the system.

> **Important:** The System i power cord should *not* be plugged in yet.

Configuring the Operations Console

Now that the iSeries Access for Windows product has been installed on the PC client system, the Operations Console component needs to be configured. Perform the following steps:

1. From the client's start menu, select **Start** → **IBM iSeries Access for Windows** → **Operations Console**.
2. On the Configure iSeries Operations Console - Welcome window (Figure A-9), click **Next**.

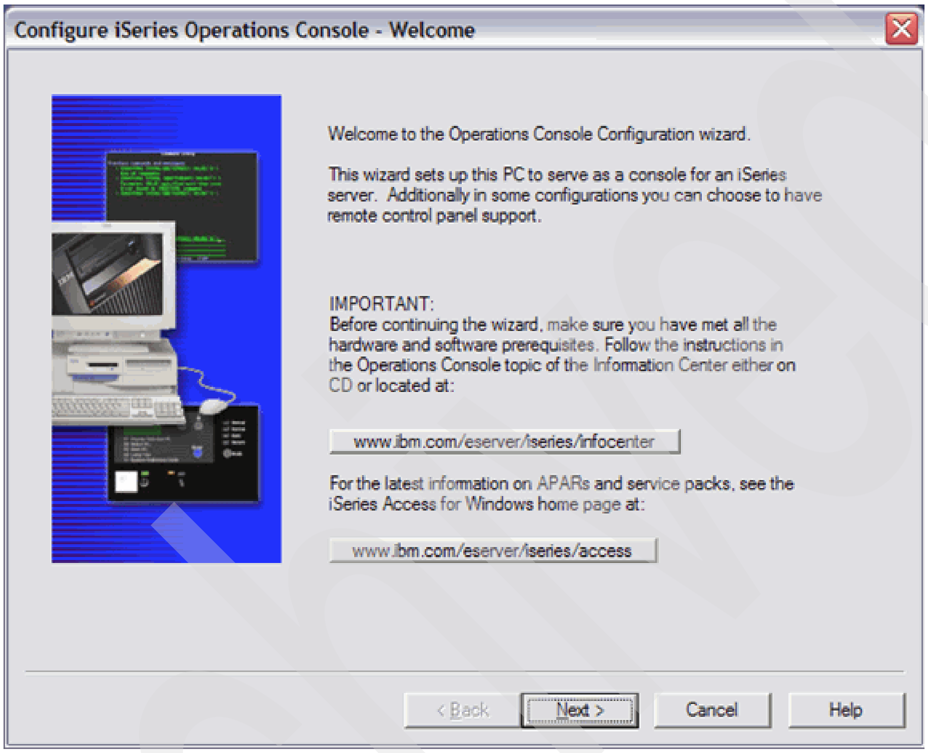

Figure A-9 Operations Console configuration - Welcome

3. Operations Console supports a number of connection methods between the client and System i machine, as shown in the Configure iSeries Operations Console - Select Configuration window in Figure A-10). In our example we are using a LAN connection, so we select **Local console on a network (LAN)** and click **Next**.

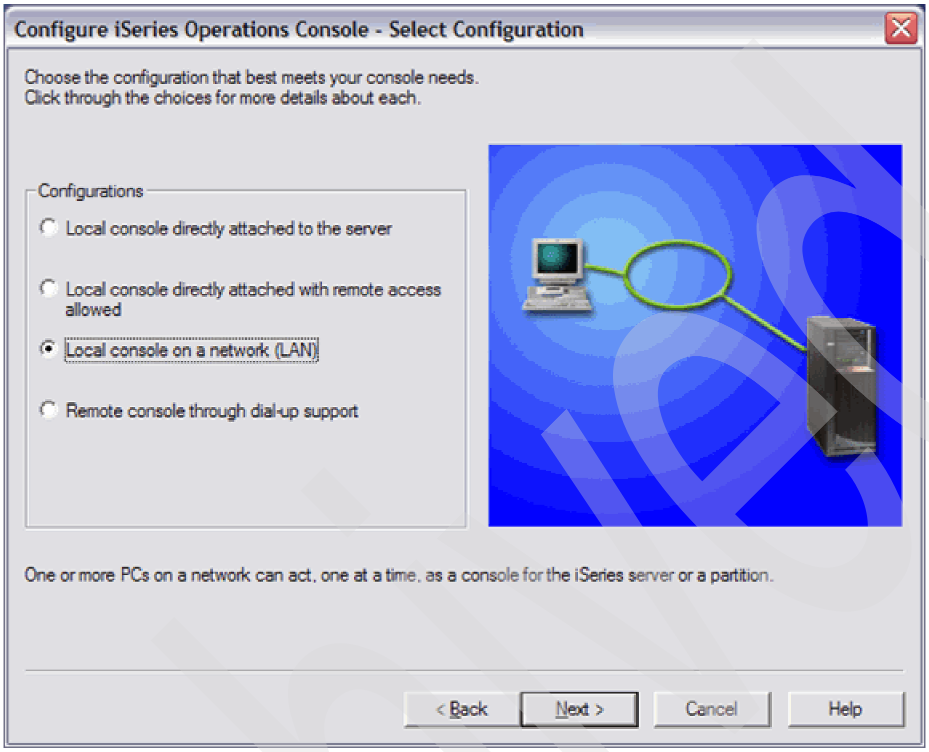

Figure A-10 Operations Console configuration - Select Configuration

4. On the Configure iSeries Operations Console - Specify Service Host Name (Figure A-11), a name needs to be assigned for the connection. Typically this will be the name of the System i machine that you are connecting to. For a new System i machine any name will work, because a name has not yet been assigned to the system.

   Operations Console supports the ability to connect to different i5/OS partitions on the same system. There will currently only be a single i5/OS partition, so select **1** for the Target partition field and click **Next**.

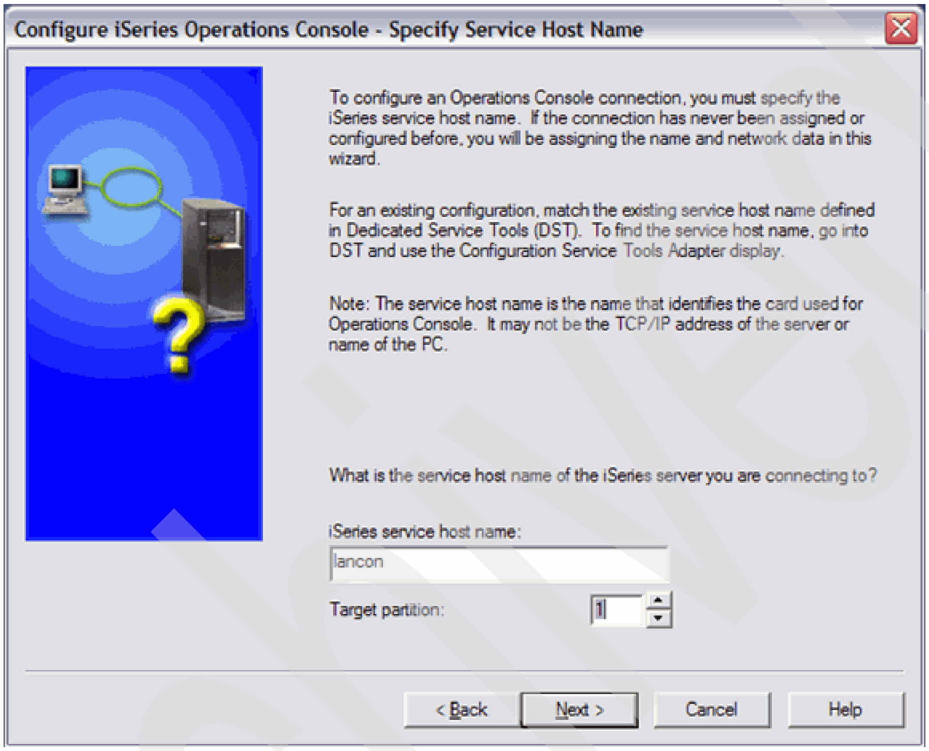

Figure A-11 Operations Console configuration - Specify Service Host Name

5. On the Configure iSeries Operations Console - Specify Interface Information window (Figure A-12), enter the following information:
   - **Service TCP/IP Address**: This is an address that is assigned to the System i machine for the initial system configuration and setup. This address should be in the same subnet as the address that you assigned to the PC client system.
   - **Service subnet mask**: This is the subnet mask that is assigned to the System i machine for initial system configuration and setup. This subnet mask should be the same subnet mask that you assigned to the PC client system.
   - **Service gateway address 1**: This is the address of the gateway on the network. Because we have established a private network, there is no need for a gateway. However, a value is needed in this field, so enter an unused address in the same subnet as the client and System i IP addresses.
   - **Service gateway address 2**: This is an optional field. Leave it blank.
   - **iSeries serial number**: Enter the serial number of the System i machine. The serial number can be found on the front panel of the system. It will be a 7-digit number where the first two digits are always 10. The serial number should be entered without the dash.

   > **Note:** Essentially what occurs is that Operations Console becomes a bootp server on the network and assigns the Service TCP/IP address to the bootp client that corresponds to the System i serial number that was entered.

   After all of the values have been defined, click **Next**.

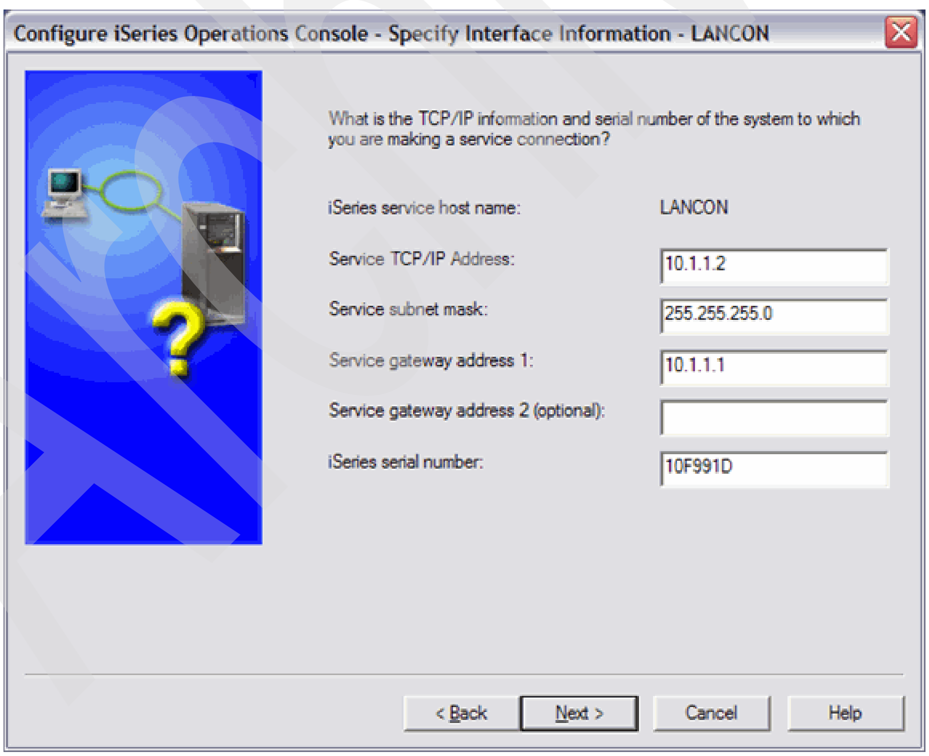

Figure A-12 Operations Console configuration - Specify Interface Information

6. On the Configure iSeries Operations Console - Specify Service Tools Device ID window (Figure A-13), ensure that the Service tools device ID for this PC is set to QCONSOLE. Click **Next**.

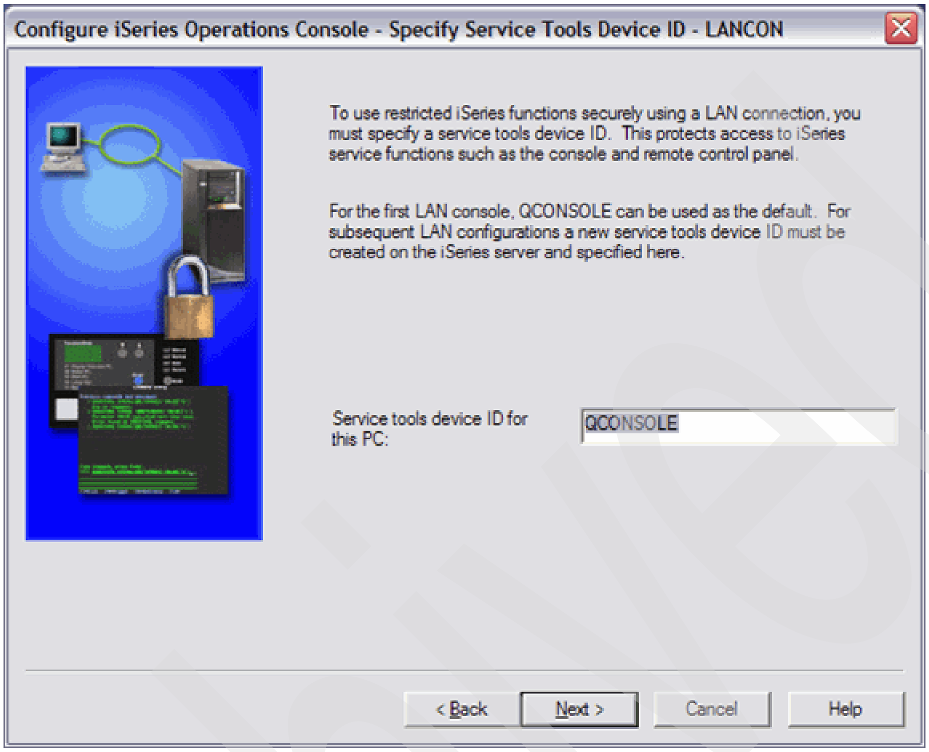

Figure A-13 Operations Console configuration - Specify Service Tools Device ID

7. On the Configure iSeries Operations Console - Specify Access Password window (Figure A-14), the initial console connection to the system will require a password for authentication. Enter a password and confirm the password. Click **Next**.

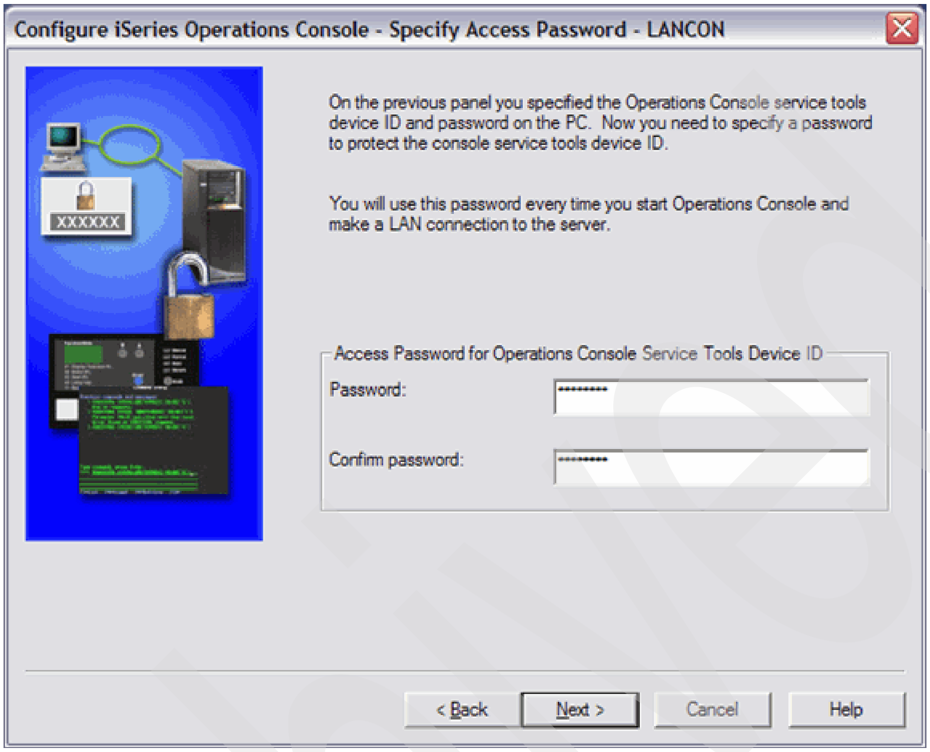

Figure A-14 Operations Console configuration - Specify Access Password

8. At this point the configuration of the Operations Console configuration is complete (Figure A-15). Click **Finish**.

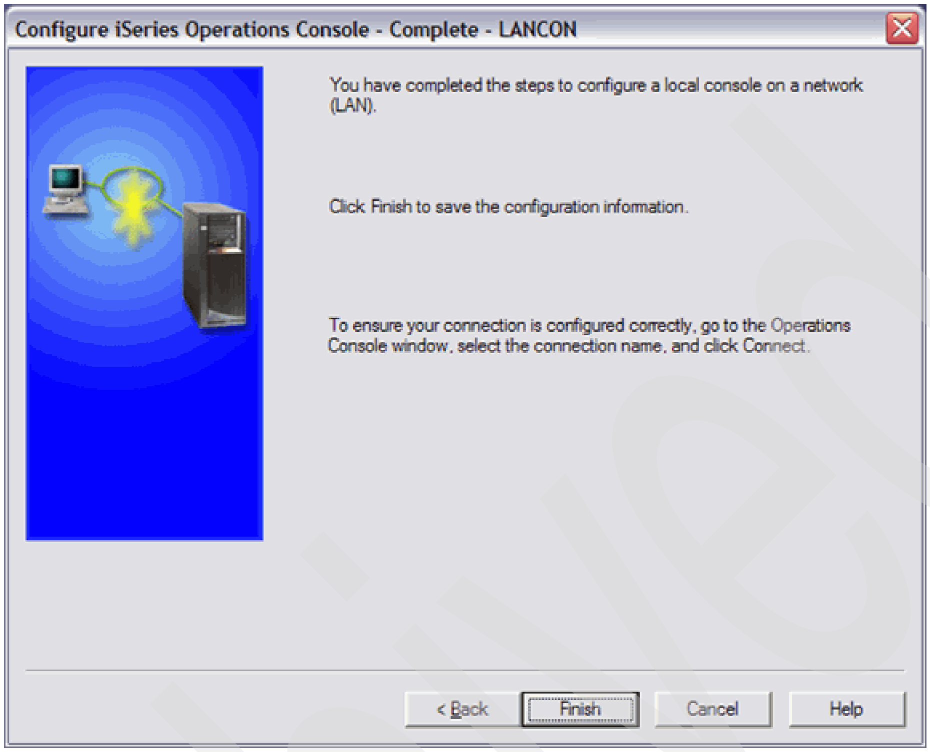

Figure A-15 Operations Console configuration - Complete

Starting the Operations Console

Perform the following steps to start the Operations Console on the PC client system:

1. From the Start menu, click **All Programs** → **iSeries Access for Windows** → **Operations Console**.
2. From the console connection window, right click the listed console and select **Connect**.

Applying power to the System i machine

> **Note:** The steps in this section use the selection buttons on the front panel of the System i machine. When instructed to enter a value, use the up and down buttons (the buttons on the left and right) to scroll to the indicated value, and then press the middle button to select or enter the value.
>
> When the value has two parts (for example, 02 M), scroll to the first part, press the middle button, and then scroll to the second part and press the middle button again.

Perform the following steps to apply power to the System i machine:

1. Plug in the power-cord for the System i machine.
2. After the Service Processor has performed its initial boot, put the system in manual mode. Use the selection keys on the front panel of the system to select **02 M**.
3. Power on the system by pressing the white button on the front panel.

4. If the SRC of A6005008 is displayed, this is an indication that the console was not found and the configuration of the service processor needs to be changed.
   a. To change the configuration, start the edit mode by using the selection keys to enter the following values:
      - 25
      - 26
   b. After edit mode has been started, use the selection keys to enter the following values:
      - 65
      - 21
      - 11
5. After the correct SRC of A603500B is displayed, use the selection keys to enter 21. This will submit the action (selection of LAN console) and continue the power-on of the system.
6. The LAN Service Tools Sign-on (Figure A-16) will eventually be displayed on the client. Enter the following values:
   - **Access password**: This is the password that was defined during the configuration of the Operations Console.
   - **Service tools user**: 11111111
   - **Password**: 11111111

   At this point a console connection has been established to the System i machine and the initial configuration of the system can be completed.

> **Note:** Initial configuration of i5/OS is beyond the scope of this book. Information for configuration of the operating system is provided with system delivery and is also available in the Infocenter.

After the operating system has been configured, resources will need to be removed from the i5/OS partition as detailed in 3.3, “Partitioning with all virtual resources via Virtual Partition Manager” on page 87.

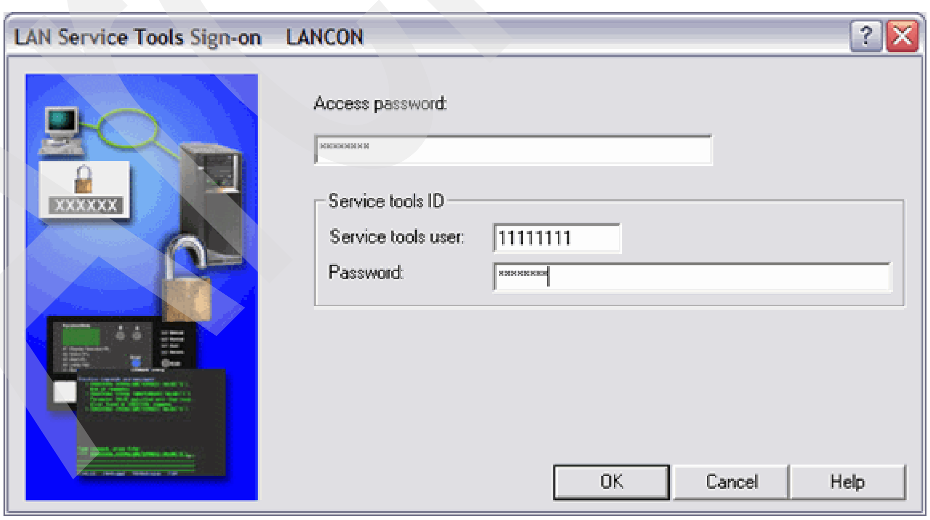

Figure A-16 LAN Service Tools Sign-on

B

Identifying virtual hardware

Virtual I/O provides resources that are not physical hardware but which appear to the operating system as actual hardware that can be used to do I/O operations so that the user can minimize the amount of hardware that they require. This appendix shows you how to identify virtual hardware in i5/OS and Linux partitions.

Identifying virtual hardware on i5/OS

Virtual hardware in i5/OS is managed by the i5/OS hardware manager. Perform the following steps to identify the virtual hardware on your system:

1. Hardware resources can be displayed using the following Work with Hardware Resources (WRKHDWRSC) command:

   ```
   WRKHDWRSC *CMN
   ```

2. There are four types of virtual hardware to look for as shown in Figure B-1 and Figure B-2:

   – 268C - virtual Ethernet port
   – 290B - virtual SCSI server adapter
   – 6B03 - virtual Serial server adapter
   – 6B04 - virtual Serial client adapter

```
                           Work with Communication Resources
                                                                    System:   RCHAS10
 Type options, press Enter.
   5=Work with configuration descriptions   7=Display resource detail

 Opt  Resource        Type  Status                Text
      CMB01           2844  Operational           Combined function IOP
        LIN04         2793  Operational           Comm Adapter
          CMN04       2793  Operational           Comm Port
          CMN05       2793  Operational           Comm Port
        LIN01         2849  Operational           LAN Adapter
          CMN01       2849  Operational           Ethernet Port
      CMB02           268C  Operational           Combined function IOP
        LIN02         6B03  Operational           Comm Adapter
          CMN02       6B03  Operational           Comm Port   (server serial)
        LIN03         6B03  Operational           Comm Adapter
          CMN03       6B03  Operational           Comm Port (server serial)
        CTL02         290B  Operational           Comm Adapter (server scsi)
        LIN08         268C  Operational           LAN Adapter
          CMN10       268C  Operational           Ethernet Port (virtual ether)
        CTL03         290B  Operational           Comm Adapter
                                                                             More...
 F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure B-1 Viewing virtual hardware

```
 LIN11         6B04  Operational           Comm Adapter
         CMN13       6B04  Operational           Comm Port (client serial)
```

Figure B-2 Viewing virtual hardware - continued

3. To identify which resource is associated with which adapter, you can display the details by typing an option 7 (Display resource detail) in front of the resource and pressing Enter; see Figure B-3.

```
                       Work with Communication Resources
                                                             System:   RCHAS10
 Type options, press Enter.
   5=Work with configuration descriptions   7=Display resource detail

 Opt  Resource        Type  Status               Text
  7     CTL04         290B  Operational          Comm Adapter
```

Figure B-3 Displaying details of a virtual resource

4. Displaying the resources detail provides the location of the adapter in the system. Note the card location or the adapter number which will equate to the slot number; in this example, C5 is slot 5. A detailed explanation of the location code is beyond the scope of this book. See Figure B-4.

```
                            Display Resource Detail
                                                             System:   RCHAS10
 Resource name  . . . . . . . :   CTL04
 Text . . . . . . . . . . . . :   Comm Adapter
 Type-model . . . . . . . . . :   290B-001
 Serial number  . . . . . . . :   00-00000
 Part number  . . . . . . . . :

 Location:   U9406.520.108A36C-V1-C5

Logical address:
 SPD bus:
  System bus                       255
  System board                     0
  System card                      0
                                                                      More...
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure B-4 Slot information for a virtual SCSI server adapter

5. The same information holds for all virtual adapters. For a virtual Ethernet, the example in Figure B-5 shows that the adapter is in slot 3 or C3, adapter 3 both pointing at slot 3.

```
                            Display Resource Detail
                                                                System:   RCHAS10
 Resource name  . . . . . . . :   CMN10
 Text . . . . . . . . . . . . :   Ethernet Port
 Type-model . . . . . . . . . :   268C-001
 Serial number  . . . . . . . :   00-00000
 Part number  . . . . . . . . :


 Location:   U9406.520.108A36C-V1-C3-T1

Logical address:
 SPD bus:
  System bus                       255
  System board                     0
  System card                      0
                                                                      More...
Press Enter to continue.

F3=Exit   F5=Refresh   F6=Print   F12=Cancel
```

Figure B-5 Slot information for a virtual Ethernet card

Identifying virtual hardware in Linux

There are specific Linux drivers which are compiled into the Linux distribution (for example, the 3Com IP Telephony software). These drivers are listed in Table B-1.

Table B-1 Virtual device drivers

Virtual console	**hvc_console**
Virtual tape	st & ibmvscsic
Virtual optical	sr & ibmvscis
Virtual disk	sd & ibmvscsic
Virtual SCSI	ibmvscsis
Virtual Ethernet	ibmveth

The command in Linux to verify that the drivers are loaded is **lsmod.** From the command line of the IP Telephony partition, entering the **lsmod** command will list the loaded modules. If you want to verify that the virtual Ethernet driver or the virtual SCSI driver were loaded, you could type the following command:

```
lsmod | grep ibm*
```

See Figure B-6 on page 265.

```
-bash-3.00# lsmod | grep ibm*
ibmveth               36169  0
ibmvscsic             37745  2
scsi_mod             197169  6 st,ipr,sg,sr_mod,ibmvscsic,sd_mod
```

Figure B-6 Running lsmod to verify that the virtual Ethernet and SCSI driver are loaded

Another Linux command that might prove useful to verify whether the configuration that the Linux partition is seeing is what is saved for the partition is the **lscfg** command. This will produce the output shown in Figure B-7.

```
INSTALLED RESOURCE LIST

The following resources are installed on the machine.
+/- = Added or deleted from Resource List.
*   = Diagnostic support not available.

  Model Architecture: chrp
  Model Implementation: Multiple Processor, PCI Bus

+ sys0                                 System Object
+ sysplanar0                           System Planar
+ eth0           U9406.520.108A36C-V6-C3-T1
                                       Interpartition Logical LAN
+ scsi0          U9406.520.108A36C-V6-C2-T1
                                       Virtual SCSI SCSI I/O Controller
+ scd0           U9406.520.108A36C-V6-C2-T1-L0-L0
                                       Virtual SCSI CD-ROM Drive
+ sda            U9406.520.108A36C-V6-C2-T1-L0-L0
                                       Virtual SCSI Disk Drive (26800 MB)
+ st0            U9406.520.108A36C-V6-C2-T1-L0-L0
                                       Virtual SCSI Tape Drive
+ mem0                                 Memory
+ proc0                                Processor
```

Figure B-7 lscfg output

C

Optional network configuration

In this appendix we provide optional networking detail as it relates to i5/OS. This appendix discusses implementation of the following:

- i5/OS DHCP server
- i5/OS Network Time Protocol server
- Quality of Service

i/5OS DHCP server

The i5/OS DHCP server supports the IP phones "out-of-the-box". Because the IP phones require a custom defined DHCP tag (128), you must define this tag in your DHCP configuration.

> **Note:** If the DHCP tag is not set, all IP phones will require that their IP Address, gateway, subnet mask, and domain name server be entered manually.

Configuring the i5/OS DHCP server

Configuring the DHCP server for i5/OS requires the iSeries Navigator graphical interface. Perform the following steps:

1. From iSeries Navigator, configure the DHCP server by clicking **Network** → **Servers** → **TCP/IP**.
2. In the right pane, double-click **DHCP** to edit the DHCP server properties. If you have configured the DHCP server prior to this, skip to step 3.

   If this is the first time you have worked with the DHCP server, it will launch a wizard that assists you in the setup of the DHCP server and setting global options. After completing the wizard, you are prompted to configure a subnet. Before configuring a subnet, read this entire book, specifically Chapter 5, "Creating the network support" on page 143.
3. If you are editing an existing subnet to add the IP phones, you simply need to add the user-defined 184 option. Skip to step f on page 270 to complete this action. In the following example, a new subnet is created using the Advanced creation method. Perform the following steps:

   a. On the DHCP Server Configuration window, right-click the **Global** and select **New Subnet – Advanced**.

   b. On the New Subnet Properties window, type the name of the subnet as shown in Figure C-1.

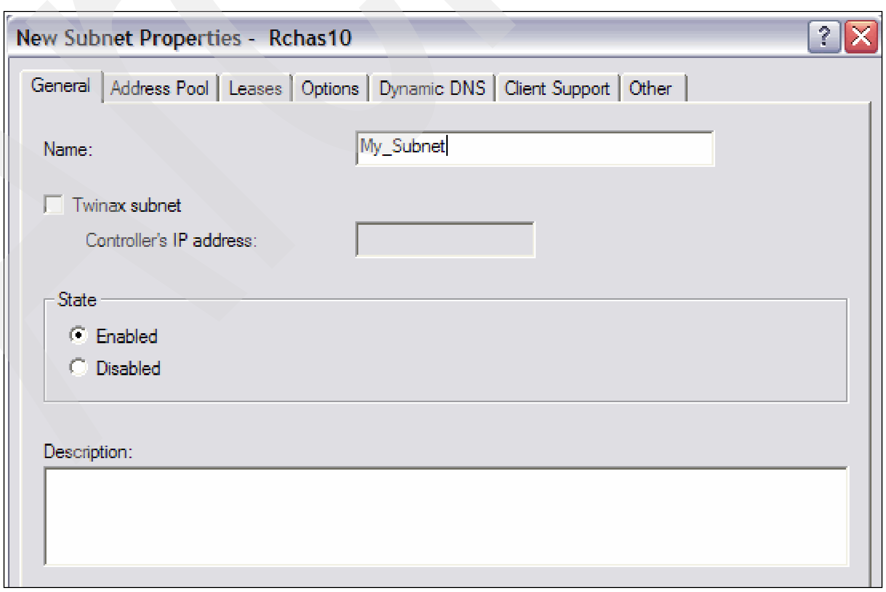

Figure C-1 Subnet properties - General tab

c. Click the **Address Pool** tab and fill in the appropriate information for your environment as shown in Figure C-2. Here we have 20 addresses that are available for leasing on this subnet.

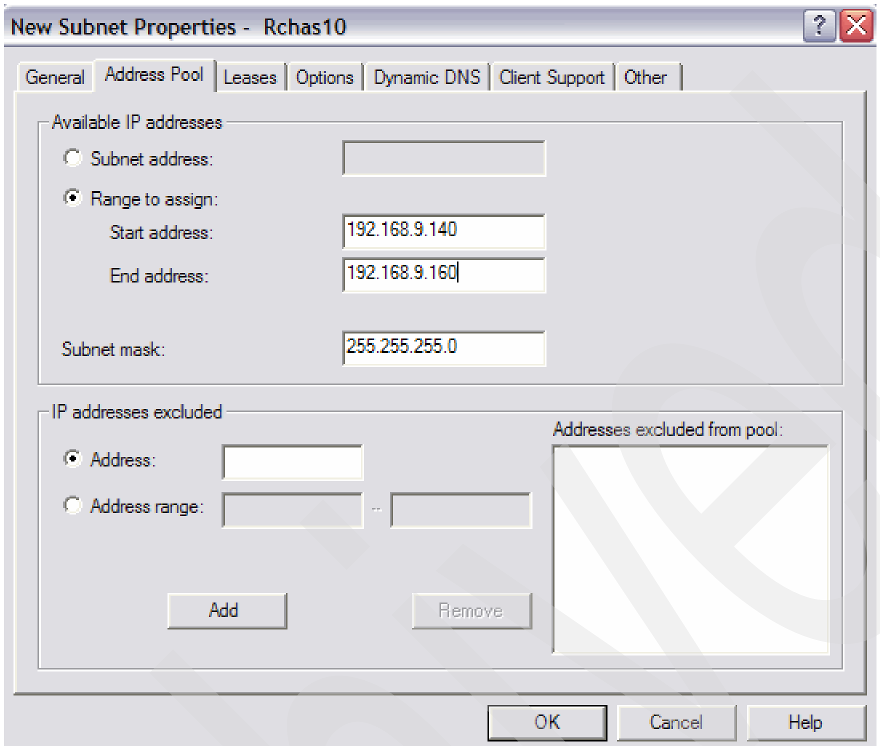

Figure C-2 Subnet properties - Address Pool tab

d. Click the **Leases** tab. You can set the default lease time for the addresses on this subnet; the default is 1 day.

e. Click the **Options** tab. Here you can decide which DHCP options (tags) are sent back to the phones. Figure C-3 shows that the subnet mask, the router or gateway address, and the domain name server address have been defined.

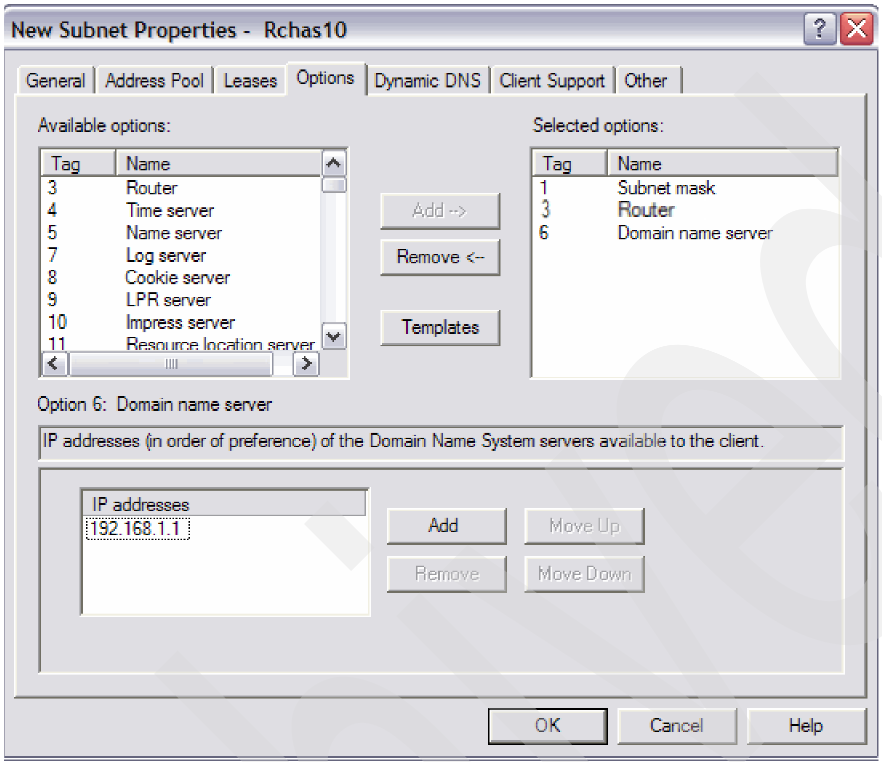

Figure C-3 Subnet properties - Options tab

f. You must also create the user-defined 184 tag on the Options tab as well. Click the **Templates** button to define the 184 tag. A example for the 184 tag is shown in Figure C-4. Click **OK**.

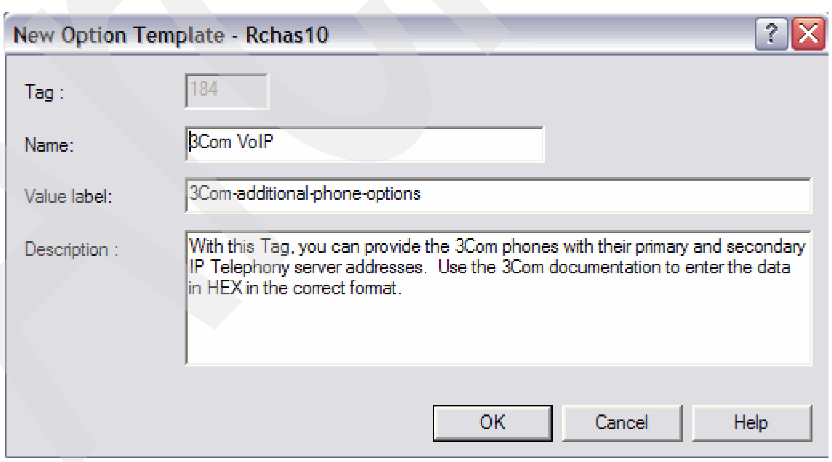

Figure C-4 Creating the 184 tag

g. After the user-defined option is created, you must add the option to the subnet and define the values that need to be passed to the phone. Figure C-5 shows an example of adding the 184 tag.

> **Important:** Consult with your 3Com representative to obtain the *DHCP - Option 184 Format Definition* documentation in order to fully understand the format of the 184 Tag.
>
> Enter the information in hexadecimal rather than ASCII. The 3Com phones will be able to parse this value and make it usable.

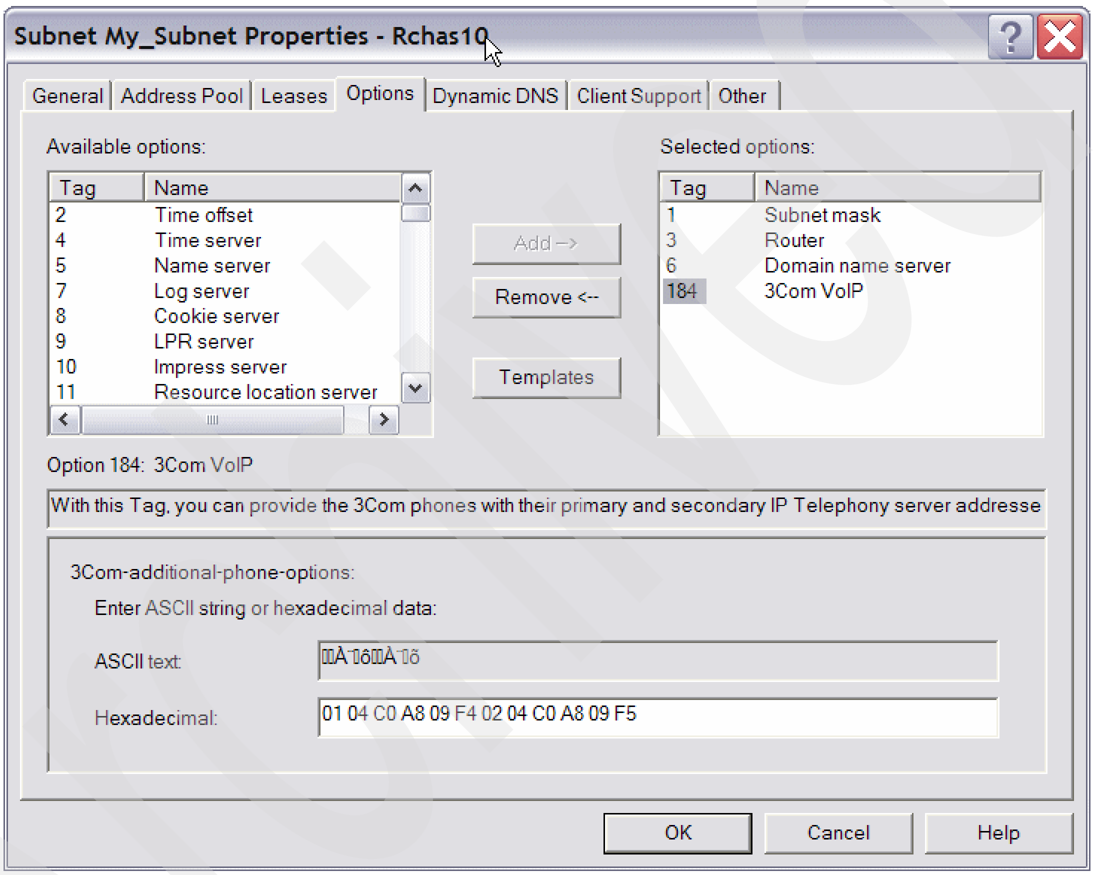

Figure C-5 Adding the 184 tag

h. Use the Dynamic DNS, Client Support, and Other tabs to further define your subnet. Click **OK** to create the new subnet.

4. After the subnet has been created, you can see the information that the subnet will inherit by clicking the subnet and looking in the lower-right pane of the window, as shown in Figure C-6.

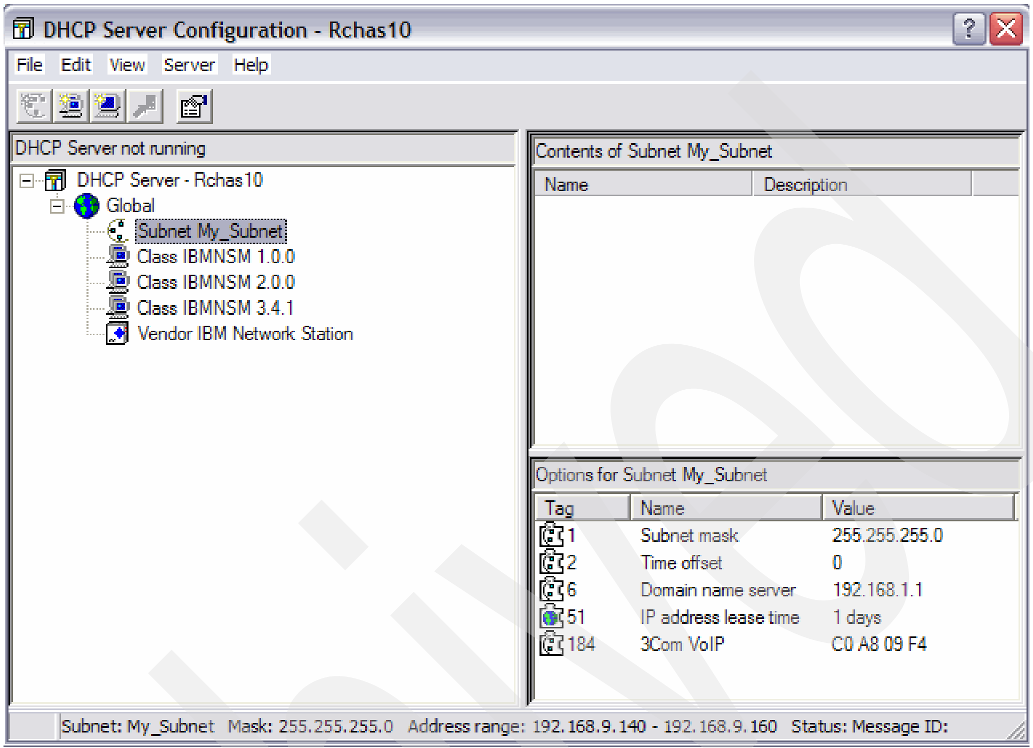

Figure C-6 Single subnet DHCP configuration

5. Close the DHCP Server Configuration window. From iSeries Navigator, right-click **DHCP** and select **Start** to start the server.
6. Right-click **DHCP** and select **Monitor**. From the DHCP Monitor window, select your subnet.

7. On the DHCP Monitor window, you can view the IP Addresses in your pool and check the status of whether they are leased or free; see Figure C-7.

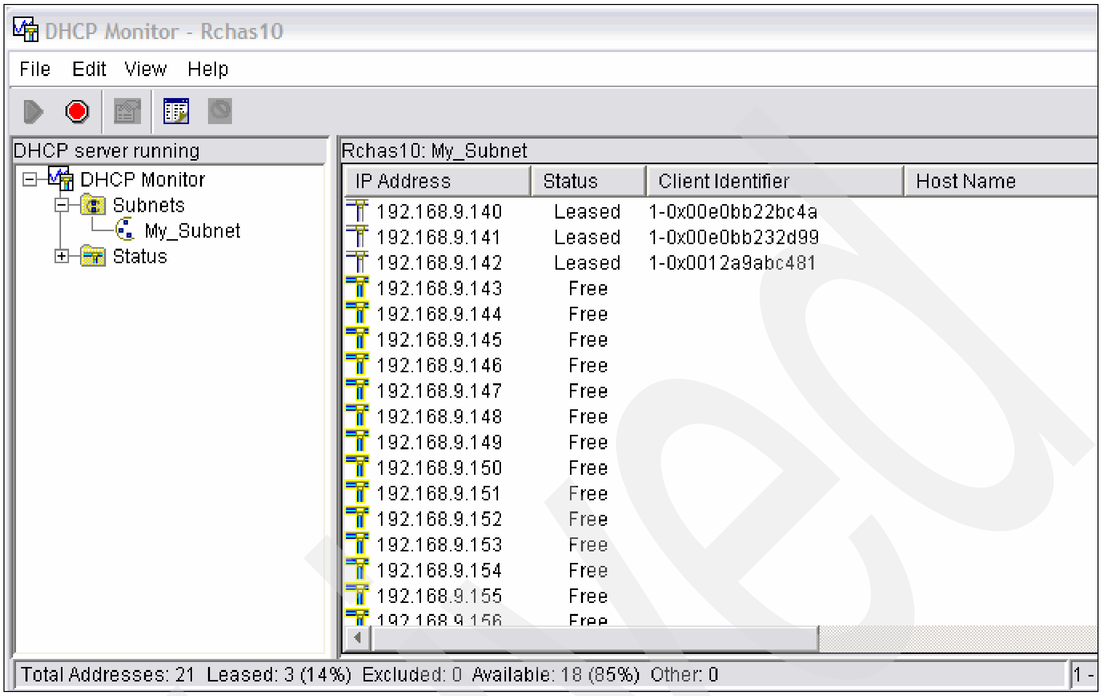

Figure C-7 DHCP monitor

Refer to the following for more information on DHCP on i5/OS:

- IBM System i Information Center - DHCP

  http://publib.boulder.ibm.com/infocenter/iseries/v5r4/topic/rzakg/rzakgkickoff.htm

- The IBM Redbooks publication *AS/400 TCP/IP Autoconfiguration: DNS and DHCP Support*, SG24-5147.

Network Time Protocol (NTP)

All IP Telephony servers access Network Time Protocol (NTP) servers to maintain accurate time and date. If the IP Telephony servers are not synchronized via NTP, then timing-related problems can occur.

Simple Network Time Protocol (SNTP) is a time maintenance application that allows you to synchronize networked hardware on i5/OS. You can use i5/OS as an SNTP server, SNTP client, or both. You can specify an amount of time that the client can vary from the time provided by a time server and allow for adjustment to keep the clocks synchronized.

The SNTP server enables you to configure your System i machine to act as a time server for other devices. Other SNTP clients check time by polling your System i SNTP server. If a client's time values do not match the SNTP server time, a time adjustment begins. The client's system time is adjusted until the required time value is reached.

The SNTP client allows you to configure the i5/OS operating system to poll a Network Time Protocol (NTP) or SNTP server to find out the time. The SNTP client updates the system clock. Most applications use the system clock as their time source. By updating the system clock, applications reflect the synchronized time obtained from the time server.

SNTP server on i5/OS

IP Telephony servers can use the i5/OS partition as their NTP server. The coordinated universal time (UTC) can be retrieved from the i5/OS server rather than being synchronized with an external time source. This internal time value would be sent to all IP Telephony servers that specify to use the i5/OS server as the NTP server in IP Telephony configuration. Figure C-8 shows an example of the System i as an SNTP server.

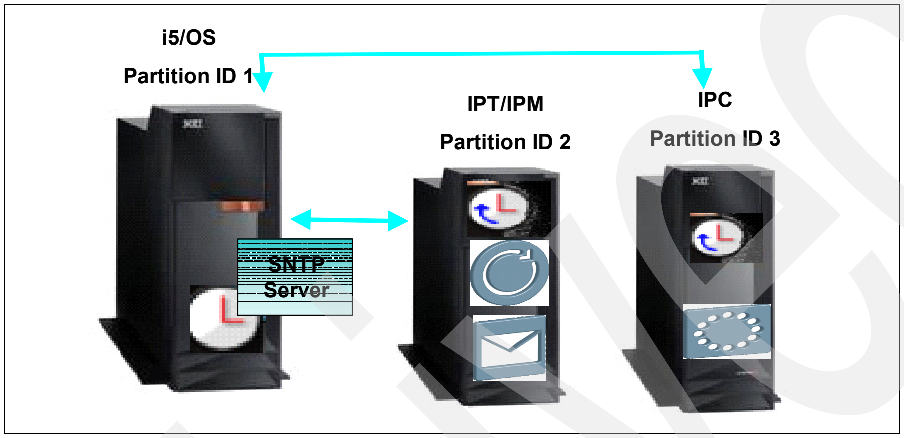

Figure C-8 i5/OS SNTP server

Perform the following steps to configure Simple Network Time Protocol (SNTP) on i5/OS:

1. From a 5250 command line interface, enter the following Change SNTP Attributes (CHGNTPA) CL command to change the NTP attributes in order for the SNTP server to run standalone, without the SNTP client and a remote connection, from trying to be established to a time source server:

   ```
   CHGNTPA RMTSYS(*NONE) SYNCRQD(*NO)
   ```

2. To start the SNTP server, you can use either the Start TCP/IP Server (STRTCPSVR) CL command or iSeries Navigator:

   a. Enter the following Start TCP/IP Server (STRTCPSVR) CL command:

   ```
   STRTCPSVR SERVER(*NTP) NTPSRV(*SERVER)
   ```

   b. From iSeries Navigator, click **Servers** → **TCP/IP**. In the right pane, right-click **SNTP** and select **Start** → **Server**; see Figure C-9 on page 275.

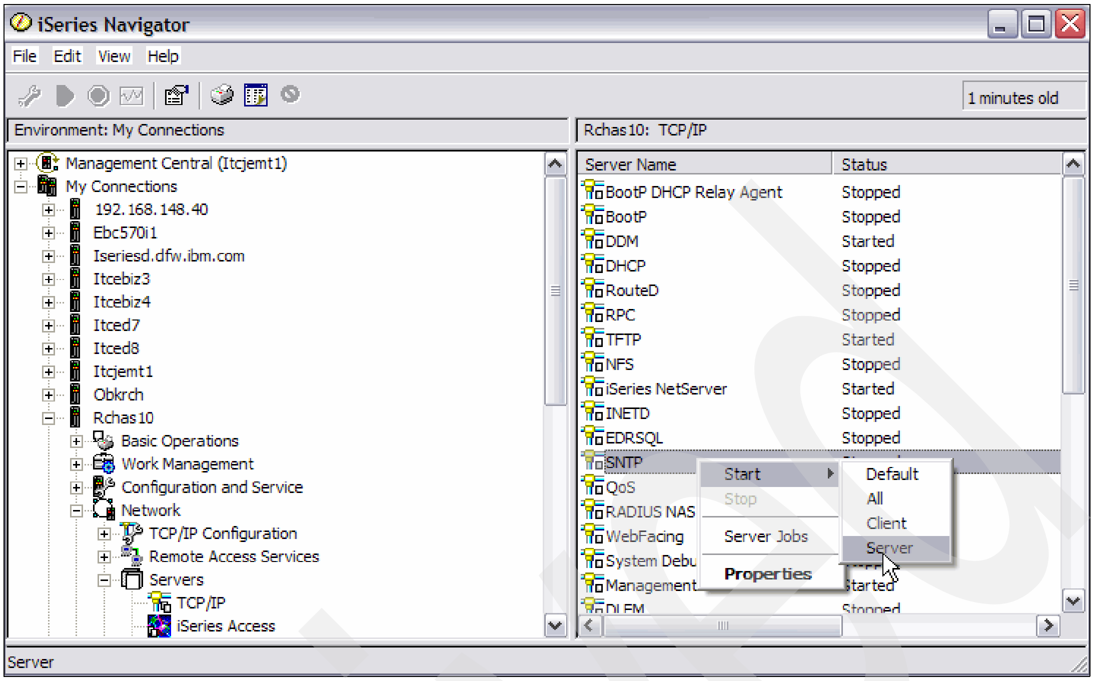

Figure C-9 Starting the SNTP server

SNTP client and server on i5/OS

i5/OS can use the SNTP application as a client and a server. The SNTP client retrieves a time value from an external time source. You can specify the address of the external time source. The SNTP application synchronizes the i5/OS partition coordinated universal time (UTC) with the time value from the external time source. Then the i5/OS partition sends the time value to all IP Telephony servers connected to it. Figure C-10 shows an example of the System i platform as an SNTP client and server.

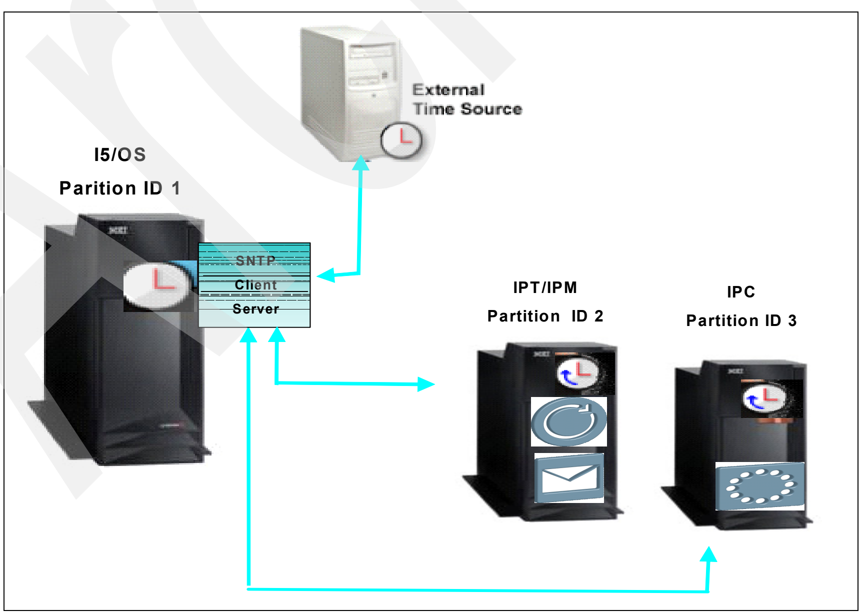

Figure C-10 System i platform as an SNTP client and server

After you have started Series Navigator and connected to i5/OS, you can use the SNTP properties window to add in remote time source servers and then start the SNTP client and server.

Perform the following steps to add a remote time source server:

1. From iSeries Navigator, click **Servers** → **TCP/IP**. From the right pane, right-click SNTP and select **Properties**.
2. On the SNTP Properties window, click the **Client** tab, enter a Time server, and click **Add** as shown in Figure C-11.

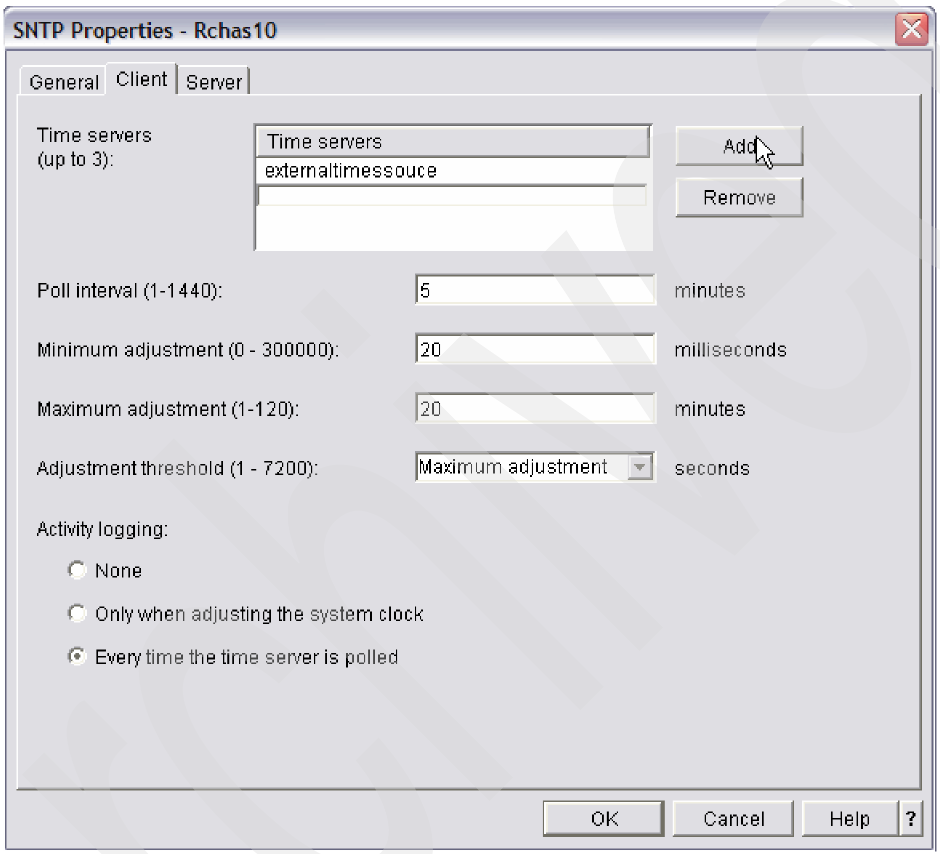

Figure C-11 SNTP Client configuration

3. When all time servers have been added, click **OK**.
4. To start the SNTP client and server, right-click **SNTP** and select **Start** → **All** as shown in Figure C-12 on page 277.

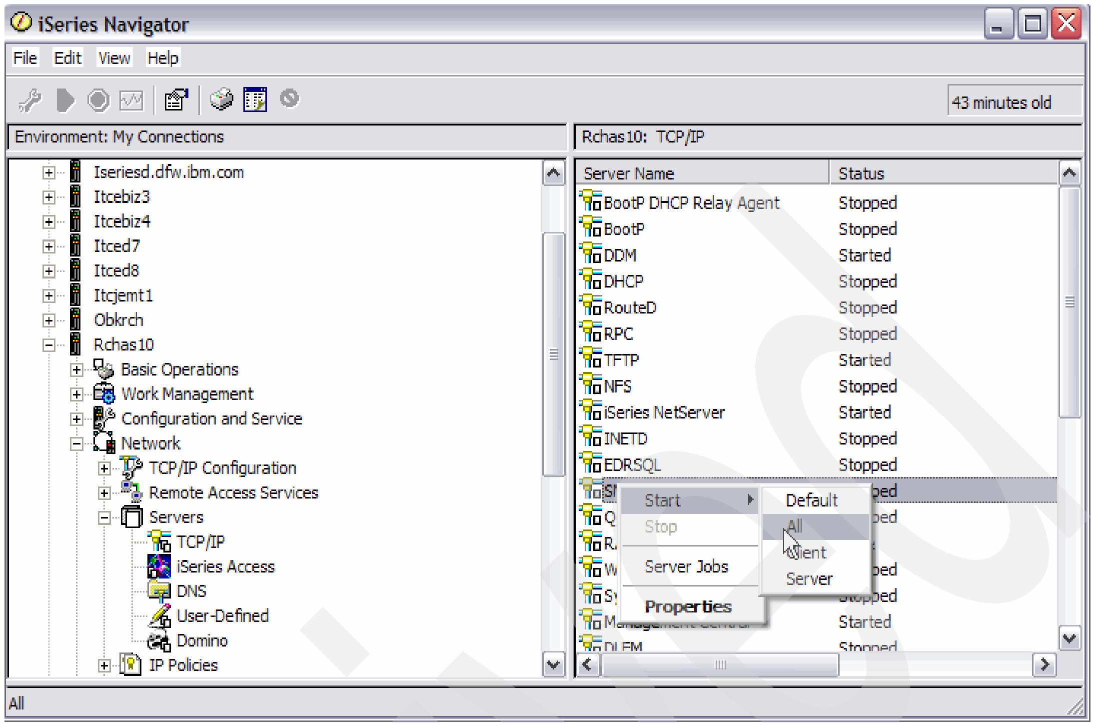

Figure C-12 Starting the i5/OS SNTP client and server

Quality of Service (QoS)

The System i IP Telephony solution is capable of supporting Quality of Service (QoS) on multiple vendor Ethernet switches and multi-protocol routers. The System i IP Telephony solution uses 802.1p on the LAN switches and IP ToS/DiffServ on the WAN routers, and 802.1q VLANs to achieve QoS.

The System i IP Telephony solution supports the following QoS features:

- VLAN tagging
  - 802.1Q tagging done via DHCP or on the phones.
  - IP Telephony servers and gateways can be tagged by configuring the switch to which they are connected.
- DSCP tagging
  - All devices including phones, attendant consoles, IP Telephony servers and gateways tag voice-related signaling and media packets with DSCP tagging to facilitate in prioritizing an end-to-end QOS mechanism.
- 802.1P COS tagging
  - 802.1P tagging is done by all the sets.
  - Servers and gateways can be tagged by configuring the switch to which they are connected.

Prioritization of voice using virtual LAN in i5/OS

Voice prioritization settings are maintained and honored in the IP datagrams as they are received from the NIC interface connected to the IP network. This enables the prioritization of voice packets being forwarded from the IP network through the Network Interface Card (NIC) interface and through i5/OS onto the virtual LAN defined for IP Telephony.

In addition, with V5R4 you can select (or prioritize) the NICs that will be used as the proxy agent for virtual Ethernet proxy. This allows you to configure a separate NIC interface that you intend to use for proxy ARP, thus preventing that NIC interface from being used to proxy for any other virtual Ethernet subnet.

Traffic being forwarded from the IP Telephony partitions on the VLAN to the NIC interface cannot be specifically prioritized. However, if you throttle all other traffic originating from inside the i5/OS partition, this ensures that the forwarded VLAN traffic always has enough bandwidth on the shared NIC interface.

The QoS feature of the i5/OS has many options for limiting the rate of locally generated TCP and UDP traffic. Because each deployment has unique workloads and Ethernet traffic patterns, this is a trial and error approach to determine the best setting.

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this book.

IBM Redbooks

For information about ordering these publications, see "How to get Redbooks" on page 280. Note that some of the documents referenced here may be available in softcopy only.

- *Implementing PowerPC Linux on System i Platform,* SG24-6388
- *Logical Partitions on System i5: A Guide to Planning and Configuring LPAR with HMC on System i,* SG24-8000
- *IBM Tivoli Storage Management Concepts*, SG24-4877
- *Virtual Partition Manager, A Guide to Planning and Implementation,* REDP-4013
- *Securing Communications with OpenSSH on IBM i5/OS*, REDP-4163
- *AS/400 TCP/IP Autoconfiguration: DNS and DHCP Support*, SG24-5147

Other publications

These publications are also relevant as further information sources:

- IBM iSeries Hardware Management Console Frequently Asked Questions

  http://www-912.ibm.com/8625680A007CA5C6/1AC66549A21402188625680B0002037E/48859A914DB132A586256F42006003A7
- 3Com IP Telephony Suite for System i WLE-based Sizing Guide

  http://www.developer.ibm.com/graphics/estimator/HTML/IP3Com.html

Online resources

These Web sites are also relevant as further information sources:

- IBM Systems Hardware Information Center

  http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp
- IBM System i IP Telephony

  http://www.ibm.com/systems/i/solutions/iptelephony/
- 3Com IP Telephony for IBM System i

  http://www.3com.com/index_jump/ibm_iptel.html
- IBM Support: Fix Central Web site can be used to obtain updates for HMC and Server firmware:

  http://www-912.ibm.com/eserver/support/fixes/fixcentral

  On the Fix Central Web page, select **System i family** → **Hardware Management Console** or **Server Firmware**.

- Use the Support for IBM System i Web site to access the **Technical Databases** link for access to the **Software Knowledge Base.** Here you can find information on technical documents for System i products.

  http://www.ibm.com/servers/eserver/support/iseries/index.html

  On the Support for IBM System i Web page, select **Technical Databases** → **Software Knowledge Base** → **Hardware Management Console**.
- 3Com IP Telephony Suite for System i WLE-based Sizing Guide

  http://www.developer.ibm.com/graphics/estimator/HTML/IP3Com.html
- System i IP Telephony Express offerings

  http://www.ibm.com/systems/i/solutions/iptelephony/express.html
- Backup Recovery and Media Services

  http://www.ibm.com/servers/eserver/iseries/service/brms/
- Tivoli Storage Manager

  http://www-306.ibm.com/software/tivoli/solutions/backup/
- IBM Portable Utilities for i5/OS, 5733-SC1

  http://www.ibm.com/servers/enable/site/porting/tools/openssh.html
- Software Knowledge Base

  http://www-912.ibm.com/s_dir/slkbase.nsf/slkbase

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IBM System i IP Telephony: Configuring the System i Infrastructure

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250 <-> 459 pages

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IBM System i IP Telephony: Configuring the System i Infrastructure

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Planning for IP Telephony on the System i platform

Configuring an IP Telephony partition using virtual or native resources

Maintaining a System i IP Telephony environment

In today's highly competitive business environment, companies want to extract business advantage from every technology in the enterprise. Many are looking to IP Telephony as a way to lower costs, simplify network management, and use existing systems and resources, while more tightly integrating business applications and customer communication with their voice and data networks. With IBM System i IP Telephony, you can get the business benefits and simplicity you seek from both your telephony and IT environments with one integrated, secure, and reliable solution delivered by two industry leaders, 3Com and IBM. System i IP Telephony delivers the proven solutions of 3Com, a leading supplier of secure, converged voice and data networking, on the IBM System i platform.

This IBM Redbooks publication is intended for system administrators and field technicians. It will help them to understand and prepare their system for deploying a System i IP Telephony solution. It introduces the System i IP Telephony environment and the specific benefits of 3Com IP Telephony on the System i platform. It shows how to prepare your system using either direct or virtual resources, as well as how to maintain the IP Telephony environment on the System i platform. It includes information on how to set up the network environment to support IP Telephony, and guides you through all the steps required to set up and install the IP Telephony solution, leaving you ready for your IBM IP Telephony-approved business partner or 3Com installation team to configure your IP Telephony system for use in your enterprise.

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