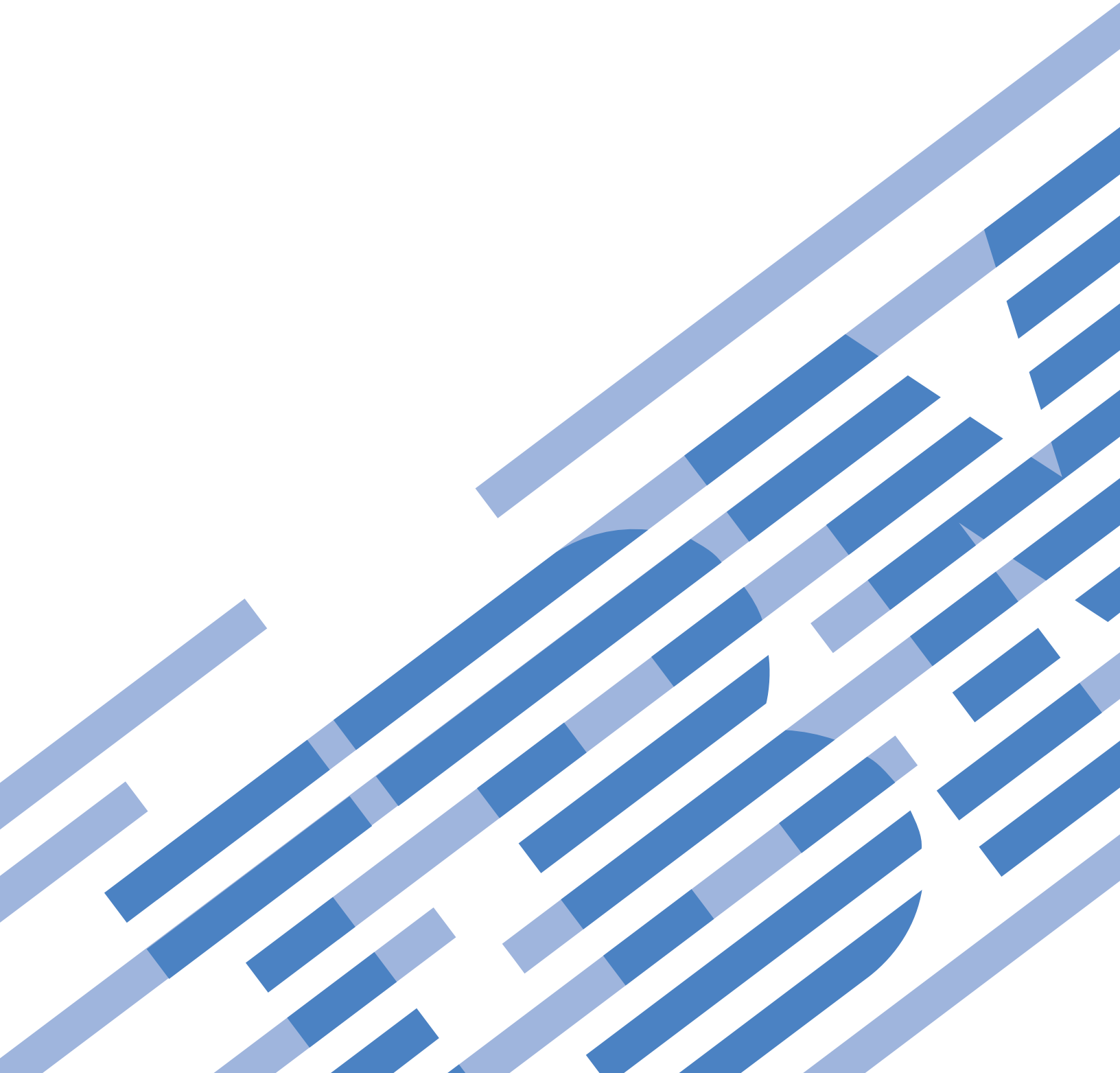# IBM

System i and System p

Solution Planning

IBM

System i and System p

Solution Planning

> **Note**
>
> Before using this information and the product it supports, read the information in "Notices" on page 77 and the *IBM Systems Safety Information* manual, G229-9054.

Contents

Safety and environmental notices

Safety notices may be printed throughout this guide:

- **DANGER** notices call attention to a situation that is potentially lethal or extremely hazardous to people.
- **CAUTION** notices call attention to a situation that is potentially hazardous to people because of some existing condition.
- **Attention** notices call attention to the possibility of damage to a program, device, system, or data.

World Trade safety information

Several countries require the safety information contained in product publications to be presented in their national languages. If this requirement applies to your country, a safety information booklet is included in the publications package shipped with the product. The booklet contains the safety information in your national language with references to the U.S. English source. Before using a U.S. English publication to install, operate, or service this product, you must first become familiar with the related safety information in the booklet. You should also refer to the booklet any time you do not clearly understand any safety information in the U.S. English publications.

Laser safety information

IBM® System i® models and System p® servers can use I/O cards or features that are fiber-optic based and that utilize lasers or LEDs.

Laser compliance

All lasers are certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter J for class 1 laser products. Outside the U.S., they are certified to be in compliance with IEC 60825 as a class 1 laser product. Consult the label on each part for laser certification numbers and approval information.

CAUTION:
This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

(C026)

CAUTION:
Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. (C027)

CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

CAUTION:
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following information: laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam. (C030)

Power and cabling information for NEBS (Network Equipment-Building System) GR-1089-CORE

The following comments apply to the IBM System i models and IBM System p servers that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE:

The equipment is suitable for installation in the following:
- Network telecommunications facilities
- Locations where the NEC (National Electrical Code) applies

The intrabuilding ports of this equipment are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of this equipment *must not* be metallically connected to the interfaces that connect to the OSP (outside plant) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Note: All Ethernet cables must be shielded and grounded at both ends.

The ac-powered system does not require the use of an external surge protection device (SPD).

The dc-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.

Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM http://www.ibm.com/ibm/environment/products/prp.shtml.

EU Only

Note: This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

This product may contain sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM Equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

For Taiwan: Please recycle batteries.

廢電池請回收

For the European Union:

EU Only

Note: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

For California: Perchlorate Material - special handling may apply. See www.dtsc.ca.gov/hazardouswaste/ perchlorate.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

IBM Cryptographic Coprocessor Card Return Program

The following information applies only for systems originally sold prior to July 1, 2006:

This machine may contain an optional feature, the cryptographic coprocessor card, which includes a polyurethane material that contains mercury. Please follow local ordinances or regulations for disposal of this card. IBM has established a return program for certain IBM Cryptographic Coprocessor Cards. More information can be found at http://www.ibm.com/ibm/environment/products/prp.shtml.

About this topic

This topic enables information technology planners to plan for hardware and hardware maintenance, operating systems, applications, Virtualization Engine technologies, consoles, interfaces, terminals, capacity, LPAR, availability, performance, networking, I/O, storage, media, testing, service and support, and IBM services. The result of the plan enables planners to make accurate information technology needs assessments for purchase, upgrades, migrations, and future business growth.

For information about the accessibility features of this product, for users who have a physical disability, see "Accessibility features," on page 75.

Capacity on Demand

Capacity on Demand (CoD) allows you to dynamically activate one or more resources on your server as your business peaks dictate. You can activate inactive processors or memory units that are already installed on your server on a temporary and permanent basis.

CoD is available on select IBM servers. Refer to machine type/model tables within each CoD offering section of this document. Some servers include a number of active and inactive resources. Active processors and active memory units are resources that are available for use on your server when it arrives from the manufacturer. Inactive processors and inactive memory units are resources that are included with your server, but are not available for use until you activate them.

These topics contain information about how to use CoD with the Hardware Management Console (HMC). For information about how to use CoD with the Advanced System Management Interface (ASMI), see Using on-demand utilities.

What's new for Capacity on Demand

Learn about new or updated information for the Capacity on Demand information.

Additions and changes were made to the Capacity on Demand feature tables for IBM System p and System i POWER6 models. *Utility CoD*, a new Capacity on Demand offering, has been announced and is now available on the new System i and System p POWER6 MMA.

New HMC Licensed Machine Code (Version 7) is required to manage POWER6 servers and associated Capacity on Demand features. HMC references (with the exception of Utility CoD) in this document are based on Licensed Machine Code (Version 6). For information about managing CoD using Version 7, see the System i and System p Operations Guide for the Hardware Management Console and Managed Systems Version 7 Release 3.1.0.

PDF files for Planning

You can view and print a PDF of this information.

To view or download the PDF version of detailed server and hardware specifications, general physical site guidelines, or solution planning information, select one of the following:

- Planning (about 14094 KB).

- Physical site planning and preparation (about 4008 KB).

- Solution planning (about 1794 KB).

Saving PDF files

To save a PDF on your workstation for viewing or printing:
1. Right-click the PDF link in your browser.
2. Click the option that saves the PDF locally.
3. Navigate to the directory in which you want to save the PDF.
4. Click **Save**.

Downloading Adobe Reader

You need Adobe Reader installed on your system to view or print these PDFs. You can download a free copy from the Adobe Web site (www.adobe.com/products/acrobat/readstep2.html).

Planning for software

Your software plan needs to include the operating systems that you want to load on your server and how you want to integrate them, and the software that you want to facilitate your solution.

It is important to know which applications best fit your solution, and under which operating systems those applications run. IBM Systems hardware allows you to run multiple operating systems on multiple partitions on the same server. This enables you to run the best applications in each class without concern for the operating systems under which they run. But, it also increases the complexity of your solution, which makes software planning important.

Planning for operating systems

Installing or upgrading an operating system requires careful planning. Learn more about planning for installation of your AIX®, i5/OS®, or Linux®operating system.

Planning for AIX

Before you install your AIX operating system on your server, you need to perform a number of recommended planning tasks. Follow these checklists to obtain the detailed information that you need to complete the planning tasks for your operating system.

Before you begin your planning tasks, complete these checklist items:

Before you begin
__ View the IBM pSeries® and AIX Information Center.
__ Read the AIX Release Notes®.

AIX planning tasks
__   **Evaluate your current and future server configuration**

      Know where your operating system currently resides on your server and whether you should make any changes according to the needs of your business.

      It is especially important to know which other operating systems you plan to run on your servers and on which partitions they will run.
__   **Understand performance issues**

      The size and location of the disk on which you select to install AIX can affect the performance of your system. For more information about the impact of your choice of boot disk on your system performance, including tuning, performance monitoring, and diagnosis, see the Performance Management Guide.
__   **Determine the type of installation**

      Decide which type of installation, including new and complete overwrite, migration, or preservation, is correct for your situation. See How-To's for AIX Installation Tasks in the AIX installation guide for more information.
__   **Identify how the partitions will communicate with the Hardware Management Console (HMC)**

      If you plan to run AIX partitions, make sure that your partitions are communicating with the HMC. For more information about setting up and communicating with the HMC, see Setting up the HMC.
__   **Ensure that your system meets all of the requirements needed to run AIX**

      An installation of AIX requires a minimum amount of memory and physical disk space. The installation might also require that hardware units be turned on or configured, and that network information be readily available. For more information about prerequisites for your AIX installation, see the installation guide.

AIX planning tasks

__   **Configure virtual I/O**

If you want to use virtual I/O with your AIX partition you must first install and configure a virtual I/O server partition. See Installing the Virtual I/O Server to install the Virtual I/O Server. For more information about using the Virtual I/O Server, see Using the Virtual I/O Server.

Planning for i5/OS

Learn how to plan for i5/OS before installing a new release of the operating system.

Note: If you plan to use i5/OS on your System p5® or System p server, make sure that you are familiar with the requirements for i5/OS. See Requirements for i5/OS on IBM System p5 and eServer™ p5 servers for more information.

Before you begin your planning tasks, complete these items:

Before you begin

__   Identify whether you are performing an upgrade, data migration, or new installation.
__   Identify the operating system version and release that you plan to install.

Planning tasks

__   **Ensure that the release can be installed on your hardware**

The System Handbook describes current hardware models for the release and the software releases that can be installed on them.

__   **Know the minimum disk requirements**

To identify the minimum disk requirements, see Determining disk storage space required.

__   **Understand preparation tasks**

Become familiar with the tasks in the Install, upgrade, or delete i5/OS and related software topic.

__   **Identify the console that you will use to interact with the operating system**

See Planning for consoles to determine which console you need to connect to and communicate with the server, partitions, and your operating system.

__   **Understand integrated operating environment options**

See Integrated operating environments to understand additional operating environments that can be supported on your server. Learn how to integrate AIX, Linux, Microsoft® Windows® operating systems, UNIX® applications, and Domino® groupware into your server environment.

When you have completed these tasks, you should have a plan that identifies these elements:

After you finish

__   Record a list of tasks that are required for your upgrade, data migration, or new installation.
__   Record the operating system version and release requirements.

Planning for Linux

Learn about the planning tasks that are required before you install your Linux operating system on your server.

If you need more information to decide whether or not to partition, see the list of topics under Partitioning for Linux with an HMC in the IBM Systems Hardware Information Center.

Before you begin

__   If you are planning to upgrade an existing server, document your current environment.

Before you begin

__ If you are migrating from another operating system to Linux, document your migration path.

Linux planning tasks

__ **Identify the hardware requirements for your Linux system**

The IBM eServer hardware and IBM System p5 hardware systems require a Linux for POWER® distribution, that is, Linux distributions designed to run on POWER technology-based systems. For more information, see the Linux on Power Web site.

__ **Identify installation media (CD or Network)**

__ **Identify whether or not to use the IBM Installation Toolkit for Linux on POWER to install Linux**

For more information about the toolkit, see IBM Installation Toolkit for Linux on POWER.

__ **Identify the Linux distribution (for example, SUSE Linux Enterprise Server or Red Hat Enterprise Linux) and the release to be installed**

For information, see the Linux on Power Web site.

__ **Identify your applications requirements**

Some applications require a specific Linux distribution. For information, see the Linux on POWER applications Web site.

After you finish

__ Identify and record the hardware requirements for your solution.

__ Identify and record the appropriate Linux distribution for your solution.

__ Ensure that the hardware requirements for your configuration have been met.

__ Record a complete hardware feature placement plan, which includes your post installation strategy for moving features to match your configuration.

Planning for applications

After your operating system plan is complete, you need to develop a plan for applications. Whether you are developing a new solution or upgrading an existing solution, you need to consider a wide range of issues, including compatibility, functionality, stability, and licensing issues.

Although hundreds of applications run on your IBM eServer hardware or IBM System p5 hardware , this section focuses on these major types of software:

- transaction management and Electronic Data Interchange (EDI)
- database management
- collaboration
- software development
- network performance and security management
- productivity

Each software category is briefly discussed before you are redirected to more comprehensive resources.

Before you begin

__ Have a list of current applications.

__ Have a list of applications that you want to upgrade or replace.

__ For each application that you want to upgrade or replace, calculate the number of server partitions that are assigned to the applications and the number of users that need licenses.

Application planning tasks

__ **Plan for transaction management and EDI applications**

Most solutions require a Web transaction or data interchange management between the divisions in your company or between your company and its partners. You could implement this management in a variety of ways. To better understand your options, from Web services to portals, see the IBM WebSphere® software platform Web site.

__ **Plan for database applications**

Database software is at the core of every solution and is often integrated into transaction systems. With database-backed Web sites, database systems are even more integral to your solution. To learn more, see the IBM DB2® information management page Web site.

__ **Plan for collaboration applications**

Your solution might involve collaboration among individuals, departments, partners, or customers. Messaging, conference, and workgroup applications can enable your business to make quicker decisions and better relate to customers. If you are planning to upgrade or enhance your existing collaboration software, or if you need more information about collaboration systems, see the Lotus® Web site.

__ **Plan for software development applications**

A growing number of businesses can improve the quality of their solutions by creating custom applications that better fit their business case, rather than using one-size-fits-all applications. If your solution requires customized applications or scripts, software development applications will play a critical role in your overall application planning. If you do not already have a software development suite in place, or if you need additional information on application development, see the Rational® Software Web site.

__ **Plan for network and storage management applications**

The success of your solution depends on a smoothly running network that gives users the bandwidth that they need while protecting vital business information from intruders. If you do not already have a performance and security suite in place, or for more information about network performance and security applications, see the Tivoli® Web site.

__ **Plan for productivity applications**

Productivity applications are central to many office-based solutions; yet current client-based office applications often are expensive to maintain and upgrade. Client-based productivity software also causes problems for users with multiple mobile information devices. For more information about a new server-based model of productivity software, see the IBM Workplace Web site.

__ **Plan for other applications**

The application planning tasks listed so far represent a typical mix of applications for business. But they are only a small subset of the applications that could run on AIX, i5/OS, or Linux operating systems. Because of the versatility of the IBM eServer hardware and IBM System p5 hardware family of servers, you can configure your system with virtually any software package on the market. See the Complete list of IBM software products for more information on applications you might want to include in your software plan.

After you finish

__ Record a table with application versions, operating system versions, and server partitions in the columns and users in the rows.

__ Record a list of licenses for each application and operating system.

__ Identify compatibility between file types and issue policies for each type.

__ Record backup and recovery strategies for each application.

__ Record backup and recovery strategies for each partition and client.

Planning for the Virtualization Engine

After your operating system and applications plans are complete, you need to develop a plan for virtualization technologies. Virtualization improves IT resource utilization by allowing system

administrators to access and manage resources across a heterogeneous environment. These resources are available virtually, as a single pool, rather than by physical location.

The IBM Virtualization Engine is a set of technologies and systems services that lead you into on demand computing. Its systems services simplify IT resource management by virtualizing data, applications, servers, and network resources.

By binding individual resources into one integrated infrastructure, the IBM Virtualization Engine:
- Simplifies network infrastructure
- Reduces cost and complexity by optimizing resource utilization
- Increases the value of IT investments

Complete these to gather the necessary information for your Virtualization plan:

Before you begin
__ Use these resources to learn about virtualization::
- Virtualization topics in Creating a virtual computing environment.
- Advanced POWER Virtualization Web site
__ Have your operating system and application plans done.
__ Develop a list of business processes that could be improved through tighter integration and centralized management.
__ For each such business process, draw a diagram that connects the applications, operating systems, and hardware systems that share resources for those business processes.
__ Perform capacity planning to identify resources that are under-utilized and areas in your business where you could use more capacity.

Refer to the IBM Systems Workload Estimator Web site.

Virtualization Engine planning tasks
__ **Plan for virtualization system services**

The IBM Virtualization Engine provides a single set of integrated systems services that reduce the complexity of your IT infrastructure by virtualizing data, application, server, and network resources. See System services in the IBM Systems Hardware Information Center. Within that topic, use the Virtualization Engine Planning Advisor to help you determine which systems services meet your specific needs.
__ **Plan for virtualization technologies**

The IBM virtualization technologies provide virtualization intelligence in the processor, memory, I/O, and network devices. Virtualization technologies are embedded in IBM hardware and delivered as features of the eServer, System p5 and TotalStorage® brands. Seevirtualization technologies to learn more about the various aspects of virtualization technologies, which include:
- Capacity on Demand
- Logical partitions
- Multiple operating system support
- Simultaneous multithreading

After you finish
__ You should have a plan for virtualizing your server environment. The plan should include how you plan to virtualize your resources and how you plan to manage those resources using the Virtualization Engine systems services.

Planning for consoles, interfaces, and terminals

Learn how to manage the connection to your server and related systems by understanding your console, interface, and terminal options.

You can communicate with your server and the other systems in your environment in many ways. The appropriate console, interface, and terminal solution allows you to manage system resources in the most efficient and effective way. You can plan for each console, interface, and terminal by understanding the prerequisites, features, and scenarios for each. You can determine the best console, interface or terminal choice for your solution and find the resources that you need to implement your choices.

Adequate console, interface, and terminal planning also ensures that you have the necessary access for service and support personnel. Consoles, interfaces, and terminals need to be carefully configured and placed in order to give service providers access to important service functions. For more information about the configuration and placement of consoles, interfaces, and terminals for service and support purposes, see Planning for consoles, interfaces, and terminals for your service environment.

When you are done planning for consoles, interfaces, and terminals, see Managing consoles, interfaces, and terminals.

Types of consoles, interfaces, and terminals

Learn about all of the console, interface, and terminal options that you have depending on your server model and business environment. Some options are required by the model; others are optional. In some cases, you can integrate multiple consoles, interfaces, and terminals.

Advanced System Management Interface

The Advanced System Management Interface (ASMI) is the interface to the service processor that is required to perform general and administrator-level service tasks, such as reading service processor error logs, reading vital product data, setting up the service processor, and controlling system power. The ASMI may also be referred to as the service processor menus.

The ASMI:
* Can be accessed through a Web browser, ASCII terminal, or the Hardware Management Console (HMC).
* Provides an interface to service processor functions, such as remote power-on and other system management functions.
* Can be used for some system management functions for nonpartitioned servers that are not managed by the HMC and can also be used with HMC-managed systems.
* Complements other consoles, by design, specifically for service functions, such as remote power management and error log access.
* Is the required interface to the service processor on all System p server models.
* For IBM eServer i5 models, you must use the ASMI to access the service processor. Prior to the i5/OS operating system, customers could use the control panel for some of the system management functions that are currently accessed through the ASMI.

For more information about accessing the ASMI, see Managing the ASMI. For more information about the functions that are available on the ASMI, see Managing your server using the ASMI.

Hardware Management Console

The Hardware Management Console (HMC) is a system that controls managed systems, including the management of logical partitions and the use of Capacity on Demand. The HMC also communicates with managed systems to detect, consolidate, and send information to IBM for analysis by using service applications.

Considerations for choosing the HMC:

- The HMC is the only console that enables you to configure server partitions.
- The HMC can control multiple partitions without needing a separate connection and adapter for each partition.
- A version of the HMC can also be used in System p server models with pre-POWER5 processors. However, previous versions of the HMC are not compatible with the version that is used to manage POWER5™ servers. You cannot manage pre-POWER5 servers and POWER5 servers with the same HMC.
- The HMC cannot be used for System i models prior to the IBM eServer i5 servers.
- You must use the HMC to manage your IBM System p5 and IBM eServer p5 servers if you plan to create or reconfigure logical partitions, or to enable Capacity on Demand.
- You also can use the HMC in conjunction with other consoles, interfaces, or terminals for specific management needs.
- You must use the HMC if you plan to manage your InfiniBand network by using the IBM Network Manager.
- You must use the HMC to perform concurrent maintenance tasks on systems that support part replacement and feature upgrades without server downtime.
- You must use the HMC to enable your system for service processor failover on systems that are equipped with redundant service processors.

For more information about the HMC, see "Solutions with the Hardware Management Console" on page 14.

iSeries consoles and interfaces

If you do not want to use the Hardware Management Console (HMC), you can communicate with your iSeries® servers in a variety of ways. You can also augment the HMC with additional consoles for added management capabilities.

After you have reviewed your i5/OS console, interface, and terminal options, see Special considerations for choosing i5/OS consoles.

5250 terminal emulator:

The 5250 terminal emulator is a management window that runs on the Hardware Management Console (HMC), Operations Console, and the twinaxial console for System i systems.

You can enter control language (CL) commands on the 5250 terminal emulator command line to run commands. You can also use the character-based interface to find information about workloads that run on i5/OS partitions. The 5250 terminal emulator is integrated with the twinaxial console, and it runs as a terminal emulator on the HMC and Operations Console. The 5250 terminal emulator can also run on a proxy server on the HMC for remote system administration.

See Character-based interface in the System i Information Center for more information about the 5250 terminal emulator and other character-based interfaces.

Control panel:

The control panel is a hardware device that enables iSeries customers and service providers to perform basic system management functions and to monitor boot-level function codes on system startup.

You can also access a virtual control panel function through Operations Console or through the Hardware Management Console (HMC). Systems managed by the HMC should use the HMC to perform control panel functions. For more information about the control panel, see Control panel functions.

iSeries Access:

iSeries Access provides you with graphical access to your server in the iSeries Access for Windows, iSeries Access for Web, and iSeries Access for Wireless environments.

For more information about iSeries Access, see iSeries Access in the iSeries Information Center.

iSeries Navigator:

iSeries Navigator is a graphical user interface that allows you to manage iSeries systems from a Windows PC. iSeries Navigator gives you control of system hardware, such as disk I/O, network resources and security, database systems, application availability, and system workload settings across multiple iSeries servers.

For more information about iSeries Navigator, see iSeries Navigator in the iSeries Information Center.

Operations Console:

You can use Operations Console with one or more PCs to access and control the server and control panel functions, either remotely or locally. Operations Console is only available on IBM eServer i5 and iSeries servers.

To use Operations Console, you need to load iSeries Access for Windows on a PC. Then, either directly connect the PC by using a cable, or connect through a local area network (LAN) with a dedicated adapter or by using the embedded Ethernet port, if available, on the server. With this type of connection, a single PC can serve as the console for multiple servers.

Considerations for choosing Operations Console:
- You can set up Operations Console to manage the i5/OS operating system in a partitioned or a nonpartitioned environment.
- You need a separate LAN adapter card for each partition that communicates by using Operations Console. This can result in less room for other I/O adapters that you need to install in the server. However, after i5/OS Version 5.4 the embedded Ethernet port is allowed for console use as well.
- Unlike the Hardware Management Console (HMC), you cannot change partition resources with Operations Console.
- Although Operations Console uses a standard Windows PC, the HMC is a dedicated system that cannot be changed except for service upgrades. This greatly increases the security and stability of the HMC versus Operations Console.
- Operations Console supports more than 40 languages.

Twinaxial console:

The twinaxial console is the traditional console for the System i family. It requires a 5250 terminal that is connected to the server over a twinaxial cable or a twisted pair cable with an adapter The twinaxial console is only available for i5/OS partitions on System i servers.

No graphical user interface is available for the twinaxial console. All interactions with the server must take place through a CL command line. The twinaxial console does not require the use of a PC to act as a console.

Considerations for choosing the twinaxial console:
- You can set up the twinaxial console if you plan to manage the i5/OS operating system in a partitioned environment or in a nonpartitioned environment.

- When used in a partitioned environment on an eServer i5 server, a twinaxial console and a twinaxial adapter are required for each partition.
- Some twinaxial consoles allow for two or four sessions at a time; however, all sessions must connect to a single i5/OS partition.
- If you plan to use the twinaxial console in a partitioned environment with the i5/OS, you need to use the Hardware Management Console (HMC) to manage partition resources.

Thin Console:

The Thin Console for System i5® is an alternative console to the twinaxial console for managing an i5/OS system *without* the Hardware Management Console (HMC) attached.

The Thin Console integrates a 5250 terminal emulator that provides the communications interface. All interactions with the server must take place through a CL command line. The Thin Console is available for System i models 9405-520, 9406-520, 9406-525, 9406-550, and 9407-515. For additional information about the Thin Console, see Managing the Thin Console.

Note: No graphical user interface (GUI) is available for the Thin Console. For a full-featured GUI interface to manage an i5/OS system, use the iSeries Navigator. For more information, see iSeries Navigator.

Considerations for choosing the Thin Console
- The Thin Console provides convenience in setup, because it directly connects to the i5 server through the HMC port.
- The console supports only single i5/OS partitioned environments.
- You can access up to four Linux partitions in a Virtual I/O configuration.
- No specific power-on sequence is required to start the console and the server, although a typical initialization scenario includes attaching the console and completing the authentication process before starting the server.

Virtual Partition Manager:

The i5/OS Virtual Partition Manager allows you to create and manage up to four Linux logical partitions from a single i5/OS logical partition on an IBM eServer i5 server.

For information about the Virtual Partition Manager, see Partitioning with Virtual Partition Manager.

See also the Virtual Partition Manager A Guide to Planning and Implementation redbook at ibm.com/redbooks.

Special considerations for choosing i5/OS consoles:

When choosing the type of console that you want to use for an i5/OS logical partition, consider how you will recover the console functions if the console device malfunctions.

Depending on the type of console that you use and the release of i5/OS that is installed on the logical partition, you can recover the console functions using one of these methods:
- Direct replacement of the console device. For example, if your Hardware Management Console (HMC) malfunctions, you can attach a replacement HMC, restore a backup of the HMC data on the replacement HMC, and use the replacement HMC to reconnect.
- Manual takeover or recovery of an Operations Console connection by an Operations Console device. For example, if a console device is malfunctioning, you can take over the console device session by using an Operations Console device. For more information about take over and recovery, see Take over or recover an Operations Console connection.

- Automatic switchover to the alternate console device. For example, if the managed system detects that a twinaxial console is malfunctioning, then the managed system switches the console device session to the twinaxial alternate console device automatically. This automatic switchover only occurs during a manual IPL to access Dedicated Service Tools (DST). This does not affect the system console in i5/OS.
- In the case of a failure of a physical console device, it is often desirable to change the i5/OS system console device without rebooting the partition. Starting with i5/OS version 5.3, it is possible to change between the HMC 5250, Operations Console (direct connect and LAN attached) or twinaxial console. It is also possible to change between two I/O adapters with the same console type. For procedures about how to change consoles without rebooting the partition, see Changing consoles, interfaces, and terminals.

System p5 and eServer OpenPower interfaces and terminals

You can use additional terminals and interfaces to manage the systems in your data center in addition to Hardware Management Console (HMC) and the Advanced System Management Interface (ASMI). Learn about how to determine if you need additional interfaces and terminals for your solution.

ASCII terminal:

The ASCII terminal is the original System p terminal, which is connected to the server through a serial link. It can be used with or without the Hardware Management Console (HMC).

The ASCII interface to the Advanced System Management Interface (ASMI) provides a subset of the ASMI functions that are available using the Web interface, and the ASCII interface is only available when the server is in the platform standby state. The ASCII interface to the ASMI is not available during initial program load or runtime. See Accessing the ASMI using an ASCII console for more information about the ASCII terminal.

You can also access the ASMI with a web browser. For more information, see Accessing the ASMI using a Web Browser.

For more information about accessing the ASMI with an ASCII console or web browser, see Managing the Advanced System Management Interface (ASMI).

Graphics terminal:

The graphics terminal is available to System p customers who want to use a graphical user interface (GUI) to their AIX or Linux servers.

The graphics terminal is primarily used for specific applications, such as animation programs and Product Lifecycle Management solutions such as CATIA. To use the graphics terminal, plug the graphics adapter into a PCI slot in the back of the server. You can connect a standard monitor, keyboard, and mouse to the adapter to use the terminal. You can use the graphics terminal with or without the Hardware Management Console (HMC).

System Management Services menus:

System Management Services (SMS) menus provide access to low-level functions through the firmware console on System p servers. Linux and AIX System p customers must use the SMS menus to specify which device or Network Information Management (NIM) server to install the operating system on the system or logical partition.

After the operating system is installed, you can use the SMS menus to change the boot sequence. You can do this if you want to boot a diagnostic CD instead of the operating system, or if you want to try booting another hard disk drive with a different version of the operating system, for example. For some models where the Advanced System Management Interface (ASMI) is not supported, additional options are available on the SMS menus. See Using the system management services for additional information.

The console that is used to access the SMS menus is usually referred to as the firmware console. On a system that is managed by the Hardware Management Console (HMC), the firmware console is usually a virtual terminal on the HMC. On a system that is not managed by the HMC, the firmware console can be a graphics terminal that is attached to a graphics adapter, or an ASCII terminal that is attached to one of the system ports on the server.

The SMS menus are not related to the ASMI, to the operating system, or to configuring partitions on the HMC. For more information about the SMS menus, see Using the system management services.

Virtual terminal:

The virtual terminal is used for some system management functions on System p servers that run AIX or Linux. The virtual terminal is an Hardware Management Console (HMC) function that emulates a standard terminal window. It can be used locally from the HMC console or from Web-based system manager remote clients.

See "Web-Based System Manager Remote Client access" on page 20 for more information about remote clients. See Virtually accessing AIX or Linux using the virtual terminal for more information about the virtual terminal.

Integrated Virtualization Manager:

The *Integrated Virtualization Manager* is a browser-based system management interface for the Virtual I/O Server. The Integrated Virtualization Manager allows you to create and manage AIX and Linux logical partitions on a single IBM System p server. On OpenPower® servers, the Integrated Virtualization Manager supports only Linux logical partitions.

The Integrated Virtualization Manager is supported only on specific server models.

Virtual I/O Server is software that provides virtual storage and shared Ethernet resources to the other logical partitions on the managed system. Virtual I/O Server is not a general purpose operating system that can run applications. Virtual I/O Server is installed on a logical partition in the place of a general purpose operating system, and is used solely to provide virtual I/O resources to other logical partitions with general purpose operating systems. You use the Integrated Virtualization Manager to specify how these resources are assigned to the other logical partitions.

To use the Integrated Virtualization Manager, you must first install Virtual I/O Server on an unpartitioned server. Virtual I/O Server automatically creates a logical partition for itself, which is called the *management partition* for the managed system. The management partition is the Virtual I/O Server logical partition that controls all of the physical I/O resources on the managed system. After you install Virtual I/O Server, you can configure a physical Ethernet adapter on the server so that you can connect to the Integrated Virtualization Manager from a computer with a Web browser.
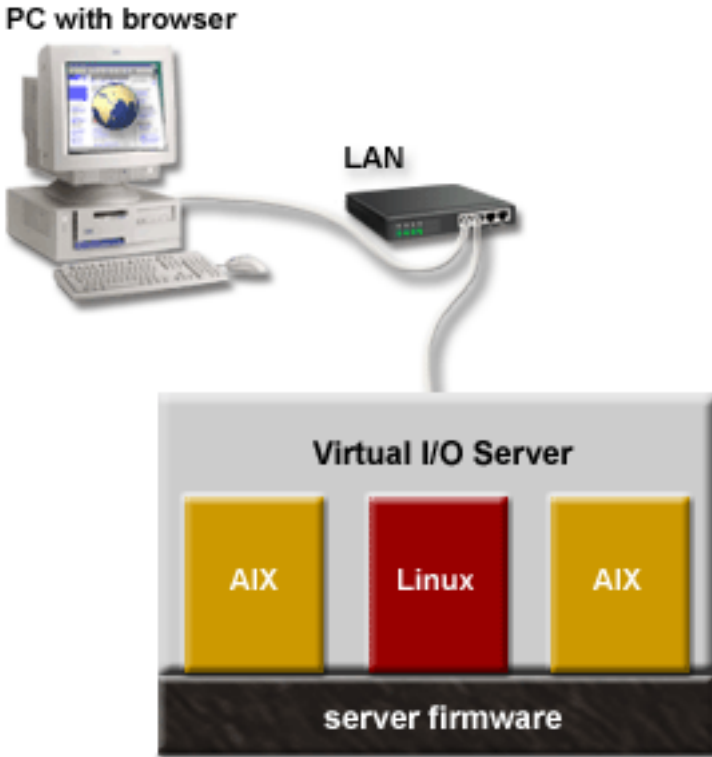
This figure illustrates Virtual I/O Server in its own logical partition, and the AIX and Linux logical partitions that are managed by the Virtual I/O Server logical partition. The browser on the PC connects to the Integrated Virtualization Manager interface over a network, and you can use the Integrated Virtualization Manager to create and manage the logical partitions on the server.

Resource assignment

When you use the Integrated Virtualization Manager to create a logical partition, then you assign memory and processor resources directly to logical partitions. If you use dedicated processors, then you specify the exact number of dedicated processors. If you use shared processors, then you specify the number of virtual processors for the logical partition, and the Integrated Virtualization Manager calculates the number of processing units it assigns to the logical partition based on the number of virtual processors. In all cases, the amount of resources that you assign is committed to the logical partition from the time that you create the logical partition until the time that you change this amount or delete the logical partition. You therefore cannot overcommit processor resources to logical partitions using the Integrated Virtualization Manager.

A logical partition that is created using the Integrated Virtualization Manager has minimum and maximum memory and processor values. The minimum and maximum values are used when you use a workload management application on the managed system, when you restart the managed system after a processor failure, or when you dynamically move resources to or from the Virtual I/O Server management partition. By default, the minimum and maximum values are set to the same value as the actual amount of committed resources. You can change the minimum and maximum processor values at any time, but you can change the minimum and maximum memory values only while the logical partition is not running.

When you use the Integrated Virtualization Manager to partition your managed system, a fraction of the memory and a fraction of the processors on the managed system are assigned to the Virtual I/O Server management partition. If desired, you can change the memory and processor resources that are assigned

to the management partition to match your Virtual I/O Server workload. Physical disks can be assigned directly to logical partitions, or they can be assigned to storage pools, and virtual disks (or logical volumes) can be created from these storage pools and assigned to logical partitions. Physical Ethernet connections are generally shared by configuring the physical Ethernet adapter as a virtual Ethernet bridge between the virtual LAN on the server and an external, physical LAN. Host Ethernet Adapter Other types of I/O devices

Solutions with the Hardware Management Console

The Hardware Management Console (HMC) is a system that controls managed systems, including the management of logical partitions and the use of Capacity on Demand. The HMC also communicates with managed systems to detect, consolidate, and send information to IBM for analysis by using service applications.

HMC capabilities

The Hardware Management Console (HMC) is a system management appliance. For the purposes of stability and security, the HMC is a closed system; that is, no other software can be loaded on it. When powered on and connected to the server through its dedicated Ethernet port, the graphical user interface gives the administrator control over all hardware resources, including all partitions and capacity settings.

The Ethernet port connects the HMC to the service processor, which enables you to perform various service functions.

The primary functions of the HMC include:
- Remote power management that enables you to power on and off your server remotely through the HMC user interface.
- Logical partition (LPAR) configuration which allows you to manage partition resources as your business changes.
- Service focal point which provides error routing, error analysis, and error reporting to IBM.
- Capacity on Demand that enables you to activate additional unused resources as your business changes.
- Virtual terminal support which allows you to manage your systems by using the virtual ASCII terminal.
- 5250 console support which allows you to manage your iSeries systems with or without other consoles.
- Concurrent maintenance that enables you to perform concurrent maintenance tasks on models that allow for feature upgrades without server downtime.

See Implementations of HMCs for more information about what you can do with the HMC.

Hardware Management Console specifications

The Hardware Management Console (HMC) is available in two forms, a desktop version and a rack-mounted version. Learn more about which form is right for your solution.

See these specification sheets to determine which model you need for your solution:
- Desktop Hardware Management Console
- Rack-Mounted Hardware Management Console

Hardware Management Console compatible servers and models

You can use Hardware Management Console (HMC) models with all POWER5 and POWER6 servers.

This table shows which HMC models work with your machine-type model.

Table 1. HMC compatible servers and models

Server or model	Machine-type model	HMC machine type and model number	Additional consoles, interfaces, and terminals[1]
System p models	9115-505 9111-285 9131-52A 9133-55A 9110-51A 9116-561 9111-520 9113-550 9117-570 9117-MMA 9119-590 9119-595	7310-C03 7310-C04 7310-C05 7310-C06 7310-CR3 7310-CR4 7042-C06 7042-CR4	ASMI, **SMS menus**, ASCII terminal, *graphics terminal*, virtual terminal
System i models	9405-520 9406-520 9406-525 9406-550 9406-570 9406-595 9407-515 9117-MMA	7310-C03 7310-C04 7310-C05 7310-C06 7310-CR2 7310-CR3 7310-CR4 7042-C06 7042-CR4	ASMI, control panel, *iSeries Access, iSeries Navigator, Operations Console*, twinaxial console
IBM eServer OpenPower servers	9124-720 9123-710	7310-C03 7310-C04 7310-C05 7310-C06 7310-CR2 7310-CR3 7310-CR4	ASMI, **SMS menus**, ASCII terminal, *graphics terminal*, virtual terminal

[1] Required additional consoles, interfaces, or terminals are listed in **bold**. Recommended additional consoles, interfaces, or terminals are listed in *italic*.

Hardware Management Console requirements and benefits

Some solutions require the use of the Hardware Management Console (HMC). Other solutions might not require the HMC, but the HMC might still help you manage your solution more effectively. Learn how to determine if the HMC is the best choice for your solution.

When the HMC is required

The HMC is required for:
- All systems that run multiple logical partitions.
- All systems that arrive in 24-inch racks with bulk power assemblies.
- All systems with redundant (active/standby) service processors.
- OpenPower and System p5 clusters with CSM hardware controls that are in 24-inch rack systems.
- Systems that are connected in an InfiniBand switch network with host channel adapters that you plan to manage by using the IBM Network Manager.

When the HMC is beneficial

The HMC is beneficial for logical partitioning, centralized hardware management, managing Capacity on Demand (CoD), advanced server functions, redundant and remote system management, and security.

Logical Partitioning

Logical partitioning enables you to consolidate multiple workloads into one server. For example, if you have 10x86 Linux servers in your data center, you can assign a logical partition on your POWER5 server for each Linux server and migrate all of your Linux workloads into your POWER5 system.

LPAR also enables you to consolidate workloads from multiple operating systems into one server. By logically isolating the operating system and its associated workload to one partition, you can ensure that its availability and performance are unaffected by other workloads, while saving overall system and administrative costs.

For System i, you can use the Virtual Partition Manager in i5/OS that allows some basic multiple LPAR configuration without the HMC.

For System p5 and OpenPower, the Integrated Virtualization Manager provides similar basic logical partitioning capability without the HMC.

Note: The Virtual Partition Manager and Integrated Virtualization Manager offerings only provide a subset of the LPAR management function and flexibility that is available with the HMC, so you may still benefit from the additional capability of the HMC.

Centralized Hardware Management

One HMC can manage up to 32 systems.

Note: You need a separate Ethernet switch to connect more than one server to an HMC. Switches are preferred over hubs.

The HMC provides a graphical interface to control servers, including powering up and down, and setting up and managing partitions running on the managed servers. On AIX or Linux partitions, this is accomplished through the HMC graphical user interface (GUI) and through the virtual terminal. On i5/OS partitions, this is accomplished through the HMC GUI and the 5250 emulator that runs on the HMC.

These tasks can be managed through the HMC GUI:
- Add and remove managed systems.
- Authentication: TheHMC gives you control over the passwords that are required to access the HMC and the managed systems that connect to the HMC.
- Managed system properties: The HMC enables you to view or change system properties of managed systems. You can view general system properties (system type, system model, serial number, and capabilities), power-on properties, processor, I/O, and memory information (current usage), and system reference codes. You can change the managed system name or power-off policy.
- Partition management: The HMC enables you to manage partition resources with its GUI.
- Remote scripting capability: The HMC provides you with a set of commands that can be used to build scripts to manage your managed systems.

See Working with the HMC for more information about configuring and using the HMC to manage your systems.

Managing CoD

You can use the HMC to activate unused processor and memory resources as your business grows. The HMC provides full support for managing all CoD and Function on Demand (FoD) capabilities. These functions ensure that you have the processor and memory capacity that you

need when you need it, either on a regular growth curve or on a seasonal basis. CoD improves your cost/performance ratio by allowing you to pay for only the capacity that you need.

See Planning for Capacity on Demand for more information about how to order and configure CoD.

Advanced Service Functions

The Service Focal Point (SFP) functions* are only available with an HMC.

These advanced service functions include:
- Service event collection
- Platform dump collection
- Call home
- SNMP traps
- Guided/concurrent repair procedures

The HMC also supports concurrent firmware maintenance, which allows you to apply fixes to your system firmware without any disruption to the operation of the system and partitions.

* The Integrated Virtualization Manager also contains a limited subset of SFP functions, but they only apply to the system on which the Virtual I/O Server is running.

Redundant and remote system management

You can integrate multiple HMCs into one data center. In some cases, one HMC can manage multiple systems. In other cases, two or more HMCs can manage one system. In still other cases, multiple consoles and interfaces can manage systems remotely by using the HMC as a gateway device.

See "Redundant Hardware Management Consoles" on page 18 for more information about redundant HMC configurations. See "Remote Hardware Management Consoles and clients" on page 19 for more information about remote HMC configurations.

Security

The HMC is a more secure console option than many others that are available for your system. First, a reliable security system is built into the machine code. Second, it is tied to specific PC hardware and is not supported or functional on vendor PCs. This guarantees that the HMC includes all of the security hardware and software that IBM includes. Finally, the HMC is closed and dedicated, which means that users are not able to install their own software onto the HMC. For all of these reasons, the HMC is a highly secure console.

See Working with users, roles, and passwords for more information about HMC security.

Hardware Management Console configurations

There are a variety of ways that you can connect multiple administrators. Learn about how to connect multiple administrators in your distributed environment.

Local Hardware Management Console with ASMI and SMS: The local Hardware Management Console (HMC) is directly connected to the server that it manages by using a private network. The HMC can launch the Advanced System Management Interface (ASMI) by using a Web browser. The HMC can display the System Management Services (SMS) menus using the virtual terminal.
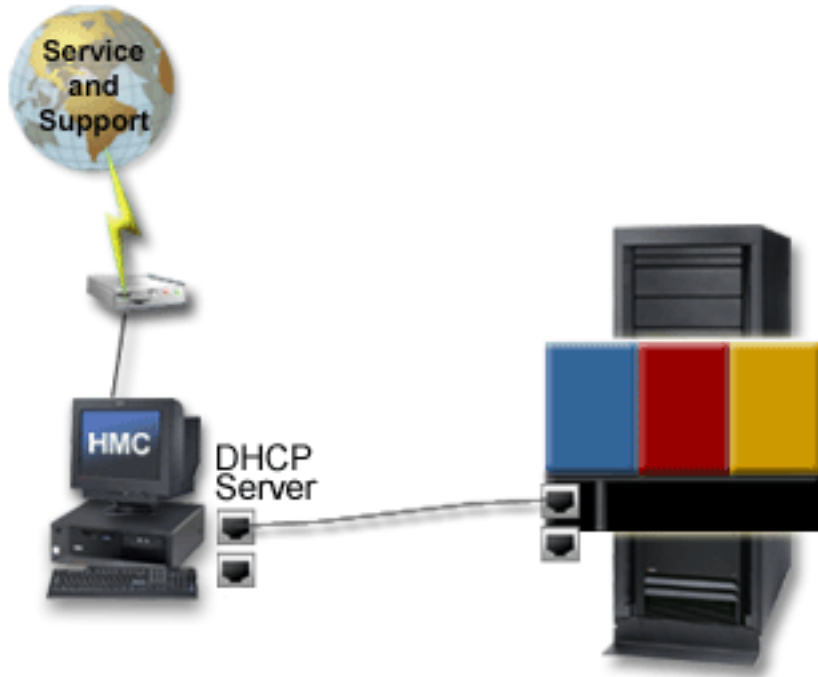
Figure 1. Local HMC connection

Redundant Hardware Management Consoles:

Multiple Hardware Management Consoles (HMCs) can manage one server.

When there are two or more HMCs managing one system, the HMCs are peers. To set up a redundant HMC, follow the instructions in Setting up an HMC.

In a DHCP environment, both HMCs must be configured as DHCP servers, and the HMCs must be on separate subnets. For instructions about setting up a DHCP server, see Configuring the HMC as a DHCP server. In a redundant HMC environment, configure only one HMC for service and support.

The following figure depicts a redundant HMC configuration in a DHCP environment. In this configuration, both HMCs are connected to the server using private networks.

Note: The HMCs must be at the same level.
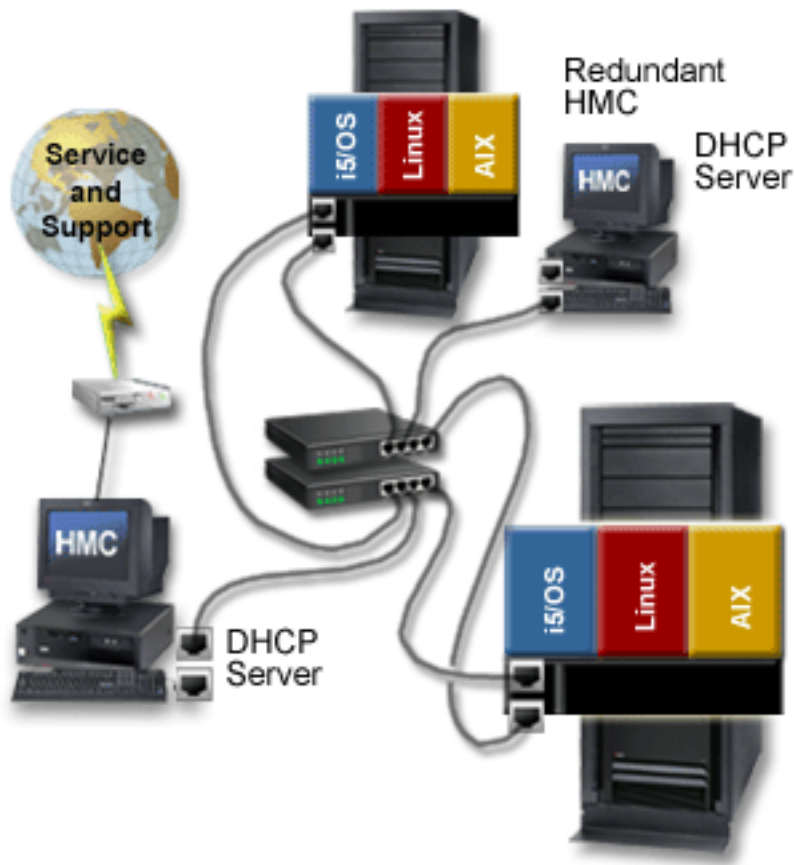
Figure 2. Redundant HMC connections

Remote Hardware Management Consoles and clients:

The local Hardware Management Console (HMC) needs to be configured to allow remote access because, in the default settings, remote access is disabled.

The local HMC can also enable remote access with other types of clients. You can configure the HMC as a Web-based System Manager Remote Server, with clients accessing the HMC server through the Web-based System Manager Remote Client. The HMC can also provide remote secure shell access for command-line and script-based management. The HMC can also act as a remote 5250 console proxy, which enables access to i5/OS partition consoles with optional shared session support.
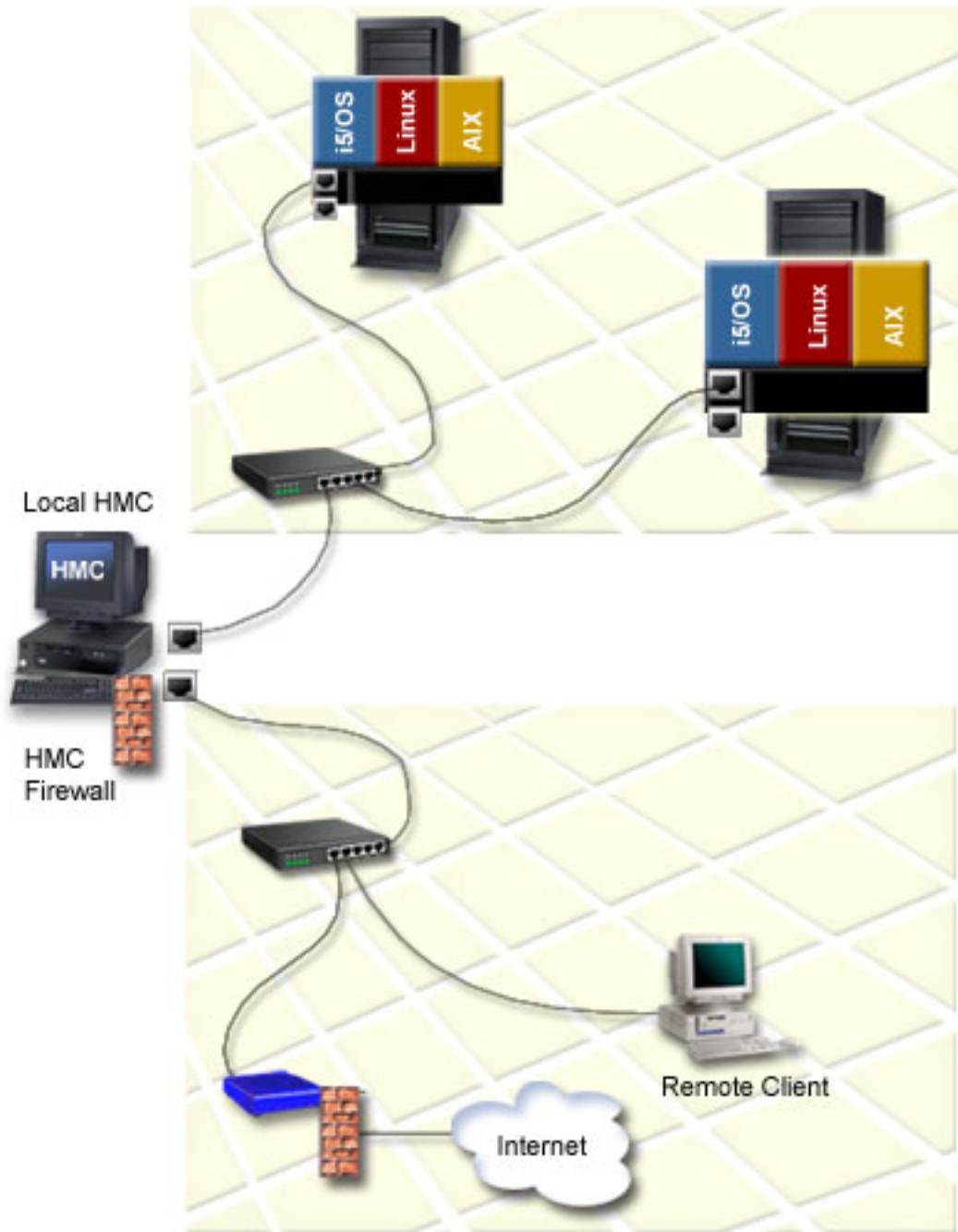
Figure 3. Remote HMC connections

Web-Based System Manager Remote Client access:

The Hardware Management Console (HMC) can be configured as a Web-Based System Manager Remote Server that allows up to five remote client PCs (at one time) to access the managed systems by using Web-Based System Manager Remote Client software. The remote client systems can be running Windows, Linux, or AIX.

For an example of how to use this scenario, see Scenario: The HMC as a Web-Based System Manager Remote Server.

For more information about remote client access, see the Web-based System Manager Remote client topic and the *Secure remote GUI access to the HMC* chapter in the Effective System Management Using the IBM Hardware Management Console for pSeries redbook at ibm.com/redbooks..

Remote secure shell access for UNIX and Linux:

The Hardware Management Console (HMC) allows Linux and AIX users to run commands and scripts through remote secure shell access to the managed system. This is useful if you need consistent results and you need to automate the administration of managed systems.

You can accomplish consistency by storing the command sequence in scripts and running them remotely. You can automate management by calling the scripts from batch-processing applications from the remote systems.

See Scenario: HMC with remote UNIX secure shell access for more information about this configuration on AIX systems.

See Scenario: HMC with remote Linux secure shell access for more information about this configuration on Linux systems.

Hardware Management Console as a 5250 proxy server for the i5/OS:

You can administer your eServer i5 server through the Hardware Management Console (HMC) with a PC by using a 5250 emulator, such as PC5250, on either a local network or an open network.

You can also choose two are shared proxy configuration or a dedicated proxy configuration on the HMC. Shared configurations enable two administrators to share the same screen. Dedicated configurations allow only one screen per administration session. If you choose to use the 5250 emulator from a remote client, you can either use Secure Sockets Layer (SSL) encryption or no encryption. SSL encryption is highly recommended.

See Scenario: HMC as a remote 5250 proxy server for more information about this configuration.

Hardware Management Console with Operations Console:

You can integrate Operations Console with the Hardware Management Console (HMC). Some iSeries customers prefer Operations Console with iSeries Access and iSeries Navigator for certain management tasks, such as graphical I/O management.

Operations Console requires a dedicated LAN card for each partition that you manage. However, in i5/OS Version 5.4 and later, the embedded Ethernet port is also allowed for console use. You might be limited in how many partitions you can manage with this console type, because the number of slots that are available to the LAN cards are limited.

Note:
Operations Console cannot alter partition resources. You must use the HMC to alter partition resources.

See Scenarios: The HMC and Operations Console in an integrated environment for more information about this configuration.

Hardware Management Console and the twinaxial console:

For some System i tasks, the twinaxial console enables quicker administration of an System i partition than the Hardware Management Console (HMC). For this reason, some customers choose to use twinaxial consoles in addition to the HMC.

If you do not plan to run multiple partitions, you can install the I/O processor (IOP) card for the twinaxial console in the default slot. If you want to manage multiple partitions with twinaxial consoles, you need a separate IOP card for each partition to which you want to connect to a twinaxial console.

See Scenario: The HMC with the twinaxial console in an integrated environment for more information about this configuration.

Scenarios: Hardware Management Console for IBM eServer i5

Learn more about how users have integrated the Hardware Management Console (HMC) into distributed System i environments with other consoles, interfaces, and terminals.

Scenario: Hardware Management Console as a remote DHCP server:

Use this scenario to learn how to use administrators at two data centers to manage servers at both locations. You can set up the Hardware Management Consoles (HMCs) in both locations as Dynamic Host Configuration Protocol (DHCP) servers, which provides access to the DHCP client for the remote HMCs.

User needs highly secure collaborative administration solution

In this scenario, the user has two mirrored data centers of IBM eServer i5 model 570 that run consolidated workloads, including the Web site for the user. The user needs administrators at both data centers to manage all servers at both locations. To do this, the user sets up the HMCs in both locations as Dynamic Host Configuration Protocol (DHCP) servers, which provides access to the DHCP client for the remote HMCs. Because the respective HMCs are behind the firewalls of the data centers, the firewall software must allow access through a port for the HMC traffic and nothing else. The HMC data also must be secured against snooping while it is transported over the open network. This is done through virtual private networking on the open network between the HMCs.

Scenario: Hardware Management Console as a Web-Based System Manager Remote Server:

Use this scenario to learn how to give remote access to up to six administrators at a time, so they can manage an IBMSystem i model 595 with an entire data center and many workloads that are consolidated on one managed system.

User needs to allow multiple administrators to have the ability to manage servers from a PC

In this scenario, a user has an IBM eServer i5 model 595 with an entire data center and many workloads that are consolidated into one managed system. The user has a large number of administrators, each of whom specialize in certain application families. Because these administrators already have PCs in their offices, the most economical way for the user to configure the console systems is for one Hardware Management Console (HMC) to be located near the managed system with all of the administrators accessing the HMC through the Web-based System Manager Remote Client. The Web-Based System Manager Remote Client gives access to a maximum of six administrators at one time. The administrators access the HMC management interface by using an HMC ID and password.

Scenario: Hardware Management Console Management Console as a remote 5250 proxy server:

Use this scenario to learn how to use a partitioned System i using an unsupported Hardware Management Console (HMC) language.

Partitioned System i using an unsupported Hardware Management Console (HMC) language

The HMC must be used to create the logical partitions and make changes to the partition, because the system is partitioned. However, the administrator only speaks a language that is not supported by the HMC, so a special accommodation must be made for the administrator. In this case, System i Access is

installed on the administrator PC, and the PC5250 component of System i Access is configured to connect to a port on the HMC with Secure Sockets Layer (SSL) encryption. The HMC is configured to allow remote PC telnet sessions for console use. When the PC connects to the HMC, the administrator is prompted for the HMC user ID and password. The console session will connect and the administrator has 5250 access to a single logical partition as configured by the local administrator of the HMC.

Scenarios: Hardware Management Console and Operations Console in an integrated environment:

Use these scenarios to learn how to use a partitioned System p server with i5/OS on a partition, how to use 64 partitions on a single server, and how to upgrade from a Model 840 to a Model 570.

Partitioned System p server with i5/OS on a partition

A user wants to consolidate an System i workload with a System p server. The user can order the 9411-100 feature, which allows the i5/OS to run on a partition on a 9117-570 System p rack-mounted server. With one rack-mounted Hardware Management Console (HMC) and a rack-mounted TF3 LCD with keyboard, the user can view i5/OS system resources that are dedicated to that partition, including the System i I/O expansion unit, which is connected to the Model 570 through an HSL link. By using a 5250 emulator on the HMC, the user can manage the i5/OS partition as if it were an i5/OS server. The user can also manage AIX and Linux partitions on the Model 570 server, and all I/O resources that are attached to these partitions, with the same HMC by using its applications and the virtual terminal.

After the user gets the i5/OS partition and the System i I/O expansion unit working, the user wants to manage aspects of the i5/OS partition with a PC using System i Access with Operations Console and iSeries Navigator. This can be accomplished by plugging a LAN card into a slot in the System i I/O expansion unit or into the first embedded Ethernet port. In this way, the Operations Console PC is viewed by the HMC as another I/O device, yet Operations Console can administer most aspects of the i5/OS partition, including graphical management of all I/O devices on the System i expansion unit.

64 partitions on a single server

In this scenario, the administrator wants a console to run concurrently at all times on all partitions. Because the service processor component cannot handle the amount of network traffic that this would require, some percentage of the partitions could not be managed with the HMC. Instead, some of the partitions need to use other consoles. If i5/OS runs on these partitions, the administrator can access the partitions by using Operations Console. If so, each partition needs a dedicated LAN card for Operations Console. Operations Console can manage multiple partitions, but it cannot create partitions or change how resources are allocated to partitions. However, withi5/OS Version 5.4 or later, the embedded Ethernet port is allowed for console use as well.

Upgrading from a Model 840 to a Model 570

In this scenario, a user starts with a Model 840 with five partitions, that are all managed by Operations Console that is connected through a LAN. The user is upgrading to a Model 570 and will continue to need five partitions. The user needs the HMC to manage partition resources, but the user wants to continue to use graphical disk management. The user can connect any PC to the partitions that are assigned to the disk I/O and use System i Access and iSeries Navigator to manage disk resources. However, because the user is familiar with Operations Console, System i Access, and iSeries Navigator, the user chooses to manage each partition to which the disk I/O is assigned with Operations Console.

Scenario: Hardware Management Console and the twinaxial console in a traditional iSeries environment:

Use this scenario to learn how to continue to use the twinaxial console after an upgrade to Model 520 or Model 570.

Upgrade from a Model 830 to an i5 system that has the twinaxial console

In this scenario, the user has always been an iSeries user and has always used the twinaxial console. The administrator wants to continue to use the twinaxial console after the upgrade because familiarity with the interface makes it the most efficient option. If the user upgrades to a Model 520 (hence, without partitions), the twinaxial adapter is installed in slot 5 or slot 2 and the user can maintain interface consistency. In this case, the default I/O Processor (IOP) will be used, so no additional IOP is required. If the user upgrades to a Model 570 with partitions, an additional IOP will need to be ordered for each partition and an additional slot will be used for each twinaxial adapter. The user will still need to use the Hardware Management Console (HMC) to manage the partitions, and might find that the HMC is the preferred console, especially if other I/O needs to be installed in the slots that are being used by the twinaxial adapters.

Scenarios: Hardware Management Console for System p servers

Learn more about how users have integrated the Hardware Management Console (HMC) into distributed System p server environments with other consoles, interfaces, and terminals.

Scenario: Hardware Management Console with remote UNIX secure shell access:

Use this scenario to learn how to access the Hardware Management Console (HMC) and manage System p servers remotely with remote shell access commands.

Customer has multiple remote administrators

In this scenario, the user has a large data center of System p servers with multiple administrators. Rather than forcing the administrators to go to the data center every time they want to manage the systems, the administrators can access the HMC and manage their systems remotely. The remote administrators enter a user ID and password to access the HMC. This shell access is restricted to a set of commands that can be used to manage the HMC and the servers that are managed by the HMC. The user can also use the remote scripting capability of Secure Shell (SSH) to run scripts on a local system that issues HMC management commands to the HMC, thus giving the user access to a full range of commands on the managed systems.

For more information about using the HMC remote command line and setting up secure script to run between SSH clients, see Using the HMC remote command line.

Scenario: Hardware Management Console and graphics with ASCII terminals in an integrated environment:

Use this scenario to learn how to connect to older System p servers as you continue to add new servers to the data center as your business grows.

Multiple System p server models of various ages

The user has an existing data center that runs System p servers and continues to add servers to the data center as the business grows. The user connects to the older servers using ASCII terminals and graphics terminals, and to p5 servers through the Hardware Management Console (HMC) .

Scenarios: Hardware Management Console for eServer OpenPower Servers

Learn more about how users have integrated the Hardware Management Console (HMC) into distributed OpenPower environments with other consoles, interfaces, and terminals.

Scenario: Hardware Management Console with remote Linux secure shell access:

Use this scenario to learn how to access the Hardware Management Console (HMC) and manage IBM eServer OpenPower servers remotely with remote shell access commands.

Customer has multiple remote administrators

In this scenario, the user has a large data center of IBM eServer OpenPower servers with multiple administrators. Rather than forcing the administrators to go to the data center every time they want to manage the systems, the administrators can access the HMC and manage their systems remotely. Depending on what needs to be done, the administrators can use the Web-based System Manager Remote Client, which is loaded either on a PC or a Linux workstation. In other cases, the administrators can run shell commands and scripts for more advanced system management. In either case, the remote administrators enter a user ID and password to access the HMC. This shell access is restricted to a set of commands that can be used to manage the HMC and the servers that are managed by the HMC. The user can also use the remote scripting capability of Secure Shell (SSH) to run scripts on their local systems that issue the HMC management commands to the HMC, thus giving the user access to a full range of Linux commands on the managed systems.

Solutions without the Hardware Management Console

Although choosing not to use the Hardware Management Console (HMC) limits your ability to flexibly handle business changes, you may choose not to use the HMC. Learn more about your server families to understand your console, interface, and terminal options other than the HMC.

IBM eServer i5

If you choose not to use the Hardware Management Console (HMC) on IBM eServer i5, you have several options to choose from. Learn more about your options before planning to develop your solution without the HMC.

Operations Console:

Learn how to manage the eServer i5 server with Operations Console instead of the Hardware Management Console (HMC).

Scenario: An IBM eServer i5 user without the HMC: In this scenario, the user is not partitioning the server, so the user chooses to manage the eServer i5 server with Operations Console.

Twinaxial console:

The twinaxial console is the traditional console for the System i family. It requires a 5250 terminal that is connected to the server over a twinaxial cable or a twisted pair cable with an adapter The twinaxial console is only available for i5/OS partitions on System i servers.

No graphical user interface is available for the twinaxial console. All interactions with the server must take place through a CL command line. The twinaxial console does not require the use of a PC to act as a console.

Considerations for choosing the twinaxial console:
- You can set up the twinaxial console if you plan to manage the i5/OS operating system in a partitioned environment or in a nonpartitioned environment.
- When used in a partitioned environment on an eServer i5 server, a twinaxial console and a twinaxial adapter are required for each partition.
- Some twinaxial consoles allow for two or four sessions at a time; however, all sessions must connect to a single i5/OS partition.
- If you plan to use the twinaxial console in a partitioned environment with the i5/OS, you need to use the Hardware Management Console (HMC) to manage partition resources.

Thin Console:

The Thin Console for System i5 is an alternative console to the twinaxial console for managing an i5/OS system *without* the Hardware Management Console (HMC) attached.

The Thin Console integrates a 5250 terminal emulator that provides the communications interface. All interactions with the server must take place through a CL command line. The Thin Console is available for System i models 9405-520, 9406-520, 9406-525, 9406-550, and 9407-515. For additional information about the Thin Console, see Managing the Thin Console.

Note: No graphical user interface (GUI) is available for the Thin Console. For a full-featured GUI interface to manage an i5/OS system, use the iSeries Navigator. For more information, see iSeries Navigator.

Considerations for choosing the Thin Console

- The Thin Console provides convenience in setup, because it directly connects to the i5 server through the HMC port.
- The console supports only single i5/OS partitioned environments.
- You can access up to four Linux partitions in a Virtual I/O configuration.
- No specific power-on sequence is required to start the console and the server, although a typical initialization scenario includes attaching the console and completing the authentication process before starting the server.

System p5 and IBM eServer p5

For IBM eServer p5 and System p5 models, you have several console, interface and terminal options other than the Hardware Management Console (HMC).

See "System p5 and eServer OpenPower interfaces and terminals" on page 11 for details.

IBM eServer OpenPower servers

For IBM eServer OpenPower servers, you have several console, interface and terminal options other than the Hardware Management Console (HMC).

See "System p5 and eServer OpenPower interfaces and terminals" on page 11 for details.

Planning for consoles, interfaces, and terminals for your service environment

During a service activity, the service provider will use one or more of the following: the Hardware Management Console (HMC), a system console, or a PC that is capable of connecting to the Advanced System Management Interface (ASMI).

To prepare for the service provider:

1. Provide a supported HMC, a system console, a PC capable of connecting to the ASMI, or any appropriate combination that is capable of accessing the ASMI that is connected to the service processor over Ethernet.
2. Load and configure all current, supported software and software fixes.
3. Locate the consoles in the same room and within 8 meters (26 feet) of the system that is being serviced.
4. Make sure that the devices that are connected to the system are operational and communicating with the service processor before the service representative arrives.

Failure to meet the requirements stated above will result in delays to IBM service providers. These delays are billable at current hourly rates.

Planning for logical partitions

IBM hardware architectures allow you to create logical partitions to distribute resources within a single server and make it function as if it were two or more independent servers. Before creating logical partitions (LPARs), you need to plan for several variables that are specific to your solution. You need to understand how you can reconfigure partitions to respond to future needs.

You can create logical partitions on your server to integrate multiple operating systems and consolidate several servers into one. Consolidation helps you reduce maintenance and administration costs while improving performance. Planning for logical partitions is a multistep process. Here are the recommended tasks for LPAR planning for AIX, i5/OS, and Linux logical partitions.

Before you begin your planning tasks, complete these items:

Before you begin

__ **Determine what you want to do**

For example, you can:
- Plan a new system
- Reconfigure an existing system
- Upgrade an existing system
- Physically set up a new system
- Partition a new system
- Virtualize systems resources
- Install operating systems on new partitions
- Migrate a partition between physical systems

To help you determine what you want to do, see Logical partition overview and Concepts for partitioning the server in the IBM Systems Hardware Information Center.

This information familiarizes you with the hardware and software that is required for logical partitions and prepares you to plan for and create logical partitions on your server.

Before you begin

__ **Learn about available tools**

The available tools include:

IBM Prerequisite site
> IBM Prerequisite site
>
> The IBM Prerequisite site provides you with compatibility information for hardware features. This site helps you plan a successful system upgrade by providing you with the prerequisite information for features that you currently have or plan to add to your system.

Workload Estimator
> IBM Systems Workload Estimator
>
> The Workload Estimator estimates the computer resources that are required for Domino, WebSphere Commerce, WebSphere, Web Serving and traditional workloads. The Workload Estimator projects the most current System i and System p models that meet the capacity requirements that are within the CPU percent utilization objectives.

System Planning Tool
> System Planning Tool
>
> The System Planning Tool (SPT) emulates an LPAR configuration and validates that the planned partitions are valid. In addition, the SPT allows you to test the placement of AIX, i5/OS and Linux hardware within the system to ensure that the placement is valid.

Hardware Management Console
> Managing your server using the Hardware Management Console
>
> The Hardware Management Console (HMC) is a system that controls managed systems, including server hardware, logical partitions, and Capacity on Demand (CoD).

Performance toolbox
> AIX Performance Toolbox and Performance AIDE for POWER Version 3.0
>
> The AIX Performance Toolbox (PTX) for POWER Version 3.0 is a licensed program product that provides a comprehensive tool for monitoring and tuning system performance in distributed environments.

Integrated Virtualization Manager
> Partitioning with Integrated Virtualization Manager
>
> Integrated Virtualization Manager is a browser-based system management interface that you can use to manage a single managed system that uses Virtual I/O Server on a managed partition.

Virtual I/O Server
> Using the Virtual I/O Server
>
> The Virtual I/O Server is an appliance that resides in a logical partition that facilitates the sharing of physical I/O resources between AIX and Linux client logical partitions within the server.

__ **Check prerequisites**

Use these resources to check prerequisites:

- Hardware resources

- IBM Prerequisite Web site at http://www-912.ibm.com/e_dir/eServerPrereq.nsf

Logical partition planning tasks

__ **Take inventory of your current environment, and what is available through CoD**

See Working with Capacity on Demand.

Logical partition planning tasks

__ **Perform capacity planning**

Use the Workload Estimator (WLE) for each logical system, new or consolidated, to determine the number of partitions that are needed and the size of each. Use your existing Performance Monitor (PM) information as input for the WLE. See the IBM Systems Workload Estimator Web site at

http://www.ibm.com/systems/support/tools/estimator/index.html .

__ **Design and validate your partition configuration**

Use the SPT to help you design a partitioned system and develop a system plan. See the System Planning Tool for more information about this tool. If you are using an HMC to partition, you can use the system plan file to automate the task of creating partitions on your system. See System plan overview to learn how to deploy a system plan.

__ **Use the WLE and SPT output to identify the console that interacts with the server and its operating systems**

See Console options for logical partitions to help you determine which console helps you to connect and communicate with the server and your operating systems.

__ **Use the WLE and SPT output to determine how the partitions communicate with other partitions, servers, or workstations**

See Communications options for logical partitions to help you select the communication option for your logical partition. Determine which communication option allows you to communicate with other partitions, servers, and workstations.

__ **Use the WLE and SPT output to identify how the partitions communicate with the HMC**

See Hardware Management Console (HMC) to help you determine how to implement a network connection on the HMC.

__ **Determine a service and support strategy**

See Service, support, and troubleshooting to understand how your server communicates to your service provider if you have hardware or software errors. Determine how to apply fixes to your server and how you identify problems that need to be reported to your service provider.

__ **Decide if you want your operating systems to share I/O resources with each other**

See Using the Virtual I/O Server to understand how your OS can provide I/O resources to other logical partitions.

__ **Plan for software licensing in a partitioned environment**

You need to decide how many software licenses you might need depending on your logical partition configuration.

Software licensing for IBM licensed programs on logical partitions

Software licensing considerations for Capacity BackUp.

Planning for workloads

Planning for workloads involves planning for capacity, including sizing, and planning for performance and availability. Workload planning tools differ according to the operating systems that you run on your servers. Use these capacity and performance planning checklists for each supported operating system.

Planning for capacity

Planning for capacity includes planning for sizing, performance, and availability. By calculating your initial capacity needs and projecting future business activity, you can improve your server performance and availability while minimizing costs. Many of the capacity planning tools and the steps that you take can also be used to capture performance and availability data. Capacity planning tools differ according to the operating systems that run on your servers.

Regardless of operating environment, your capacity planning might include planning for Capacity on Demand (CoD). CoD allows you to purchase a server with excess capacity and only pay for the capacity that you need. You can activate the standby processors or memory units temporarily or permanently as your business grows or on a seasonal basis. If you build CoD into your capacity plan, you ensure that you have the capacity when you need it.

Planning for capacity with AIX

Capacity planning for AIX includes the use of several tools that are also used for performance management and system accounting. Some of these tools are built-in AIX commands and others are supplemental tools, such as the Performance Toolbox. Some tools help you to plan to add Capacity on Demand (CoD).

Before you start your AIX capacity planning, answer these questions:

Before you begin
__ Which type and size of database will your company use?
__ What other software applications are involved?
__ How many users will use these applications?
__ How much data will the server handle?
__ What are the inputs and outputs for the data?
__ What are the future growth plans, both short-term and long-term, for your company?

Capacity planning tasks
__ **Use AIX commands to establish a current workload estimate**

The first step in determining your capacity needs is to capture data about existing workloads using standard AIX commands. Several commands within AIX can help you quantify various aspects of server usage. These commands include:

iostat Generates quick reports that you can use to determine if there is an imbalanced I/O load between physical disks and adapters. It also reports on CPU usage.

ipcs Reports status information about active interprocess communication (IPC) facilities.

ps Monitors memory usage between processors and partitions.

sar Gathers data about system performance.

svmon Captures a current view of virtual memory usage.

topas Enables you to perform broad-spectrum performance analysis.

vmstat Reports statistics about kernel threads in the run queue and wait queue, memory, paging, disks, interrupts, system calls, context switches, and CPU activity.

For more information about how to use these commands, see the IBM eServer pSeries Sizing and Capacity Planning redbook.

__ **Use the Performance Toolbox to gather additional workload data**

The Performance Toolbox collects and graphically displays data from various systems in your current configuration. The Performance Toolbox can give you a better understanding about how all of your systems work together than the screens of ASCII numbers that are generated by AIX commands. For more information about using the Performance Toolbox to determine current workloads, see Performance Toolbox Version 2 and 3 Guide and Reference.

__ **Optimize current usage with AIX Workload Manager**

After you have a good idea about how your systems are being used, you can deploy the AIX Workload Manager to improve system usage. The AIX Workload Manager is a part of AIX that gives system administrators control over many system resources, either manually or automatically. It also generates graphical reports, including graphs of capacity usage over time. The result gives you a better understanding of your capacity needs. To learn more about the AIX Workload Manager, see Workload Manager.

Capacity planning tasks

__ **Plan for Virtualization Technologies**

You can use Enterprise Workload Manager or Director Multiplatform to help you plan for capacity. Enterprise Workload Manager (EWLM) allows you to define business-oriented performance goals for an entire domain of servers, and provides an end-to-end view of actual performance relative to those goals. See Enterprise Workload Manager for more information about using EWLM to plan for capacity.

Director Multiplatform contains the Capacity Manager plug-in, available in the Server Plus Pack, which you can use to plan resource management and monitor managed-system hardware performance. It can identify bottlenecks and potential bottlenecks, recommend ways to increase capacity through performance analysis reports, and forecast performance and capacity trends. See Director Multiplatform for more information about using Capacity Manager to plan for capacity.

__ **Estimate future server usage**

Estimating future server usage is a critical step in the process of planning for future capacity. Start your estimation by charting capacity and workload usage over the past year and extrapolate the growth curve for the coming year. This gives you a good short-term estimate of your capacity needs for next year. For long-term estimates, use capacity data from the past five years to develop a capacity curve for the next five years. When extrapolating, increase the growth curve for new initiatives that will affect server usage.

__ **Plan for logical partitions**

You might need to shift logical partition (LPAR) resources as your business needs dictate. Your capacity plan will be affected by how your partition resources are allocated. For more information about LPAR planning on your AIX servers, see Planning for logical partition.

__ **Plan for CoD**

With CoD you can acquire excess capacity and pay for only the capacity that you use. This helps you to adjust your capacity plan for unexpected server usage. Understanding how you can upgrade only what you need is a critical aspect of your capacity planning. See Planning for Capacity on Demand for more information about developing that plan.

When you have completed these tasks, you should have a plan for capacity that identifies these elements:

After you finish

__ Record your current configuration with all standby capacity listed.
__ Record a list of hardware that you will need to upgrade dynamically.
__ Record a timetable for short-term or seasonal upgrades.
__ Record a timetable for long-term upgrades.

Planning for capacity with i5/OS

Capacity planning for i5/OS involves using several tools to size your current workload and plan for future workloads. After you gather your workload data, you can plan for logical partitions and Capacity on Demand (CoD).

Before you start your i5/OS capacity planning, answer these questions:

Before you begin

__ Which type and size of database will your company use?
__ What other software applications are involved?
__ How many users will use these applications?
__ How much data will the server handle?
__ What are the inputs and outputs for the data?
__ What are your future growth plans for your company both in the short term and long term?

Capacity planning tasks

__ **Establish current workload size**

You need to determine your current server usage. You can use the IBM Performance Manager for eServer iSeries with Workload Estimator, which is available at no extra charge for users that are under warranty. For more information about this tool, see the PM eServer iSeries news Web site, which explains how the performance management and workload estimating tools work.

__ **Plan for Virtualization Technologies**

Enterprise Workload Manager (EWLM) and Director Multiplatform can help you plan for capacity. EWLM allows you to define business-oriented performance goals for an entire domain of servers, and then provides an end-to-end view of actual performance relative to those goals. See Enterprise Workload Manager for more information about using EWLM to plan for capacity.

Director Multiplatform contains the Capacity Manager plug-in, available in the Server Plus Pack, that you can use to plan resource management and monitor managed-system hardware performance. It can identify bottlenecks and potential bottlenecks, recommend ways to increase capacity through performance analysis reports, and forecast performance and capacity trends. See Director Multiplatform for more information about using Capacity Manager to plan for capacity.

__ **Estimate future workloads**

Estimating future server usage is important in planning for future capacity. To estimate future workloads, start by charting capacity and workload usage over the past year and then extrapolate the growth curve for the coming year. This gives you a short-term estimate of your capacity needs for next year. For long-term estimates, you can use capacity data from the past five years to develop a capacity curve for the next five years. Make sure that you add new initiatives that will affect server usage. For more information about estimating future workloads and performance needs, see the IBM Performance Management for eServer iSeries Web site.

__ **Plan for logical partitions**

You might need to shift logical partition (LPAR) resources as your business needs dictate. Your capacity plan is affected by how your partition resources are allocated. For more information about LPAR planning on your i5/OS servers, see Planning for logical partitions.

__ **Plan for CoD**

Planning for CoD helps you prepare for business growth without paying for the excess capacity until you need it. See Planning for Capacity on Demand for more information about developing that plan.

When you have completed these tasks, you should have a plan for capacity that identifies these elements:

After you finish

__ Record your current configuration with all of your standby capacity listed.
__ Record a list of hardware that you will need to upgrade dynamically.
__ Record a timetable for monthly or seasonal upgrades.
__ Record a timetable for long-term upgrades.

Planning for capacity with Linux

You can use several tools that are related to sizing your current workloads and planning for future workloads when planning for capacity for Linux. Most of the data that you gather to complete your plan is also used to plan for performance and availability.

Before you begin your capacity planning checklist, answer these questions and read the Linux whitepaper.

Before you begin

__ Which type and size of database will your company use?
__ What other software applications are involved?
__ How many users will use these applications?
__ How much data will the server handle?

Before you begin

__ What are the inputs and outputs for the data?

__ What are your future growth plans for your company both in the short term and long term?

__ Read the Optimizing Linux environments for performance and scalability white paper for an overview of the tasks that are involved in planning for Linux capacity as it relates to performance.

Linux capacity planning tasks

__ **Identify capacity considerations for Linux distribution requirements**

Each Linux distribution has unique requirements for determining how much capacity your Linux server can handle. Also, each distribution is tuned differently with different workload and simulation tools that help you develop a plan for current and future capacity. To learn more about capacity planning within your Linux distributions, see these resources.

- Red Hat Linux service offerings.

- Novell SUSE Linux.

__ **Measure current workloads**

You need to assess the existing workloads that are assigned to your Linux partitions. Several tools can measure these workloads.

See the Linux on POWER applications Web site for more information about available applications, including those that can help you gather workload data.

__ **Plan to simulate the environment**

You need to model current and future capacity to ensure that you have the adequate resources for your workloads. There are several capacity simulation tools available.

See the Linux on POWER applications Web site for more information about software products that can help you model and simulate workloads.

__ **Plan for logical partitions**

You might need to shift logical partition (LPAR) resources as your business needs dictate. Your capacity plan will be affected by how your partition resources are allocated. For more information about LPAR planning on your Linux servers, see Planning for logical partitions.

__ **Plan for Capacity Upgrade on Demand**

If your simulations show that you will need seasonal or permanent capacity upgrades, you need to plan for additional processors. For more information about planning for, activating, and ordering additional processors for your hardware system, see Planning for Capacity on Demand.

When you have completed these tasks, you should have a plan for capacity that identifies these elements:

After you finish

__ Record your current configuration and list all standby capacity.

__ Record a list of hardware that you will need to upgrade dynamically.

__ Record a timetable for monthly or seasonal upgrades.

__ Record a timetable for long-term upgrades.

Planning for performance

Effective performance management requires thorough planning to ensure that you have the necessary server resources for your business needs. By ensuring that you are prepared for business contingencies, effective planning also reduces the time involved in managing your system performance when you need to add resources.

Planning for performance with AIX

Use these planning checklists to gain the performance that your business needs from your AIX server.

Before you begin your planning tasks, complete these checklists.

Before you begin
__ See the IBM System p and AIX Information Center Web site at

http://publib.boulder.ibm.com/infocenter/pseries .
__ Read the AIX Release Notes.

AIX performance planning tasks
__ **Build a plan for performance**

The Planning and Implementing for Performance chapter of the Performance Management Guide guides you through the complete process of setting performance objectives and using those objectives to plan a performance management strategy. Refer to the Performance Toolbox Guide and Reference for additional information about the tools that are available in the Performance Toolbox.
__ **Understand the tools that are available to you**

The Performance Toolbox Version 2 and 3 Guide and Reference explains the tools that are available in the Performance Toolbox for monitoring your systems performance.
__ **Identify performance considerations for AIX release requirements**

See the AIX Release Notes or the guide to Installing AIX to identify the disk storage, CPU, memory, and other requirements of your AIX release. Identify any implications for your performance planning.
__ **Determine if you need huge-page memory**

The POWER processor-based server models provide support for huge-page memory allocation. This support allows you to assign a portion of the system real memory to a huge-page memory pool to accommodate applications and environments that would benefit from the use of 16-GB memory segments, such as DB2 partitioned databases. You can assign huge pages from the huge-page memory pool to logical partitions. Because huge-page memory reduces the amount of configurable memory available for logical partitions, you must calculate the amount of huge pages that you need for your specific applications and determine the amount of available system memory that would be required to support the huge pages. See Calculating huge page memory for more information.
__ **Understand how to activate additional processors on your server**

Capacity on Demand (CoD) allows you to activate inactive processors or memory on select models as your changing business needs demand more resources. For more information about planning for, activating, and ordering additional processors for your hardware system, see Capacity Upgrade on Demand for pSeries servers.

When you have completed these tasks, you should have a plan for AIX performance that identifies these elements:

After you finish
__ Identify and record any necessary changes to the server operating environment, such as adding a large number of users or a significant software product.
__ Identify and record any considerations for upgrading to a new AIX release, such as requirements for disk storage, CPU, and memory.
__ Identify and record interactive CPU requirements.
__ Identify and record memory requirements, including huge-page memory requirements, if applicable.
__ Identify and record communications performance requirements.
__ Identify and record database accessibility requirements as they relate to disk and disk device requirements.
__ Identify and record performance considerations for replacing hardware or features no longer supported by the manufacturer.
__ Identify and record the components of the workload.
__ Identify and record all performance requirements.
__ Identify and record the estimated resource requirements of the workload.
__ Record a complete strategy for meeting the performance requirements of projected workloads.

Planning for performance with i5/OS

Managing performance on an i5/OS server can be a complex task that requires a thorough understanding of work management. Resolving performance problems requires the effective use of a large suite of tools, each with its own unique set of requirements and supported functions.

Before you begin your planning tasks, complete these items:

Before you begin
__ Identify stress on physical components of the configuration.
__ Document trends and problems with your current performance environment.
__ Identify future performance needs for your environment.

Performance planning tasks
__ **See the Performance Capabilities Reference information**

Use the detailed technical information in the Performance Capabilities Reference to do complex performance planning. You can access various release levels of this publication on the Performance Management Web site.

__ **Plan for performance management services**

The IBM Electronic Service Agent™ can capture performance information that can then be used for performance management. You can access performance management services as an optional fee-based service. For information about the Electronic Service Agent, see the Electronic Services Web site. SeeIBM Global Services to plan for any performance management services that you need.

__ **Identify performance considerations for i5/OS release requirements**

Refer to the Install, upgrade, or delete the OS/400® and related software topic to identify the disk storage, CPU, memory, and other requirements of the i5/OS release.

__ **Understand that you can upgrade the capacity of your server**

Working with Capacity on Demand enables you to activate inactive processors on select models as changing business needs demand more resources. You can activate these processors for a trial period, on a set schedule, or on a permanently activate these processors. For more information on capacity planning see the Planning for Capacity on Demand topic.

When you have completed these tasks, you should have a plan for performance that identifies these elements:

After you finish
__ Identify and record any necessary changes to the operating environment of your server, such as adding a large number of users or a significant software product.
__ Identify and record any considerations for upgrading to a new i5/OS release, such as requirements for disk storage, CPU, and memory.
__ Identify and record cache requirements.
__ Identify and record interactive CPU or total processor capacity requirements.
__ Identify and record memory requirements.
__ Identify and record communications performance requirements.
__ Identify and record database accessibility requirements as they relate to disk and disk device requirements.
__ Identify and record performance considerations for replacing hardware or features that are no longer supported by IBM, for example, replacing SPD-based hardware with PCI-based hardware.
__ Record a complete strategy for meeting the performance requirements of projected workloads.

Planning for performance with Linux

Learn about the planning tasks that you need to perform to get the performance that your business needs from your server running Linux.

Before you begin your planning tasks, complete these tasks.

Before you begin
__ See the eServer Linux Web site for information on the various server platforms that support Linux and the three supported Linux distributions.
__ Read the Optimizing Linux environments for performance and scalability white paper to get an overview of the tasks that are involved in planning for Linux performance.

Linux performance planning tasks
__ **Identify performance considerations for Linux distribution requirements**

Each Linux distribution has unique requirements that need to be met to get desired performance. Also, each distribution is tuned differently with different shell scripts or performance-enhancement tools. To get the most out of your distributions, see these resources:

- Red Hat Linux service offerings
- Novell SUSE Linux

__ **Plan to create a performance baseline**

You need to assess the existing workloads that are assigned to your Linux partitions. There are several tools that you can use to measure these workloads. See the Linux on POWER applications Web site for more information about the available applications, including those that can help you establish a baseline and perform other performance-related tasks.

__ **Plan to simulate the environment**

You need to model current and future capacity to ensure that you have the adequate resources for your workloads. There are several capacity simulation tools available.

See the Linux on POWER applications Web site for more information about software products that can help you model and simulate workloads.

__ **Plan for Capacity on Demand**

If your simulations show that you need seasonal or permanent capacity upgrades, you need to be prepared to address these needs. For more information about planning for, activating, and ordering additional processors for your hardware system, see Planning for Capacity on Demand .

__ **Plan to test the performance of your solution**

It is important to test the performance of your solution before running it in a production environment. Testing validates that your simulations take into account all of the variables and accurately represent production workloads. Testing also stresses the actual code with user transaction loads to capture performance bottlenecks that are inherent in the applications that you plan to run under Linux. For more information about planning to test the performance of your solution in a lab setting, see Planning for testing.

__ **Plan to sustain performance through growth**

Ongoing monitoring of your Linux systems provides for updated data points that you can use to validate and enhance your system performance.

When you have completed these tasks, you should have a plan for Linux performance that identifies these elements:

After you finish
__ Identify and record any necessary changes to the operating environment of your server, such as adding a large number of users or a significant software product.
__ Identify and record any considerations for upgrading to a new Linux release, such as requirements for disk storage, CPU, and memory.
__ Identify and record communications performance requirements.
__ Identify and record database accessibility requirements as they relate to disk and disk device requirements.
__ Identify and record the components of the workload.
__ Identify and record all performance requirements.

After you finish

__ Identify and record the estimated resource requirements of the workload.

__ Record a complete strategy for meeting the performance requirements of projected workloads.

Planning for availability

To minimize downtime and maximize availability, you need to prepare for hardware failures, power outages, server transitions, and disaster recovery.

Planning for availability with AIX

Learn how to minimize downtime and maximize availability on your AIX server.

Before you begin your planning tasks, complete this checklist:

Before you begin

__ Go to IBM System p and AIX Information Center Web site at http://publib.boulder.ibm.com/infocenter/pseries

   to review information about System p and AIX.

__ Read the AIX Release Notes.

__ Identify your disaster recovery plan.

__ Identify your backup and recovery strategy.

__ Identify the cost per hour of a system outage to both your business and your users.

AIX availability planning tasks

__ **Establish a backup policy**

Determine a strategy for backing up the systems and files that are needed for your organization. For more information about backing up your systems, see Backup files and storage media and Establishing a backup policy.

__ **Establish a logical volume policy**

Determine a strategy for logical volume use that is oriented toward availability and performance. This policy may include write-verify and mirroring, which can enhance availability, but degrade performance. Establish a policy that is best suited to your needs. For more information about creating a logical volume policy, see Developing a Logical Volume Strategy.

__ **Establish a volume group policy**

Determine a strategy for volume groups to protect against disk failure. This should include mirroring, which can also aid performance. For more information about creating a volume group policy or using commands to mirror your volume group, such as the alt_disk_install command, seeDeveloping a Volume Group Strategy.

__ **Understand the different file system types**

Know the difference between CIFS, GPFS, JFS, JFS2, NFS, UDFS, and other file system types and how they can increase your AIX availability. For more information about clusters in AIX, see File Systems.

__ **Plan for High Availability Cluster Multi-Processor (HACMP™) technology**

Depending on the size and scope of your enterprise, consider using an HACMP solution to ensure continuous data and application availability. Current HACMP solutions enable long-distance site mirroring, which is why they are called HACMP/XD (eXtreme distance). HACMP/XD High Availability Geographic Cluster (HAGEO) for AIX 5L™ is a high-end solution for business-critical applications and data. HACMP/XD Remote Copy for IBM Enterprise Storage Server® is appropriate for less critical operational applications and data. To determine which solution is right for your business and to plan accordingly, see the Planning considerations for geographically dispersed clusters using HACMP/XD HAGEO technology white paper. Once you have decided on an HACMP solution, see the High Availability Cluster Multi-Processing for AIX Web site for resources that enable you to add more detail to your plan.

AIX availability planning tasks
__ **Plan for High Performance Switch (HPS) clusters**

You should install High Performance Switches (HPSes) for your high availability clusters to function at their peak performance. To plan for HPSes on pSeries servers, see eServer Cluster 1600: pSeries High Performance Switch Planning, Installation, and Service . To plan for HPSes on eServer p5 servers, see eServer Cluster 1600: High Performance Switch Planning, Installation, and Service for IBM eServer p5 servers .

When you have completed these tasks, you should have a plan for AIX availability that identifies these elements:

After you finish
__ Implement your established backup policy.
__ Record a complete availability strategy for a single server or multiple server environment.
__ Record a complete strategy for backing up your server.
__ Record a complete strategy for server recovery.
__ Record a complete strategy for data protection that includes mirroring, concurrent maintenance, and Redundant Array of Independent Disks (RAID). Include detailed configuration and placement information for disk subsystem components.
__ Record a complete and validated plan for HACMP cluster configurations, if applicable.
__ Ensure that the hardware requirements for your cluster configuration have been met, if applicable.

Planning for availability with i5/OS

To minimize downtime and maximize availability on your i5/OS system, you must plan for availability. Learn how to create a plan for i5/OS availability.

Before you begin your planning tasks, complete these items:

Before you begin
__ Identify your current disaster recovery plan.
__ Identify your current backup and recovery strategy.
__ Identify the cost-per-hour of a system outage to both your business and your users.

i5/OS availability planning tasks
__ **Build an availability plan**

Use the Availability roadmap to choose the availability options that are based on your environment and business needs. You need to plan in order to maintain availability at the required levels during disaster recovery and server transitions. You need to create an availability plan that addresses these options:
- Capacity on Demand
- Clusters
- Commitment control
- Concurrent maintenance
- Device parity protection
- Disk pools
- Journaling
- Mirrored protection
- Outage recovery
- Online backups
- Redundant Arrays of Independent Disks (RAID)
- Transition planning

i5/OS availability planning tasks

__ **Identify clustering requirements**

To identify your clustering requirements and to build a clustering plan, see Plan for clusters. To learn more about the availability strategies and solutions that use clusters, see the System i High Availability and Clusters Web site and Availability for multiple servers: Clusters.
Note: Minimum memory requirements increase when you cluster IBM eServer i5 servers. Pay special attention to these requirements if you plan to use clusters to boost availability.

__ **Identify independent disk pools strategy**

To understand how independent disk pools and switchable disk units fit into your availability strategy, see Independent disk pools. IBM Business Continuity and Recovery Services can also assist you with complex availability planning, such as clusters and independent disk pools.

__ **Identify Electronic Service Agent options**

The IBM Electronic Service Agent helps you achieve higher availability by detecting errors and transmitting them to the support center before a failure occurs (in most cases). Skilled technicians review the problem details and inventory information. The support center can then send a service representative to your site to replace the failing hardware before a system outage occurs. For more information, see Electronic Service Agent.

__ **Build a backup and recovery strategy**

To plan and build a backup and recovery strategy that is customized for your computing environment, seePlan a backup and recovery strategy.

__ **Learn more about high availability**

To learn more about availability strategies and solutions, see the Data Resilience Solutions for IBMi5/OS High Availability Clusters redbook.

__ **Estimate the level of availability that you need in your business environment**

See Availability to learn more about System i5 high availability concepts and solutions. Find the information that you need to build a complete availability plan.

When you have completed these tasks, you should have a plan for availability that identifies these elements.

After you finish

__ Record a complete availability strategy for a single server or multiple server environment.
__ Record a complete strategy for backing up your server.
__ Record a complete strategy for server recovery.
__ Highlight any unique cluster considerations for the new release, if applicable.
__ Record a complete and validated plan for cluster configuration, if applicable.
__ Ensure that the hardware requirements for your cluster configuration have been met, if applicable.
__ Record a complete strategy for cluster communications that highlights any key considerations, such as OptiConnect, if applicable.
__ Record a complete strategy for data protection that includes solutions such as mirroring, concurrent maintenance, and RAID. Include detailed configuration and placement information for disk subsystem components.

Planning for availability with Linux

Learn how to keep your business running continuously with your Linux server by performing the appropriate planning tasks.

Before you begin your planning tasks, complete this checklist:

Before you begin

__ If you are migrating or upgrading, identify your current disaster recovery plan.
__ If you are migrating or upgrading, identify your current backup and recovery strategy.

Before you begin
__ Identify the cost-per-hour of a system outage to both your business and your customers.

Linux availability planning tasks
__ **Determine how clusters enhance availability**

Decide how to use clusters in your environment to enhance availability. For more information about clusters in Linux, see Linux cluster software documentation and see the documentation that is provided by your Linux distributor.

__ **Identify options for service support**

Several options are available to provide Linux information directly to your service provider, so skilled technicians can review your problem details and inventory information. Your next level of support can then send an authorized service provider to your site to replace the failing hardware before a system outage occurs. For more information, see Setting up your server to connect to service and support.

__ **Identify options for Linux reliability**

Several tools are available to support Linux reliability, availability, and scalability (RAS), including:
- snap, which provides snapshots of system error data
- update_flash, which allows customers to download firmware updates
- diagela, which provides error analysis and writes interpreted errors back to the Linux syslog

For more information, see Service aids for Linux on IBM eServer p5.

__ **Build a backup and recovery strategy**

See Backup and recovery to plan and build a backup and recovery strategy that is customized for your computing environment.

When you have completed these tasks, you should have a plan for availability that identifies:

After you finish
__ Record a complete strategy for backing up your server.
__ Record a complete strategy for server recovery.
__ Record a complete strategy for data protection that includes solutions, such as mirroring, concurrent maintenance, and Redundant Array of Independent Disks (RAID). Include detailed configuration and placement information for disk subsystem components.
__ Record a complete and validated plan for cluster configuration, if applicable.
__ Ensure that the hardware requirements for your cluster configuration have been met, if applicable.
__ Record a complete availability strategy for a single server or multiple server environment.

Planning for service processor failover

The 570 models support redundant service processor configurations that allow you to plan for dynamic failover. It is important to understand the considerations and requirements for a redundant service processor configuration to prepare for enabling the failover capability.

The redundant service processor capability enables you to configure a secondary service processor that is activated when the primary service processor fails. This information describes the considerations and requirements for enabling this capability, whether you are installing a new system with redundant service processor capability or upgrading an existing system.

Preparing your network environment for failover
_ **Network requirements**

Service processor failover is supported in a private or open service network, using static or dynamic IP addressing.

Preparing your network environment for failover

_ **HMC setup requirements**

You must have a Hardware Management Console (HMC) to enable the redundant service processor capability. The HMC is required to be at the same level or a higher level as the system firmware for service processor failover capability. Currently, two HMC configurations are supported for redundant service processor enablement, as shown in the following diagrams.

• "Using a single Hardware Management Console configuration"

• "Using a redundant Hardware Management Console configuration" on page 43

_ **Cabling requirements**

If you are upgrading a system with a single service processor to a redundant service processor system, plan for any additional cables that you will need for this environment:

• You must have enough Ethernet cables to connect both service processors to the hub.

• You must provide your own hub.

• You must have a cable to connect between the two service processors on the HMC2 port on a Power5 system.

• If you have I/O towers or I/O drawers in your configuration, you will need additional System Power Control Network (SPCN) cables to connect the two service processors together and to connect the service processors to the I/O tower or I/O drawer.

For more information about cabling for a redundant service processor, see Replace the model 570 or 9116-561 service processor cable

Preparation checklist

Use this checklist to prepare for redundant service processor enablement.

_ Review the configuration requirements discussed in the preceding section.

_ Decide which HMC configuration you will use (single HMC configuration or redundant HMC configuration).

_ Determine if additional cables are required for the redundant service processor.

_ If you are replacing your service processor to upgrade to a redundant service processor, ensure that you first back up your logical partition (LPAR) profiles and your service processor settings. Replacing your service processor causes a loss of LPAR configurations.

Back up your partition profile data to a named file, using the instructions described in Backing up partition profile data. Make sure you specify a backup file name and do not use the HMC default file name. This enables you to preserve a perpetual copy of the backup settings on the HMC. Record the backup file name that you specify because you will use this file name to restore your partition data. See Restoring Profile Data.

_ Ensure that your system meets the supported hardware and software version requirements for the service processor failover functionality. See the IBM Prerequisite Web site at

http://www-912.ibm.com/e_dir/eServerPrereq.nsf   for information.

_ Ensure that the service processors in the top two drawers have the same firmware level.

Enabling service processor failover

After the redundant service processor environment setup has been completed, you can enable the service processor failover from the HMC. See Enabling service processor failover to enable the redundant service processor for failover mode.

Note: To initialize service processor failover, the first time you enable it your system must be in the powered-off state. For information about powering off and powering on your managed system from the HMC, see Powering on and off a managed system. After the initial enablement on the Power5 system, powering off the system is not required to enable or disable the failover.

Using a single Hardware Management Console configuration

You can configure a redundant service processor with a single Hardware Management Console (HMC) that is connected to the service processors. A specific connection scenario is required for this configuration.

Using a single HMC with your redundant service processor setup requires a specific port configuration, as shown in the following figure. In this configuration, the HMC Ethernet port connects to the hub or switch. The HMC 1 connection on both of the service processors connect to the hub. On a Power5 system, the loop-back cables connect to the two service processors.

Power5 system configuration
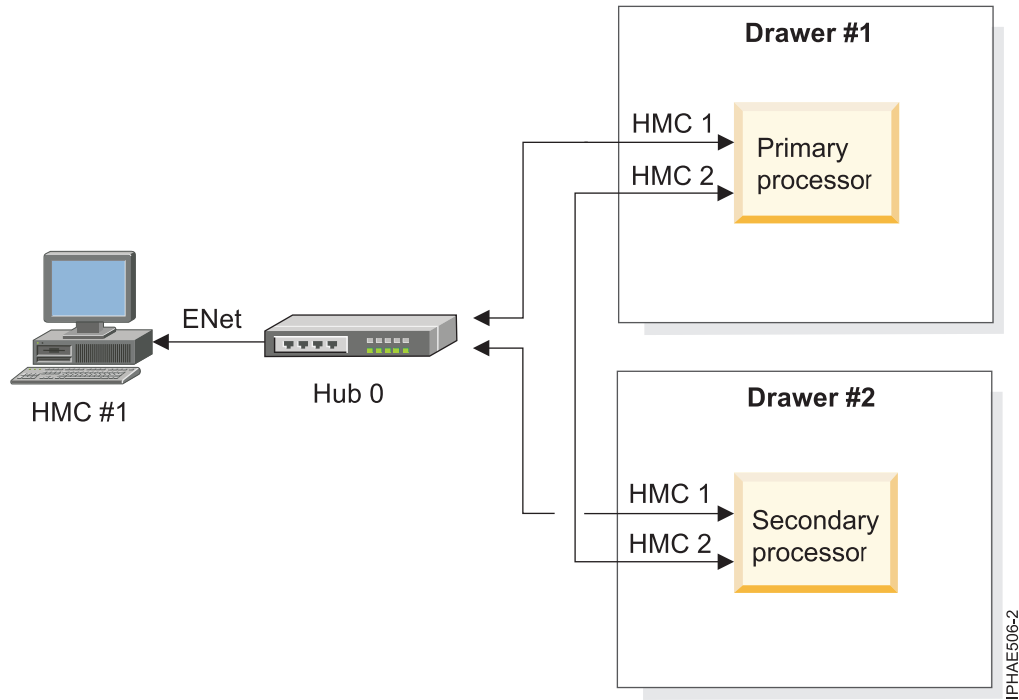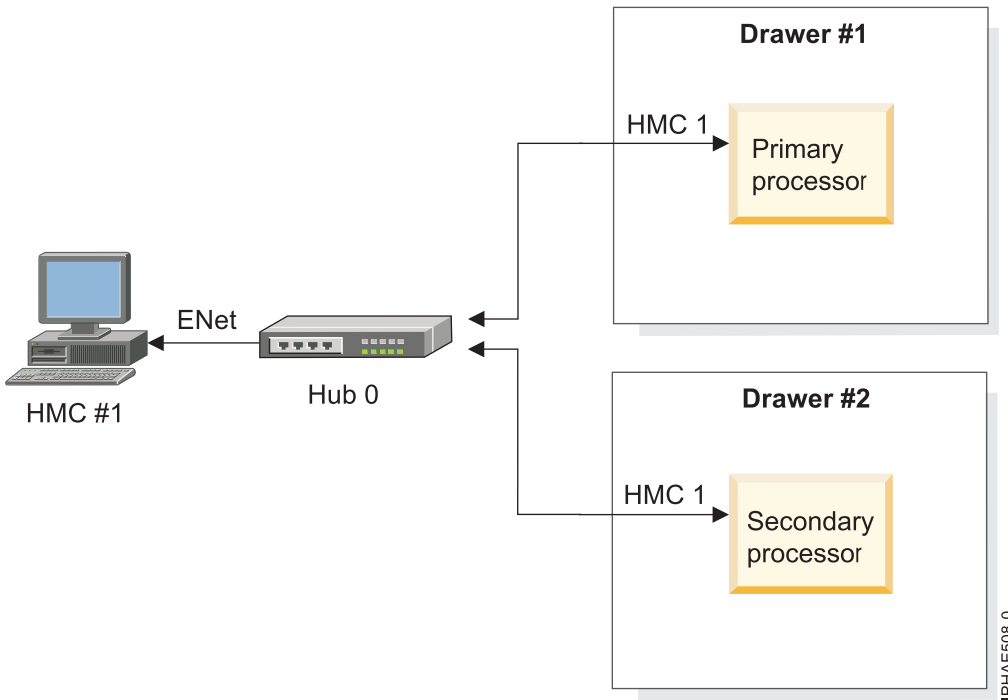
Using a redundant Hardware Management Console configuration

You can configure a redundant service processor by using a configuration in which two Hardware Management Console (HMC) servers are connected to the service processors. A specific connection scenario is required for this configuration.

Using a redundant HMC configuration with your redundant service processor setup requires a specific port configuration, as shown in the following diagram. In this configuration, both service processors connect to each network hub that is connected to each HMC. The network hubs connected to the service processors must remain in the power-on state. Any 10/100BASE-T Ethernet switch or hub can be used to connect the server and HMC.

Note: The HMCs must be at the same level.

Enclosure 1

HMC 1
HMC 2
Primary service processor

HMC #1
Hub 0

Enclosure 2

HMC 1
HMC 2
Secondary service processor

HMC #2
Hub 1

IPHAE507-2
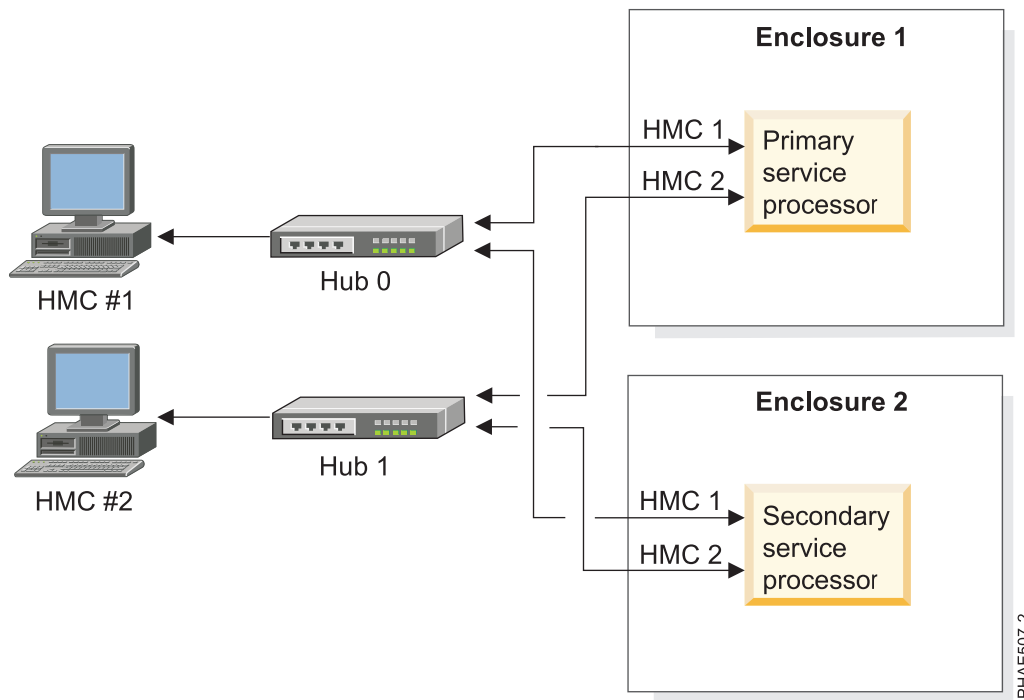
Planning for networking communications

To plan for a successful implementation of networking communications, you must determine how you want to configure your server to connect servers and other systems through local area networks, wide area networks, and to the Internet.

Servers exist to communicate with clients through networks. Therefore, network planning is an important part of overall solution planning. Many solutions contain several different types of networks, including local area networks (LANs), wide area networks (WANs), and various networks across the Internet, such as virtual private networks (VPNs). When you consider all of the elements in a successful networking strategy, you need to plan your networking and communications setup.

Network planning contains two primary components: planning the logical connections and planning the physical connections between network hosts, or nodes. For the purpose of convenience, this topic uses software to comprise the logical network planning and hardware to comprise the physical network planning.

This topic is not a comprehensive resource for planning your network but a series of checklists that provide a starting place for your network planning. It condenses several existing resources on network planning and makes the resulting information task oriented. If you want to read more detailed and extensive background information related to network planning and design, see the Redbook: IP Network Design Guide.

Planning for network software

When planning your network, you need to develop a software plan, which details the applications that you need to run over the network and the minimum bandwidth and latency that is required by the applications. After you have determined the required bandwidth and latency for your applications, you can begin to develop a hardware plan.

Before you begin your network software planning tasks, complete these tasks.

Before you begin

__ Develop a list of business activities that require network resources.

__ Review resources that are relevant to your family of servers, including the network planning work sheet in the iSeries Information Center and the Planning your TCP/IP Network topic in the *System Management Guide* in the

IBM System p and AIX Information Center Web site at http://publib.boulder.ibm.com/infocenter/pseries .

Network software planning tasks

__ **Develop a list of network applications**

Start with the list of business activities to develop a list of applications that require network resources. These types of applications range from universal applications, such as e-mail and Web serving, to specialized applications, such as video conferencing and voice over IP. Depending on the list of applications and the number of users that require access to the applications, your network resource needs can vary widely. Therefore, start by developing a list of network applications to determine the scope of your network plan.

__ **Obtain a network number**

You need to obtain a network number and register your domain with an accredited domain registration service for your network to communicate with the Internet. The Internet Corporation of Assigned Names and Numbers (ICANN) maintains a list of accredited registrars in your area. Your entire logical connection scheme, including the IP addresses and the host names that are associated with the addresses, starts with the assigned name and number for your company.

For information about how to obtain an assigned name and number, see the ICANN Information Web site.

__ **Devise an IP addressing scheme**

Your hosts, or end user workstations, need IP addresses that are based on your assigned name and number. The scheme that you devise needs to scale to your business needs and enable easy management, thus an addressing scheme is an important part of your network software plan. The basic scheme involves assigning a unique IP address and host name to every host in your network. This allows the applications to look up the address and the host name to send the appropriate host the needed messages.

Depending on the size and scale of your network, you must determine whether you want to use static or dynamic addressing. To manage a growing network, most networks use dynamic addressing for workstations and static addressing for servers. Dynamic addressing automates IP address assignment, which can significantly reduce management overhead. Dynamic addressing is performed through a Dynamic Host Configuration Protocol (DHCP) server. Depending on your operating environment, there are a variety of tools that can make setting up and managing a DHCP server relatively easy.

To learn about how to plan your IP addressing scheme, see the chapter about address, name, and network management in the IP Network Design Guide.

__ **Build an IP address and host name database**

You will need to keep track of all of your IP addresses and host names that are in your network to efficiently manage organizational change and troubleshoot bandwidth and latency problems. Start by creating a list of all of the IP addresses and host names on your network. There are research tools available to help you create a database that relates IP addresses or host names to individual machine names on your network topology. The machine names are typically identified by the medium access control (MAC) address on the network card of the host.

To learn about how to build an IP address and host name space, see the chapter about address, name, and network management in the IP Network Design Guide.

Network software planning tasks

__ **Plan for name management**

Some form of directory services is required to manage host names and addresses, and their interrelations in network domains and zones. You have many options that are related to the type of name service that you use. If you use static addressing, use a Domain Name System (DNS). The DNS provides applications with a mapping of IP addresses to host names wherever they reside in various network domains and zones. It also provides other vital information to the application. If you use DHCP to dynamically assign addresses, your hosts have a different IP address every time they start up and initialize a connection to the DHCP server. To manage the names and addresses in a dynamic addressing system, you need to plan for a dynamic DNS.

To learn about how to plan for name management, see the chapter about address, name, and network management in the IP Network Design Guide.

__ **Plan for subnets**

In large networks, with routers, a lot of overhead is created with a large number of hosts. To improve performance and manageability, the host number (typically the second half of an IP address) can be subdivided into a subnet number and a host number to provide a second logical network. The second network is called a subnetwork or subnet. You need to determine your subnet scheme as part of your network software plan. A good scheme can ensure that each router in your network is performing well and that your hosts do not need to send messages through too many hops to get them to their destinations.

To learn about how to plan for subnets, see the chapter about address, name, and network management in the IP Network Design Guide.

__ **Plan for administrative subdivisions**

You need to create administrative subdivisions to improve manageability, to isolate sensitive information, and to ensure adequate resources to mission-critical applications. Typically, businesses are divided into a front end and a back end. The front end includes a basic file and print network, which also provides e-mail and Web browsing to users. The back end contains all of the transaction processing for the business, such as automated accounting, shipping, receiving, Web and e-commerce workloads, and other types of electronic data interchange (EDI).

Your plan for administrative subdivisions must include the platforms on which to run the subdivisions. The front end may not need to meet the rigorous requirements of performance, availability, and security that the back end requires.

IBM operating systems and server families include every type of administrative subdivision. IBM systems allow you to have a Windows or Linux front end with a mixed back end of AIX, i5/OS, and Linux workloads. Consult with your solution assurance marketing representative to design an administrative subdivision scheme for your business.

To learn about how to plan for administrative subdivisions, see the chapter about address, name, and network management in the IP Network Design Guide.

When you have completed these tasks, you should have a network software plan that identifies these elements:

After you finish

__ Record your assigned network names and numbers.
__ Record a database of IP addresses or host names for your network.
__ Record a table of subnets on your network and compare it to your routing topology after you complete the topology.
__ Record a table of administrative subdivisions on your network and include the operating environment and server that is responsible for each subdivision.

Planning for network hardware

After you have a software plan in place, you can begin designing a network hardware topology that provides sufficient network resources for your applications.

Many networks grow without proper planning. As the business grows, they become unmanageable and suffer from performance problems. Networks that are not properly planned can lack the scalability that allows them to grow without adversely affecting future business needs. Adequate network design can enable sufficient performance, availability, and security. In the process, you can provide enough information and transaction processing for all of your users.

These checklists help you make planning decisions and begin designing a network that fits your needs.

Before you begin
__ Review Network communications to coordinate information gathering that pertains to the communications infrastructure at your site.
__ Create a list of users that need network access.
__ Develop a list of servers that need network connections.

Network hardware planning tasks
__ **Determine the number of host machines**

You need to develop a list of host machines for your networks to support. Host machines are user workstations that connect to networks. Each host machine needs a unique IP address and name. Each host machine also needs access to an appropriate amount of bandwidth to support the applications that are planned for the host machine.
__ **Plan for types of hosts**

Your network might contain several types of hosts, including stand-alone, diskless, and dataless hosts. Your network design is affected by your host types. For example, if you have a large number of stand-alone Windows-based PC hosts, you need to take into account server platforms, client protocols, and additional security measures. If you have diskless hosts, some network media not be suitable.
_ **Plan for network media**

Network media are the types of connection that make up the network. They include the actual cables as well as the protocols that govern the connections. You have several options in choosing network media, such as Ethernet (fast or Gigabit), token ring, Fiber Distributed Digital Interface (FDDI), Asynchronous Transfer Mode (ATM), wireless technologies, and others. Ethernet is used most often because it is inexpensive and easy to manage, but it carries a performance cost. Mission-critical hosts can connect by using token-ring or FDDI technologies instead of Ethernet to improve performance. ATM is most often used as a backbone technology between different networks because of its unique properties. Choosing your network media is often determined by the balance between performance and availability on one side and cost on the other.

To learn more about how to plan for network media, see the chapter on network infrastructure in IP Network Design Guide.
__ **Plan for routers and switches**

Different subnets or administrative subdivisions within a network can be connected by bridges, hubs, routers, or switches. Bridges and hubs are used sparingly because of their inherent limitations. Routers are most commonly used to connect different domains or subnets within a network because they offer better administrative control over network traffic. However, they can cause performance problems if too many routers exist between hosts. For this reason, switches are often used to speed connections between subnets on a network. Whether you choose a router or a switch to connect network subnets requires careful planning. An adequate plan for routers and switches enables your network to grow with your business without adversely affecting network performance.

To learn how to plan for routers, see the chapter about routing and design in the IP Network Design Guide.
__ **Create a network topology**

After you have determined the components of your network, you need to develop a network topology. The two main types of typology are flat and hierarchical networks. Unless your network is quite small, you will most likely create a hierarchical network, which resembles an inverted tree with the root or trunk at the top and the nodes of the network (or hosts) connected by branches at the bottom. Your topology should schematically itemize all of the physical cables and connections of the hardware that is connected to the network. It should include the types of hosts, network media, hubs, bridges, routers, switches, and servers.

To learn more about how to design a network topology, see the IP Network Design Guide.

When you have completed these tasks, you should have a networking hardware plan that identifies these elements:

__ Record a topology of your network.
__ Record a list of hardware, such as network hosts, interface cards, and cables, that you need to implement the topology.

Planning for remote access

In distributed businesses, employees need to remotely access corporate resources. You must create a plan to ensure that users who need remote access will experience the network as if they were on site, without compromising the security, reliability, performance and manageability of the overall network.

Before you begin
__ Create a table with the users that need remote access to the corporate infrastructure in one column and all of the applications that they use in a related column.

Remote access planning tasks
__ **Plan for remote offices**

A remote office extends the network topology to off-site locations. At a minimum, it contains one or more hosts and might contain servers, hubs, bridges, routers, or switches. You can either connect the remote office to the local office through a private leased line or through a virtual private network (VPN), which creates a secure connection over the Internet. A physical private network is easier to manage, performs better, and is more secure than a VPN at a substantially higher cost. The decision to use a VPN rather than committing to a leased line is typically based on the size of the office. Home office employees and small satellite offices are best suited to VPNs. For medium-sized and large remote offices, leased lines are recommended. Also, if small offices have high-bandwidth or low-latency needs, such as video conferencing or Voice over IP (VoIP) respectively, a leased line is recommended.

To learn more about how to plan for remote offices, see the chapter on remote access in the IP Network Design Guide.

__ **Plan for Internet connections**

You need to choose internet service providers (ISPs) and design connections to them when developing your network plan. Various technologies enable your company to connect to the Internet, and for clients and remote offices to access your company resources and enable remote access to your company resources. Large companies typically use leased lines to connect to an ISP. Small companies and small offices can often save on cost by using broadband connections, such as DSL. In addition to the connection type, you must take several other design considerations into account. For example, you need to decide whether your ISP hosts your Web and e-mail servers, or whether you do. These decisions effect many later network planning decisions, such as the locations of firewall servers.

To learn more about how to plan for Internet connections, see the chapter on remote access in the IP Network Design Guide.

__ **Plan for other remote access**

Often employees will need to dial into your network while traveling or for server and network diagnostics. If traveling employees have Internet access, this is typically done through the same VPN that you set up for small satellite offices. You also need to plan for remote personnel to dial directly into your network through a modem that is connected to a server. There are several reasons to plan for direct remote access:

• It is often the most economical solution for text-based data transfer.
• It is often necessary for service providers.
• It can provide emergency failover if your ISP or your leased line connection are out of service.

To learn more about how to plan for remote dial-in access, see the chapter on remote access in the IP Network Design Guide.

When you have completed these tasks, you should have a remote access plan that identifies these elements:

__ Record a topology of all off-site network resources, including the remote access connection points to your local area network (LAN).
__ Record a list of service providers and leased lines that are in use and determine the peak bandwidth of each line.
__ Estimate future remote access needs and record a strategy for improving the reliability, manageability, security, and accessibility of your remote networks, while lowering their cost.

Planning for network security

Network security is a critical aspect of your network planning. Your network connection must securely allow legitimate traffic through the door while keeping illegitimate traffic out.

Before you begin your network security planning tasks, complete these tasks.

Before you begin
__ Develop a list of all of the points of entry into your network.
__ Create a corporate security policy that network security policy will follow. Include policies about access to confidential and sensitive information, what actions are taken in the event of a breach, and by whom.

Network security planning tasks

__ **Develop a network security policy**

You can develop a network security policy by starting with your corporate security policy, develop a network security policy. These elements are recommended for your plan:

- **Create a firewall**

  Include a firewall in your security policy to filter traffic in and out of the network. The firewall should restrict data according to the protocol that it uses and terminate traffic if the protocol does not match the port that it is to travel through. Your firewall should also strictly limit open ports to prevent intruders from entering the corporate network.

- **Isolate confidential information**

  Any system that has confidential or sensitive information should not be directly accessible from the outside. Access to these types of systems should be restricted from the inside; only authenticated users should gain access.

- **Create a demilitarized zone**

  A demilitarized zone is an area that is outside of the firewall where transactions can take place without putting the network in jeopardy. All anonymous access to the network should remain in the demilitarized zone.

- **Develop an authentication scheme**

  Authentication is the process of requiring a user ID and password, or some form of certificate-based authentication, to access a network domain. All direct access to the corporate intranet should require authentication. All direct access through the firewall should also require authentication. Plan to follow user ID and password best practices, which include long passwords (at least 8 characters), mixed passwords (a combination of letters, numbers, capitals, and lower case symbols), and regularly changed passwords (every two or three months).

- **Develop an encryption system**

  Encryption is the process of turning all data into a code that is only decipherable by a system of private and public keys. All sensitive data that exits the corporate network should be encrypted. All sensitive data that arrives from remote offices into the network should also be encrypted.

- **Develop a social engineering blocking system**

  Social engineering is the process of impersonating trusted individuals, over the phone, to gather sensitive information, such as passwords and corporate organizational information. This is a common technique used by hackers to gain access to networks. You should train employees to never give out this information over the phone. Proper training is the only defense against this type of security breach.

To learn more about how to develop a network security policy, see the chapter on IP security in the IP Network Design Guide.

__ **Plan for IP Security Architecture**

IP Security Architecture (IPSec) is an open, standards-based security architecture that provides these features:

- Data integrity, which prevents attacks that are based on ill-formed data
- Replay protection, which prevents attacks that are based on replaying messages
- Secure creation and automatic refresh of encryption keys
- Strong cryptographic algorithms
- Certificate-based authentication

IPSec includes several protocols that each perform one of these functions. Many security products use IPSec as a foundational architecture.

To learn more about IPSec, see the chapter on IP security in the IP Network Design Guide.

__ **Plan for virtual private networks**

Virtual private networks (VPNs) use IPSec to create a secure, private connection, or tunnel, through a public network such as the Internet. You can use several tools on each platform to turn ordinary Internet connections into VPNs. VPNs encrypt and authenticate information between remote nodes of the corporate network for communication between remote users, branch offices, and corporate partners.

To learn more about how to implement a VPN, see the chapter on IP security in the IP Network Design Guide.

Network security planning tasks
__ **Plan for virus and spyware protection**

Viruses and other harmful software, called malware, disguises itself as legitimate business content, only to run malicious activity after it is inside the company network. Malware is the most pervasive form of network security breach. Each host on your network should be equipped with antivirus and antispyware applications that are updated weekly and run at least weekly. These programs are designed to block malware before it can replicate themselves over your network.

To learn how to prevent virus and spyware infections, see the chapter on IP security in the IP Network Design Guide.

When you have completed these tasks, you should have a network security plan that identifies these elements:

__ Record a network security policy, which includes firewalls, demilitarized zones, access rules for sensitive information, authentication, encryption, and counter-social engineering training.
__ Record a topology of your security architecture, which includes the areas that require authenticated access, areas that are protected by firewalls, areas where your demilitarized zones are connected, and which remote users or offices use VPNs.
__ Record a list of antivirus and anti-spyware applications that you plan to load on host machines. Develop a policy for weekly updates and configure the hosts to automatically run the applications at least weekly.

Planning for network performance

You can have fast servers and workstations, but if the data traffic between them is slow, the whole enterprise is slow. Therefore, it is important to plan your network bandwidth to match the speed of your business.

You can improve performance by:
- Increasing the speed of all of the data traffic throughout the network
- Changing some of the data flow from point-to-point to multicast
- Allowing higher priority data to flow faster than lower priority data, which is called Quality of Service (QoS)

Before you begin
__ Highlight areas of your network topology where potential bottlenecks may occur.
__ Identify network traffic that should be given the highest priority.

Network performance planning tasks

__ **Plan to remove bottlenecks**

You need to identify areas where network traffic is greater than the bandwidth that it is flowing through. Start by examining the topology and identifying potential slow areas, and then monitor those areas. After you identify slow areas, or bottlenecks, plan to upgrade hardware and improve performance. Possible problem areas include:

- **Older Ethernet network cards**

  If your Ethernet network interface cards (NICs) are 10BASE-T, they can be easily upgraded to Fast Ethernet. In -critical networks, you can upgrade Ethernet to Fiber Distributed Digital Interface (FDDI).

- **Hubs instead of switches**

  Hubs send data to all participants that are connected to them. Switches send data only to its desired destination. If a hub is connected to three hosts, a switch will typically be three times faster than that hub. If tens of hosts are connected to a hub, then the switch speeds performance.

- **Overloaded routers**

  Routers can significantly slow traffic if more hosts are connected to them than they can reasonably handle. You can either upgrade upgrading the router or convert to a smart switch.

- **Too many routers**

  You may try to fix overloaded routers by adding more subnets and connecting them with more small routers. This can make your situation worse by increasing the number of hops that data must travel through to get to its destination. It is often better to upgrade the router than to add hops to the network.

- **Outdated servers**

  Some network administrators put older servers on the front end because the data flow is not as critical as it is in the back end. But, older servers might not be able to keep up with graphics-intensive user applications, such as Flash programs that run over the Web, and users may become frustrated by waiting for applications to load.

To learn more about how to improve network performance, see the chapter on multicasting and quality of service in the IP Network Design Guide.

__ **Plan for multicasting**

Multicasting sends data from the server to multiple clients at one time. In one-to-one networking, the total bandwidth that is required equals the bandwidth that is needed by the application times the number of clients. With multicasting, the total bandwidth that is required only equals the amount of bandwidth that is needed by the application. Multicasting only works with "push" applications, such as online newsletters. If you can convert some of your one-to-one applications to multicasting, you can conserve network bandwidth and improve performance. However, setting up the network to handle multicast traffic involves designing the entire network topology with multicasting in mind.

__ **Plan for QoS**

QoS works like the high-occupancy commuting lanes that are on highways. Special lanes are set up for traffic, vehicles with two or more passengers per car, so they can arrive at their destinations faster by not getting stuck in traffic in the slower lanes. Similarly, with QoS, the network gives priority to certain data packets and ensures that they arrive at their destinations within a certain time frame. Like multicasting, planning for QoS must include the entire network topology. If you plan to implement QoS, review the network software and hardware planning steps and incorporate prioritized traffic protocols throughout your topology.

When you have completed these tasks, you should have a network performance plan that identifies these elements:

After you finish

__ Identify the nodes of your network topology that need performance-related equipment upgrades.

__ If you plan to multicast, record a list of hardware and software that enables multicasting.

__ If you plan to use QoS, record a list of hardware and software that enables QoS.

Planning for network availability

High availability networks provide redundant infrastructure that can be switched on when the primary network resources experience performance problems or failures of any kind. Learn how to plan for network availability by taking a closer look at your network.

When planning for network availability, you must first determine your necessary degree of uptime. Systems with better than 99% uptime are considered fault tolerant. As the availability percentage approaches 100%, you move into the high availability networks. The closer you get to 100% percent uptime, the more expensive this availability gets. Therefore, you need to develop a good business case for high availability networks. For example, application service providers need high availability (99.9999% uptime). But, your corporate Web site might only need 99.9% uptime. The difference in cost can be substantial, depending on the size and scale of your network.

Before you begin

__   Create a table of applications that require fault tolerant or high-availability networks.
__   Identify the parts of the network topology that are used by those applications.

Network availability planning tasks

__ **Identify single points of failure**

The easiest and most economical way to improve network availability is to remove single points of failure. A single point of failure occurs when there is just one physical connection between parts of a network. Many different network topologies can help you remove single points of failure. The basic principle is to connect more nodes to individual servers and other network resources. If one of the nodes fails, traffic can be rerouted around the failed system.

__ **Plan for fault tolerance**

Fault-tolerant networks have very few single points of failure, if any. In addition, fault-tolerant networks have disaster-recovery hardware at each node. Typical hardware measures per node include:

- **Replicated hardware subsystems**

  If a network is important enough, a second server, router, or other device is available at each node in case of system failure of the primary device.

- **Standby hardware**

  An example of standby hardware is a redundant array of independent disks (RAID), which enables hot-swappable storage media.

- **Fast boot methods**

  You need to be able to dump and reboot in the shortest possible time to maximize uptime.

- **Backup power**

  Plan to connect as many nodes as you can to uninterruptible power supplies. Large data centers should have backup generators as well.

- **Total remote management**

  You should be able to remotely diagnose and reboot servers regardless of their state.

- **Concurrent backup and restore**

  Make sure that you can use the backup system as soon as a failure is detected, and begin backing up again in real time.

To learn how to plan for high availability and clusters, see Planning for availability.

Network availability planning tasks
__ **Plan for clustering**

Clustering is the process of connecting a large number of servers to achieve continuous, or 100% uptime. Many families of servers enable clustering, and several software packages, such as WebSphere application and Web server software, enable clustering. Clustering can be relatively straightforward for continuous or steady-state usage. The challenge is to maintain uptime during routine maintenance or while upgrading systems within a cluster.

The basic principle behind clustering is virtualization. That is, though a group of servers are physically distinct, they are logically indistinct. Part of the virtualization process includes virtual IP addressing, which assigns IP addresses to a pool of servers rather than each physical server. In this way, no routing is involved when one server goes down and one of the backup servers that are connected to the same cluster as the primary server takes its workload.

In System i, you can use virtual IP addresses to provide redundancy of physical adapters by not having a given virtual IP address assigned to a single physical adapter.

When you have completed these tasks, you should have a network availability plan that identifies these elements:

After you finish
__ Record a list of all single points of failure and plan to create redundancy.
__ Record a list of hardware that requires backup and disaster recovery measures.
__ Record a list of servers that will be part of a cluster, and develop a plan for clustering software that enables you to implement your clustering plan.

Planning for network management

After you design your network to provide adequate bandwidth to your business processes, applications, and users, you need to design additional systems so your network continues to function as designed with growth and other business change. This involves routine maintenance, monitoring and troubleshooting problems, and developing upgrade paths in an iterative process. Sufficient planning for network management ensures that you have the right processes, tools, and infrastructure to maintain and grow your network resources as your business demands.

These checklists help you plan a network that meets your needs.

Before you begin
__ Have a completed network plan that includes software, hardware, remote access, security, performance, and availability.
__ Identify all administrators who are responsible for managing administrative subdivisions within the network.

Network management planning tasks
__ **Plan for a network management protocol**

Because Simple Network Management Protocol (SNMP) is the most widely used management protocol, every family of servers includes an SNMP agent. The SNMP agent provides a framework that enables information that is stored in hosts and in the Management Information Base (MIB) to affect changes in the network. Several network management software packages include SNMP as a foundational architecture. These tools vary by software operating system.

In addition to SNMP, IBM includes an implementation of the Common Information Model (CIM) with every family of servers. CIM is a vendor-neutral and technology-neutral model for describing and accessing data across an enterprise. Using CIM, you can write systems management applications by using a single model for communicating with different IT resources. To learn more about CIM, see the Common Information Model topic in the IBM Systems Software Information Center.

Network management planning tasks
__ **Develop a network management strategy**

Network management is critical, but it add a cost on the network. Network monitoring, which is designed to enhance network performance and availability, requires network resources that can slow down a network. Therefore, an adequate network management strategy enables strong management without causing performance or availability problems. These tasks should all be part of your network management strategy:

- Create a network management objective that details a successful strategy.
- Determine the SNMP capability of your system.
- Determine your network management software capability.
- Customize your network management software to meet your objectives, if necessary.
- Configure the agents and managers for correct community names.

To learn more about managing your network, see the chapters on network management in the IP Network Design Guide.

When you have completed these tasks, you should have a network management plan that identifies these elements:

After you finish
__ Record a network management strategy.
__ Record a test procedure to ensure that you have adequate software to manage your network resources on implementation.

Planning for InfiniBand networks

IBM Systems server hardware supports clustering by using InfiniBand hardware. Learn about planning resources and considerations for clustering your systems by using InfiniBand hardware.

Overview of InfiniBand products and networks

If you plan to set up a clustered server configuration by using InfiniBand switches to network your servers, you need to understand the components that are required for the network. The requirements are based on the type of host channel adapter (HCA) that is used to connect to the InfiniBand fabric.

This table shows the required components and supported adapters for setting up your InfiniBand network.

Table 2. Supported InfiniBand components

InfiniBand component	PCI adapter	GX adapter
Adapter	GX Dual-port 4x HCA	GX Dual-port 4x HCA orGX Dual-port 12x HCA
Systems	IBM System p5, low-end	IBM System p5, mid-range and high-end
Switches	Topspin 120 Server Switch (7048-120), Topspin 270 Server Switch (7048-270)	
Cables	IBM certified cables	
Fabric Management	Topspin Web user interface and Element Manager	IBM Network Manager
AIX version	AIX 5L version 5.3 with the 5300-03 Recommended Maintenance package	
Linux version	SUSE Linux Enterprise Server 9 SP2 with Topspin Enterprise Commercial Stack	SUSE Linux Enterprise Server 9 SP2 with IBM IB GX HCA driver and OpenIB Gen2 Stack

Note: For the most recent information about cluster offerings, see the Facts and Features Web site, at http://www.ibm.com/servers/eserver/clusters/hardware/factsfeatures.html.

This figure shows servers that are working in a cluster with InfiniBand switch networks.

IPHAE505-1
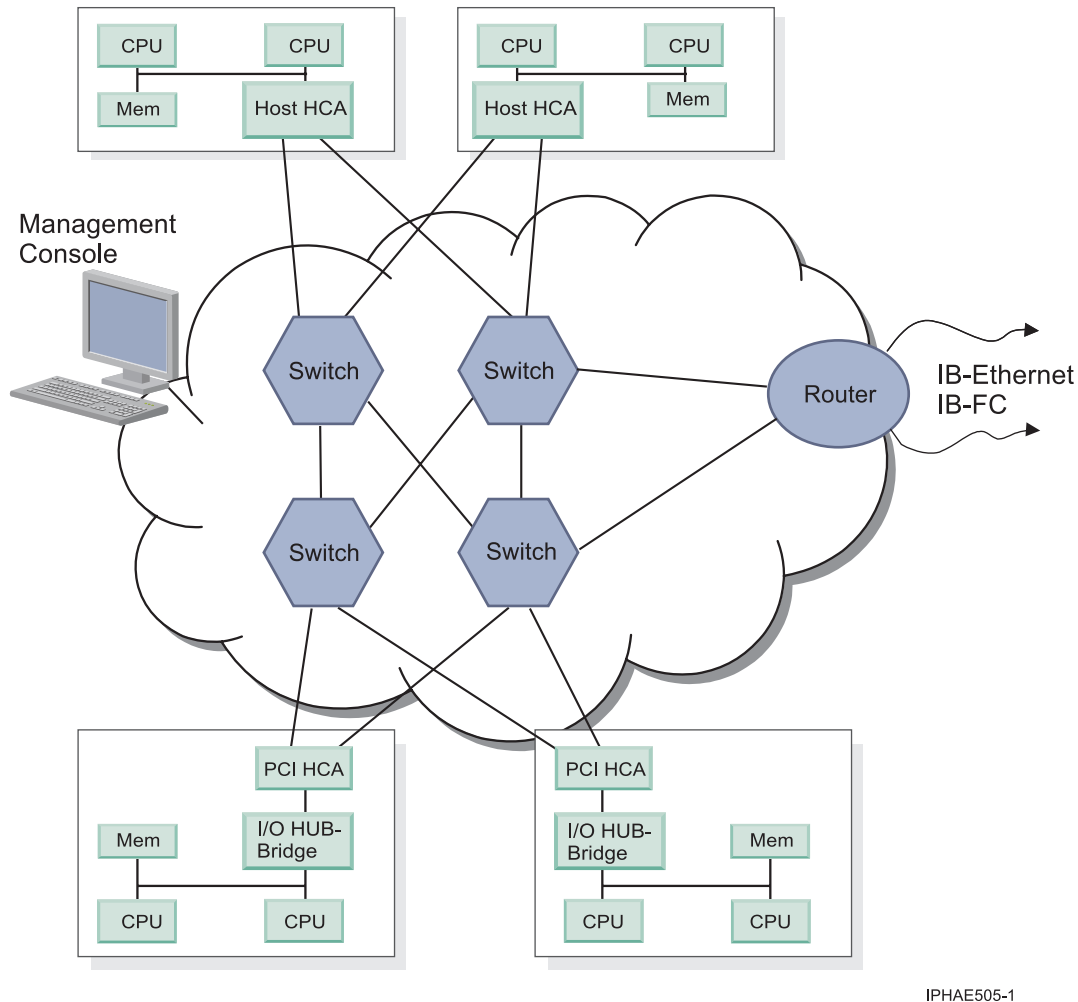
Figure 4. Servers configured in an InfiniBand network

Planning switch networks

Use these resources and guides to plan for your InfiniBand switch network.

Use these resources to plan your InfiniBand network:
- For information about the requirements and installation procedures for Topspin switches and InfiniBand environments, see the InfiniBand Hardware Installation and Cabling Guide Web Release, Topspin number: 10-00122-WEB.
- To help you get started with planning your InfiniBand switch network by using the 7048-120 - Topspin 120 and 7048-270 - Topspin 270 switches, see the steps for installing the cluster in
- If you are setting up or servicing a cluster network, use the *Guide to Clustering systems using InfiniBand hardware*

These guides are also available to help you set up and service your network:

InfiniBand Hardware Installation and Cabling Guide Web Release, Topspin number: 10-00122-WEB

Topspin 120/Cisco SFS 7000 Hardware Guide, Topspin number: 10-00032-04-A0

Topspin 120/Cisco SFS 7000 Quick Start Guide, Topspin number: 10-00033-04-A0

Topspin 270/Cisco SFS 7008 Hardware Guide, Topspin number: 10-00044-04-A0

Topspin 270/Cisco SFS 7008 Quick Start Guide , Topspin number: 10-00045-04-A0

Element Manager User Guide, Topspin number: 10-00116-02-A0

Chassis Manager User Guide, Topspin number: 10-00029-05-A0

Command Line Interface Reference Guide, Topspin number: 10-00012-07-A0

Host-side Drivers User Guide for Linux, Topspin number: 10-00125-02-A0

These guides are available for download in the IBM Systems Hardware Information Center.

Planning for hardware

Before installation, you must ensure that you have all of the required upgrade hardware. You also need to plan for power, environmental needs, and server placement. Finally, you need to prepare for unique configurations that are based on how you plan to use the server, including data storage and cabling.

Whether you are upgrading an existing solution or developing a new solution, good hardware planning is essential for the successful setup and use of your server. Proper planning ensures that you have everything that you need and that you have met all of your server requirements.

Planning for your physical site

When planning for your physical site, prepare a cool, dry space with a raised floor, plenty of clean, steady power and all of the necessary bandwidth for your server

Before you begin with the main planning tasks, you need to gather this information:

Before you begin
__ Have a list of current hardware.
__ Have a list of current configurations.
__ Have a list of new hardware.

Physical site planning tasks
__ **Plan for physical hardware**

This quick reference organizes your Planning reference into logical categories. Within each category, you can choose step-by-step processes that give you the guidance that you need to prepare your site for your server. It includes physical site planning, server specifications, hardware specification sheets, power, and cables.
Note: Pay particular attention to the power cable specifications. If you plan to use a 64-way server, you need 100 amp-rated breakers and power cords.
__ **Plan for server cables**

Depending on the number of adapters and devices that you connect to your system, cabling can become complicated.

See the information that is available for your IBM eServer i5 at Plan for cables or for your IBM eServer p5 system that is available at the pSeries Hardware documentation Web site.

After you finish
__ Record a physical floor plan for placement of your system components.
__ Record a configuration plan that shows placement of the internal components of your system.
__ Identify hardware placement to support logical partitions and disk unit configuration.

Planning for I/O

There are a variety of I/O types and processes that you could have in your server solution.

See Planning for networking and communications, which focuses on I/O that is not related to networking and communications. Even though I/O processes are complicated, your manufacturer also has resources that can help you plan.

Before you begin with the main planning tasks, you need to gather this information:

Before you begin
- __ Have a list of devices that need to communicate with your server.
- __ For each device, indicate the type of connection that it makes to the server.
- __ Ensure that those types of I/O connections are still supported.

I/O planning tasks
- __ **Plan for I/O expansion units**

  If your solution requires I/O expansion units, make sure that you add this to your plan, complete with the RIO/HSL loop connection to the expansion unit. For each unit, you should include a list of attached I/O devices; and for each device, you should make sure that you have the appropriate driver. If you plan to hot swap cards or drives in your expansion units, add this to your plan.

  See System Planning Tool to determine all of this information.
- __ **Plan for I/O devices**

  I/O devices typically connect to expansion units. The devices perform functions that your solution demands, such as storage. Your plan needs to include a list of all devices, including their connection to the server through expansion units.
- __ **Plan for I/O adapters**

  Often solutions demand special adapters to connect I/O devices. If your solution requires adapters, add these to your plan.

  See "Special planning considerations for auxiliary write cache I/O adapters."
- __ **Plan for virtual I/O**

  Virtual I/O enables sharing of physical resources — such as storage, adapters, and devices — among partitions. Multiple partitions can share the physical I/O resources of the server, and each partition can simultaneously use both virtual and physical I/O devices. In addition, virtual I/O allows administrators to create new partitions without adding physical I/O adapters to the system. For more information about virtual I/O with AIX or Linux, see Planning for the Virtual I/O server.

  For more information about virtual I/O with i5/OS, see Creating a Linux logical partition using i5/OS virtual I/O resources.

After you finish
- __ Record a list of I/O expansion units that need to be installed with a diagram of their RIO/HSL loops.
- __ Record a list of devices that are initially plugged into the I/O expansion units with the necessary drivers and adapters next to the name of each I/O device.
- __ Detail your virtual I/O plan.

Special planning considerations for auxiliary write cache I/O adapters

Two auxiliary write cache I/O adapter features are available for IBM eServer i5 and System i servers that enhance data integrity and continuity by providing two complete nonvolatile copies of write cache data.

To help you plan and implement a data integrity solution that includes the auxiliary write cache feature, see the Planning for Disk Storage Protection with Auxiliary Write Cache Solutions redpaperat

ibm.com/redbooks. Use the redpaper to learn more about what the auxiliary write cache feature is and what it does. The redpaper also helps you plan for implementing auxiliary write cache on your servers and provides references and links to other documentation.

You need to consider and plan for the following points prior to ordering, because the additional IOA space required may require the purchase of another expansion unit:

- The auxiliary write cache is an additional I/O adapter (IOA) that requires a slot of its own.
- The auxiliary write cache IOA has a one-to-one relationship with a disk IOA. The pair of IOAs is sometimes referred to as the primary IOA (disk IOA) and the secondary IOA (auxiliary cache IOA).
- The two IOAs must be in the same enclosure.
- The two IOAs must be in the same logical partition.
- The two IOAs are cabled directly together by a SCSI cable on a dedicated SCSI bus that runs in Ultra3 mode (U320).
- The cable attaches to the SCSI port on the secondary IOA and to the fourth SCSI port on the primary IOA.
- If all four SCSI ports on the primary IOA are already being used, you need to determine how to free up the fourth SCSI port. You could use all four ports if there are more than 15 disk drives that are attached to the disk IOA. In this situation, you need to move the cable and you might have to move disk drives.
- If there are not enough open PCI slots in an enclosure for the desired quantity of auxiliary write cache IOAs, you need to determine what other IOAs can be moved to provide open PCI slots, and where the displaced adapters can be reinstalled.

  Attention:
  – The need to move disk drives or a cable may also require the stopping and restarting of device parity protection (RAID).
  – Moving adapters or disk drives to provide open PCI slots or SCSI ports in the same partition or enclosure might change the configuration of logical partitions.

- The auxiliary write cache IOA is only supported with the #2757 PCI-X Ultra RAID Disk Controller and #2780 PCI-X Ultra4 RAID Disk Controller IOAs.
- The two feature codes for the auxiliary write cache IOA are #5580 and #5581.
  – #5580 is the #2780 PCI-X Ultra4 RAID Disk Controller with an auxiliary write cache IOA
  – #5581 is the #2757 PCI-X Ultra RAID Disk Controller with an auxiliary write cache IOA.
- The System i5 models that support the #5580 and #5581 are the 270, 520, 550, 570, 595, 800, 810, 820, 825, 830, 840, 870 and 890. The basic placement rule is that #5580 and #5581 are supported anywhere a #2780 or #2757 are supported. For more information, see the PCI Placement Rules for the IBM eServer i5 and iSeries Servers with i5/OS V5R3 redpaperat ibm.com/redbooks.

  Note: The auxiliary write cache IOA cannot be placed in the system units of the Models 520, 550 and 570. On those models the auxiliary write cache IOA needs to be placed in the I/O unit on your system.

- The auxiliary write cache IOA is supported on the System i5 servers under i5/OS and OS/400 only. i5/OS V5R3 or later is required to support auxiliary write cache. Support for OS/400 V5R2 will be added at a later date. There are also additional PTFs that are needed to support the auxiliary write cache IOA for both V5R3 and V5R2. See the IBM eServer Prerequisite Web site.
- AIX and Linux do not support the auxiliary write cache IOA.

  Related links:

  Type 5708, auxiliary-write cache IOA (FC 5580, 5581)

  Managing Peripheral Component Interconnect (PCI) adapters

Planning for disk space

You must plan for flexible data storage as part of your server solution. A complete plan includes both independent disk pools (also known as independent auxiliary storage pools) and switchable disk units.

Before you begin with the main planning tasks, you need to gather this information:

Before you begin
__   Have a schematic of all of the current disk storage that details how the storage is attached.
__   Quantify available disk storage.
__   Have a list of disk requirements for both applications and data.

Disk planning tasks
__   **Plan for physical disks**

Calculate the amount of storage that you need initially and develop an upgrade path that allows for additional disk drives to be added later. Determine how each drive will be attached, what type of drive it is (for example, SCSI), and what its function is in the overall solution.

See the Disk topic to effectively plan for disk storage requirements, independent disk pools, and switchable disk units. Also see the Disk Drives Web site for a list of drives that you could use as part of your solution.
__   **Plan for disk partitions**

On AIX and Linux systems you can divide your hard disks into partitions. Each disk can have a number of partitions on it, which allows you to separate system recovery software from other applications, for example. For each disk, you need to determine the size and quantity of partitions. Allow for future reconfiguration of your disk partitions where necessary.

After you finish
__   Record a list of disks that must be added and how those disks will be attached.
__   Record a disk partition plan that shows where partitions data and applications reside, if applicable.
__   Identify an upgrade path for future disk storage needs.

Planning for an Enterprise Storage Server environment

The following resources provide you with the information you need to plan for the IBM TotalStorage DS6000 and DS8000 Enterprise Storage Servers (ESS).

Planning consideration

If you plan to implement an Enterprise Storage Server environment, consider the ability to initiate a system boot from an ESS server in the storage area network (SAN). This capability is an Initial Program Load (IPL) option offered on supported p5 and i5 systems. See http://www.redbooks.ibm.com/redpieces/abstracts/sg247120.html for details.

DS6000 servers

Refer to the Planning topic in the IBM TotalStorage DS6000 Information Center .

Topics covered include physical configuration, licensed functions, delivery requirements, site requirements, migration, and ordering features.

See also the DS6000 Planning Guide .

DS8000 servers

Refer to the Planning topic in the IBM TotalStorage DS8000 Information Center .

Topics covered include physical configuration, licensed functions, delivery requirements, site requirements, migration, and ordering features.

See also the DS8000 Planning Guide .

Planning for removable media

Your media plan should include the types of backup media, how the drives are connected to the server, what drivers you need for your drives, where you plan to store your media, and your backup schedule.

Before you begin with the main planning tasks, you need to gather this information.

Before you begin

__   If you have not already done so, record a backup and recovery plan that details your backup media needs.

__   Have a list of current data to backup.

__   Have a list of applications to backup.

Backup media planning tasks

__   **Plan for tape drives**

If you plan a new installation with tape backup media, ensure that you choose the appropriate tape size and format for your solution.

__   **Plan for tape compatibility**

If you plan a data migration, ensure that your current and target servers and tape devices are compatible.

Specific tape drive incompatibilities on IBM eServer i5 servers are located at the IBM eServer Prerequisite Web site.

__   **Plan for optical media**

Optical media allows you to access your backup data much more quickly than tape. If you are planning to use optical media, such as DVD drives, include this in your plan. Make sure you include a plan for your Hardware Management Console (HMC) optical drive.

To learn more about optical devices in general, see Optical storage.

After you finish

__   Record a list of tape drives and include the devices that they are attached to.

__   Record a list of optical drives and include how they are attached.

__   Calculate how much tape and optical media you need for your backup plan.

Related Information

For more information about managing media devices, see Managing Devices.

For more information on using tape on System i, see Tape.

For more information on using tape on System p, see Tape Drives/Autoloader.

Planning for printers

Printing can reduce productivity if it is not properly planned and implemented. Learn how to ensure that your printers handle the work that your users demand.

Before you begin with the main planning tasks, you need to gather this information:

Before you begin
__ Have a list of current hardware.
__ Have a list of current configurations.
__ Have a list of new hardware.

Printer planning tasks
__ **Plan for new printers**

To develop an adequate printing plan, start by calculating printer workloads based on the number of users on the network and how much each user prints. Next, take an inventory of all network-attached printers and detail the number and type of new printers that you need to cover the workloads. Then, add the printers that need to be directly connected to client machines.

To better understand the available options, see the Printing Systems Web site. This site can help you match printing workloads with the appropriate printers.
Note: It might be more economical to purchase one high-end printer instead of two midrange printers.

After you finish
__ Record a list of users with anticipated printer use for each user.
__ Record a list of printers that collectively will handle those workloads.
__ Identify future printing needs and how you plan to meet those needs.

Planning for hardware no longer supported

As system performance demand continues to increase, you must upgrade any hardware that does not meet those demands. If you are upgrading an existing solution, start your hardware upgrade plan by identifying the hardware that is no longer supported by your manufacturer.

Before you begin your main planning tasks, you need to gather this information.

Before you begin
__ Have a list of current hardware.
__ Have a list of current configurations.

Upgrade planning tasks
__ **Identify the hardware that requires upgrades**

If you are planning to install a new solution, you can skip this step. But, if you are upgrading an existing solution, make sure that your new server works with all of your existing devices. Contact with your sales representative to develop a list of hardware that is no longer supported. For example, certain System Pathways Definition (SPD) devices need to be upgraded to comparable RIO/HSL devices. After you have that list, plan to upgrade those items that are no longer supported.

After you finish
__ Record a list of hardware that you need to replace.
__ Record a list of hardware that you need to acquire to replace hardware that is no longer supported.

Planning for service and support

Create a service and support plan to make sure that ongoing regular preventative maintenance schedules are maintained. You need to understand the different functions and features of your service environment to prevent server problems.

Before you begin your planning tasks, complete these items:

Before you begin
__ Identify the partitioning environment.
__ Identify the operating system that you will install on your partitions.
__ Identify your console environment.

Plan for service and support
__ **Understand the service environment**

Understand all of the elements of your service environment before developing a service and support plan.

- Elements of your service environment

  These elements include connectivity, inventory, electronic problem reporting, fixes, and remote support.

- Introduction to the service applications

  You can run various service applications on the Hardware Management Console (HMC) and the partitions, such as Electronic Service Agent, Inventory Scout, Remote Support Facility, and Service Focal Point.

- Map of service applications and functions

  Create a map of the different elements of the service environment to your applications.

__ **Plan your console configuration and placement**

You need to carefully configure and place your consoles in order to give service providers access to important service functions. For more information about the configuration and placement of consoles for service and support purposes, see Planning for consoles for your service environment.

__ **Plan your network**

Understand the networking requirements for setting up your service environment.

- Networking for your service environment

  Understand physical and logical requirements before developing a network plan for your service reporting.

- Managing your server using the Hardware Management Console

  Understand the requirements and capabilities of the HMC before planning to use the HMC on your network for service reporting.

__ **Choose a service configuration**

Understand how to set up your service environment by using different scenarios before developing a service configuration plan.

- Scenarios: AIX

  This scenario demonstrates the recommended connectivity methods for AIX.

- Scenarios: i5/OS

  This scenario demonstrates the recommended connectivity methods for i5/OS.

- Scenarios: Linux

  This scenario demonstrates the recommended connectivity methods for Linux.

__ **Plan a fix strategy**

Understand how to develop a fix management strategy before adding it to your service and support plan.

Plan for service and support
__ **Review additional resources**

Other resources can help you develop a richer and more effective service and support plan.

- Directory of worldwide contacts

  View contact information for worldwide service and support.

- IBM Electronic services news

  Learn how to report problems electronically to IBM before adding that to your plan.

- IBM eServer p5 support

  Use this Web site as your starting point to find tools and resources that help you streamline the technical planning and support for your IBM eServer p5 and RS/6000® server.

- Linux servers

  View Linux solutions.

- Fix Central

  Review the comprehensive fix delivery service for IBM eServer i5 and eServer p5 systems that run AIX, i5/OS, or Linux.

- If you plan to run Linux, download the IBM diagnostic service code for your distribution. For more information and to download the appropriate service code, see the Services and productivity tools for Linux on POWER systems Web site.

After you finish
__ Record the networking requirements for your environment.
__ Record additional hardware requirements.
__ Identify your electronic reporting strategy.

Planning for testing

Testing validates that your new system is functioning as planned. Based on your system requirements and needs, your test can range from covering the basics to an in-depth analysis. Testing is an ongoing process where parts of your solution run in real time while others are still in the testing phase on secondary partitions.

Before you begin with the main planning tasks, you need to:

Before you begin
__ Have the rest of your hardware planning done.
__ Verify that you have taken into consideration physical planning and installation requirements.
__ Have an understanding of how your solution is supposed to work.

Test planning tasks
__ **Determine acceptance criteria**

The acceptance criteria should establish requirements for bringing your system to the appropriate level of function, performance, availability, and risk. These criteria promote a quick and easy transition from the time the authorized service provider presents the system to you until you formally accept your new system.

__ **Assess your business needs**

An adequate business assessment should place testing priority on mission-critical functions. Mission-critical functions may require multiple regression tests, in addition to the overall system testing that you plan to perform.

Test planning tasks

__ **Identify resources that could support this testing**

Testing can be resource-intensive. In your test plan, make sure that you have sufficient resources in these areas:

- Hardware
- Software
- Labor
- Tools
- Licenses
- Location

__ **Assign personnel**

Make sure your plan includes human resources assigned to perform and monitor the testing.

__ **Develop a test schedule**

Your plan must include the length of time for testing, a target date for activating your solution, and how long you will continue to test certain inactive features.

For more information about testing your solution see the System and solution testing Web site.

After you finish

__ Review your test plan thoroughly before implementing it. This review should focus on your time-line, requirements, and the steps that are necessary to complete your plan.

__ Record a list of resources that you need, including human resources and the costs of those resources.

Planning for IBM services

IBM services can help you fill in the gaps in your core competencies. Part of your plan needs to include an assessment of where you can use IBM Services now or in the future.

IBM offers a wide variety of services that are designed to help you plan, design, install, implement, and manage your IT environment.

Here are the options for IBM services:

Planning for IBM services

Learn more about the IBM services that are designed to help you plan, design, install, implement, and manage your IT environment. Onsite and remote support options allow you to choose the services you need, when you need them. Flexible service options at IBM help protect your IT investment, integrate new technologies into your environment, and give your staff access to the support that they need to remain productive.

You can use the IBM Global Services Technical support Web site to evaluate the service offerings and to determine the services that are required for your environment in the following areas:

Identify IBM service offerings and requirements

- IBM System p services

  View a complete listing of available services, including installation and implementation, maintenance, migration, support, relocation, data center, site enablement, site planning, and software.

- IBM Implementation Services for HACMP

  Help improve your server availability with a cluster implementation.

- Installation Services for WebSphere Application Server — Advanced Edition

  Consider a highly secure, scalable solution for e-commerce payment processing in an environment.

- Maintenance and technical support

  Manage maintenance levels for IBM PC to enterprise server hardware.

- IBM Migration Services — for IBM eServer Cluster 1600

  Get planning and migration assistance for an IBM eServer Cluster 1600.

- IBM Migration Services — for eServer p5 and pSeries LPAR

  Receive expert installation, migration, and configuration assistance of your system.

- IBM Operational Support Services — Advanced Support

  Receive the highest level of remote software support that is customized to meet your needs.

- IBM Equipment Modification (EMOD)

  Receive assistance from IBM technical specialists for modifications and upgrades.

- IBM Data Center - Planning, Design, and Construction Services

  Receive help with building your data center.

- IBM Data Center Services

  Redirect your focus on core business objectives.

- IBM Site Enablement Services for Internet Data Centers

  Consider an advanced data center solution for your Internet environment.

- IBM Site Services — Site Planning Services

  Receive physical site planning help.

- IBM eServer Solutions

  Learn about end-to-end solutions that are designed to meet your unique business needs. These solutions combine the foundation of IBM hardware, software, and middleware with the strength of applications to help you overcome the challenges of doing business in the on demand world.

When you have completed these tasks, you should have a plan that identifies these elements:

After you finish
- __ Record a complete plan for what billable IBM services you will contract.
- __ Record a schedule for services that fits into your overall plan.
- __ Identify and create a timeline for any tasks that you must complete prior to any IBM service activities.

Planning for IBM i5/OS services

IBM offers a variety of services that are designed to help you plan, design, install, implement, and manage your IT environment. Onsite and remote support options let you choose the services that you need, when you need them. Flexible service options at IBM can help protect your IT investment, integrate new technologies into your environment, and give your staff access to the support that they need to remain productive.

See the IBM Global Services Technical support Web site to evaluate the service offerings and to determine the services that are required for your environment in these areas:

Identify IBM service offerings and requirements

- IBM System i services

  Review all of the service and support options for your server.

- System i5 and System i High Availability

  Reduce the impact of outages and their costs with IT services that are designed to help increase system reliability and availability of your business-critical environments.

- Maintenance

  Help keep your hardware up and running with single-source, flexible maintenance services for your multi-vendor environment.

- IBM Migration Services for AS/400® Data Migration

  Consider hardware and software services that help you efficiently migrate applications and data in your multi-vendor environment.

- Operational support services

  Employ remote and on-site support services for your hardware and software technical support needs.

- IBM Maintenance Services — for uninterruptible power system

  Reduce downtime with power protection solutions that include planning, design, installation coordination, software monitoring, and testing.

- ServicePac® Services

  Consider prepackaged support services that range from operational support for server systems to warranty and maintenance options.

- IT rollout services and data center support

  Consider services that help you plan, design, and make physical changes to your new or existing IT facilities, which includes wiring, cabling, and equipment modification.

- Storage

  Plan, design, and implement an optimal storage solution for your environment.

When you have completed these tasks, you should have a plan that identifies these elements:

After you finish

__ Record a complete plan for what billable IBM services you will contract.
__ Record a schedule for services that fits into your overall plan.
__ Identify and create a timeline for any tasks that you must complete prior to any IBM service activities.

Planning for IBM Linux services

IBM offers a variety of services that are designed to help you plan, design, install, implement, and manage your IT environment. Onsite and remote support options allow you to choose the services you that you need, when you need them. Flexible service options at IBM can help protect your IT investment, integrate new technologies into your environment, and give your staff access to the support they need to stay productive.

You can use the IBM Global Services Technical support

Web site to evaluate the service offerings and to determine the services that are required for your environment in these areas:

Identify IBM service offerings and requirements for Linux

- IBM Technology Assessment and Consulting Services – Linux strategy workshop

  Consider a two-day workshop to help you integrate Linux into your solution.

- IBM Installation Services for Linux pSeries and xSeries® clusters

  Implement IBM cluster management software, which enables you to realize the price and performance advantages of clusters.

- IBM Managed Hosting – Server services

  Consider services to help you manage the servers in your hosting environment.

- IBM Operational Support Services — Advanced Support

  Receive the highest level of remote software support that is customized to meet your needs.

- IBM Equipment Modification (EMOD)

  Receive assistance from IBM technical specialists for modifications and upgrades.

- IBM Data Center - Planning, Design, and Construction Services

  Receive help with building your data center.

- IBM Data Center Services

  Redirect your focus on core business objectives.

- IBM Site Enablement Services for Internet Data Centers

  Consider an advanced data center solution for your Internet environment.

- IBM Site Services — Site Planning Services

  Receive physical site planning help.

- IBM eServer Solutions

  Learn about end-to-end solutions that are designed to meet your unique business needs. These solutions combine the foundation of IBM eServer hardware, software, and middleware with the strength of applications to help you overcome the challenges of doing business in the on demand world.

When you have completed these tasks, you should have a plan that identifies these elements:

After you finish

__ Record a complete plan for what billable IBM services you will contract.
__ Record a schedule for services that fits into your overall plan.
__ Identify and create a timeline for any tasks that you must complete prior to any IBM service activities.

Related information

This section provides a printable list of external topics that have been referred to in Solution Planning, along with information about where to locate those topics.

IBM Systems Hardware Information Center

The easiest way to access these topics is to use the links in the online version of Solution planning in the IBM Systems Hardware Information Center. However, if you prefer to work from a printed copy of the Solution Planning PDF file, you can use this list to identify and locate topics that are referred to in Solution Planning, but that are not part of the Solution Planning PDF.

The following topics can be found in the same IBM Systems Hardware Information Center as Solution Planning, at **http://publib.boulder.ibm.com/eserver**. Use the Information Center's search function or site map to locate any of the following topics.

- Accessing the ASMI using an ASCII console
- Accessing the ASMI using a Web Browser
- Backup and recovery
- Changing consoles, interfaces, and terminals

- Communications options for logical partitions
- Concepts for partitioning the server
- Considerations for i5/OS license agreements
- Console options for logical partitions
- Control panel functions
- Creating an AIX logical partition using i5/OS virtual I/O resources
- Creating a Linux logical partition using i5/OS virtual I/O resources
- Desktop Hardware Management Console
- Elements of your service environment
- Electronic Service Agent
- Hardware Management Console (HMC)
- HMC concepts for managing servers
- i5/OS hardware requirements
- i5/OS on IBM eServer p5 servers
- Implementations of HMCs
- Introduction to the service applications
- iSeries upgrades and iSeries data migrations
- Managing consoles, interfaces, and terminals
- Managing adapters and devices
- Managing the Advanced System Management Interface (ASMI)
- Managing your server using the Hardware Management Console
- Map of service applications and functions
- Minimum hardware configuration
- Networking for your service environment
- Plan a fix strategy
- Plan for cables
- Planning
- Planning for Capacity on Demand
- Planning for the Virtual I/O server
- Planning reference
- Partitioning with Integrated Virtualization Manager
- Partitioning with Virtual Partition Manager
- Service, support and troubleshooting
- Service Scenarios: AIX
- Service Scenarios: i5/OS
- Service Scenarios: Linux
- Setting up your server to connect to service and support
- Setting up the HMC
- Software licensing considerations for Capacity BackUp
- Virtualization Overview
- Using System Management Services (SMS)
- Using the HMC configuration checklist
- Using the Virtual I/O Server
- Take over or recover an Operations Console connection
- Virtually accessing AIX or Linux using the virtual terminal

- Virtualization technologies
- Working with capacity on demand
- Working with the HMC
- Working with users, roles, and passwords

IBM eServer iSeries Information Center

The following topics can be found in the IBM eServer iSeries Information Center Web site at **http://www.ibm.com/eserver/iseries/infocenter**. Use the search function on the Web site to locate any of the following topics.

- Availability
- Availability for multiple servers: Clusters
- Availability roadmap
- Character-based interface
- Determining disk storage space required
- Disk pools
- Install, upgrade, or delete i5/OS and related software
- Integrated operating environments
- iSeries Access
- iSeries Access for Web
- iSeries Access for Windows
- iSeries Access for Wireless
- iSeries Navigator
- Network communications
- Network planning work sheet
- Optical storage
- Plan a backup and recovery strategy
- Plan for clusters
- Tape

IBM System p and AIX Information Center

The following topics can be found in the IBM System p and AIX Information Center Web site at

http://publib.boulder.ibm.com/infocenter/pseries . Use the search function on the Web site to locate any of the following topics.

- AIX Installation Guide and Reference
- AIX Release Notes
- Backup files and storage media
- Developing a Logical Volume Strategy
- Developing a Volume Group Strategy
- Disk Drives
- Establishing a backup policy
- File Systems
- High Availability Cluster Multi-Processing for AIX
- IBM eServer p5 Information Center
- Performance Toolbox Version 2 and 3 Guide and Reference
- Planning your TCP/IP Network

- pSeries Hardware documentation
- Workload Manager

IBM

The following topics can be found in the IBM Web site at **www.ibm.com**. Use the search function on the Web site to locate any of the following topics.
- Directory of worldwide contacts
- Printing Systems
- Wireless & Networking

IBM Electronic Services

The following topics can be found in the IBM Electronic Services Web site at **http://www-306.ibm.com/ services/cwi/portal**. Use the search function on the Web site to locate the following topic.
- IBM Electronic services news

IBM Global Services

The following topics can be found in the IBM Servers Web site at **http://www.ibm.com/services/us/ index.wss/home**. Use the search function on the Web site to locate any of the following topics.
- IBM Implementation Services for HACMP for System p and IBM RS/6000
- IBM Business Continuity and Recovery Services
- IBM Data Center - Planning, Design, and Construction Services
- IBM Data Center Services
- IBM eServer iSeries support services
- IBM eServer pSeries support services
- IBM Equipment Modification (EMOD)
- IBM Installation Services for Linux pSeries and xSeries clusters
- Installation Services for WebSphere Application Server — Advanced Edition
- IBM Maintenance Services — for uninterruptible power system
- IBM Managed Hosting – Server services
- IBM Migration Services — for eServer p5 and pSeries LPAR
- IBM Migration Services — for IBM eServer Cluster 1600
- IBM Operational Support Services — Advanced Support
- IBM Site Enablement Services for Internet Data Centers
- IBM Site Services — Site Planning Services
- IBM Technology Assessment and Consulting Services – Linux strategy workshop
- IT rollout services and data center support
- Service aids for Linux on IBM eServer p5
- ServicePac Services
- Storage
- Technical support

IBM Redbooks® and Redpapers

The following topics can be found in the IBM Redbooks Web site at **http://www.redbooks.ibm.com**. Use the search function on the Web site to locate any of the following topics.
- Effective System Management Using the IBM Hardware Management Console for pSeries

- IBM eServer pSeries Sizing and Capacity Planning
- http://www.redbooks.ibm.com/redpieces/abstracts/sg247120.html
- IP Network Design Guide.
- Roadmap to Availability on the System i 400®
- Virtual Partition Manager A Guide to Planning and Implementation

IBM Servers

The following topics can be found in the IBM Servers Web site at **http://www.ibm.com/servers**. Use the search function on the Web site to locate any of the following topics.

- AIX Performance Toolbox and Performance AIDE for POWER Version 3.0
- Capacity on Demand
- Director Multiplatform
- DS6000 Planning Guide
- DS8000 Planning Guide
- Enterprise Workload Manager
- eServer Cluster 1600: High Performance Switch Planning, Installation, and Service for IBM eServer p5 servers
- eServer Cluster 1600: pSeries High Performance Switch Planning, Installation, and Service
- eServer Linux
- IBM eServer Solutions
- Support for System p
- IBM Prerequisite Web site
- IBM eServer Software Information Center
- IBM Fix Central
- IBM Systems Workload Estimator
- IBM Global Services
- System i High Availability and Clusters
- Service and productivity tools for Linux on POWER systems
- IBM System Planning Tool
- Linux cluster software documentation
- Linux on POWER
- Linux servers
- Planning considerations for geographically dispersed clusters using HACMP/XD HAGEO technology
- Performance Management for IBM System i
- System services

IBM Software

The following topics can be found in the IBM Software Web site at **http://www-306.ibm.com/software**. Use the search function on the Web site to locate any of the following topics.

- Complete list of IBM software products
- DB2 information management
- IBM WorkPlace
- Lotus
- Optimizing Linux environments for performance and scalability
- Rational Software

- Tivoli
- WebSphere software platform

IBM TotalStorage Information Centers

The following topics can be found in the IBM TotalStorage Information Center Web sites at **http://publib.boulder.ibm.com/infocenter/ds6000ic** and **http://publib.boulder.ibm.com/infocenter/ds8000ic**. Use the search function on the Web site to locate any of the following topics.

- IBM TotalStorage DS6000 Information Center
- IBM TotalStorage DS8000 Information Center

Other

The following topics can be found at the Web sites listed along side the topics.

- ICANN Information : **http://www.icann.org**
- Novell SUSE Linux : **http://www.suse.com**
- Red Hat Linux service offerings : **http://www.redhat.com/offerings**

Appendix. Accessibility features

Accessibility features help users who have a physical disability, such as restricted mobility or limited vision, to use information technology products successfully.

The following list includes the major accessibility features:
- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are tactilely discernible and do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

IBM and accessibility

See the IBM Accessibility Center at http://www.ibm.com/able/ for more information about the commitment that IBM has to accessibility.

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This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A respecte est conforme à la norme NMB-003 du Canada.

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This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

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European Community contact:
IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Tele: 0049 (0)711 785 1176
Fax: 0049 (0)711 785 1283
E-mail: tjahn@de.ibm.com

Warning: This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

VCCI Statement - Japan

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Electromagnetic Interference (EMI) Statement - People's Republic of China

声　　明

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该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Declaration: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may need to perform practical action.

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種情況下，使用者會被要
求採取某些適當的對策。

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IBM Taiwan Contact Information:

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

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Germany Compliance Statement

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Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Electromagnetic Interference (EMI) Statement - Russia

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The following Class B statements apply to model 9111-520 (stand-alone version), 9131-52A (stand-alone version), 7047-185 and the 9111-285.

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. IBM is not responsible for any radio or television interference caused by using other than recommended cables or connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interferences, and (2) this device must accept any interferences received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe B respecte est conforme à la norme NMB-003 du Canada.

European Community Compliance Statement

This product is in conformity with the protection requirements of EC Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class B Information Technology Equipment according to CISPR 22 / European Standard EN 55022. The limits for Class B equipment were derived for typical residential environments to provide reasonable protection against interference with licensed communication devices.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for an interference caused by using other than recommended cables and connectors.

European Community contact:
IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569

Tele: 0049 (0)711 785 1176
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E-mail: tjahn@de.ibm.com

VCCI Statement - Japan

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準
に基づくクラスＢ情報技術装置です。この装置は、家庭環境で使用すること
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使用されると、受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

The following is a summary of the VCCI Japanese statement in the box above.

This is a Class B product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

IBM Taiwan Product Service Contact Information

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

Electromagnetic Interference (EMI) Statement - Korea

이 기기는 가정용으로 전자파적합등록을 한 기기로서 주거 지역
에서는 물론 모든 지역에서 사용할 수 있습니다.

Radio Protection for Germany

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse B ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM

übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der IBM gesteckt/eingebaut werden.

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse B.

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse B.

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