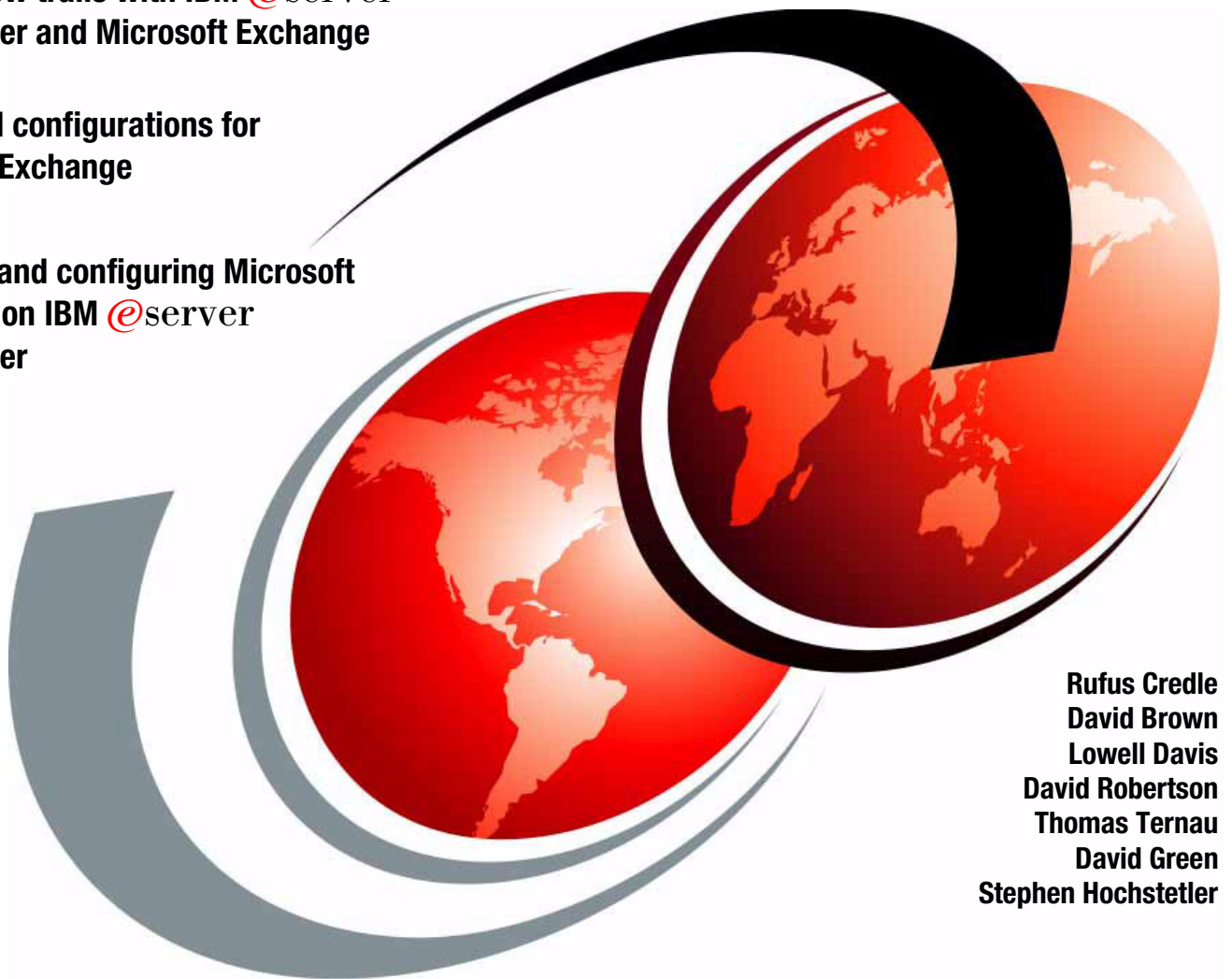IBM

Deploying Microsoft Exchange on IBM @server BladeCenter

Blazing new trails with IBM @server BladeCenter and Microsoft Exchange

Suggested configurations for Microsoft Exchange

Installing and configuring Microsoft Exchange on IBM @server BladeCenter

Rufus Credle
David Brown
Lowell Davis
David Robertson
Thomas Ternau
David Green
Stephen Hochstetler

Redpaper

IBM

International Technical Support Organization

**Deploying Microsoft Exchange on
IBM** *e*server **BladeCenter**

November 2003

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

Second Edition (November 2003)

This edition applies to IBM @server BladeCenter (8677-1xx), IBM @server BladeCenter HS20 (8678-21x and 8678-41x), and Microsoft Exchange 2000.

Contents

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Preface

Because data centers have grown with the proliferation of Wintel Servers over recent years, it is important to note that rack space and floor space can be more efficiently taken up with the use of the IBM @server BladeCenter™ HS20 servers. Attractive cost savings are also possible where a large number of rack installed servers are required, since the equivalent number of 1U servers will be much more expensive.

This Redpaper describes how to set up and configure Microsoft® Exchange 2000 on the IBM @server BladeCenter and give some pointers on what applications to use to manage the installation. It also describes the functionality of the IBM @server BladeCenter in this type of environment.

The team that wrote this Redpaper

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

The team, left to right: (standing) Rufus Credle, Lowell Davis, David Robertson, (seated) Thomas Ternau and David Brown

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Charles D Perkins, WW xSeries Service and Support Course Developer
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Summary of changes

This section describes the technical changes made in this edition of the Redpaper and in previous editions. This edition may also include minor corrections and editorial changes that are not identified.

Summary of Changes
for Deploying Microsoft Exchange on IBM @server BladeCenter
as created or updated on November 19, 2003.

November 2003, Second Edition

This revision reflects the addition, deletion, or modification of new and changed information described below.

New information

- ▶ Added 1.2.7, "BladeCenter Layer 2-7 GbE Switch Module" on page 13
- ▶ Added Chapter 6, "A brief introduction to Layer 4-7 Switching" on page 49
- ▶ Added information to 1.2.4, "BladeCenter 1200W Power Supply Module" on page 9
- ▶ Added URLs to "Related publications" on page 53.

Changed information

None at this time.

1

Introduction to IBM eServer BladeCenter technology and its advantages

In this chapter, we will introduce the IBM @server BladeCenter. This introduction includes an overview of the BladeCenter technology and hardware for the chassis and the blades; we also look at blade management and the options that are currently available. We will also discuss the advantages of blade servers over other servers in the market, where the blade servers fit into the market and why the market is driven towards blade servers.

1.1 Introduction to blade server technology

Blade servers are a relatively new technology that has captured industry focus because of its modular design, which can reduce cost with a more efficient use of valuable floor space, and its simplified management, which can help to speed up such tasks as deploying, reprovisioning, updating and troubleshooting hundreds of blade servers. All this can be done remotely with one graphical console using IBM Director systems management tools. In addition, blade servers provide improved performance by doubling current rack density. By integrating your resources and sharing key components, you will not only reduce cost but also increase availability.

1.1.1 IBM eServer™ BladeCenter and BladeCenter HS20 features

► The IBM @server BladeCenter has the following features:

 – Rack-optimized, 7U modular design enclosure: holds up to 14 hot-swap BladeCenter HS20 blades with up to six enclosures in a 42U rack.

 – Contains a high availability MidPlane supporting the hot-swap of individual blades.

 – Two 1200-watt, hot-swap power modules and support for two optional 1200-watt power modules: provides redundancy and power for robust configurations. See guidelines in 1.2.4, "BladeCenter 1200W Power Supply Module" on page 9.

 – Two hot-swap 325 CFM blowers and thermal sensors throughout to monitor and alert you to over-temperature conditions.

 – Management module: lets you manage and control components in the enclosure.

 – Optional hot-swap redundant Ethernet and Fibre Channel switch modules (supports up to four network switch modules).

 – Control panel : contains USB port and status LEDs.

► The IBM @server BladeCenter HS20 features are as follows:

 – Choose between 2.0 or 2.4 GHz(1) Xeon processors with quad-pumped 400 MHz front-side bus (FSB) and full-speed 512 KB ECC L2 caches.

 – Standard 512 MB system memory with Chipkill ECC support: supports 8GB maximum, when 2GB memory module becomes available.

 – Dual Broadcom Gigabit Ethernet controllers with teaming and failover support.

 – Integrated service processor: monitors critical components on each blade for remote and local systems management.

 – ATA-100 IDE controller: economical interface for up to two optional 40 GB IDE HDDs.

 – SCSI expansion connector: supports optional storage unit containing an Ultra320 RAID 1 SCSI controller and backplane support for two hot-swap HDDs.

Each of these features will be discussed in greater detail later in the paper, as well as a few other important points.

1.2 Technical overview

In this section, we will look at each of the key components individually and explain their function within the IBM @server BladeCenter and the BladeCenter HS20.

1.2.1 BladeCenter chassis

The IBM @server BladeCenter is a 7U modular chassis capable of housing up to 14 blade servers. The BladeCenter chassis allows individual blades to share resources such as power, switch, management and blower modules. The front view of the BladeCenter chassis is shown below in Figure 1-1. We can see the fourteen slots which, in this example, has been populated by one blade server and thirteen Processor Blade Fillers. These Processor Blade Fillers are required if a slot is not populated by a blade server or the HS20 SCSI Expansion Option, which will be discussed later, to provide proper airflow and system cooling. The BladeCenter Media Tray is also shown; it is located at the top of the chassis above the blade slots. This is shown in greater detail in Figure 1-2 on page 4.

Figure 1-1   Front view of BladeCenter chassis

The Media Tray is a hot-pluggable unit that contains an interface card, CD-ROM and diskette drive. Mounted on the interface card is a USB 1.1 port and system information LEDs which provide status information for your IBM @server BladeCenter and BladeCenter HS20s.

There are five LEDs on the front panel. Figure 1-2 on page 4 illustrates the location of these LEDs. The five LEDs are:

Power   This is a green LED which indicates the presence of power in the BladeCenter chassis. If this LED is not on, it could indicate one of the following conditions:

- There is no power to the chassis.
- The Management Module is not present or has failed.
- The LED has failed.

Location   This LED is used to locate or identify the particular IBM @server BladeCenter. When on, this LED is bright blue and can be set to blink or remain constant. This LED will be on as a result of a request from the systems administrator via the Management Module or if a component requires maintenance.

Over- temperature   This is an amber LED which will report any over-temperature conditions that occur either in the BladeCenter chassis or the blade servers. If an over-temperature condition occurs, the IBM @server BladeCenter may increase the speed of the blower to correct this, in which case the LED will automatically be turned off.

Information   The information LED is also amber; this LED reports non-critical events. These events are recorded in the Error log. This LED must be manually switched off via the Management Module.

System Error   Again, this is an amber LED which reports when a system error occurs. This LED reports errors such as a failure of a power, blower or switch modules. It will also be on if a system error occurs on a blade. The failed component's LED will also be on to help isolate the error.

These system LEDs are also located on the rear of the BladeCenter chassis under blower module 2.
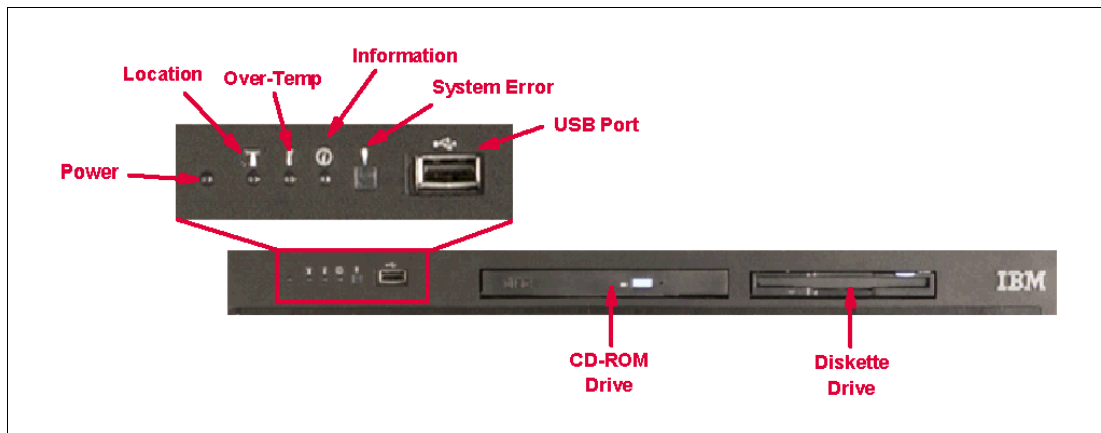
Figure 1-2   Media tray front view

As we discussed earlier, the BladeCenter chassis is capable of housing several hot swap and redundant components, such as:

► Power supply modules

► Switch modules

► Management modules

► Blower modules

In Figure 1-3 on page 5, you can see where each of these components should be located in the rear of the IBM @server BladeCenter.
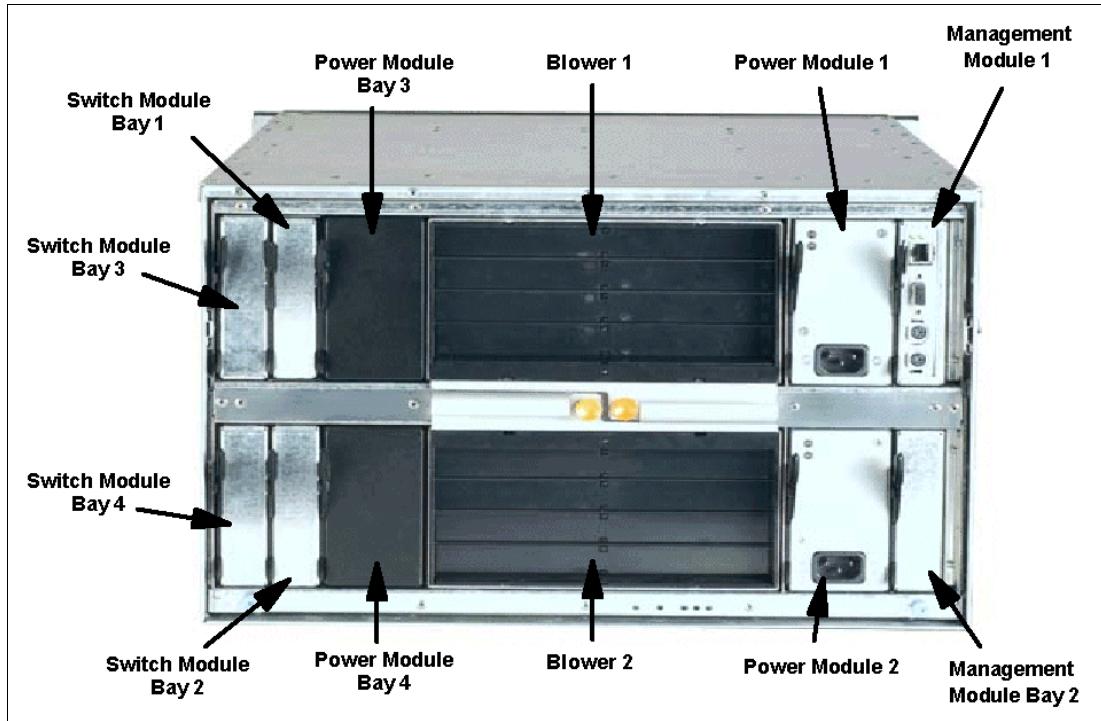
Figure 1-3   Rear view of BladeCenter chassis

The IBM @server BladeCenter automatically detects all blades and modules that are installed.

1.2.2 IBM eServer BladeCenter HS20

The IBM @server BladeCenter HS20 blades are high-throughput, two-way SMP-capable Xeon-based blade servers, highly scalable by adding memory and a second processor. Two Intel Xeon connectors are standard on the blade board to support installation of a second processor. High-speed, PC2100 DDR SDRAM is synchronized for up to 400 MHz processor-to-memory subsystem performance with current processors. There are four memory DIMM connectors; due to two-way interleaving, installation of memory options in pairs is required. Current memory options available are 256 MB, 512 MB and 1 GB size DIMMs, which support a minimum of 512 MB and a maximum of 4 GB of system memory. In the future, IBM will release a 2 GB memory option which will see the maximum system memory double from 4 GB to 8 GB.

Figure 1-4 on page 6 shows the BladeCenter HS20 with its top cover removed.
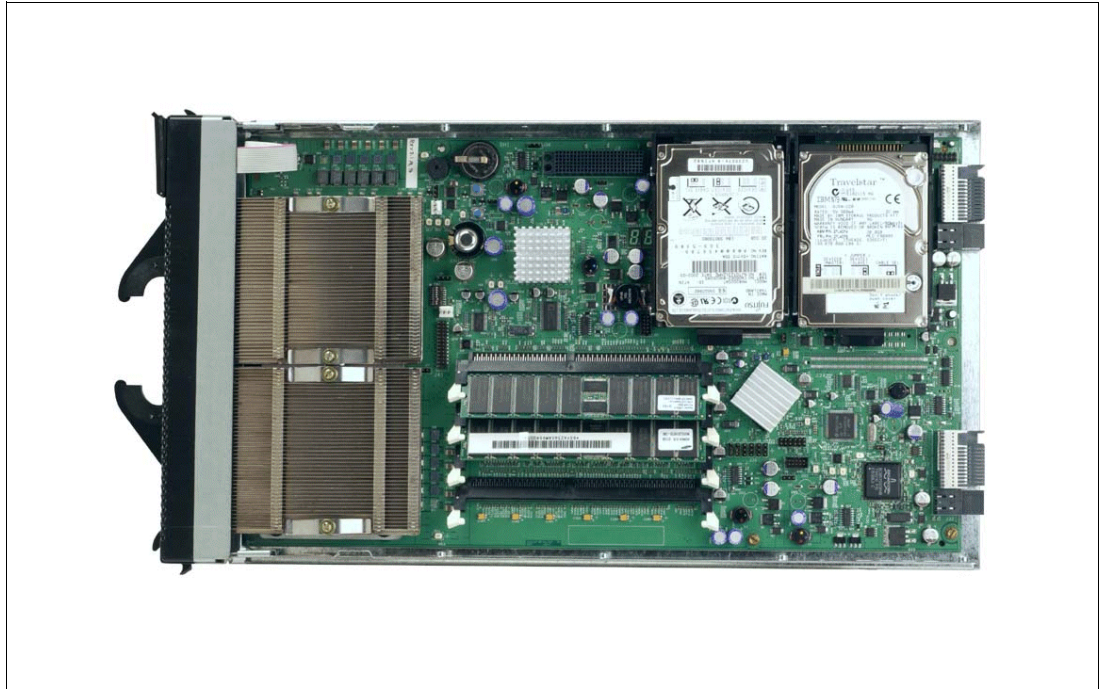
Figure 1-4   BladeCenter HS20 with top cover removed

Each BladeCenter HS20 has an integrated service processor on-board that communicates with the BladeCenter Management Module to enable blade server management remotely (see 1.2.3, "BladeCenter Management Module" on page 8 for more details on the Management Module). The service processor provides the following functions:

► Loader and OS Watch Timer

► Remote soft shutdown

► POST Watchdog Timer

► Light Path support

► VPD support

► PFA for VRM/CPU/Memory/HD

► Numeric based Error log

► ASM interconnect support (RS485)

► Environmental querying and alerts (TEMP/Voltages)

► Automatic Server Restart

► Remote Power On/Off

► In-band support for UMS/Director

► I2C interface to core logic (CSB5 chip)

► Local Environmental Monitoring

► Local LED control

► RS-485 interface to the Management Modules

The BladeCenter HS20 also has two integrated Ethernet controllers for redundancy. If redundancy is required, you must install Ethernet switch modules in switch module bays 1 and 2 (see 1.2.6, "BladeCenter 4-Port Ethernet Switch Module" on page 12 for more details).

Each controller is auto-sensing and will connect at the appropriate rate, even if the transfer rate is 10 Mbps, 100 Mbps or 1000 Mbps. The controller will also set the appropriate duplex state.

The Ethernet controller is capable of providing several teaming options that increase throughput and fault tolerance. In your blade server, a team consists of the two Ethernet controllers to utilize the options below:

Adapter fault tolerance (AFT)   Provides automatic redundancy for your Ethernet controllers. You can configure either one of the integrated Ethernet controllers as the primary Ethernet controller. If the primary link fails, the secondary controller takes over. When the primary link is restored to an operational state, the Ethernet traffic switches back to the primary Ethernet controller.

Adaptive load balancing (ALB)   Enables you to balance the transmission data flow among the two controllers. ALB also includes the AFT option. You can use ALB with any 100BASE-TX/1000BASE-T switch.

Cisco Fast EtherChannel (FEC)   Creates a team of two controllers to increase transmission and reception throughput. FEC also includes the AFT option. You can use FEC only with a switch that has FEC capability.

The BladeCenter HS20 has a control panel which is located at the top of the blade servers, as shown in Figure 1-5.
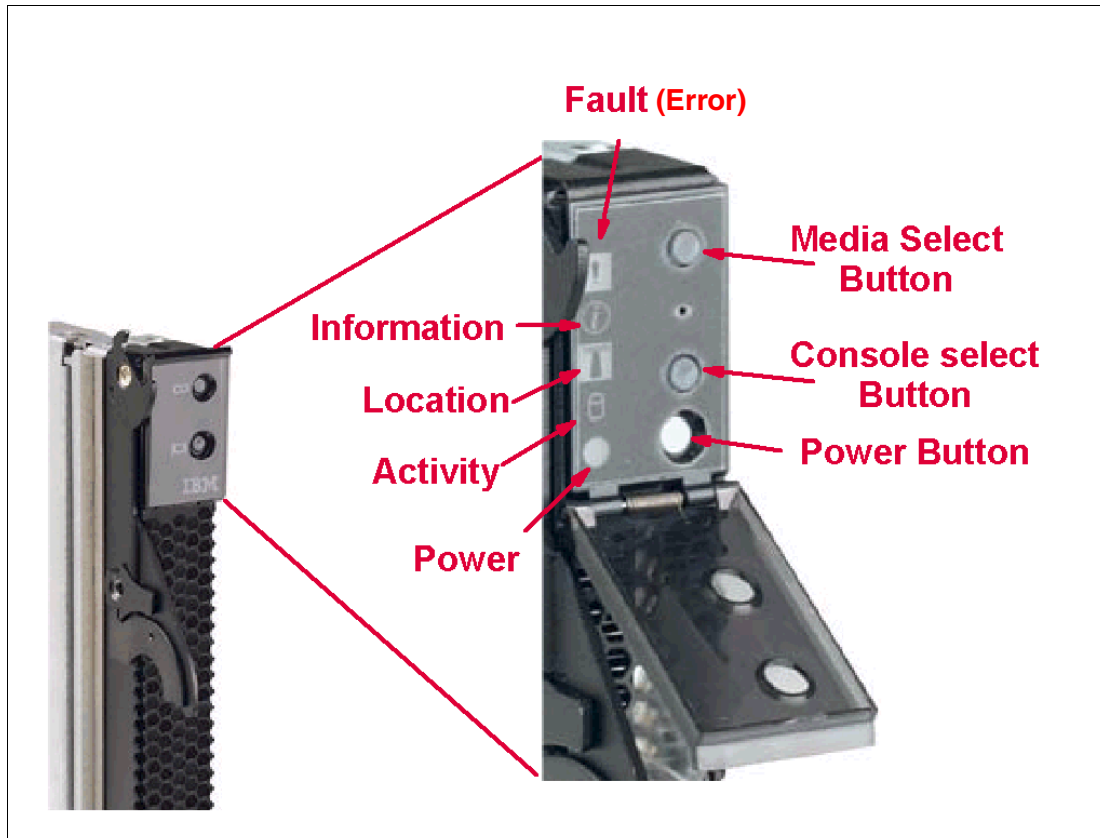

Figure 1-5   Blade server operators panel

Like the IBM @server BladeCenter's media tray, this control panel also has system information LEDs. The only difference is that the blade's panel also has control switches, which are detailed below.

Media-select button
Press this button to associate the CD-ROM drive, diskette drive, and USB port with this blade server. This button lights when the ownership of the CD-ROM drive, diskette drive, and USB port transfers to this blade server.

Blade-error
This LED is also known as the blade system-error LED. When this amber LED is on, it indicates a system error has occurred in the blade.

Information
When this amber LED is on, it indicates information about a system error for this server has been placed in the BladeCenter System Error log.

Location
This blue LED is turned on in response to a programmed condition, or remotely by the system administrator, to aid in blade identification for maintenance. The location LED on the IBM @server BladeCenter will be on also. Turn off the location LED after maintenance is complete.

Activity
When this green LED is on, it indicates that there is activity in the blade server; this includes hard disk and network activity.

Power-on
While the IBM @server BladeCenter has AC power, this green LED turns on and stays on when you turn on your blade server.

Console select button
Press this button to associate the keyboard, mouse, and video ports with this blade server. This button lights when the ownership of the keyboard, mouse, and video transfers to this blade server.

Power-control button
This button is located behind the control panel door. Press this button to manually turn the blade server on or off.

Note: The power-control button only has effect if the local power control option is enabled via the Management Module.

1.2.3 BladeCenter Management Module

The BladeCenter Management Module's primary function is to provide systems management for your IBM @server BladeCenter and blade servers, but it does have other important functions such as multiplexing the keyboard/video/mouse (KVM) to provide a local console for the individual blade servers and configuring the BladeCenter unit and switch modules. The Management Module communicates with all of the key components of the IBM @server BladeCenter including the switch, power and blower modules, as well as the blade servers themselves. The Management Module detects the presence, absence and condition of each of these components. A picture of the BladeCenter Management Module is shown in Figure 1-6 on page 9.

Figure 1-6   BladeCenter Management Module

The Management Module has a standard RJ45 connector for a 10/100MB Ethernet remote console connection, as well as two PS/2® connectors for keyboard, mouse and a 15-pin D-shell connector for video which are provided for the local console. Although the connectors for the keyboard and mouse are PS/2 type connectors, these devices are routed to a USB bus, enabling them to be switched between blades.

Note: The operating system in each blade must provide USB support for the blade server to recognize and make use of the keyboard and mouse.

The Management Module will retrieve and monitor critical information about the chassis and blade servers such as temperature, voltages, power supply, memory, fan and HDD status; this information will then be fed into an error and status log.

The manageability functions of the IBM @server BladeCenter are accessible via a Web GUI that is contained in the Management Module. This GUI allows you to view the status of, and control each blade server, which includes shutting down and restarting.

1.2.4 BladeCenter 1200W Power Supply Module

The standard BladeCenter chassis will ship with two 1200W Power Supply Modules, but, depending on the configuration of your IBM @server BladeCenter, you may require all four power modules. The standard two power modules provide power for the following components:

► Blade slots 1 through 6

► Blowers

► Management modules

► Switch modules

► Media tray

Figure 1-7   BladeCenter 1200W Power Supply Module

Power Modules 3 and 4 are required to provide power to blade slots 7 to 14. Figure 1-8 on page 11 shows how power is distributed by each power module. One power module is capable of providing enough power in the event of a power module failure. Power module 2 provides redundancy for power module 1 and power module 4 does the same for power module 3, although these power modules will effectively share the load under normal operating conditions. Supported configurations require either two or four power supplies, which is why when you order the optional BladeCenter 1200W Power Supply Module kit, you will receive two of the power modules.

> **Important:** Nonredundant power is not supported in BladeCenter products. Power modules must always be present in power bays 1 and 2. When any blade server or option is in blade bay 7 through 14, power modules must be present in power bays 1 and 2, as well as in power bays 3 and 4. If a power module fails or an ac power failure occurs, BladeCenter units configured for redundant power operation, as described in this document, will operate in a nonredundant mode, and the blower modules will run at full speed. You must replace the failing power module or restore ac power as soon as possible to regain redundant power operation and to reset the blower modules to their normal operating speed.

BladeCenter power module upgrade guidelines

This section contains information that will help you determine whether you need to upgrade the power modules in your IBM @server BladeCenter unit when installing IBM @server BladeCenter HS20 blade servers.

As of the date of this printing, three BladeCenter power module options are available: IBM BladeCenter 1200W Power Supply Module (part number 48P7052), IBM BladeCenter 1200W to 1400W Power Supply Upgrade Kit (part number 90P0197), and IBM BladeCenter 1800W Power Supply Module (part number 13N0570). Go to http://www.ibm.com/pc/compat/ for information about ordering these options. Obtain and use the Technical Update with your BladeCenter and blade server documentation for future reference.

The Technical Update can be obtained from the following URLs:

```
http://www-1.ibm.com/support/docview.wss?uid=psg1MIGR-53353
ftp://ftp.software.ibm.com/pc/pccbbs/pc_servers_pdf/13n0308.pdf
```
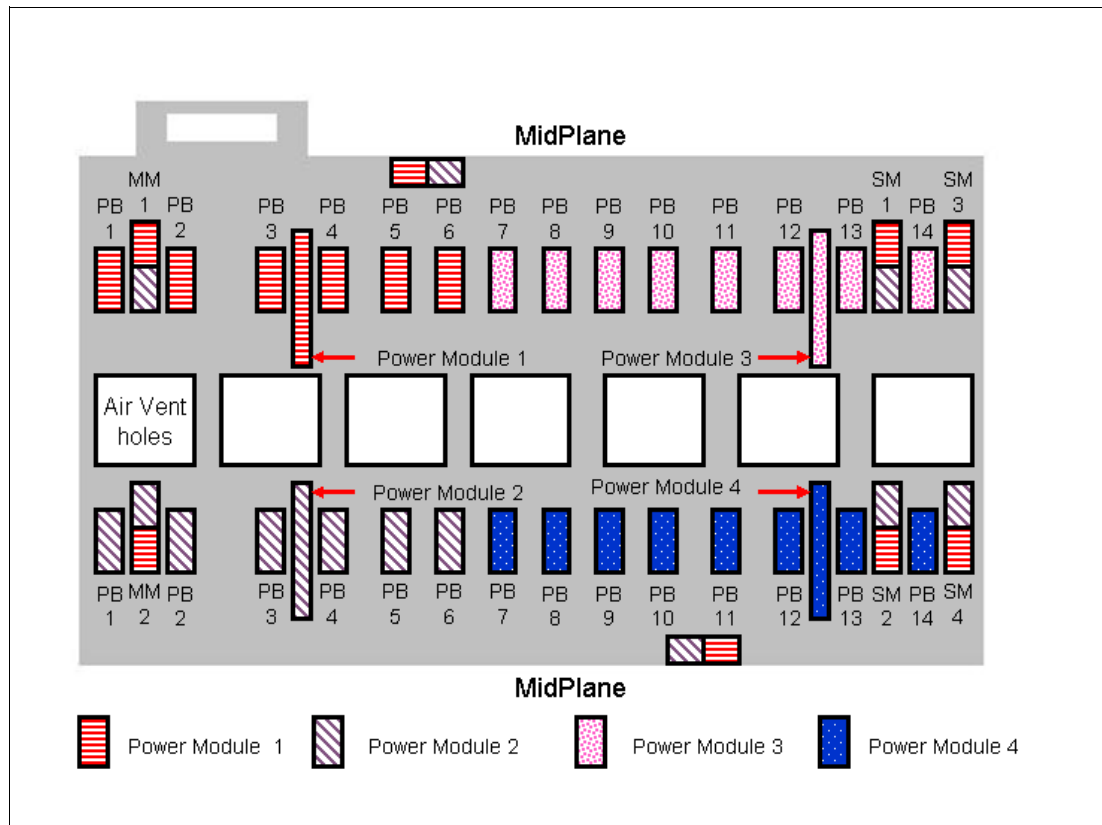

Figure 1-8   MidPlane power connector

1.2.5 BladeCenter blowers

The IBM @server BladeCenter ships with both hot-swap blowers which are required to provide adequate cooling; these blowers provide a total airflow of approximately 325 CFM; however, each blower will run at approximately 50% under normal conditions. If one blower fails, the other blower is capable of providing enough cooling for the entire chassis. However, the failed blower should be replaced within 48 hours. The speed of the blowers is controlled via the Management Module which receives signals from thermal monitors located in critical locations. There are two scenarios which will cause both blowers to function at full speed:

► The Management Module fails and the redundant module is not present.

► One of the power supply modules fails.

In Figure 1-9 on page 12, you can see that there are four fins which are currently closed since the blower is not operational. When operational, the blower draws the air from the front to the rear. Each blower also has an LED which will light up in the event of an error.

Figure 1-9   BladeCenter Blower Module

1.2.6 BladeCenter 4-Port Ethernet Switch Module

The Ethernet Switch Module (Figure 1-10 on page 13) has several purposes; in addition to providing network connectivity for the IBM @server BladeCenter and blades, it also provide interconnectivity between the blades and management modules. The Ethernet switch module does not come standard with the IBM @server BladeCenter; it is available for purchase as an option but it is required in most cases and should be installed in switch bay 1. This module is a fully functional Ethernet switch which has four 1000 Mbps ports externally, two internal 10/100 Mbps links to the management modules and fourteen 1000 Mbps links to the blades, which are also internal. Two of these switch modules can be added for redundancy. The switch module is configured via the Management Module.

Figure 1-10   BladeCenter 4-Port Ethernet Switch Module

In Figure 1-10, the two LEDs at the top of the switch module indicate power-on and Ethernet switch errors. There are also LEDs next to each port which indicate Ethernet link and activity.

1.2.7 BladeCenter Layer 2-7 GbE Switch Module

The Ethernet Switch Module (Figure 1-11 on page 14) has several purposes. In addition to providing network connectivity for the BladeCenter unit and blade servers, it also provide interconnectivity between the blades and Management Modules. The Layer 2-7 GbE Switch Module does not come standard with the IBM @server BladeCenter. It is available for purchase as an option, but it is required in most cases and should be installed in switch bay 1. This module is a fully functional Ethernet switch that has four 1000 Mbps ports externally, two internal 10/100 Mbps links to the Management Modules and 14 1000 Mbps links to the blades, which are also internal. Two of these switch modules can be added for redundancy. The switch module is configured via the Management Module. For a more in-depth look at Layer 2-7 Switching, refer to the Redpaper *IBM @serverBladeCenter Layer 2-7 Network Switching*, REDP3755.

Figure 1-11   BladeCenter 4-port Ethernet Switch Module

In Figure 1-11, the two LEDs at the top of the switch module indicate power-on and Ethernet switch error. There are also LEDs next to each port that indicate Ethernet link and activity.

1.2.8 BladeCenter 2-Port Fibre Channel Switch Module

If you require Fibre Channel connectivity for your IBM @server BladeCenter, there are two things you are required to do:

1. Install the IBM HS20 Fibre Channel Expansion Card in each blade that requires an FC connection.

2. Install one BladeCenter 2-Port Fibre Channel Switch Module (Figure 1-12 on page 15) in switch bay 3. If redundancy is required, a FC switch module must be installed in switch bay 4.

Each port on the FC switch module is capable of supporting transmission speeds of either 1 or 2 Gbps and must auto-negotiate to match the speed of any connected devices. A Small Form factor Pluggable (SFP) transceiver is required to populate these ports; these SFP transceivers are hot pluggable. The FC switch module is also managed through the Management Module.

Figure 1-12   BladeCenter 2-Port Fibre Channel Switch Module

The storage options for the IBM @server BladeCenter are covered in Chapter 3, "Storage options for the BladeCenter" of the Redpaper *The Cutting Edge:* IBM @server *BladeCenter*, REDP3581.

1.2.9 BladeCenter Acoustic Attenuation Module

In environments where it is important to minimize sound emissions, there is a noise reduction option available that can be installed on the rear of the IBM @server BladeCenter. This option is called the BladeCenter Acoustic Attenuation Module (acoustic module or muffler). The acoustical noise emissions for a single BladeCenter unit configured with 14 IBM @server BladeCenter HS20 servers are:

► 7.4 bels (operating)

► 7.4 bels (idling)

The acoustical noise emissions for a single BladeCenter unit with a BladeCenter Acoustic Attenuation Module option installed and configured with 14 IBM @server BladeCenter HS20 servers are:

► 6.9 bels (operating)

► 6.9 bels (idling)

For visibility purposes, the system LEDs on the rear of the BladeCenter unit have been replicated on the acoustic module, as these are covered when this option is fitted. The acoustic module also fully covers the blower modules and partly covers the other modules installed.

Note: The BladeCenter Acoustic Attenuation Module requires approximately eight inches between the rear of the IBM @server BladeCenter and the rack door. For this reason, the NetBay 42 Enterprise Rack Cabinet should be used when installing the IBM @server BladeCenter with this option.

1.3 The advantages of IBM eServer BladeCenter

Unlike typical server architecture which scales up, the BladeCenter allows for the scale out approach, yet balances performance and density. In this section, we identify the advantages of the BladeCenter for your business, such as:

► Systems management

► High density computing

► Redundancy

1.3.1 Systems management

The systems management component for the BladeCenter is the combination of IBM Director, the Web interface and Rapid Deployment Manager (RDM). With these tools, you can reduce system outages, increase IT personnel productivity and reduce support costs.

IBM Director

IBM Director is a comprehensive workgroup hardware manager designed for use with IBM @server xSeries servers, PCs, notebooks and now IBM @server BladeCenter.

IBM Director provides a comprehensive view of the xSeries servers.

► Remote access to the server regardless of its status

► Resetting or cycling of the server

► Server inventory, AssetID, blade slot numbers utilized

► Monitoring and setting thresholds on the server events, including PFA

► Flash BIOS

► Monitoring and identifying potential performance bottlenecks

IBM Director allows you to reduce system outages, increase IT personnel productivity and reduce support costs.

These goals can be accomplished by:

► Monitoring server health

► PFA - Predictive Failure Analysis®

► Integration with enterprise system management environments

Monitoring server health
By setting thresholds on components within IBM Director, you can monitor the following:

► Operating system load

► POST time-out

► Voltage

► Temperature

PFA - Predictive Failure Analysis
Setting alerts on disk, memory and processors via PFA allows you to identify imminent component failure. PFA can monitor the following:

► Processors

► Memory

- ► Fans
- ► Power supplies
- ► SCSI HDDs

Integration with enterprise system management environments
IBM Director agents should be installed on each of the blade servers as this allows system management of the blades and also provides the advanced management capabilities of the xSeries servers to be accessed from such products as:

- ► Tivoli Enterprise™ and Tivoli Netview
- ► Computer Associates CA Unicenter TNG
- ► HP OpenView
- ► Microsoft SMS
- ► BMC Patrol
- ► NetIQ

This is an important consideration for organizations who have already spent time, money and resources on existing system management tools.

Web interface
The Web interface allows you to configure and remotely manage your IBM @server BladeCenter via a browser; this is built into the Management Module.

Supported browsers and required components are:

- ► Microsoft Internet Explorer 4.0 Service Pack 1, or later
- ► Netscape Navigator 4.72, or later (version 6.0 is not supported)
- ► Java™-enabled Web browser
- ► Support for JaveScript 1.2 or later
- ► HTTP 1.0, or later
- ► Minimum display resolution 800*600 pixels and 256 colors

Note: The Web interface does not support double-byte character set languages (DBCS).

The Management Module Ethernet port either receives a DHCP assigned address within two minutes of connecting to the LAN or it defaults to the following IP address 192.168.70.125 with a subnet address of 255.255.255.0. The default hostname is MMxxxxxxxxxxxx where xxxxxxxxxxxx is the MAC address.

Note: If multiple IBM @server BladeCenters are to be configured, only one can be assigned the default IP address of 92.168.70.125, otherwise IP address conflicts will occur.

If your DHCP server is not on the same subnet as the BladeCenter Management Module console, DHCP traffic needs to be allowed to traverse the router to the Management Module console to receive an DHCP assigned address, or IBM Director Server needs to be on the same subnet as the IBM @server BladeCenter.

The Web interface allows you to manage and check the status of each of the modules and blade servers. Below is a list of the functions and sub-functions available.

- ► Monitor
  - – System status
  - – Event log
  - – Vital product data
- ► Blade Tasks
  - – Power/restart
  - – Firmware update
  - – Configuration
- ► Switch tasks
  - – Power/restart
  - – Management
- ► MM console (Management Module)
  - – General settings
  - – Login profiles
  - – Alerts
  - – Network interface
  - – Network protocols
  - – Security
  - – Configuration file
  - – Fireware update
  - – Restore defaults
  - – Reset MM
- ► Log off

RDM - Rapid Deployment Manager

This powerful tool allows you to deploy system images to the blade servers from the administrator's console.

RDM supports the following environments:

- ► Windows® 2000
- ► Windows 2000 Advanced Server

The advantages of Rapid Deployment Manager are:

- ► Rapid deployment of Operating System image to the destination server
- ► Hot-spare blade option, "Hot-spare blades" on page 22.

1.3.2 High density computing

As data centers have grown with the proliferation of Wintel servers over recent years, it is important to note that rack space and floor space can be more efficiently taken up with the use of blade servers. A fully populated 42U rack is capable of holding six IBM @server BladeCenters and 84 dual processor blade servers, for a total of 168 CPUs per rack. This is

twice the current density of a non-blade server. The IBM @server BladeCenter supports a minimum of one 4 port 1 GB Ethernet switch for up to fourteen blade servers. A total of four switch modules can be utilized within the IBM @server BladeCenter. This can be a combination of either Fiber Channel or Ethernet.

We recommend the use of blade servers for the following situations:

► Space constrained environments
► WebSphere®
► Linux clusters
► Web caching
► Collaboration applications (Lotus® Notes®, Microsoft Exchange and Citrix)
► Dynamic Web serving - Load balancing
► Firewall
► Telecommunications
► Active directory services
► Scientific and technical computing

These applications are typically processor and memory intensive, and so lend themselves to the scale out option rather then the scale up option. The scale out option is where the strength of the IBM @server BladeCenter becomes obvious. Due to the highly scalable range of components available with the BladeCenter unit, the blade server has a huge market.
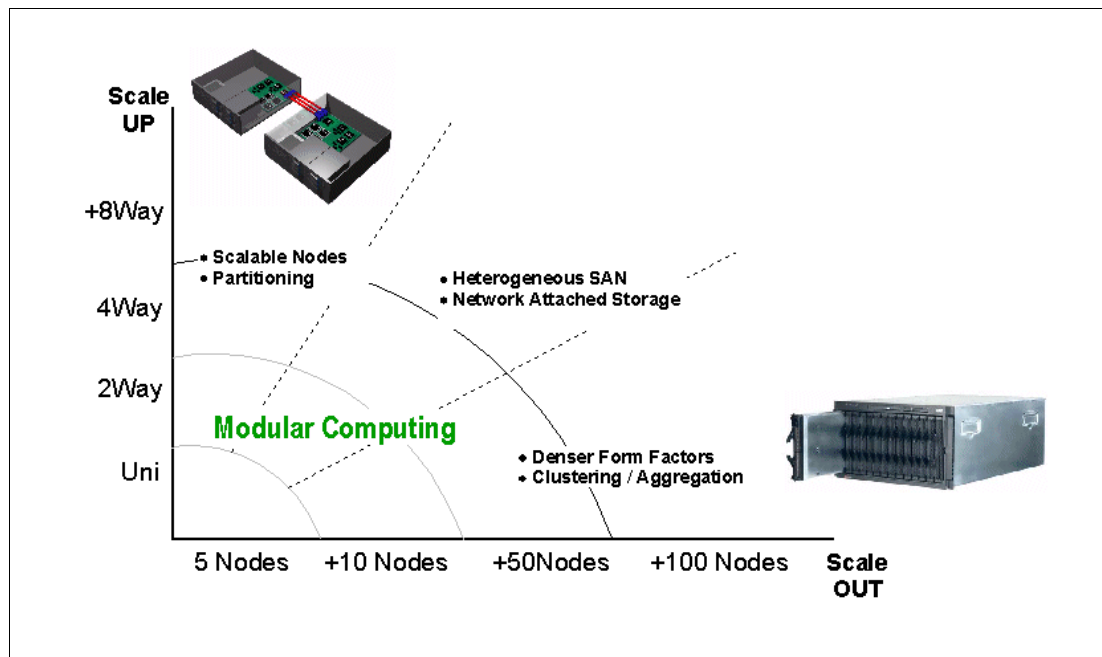

Figure 1-13   Scale up versus scale out

Attractive cost savings are also possible where a large number of rack installed servers are required. These savings run from power usage, to hardware procurement (due to not duplicating components), through to server management. Table 1-1 on page 20 demonstrates the input voltage required for different servers providing the same number of

CPUs. It also shows the heat output in BTUs, which can affect the cooling of your computer room and other equipment within the computer room.

Table 1-1   Power and BTU usage

	Number of Servers	Processor	Maximum load watts	BTU
IBM x330 4MX	14	Pentium® III 1.4GHz	3080	10502
IBM x335	14	Xeon 2.4GHz	4760	16231
IBM x342 - Dual Power	14	Pentium III 1.4GHz	5250	19821
IBM x345 - Dual Power	14	Xeon 2.4GHz	7000	23870
IBM @server **BladeCenter**	14	Xeon 2.4GHz	2500	8530

Note: The IBM @server BladeCenter in Table 1-1 is utilizing the onboard IDE controller.

Deploying an IBM @server BladeCenter is far simpler than deploying 14 1U servers and the associated cables. A single IBM @server BladeCenter only requires a KVM cable, one power cable, one Ethernet cable and a single system management cable. Even with a redundancy of these components, cabling can be reduced by eighty-three percent (see Table 1-2 for a typical example).

Table 1-2   Cable utilization

	1U Solution (2 - 42U Racks)	IBM @server **BladeCenter** Solution (2 - 42U Racks)
Power	84	12
Ethernet	168	48
KVM	84	6 (ACT)
Switch	6 (boxes)	1 (ACT)
KVM interconnect	5	0
Management connect	84	6
Total	431	73

The IBM @server BladeCenter is not intended to replace any of the xSeries suite of products, but rather to provide additional configuration options.

1.3.3 Redundancy

We all know failures occur occasionally; we also know that redundancy of key components increases system availability. Although previously, it was expensive to purchase redundant options for individual servers, the high availability features found in conventional xSeries rack servers have also been included within IBM @server BladeCenter. These features include:

► Hot-spare blades
► Processor

- ▶ Memory protection
- ▶ Disk mirroring
- ▶ MidPlane
- ▶ Hot-swap power and cooling modules
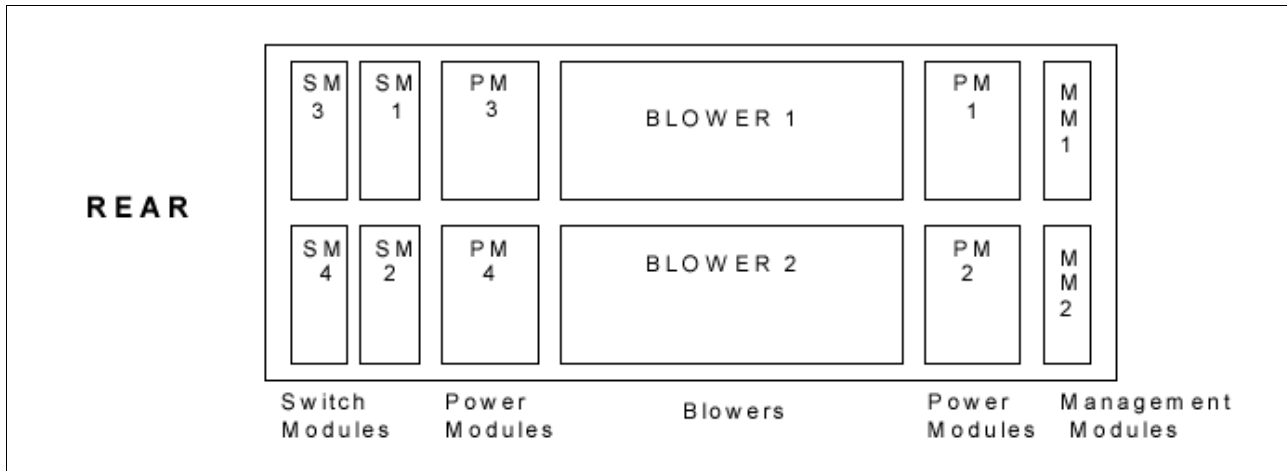- ▶ Switch modules

Figure 1-14   Module location on the rear of the IBM @server *BladeCenter*

Table 1-3 outlines which components can be redundant, hot swap, PFA or have Light Path diagnostics.

Table 1-3   Redundant, Hot-swap, PFA or Light Path

	Redundant	Hot Swap	PFA	Light Path
Blade	Yes	Yes	No	Yes
Processor	Auto Recovery	No	Yes	Yes
Memory	ECC w/Auto down size	No/Tool less	Yes	Yes
Power Supplies	Yes	Yes	Yes	Yes
Cooling Fans	Yes	Yes	Yes	Yes
Management Module	TBD	TBD	TBD	TBD
Switch Module	Yes	Yes	TBD	TBD
Backplane	Yes	No	No	No
Front Plane /Media Tray	No	Yes	No	No
CD ROM Drive	No	No	No	No
Floppy Drive	No	No	No	No
Hard Drive	Raid	Only with Blade Storage expansion (HS SCSI drives)	Yes	Yes
Power Cable	Yes	Yes	No	No

Hot-spare blades

MidPlane supports hot-spare blade servers; this operates in the same fashion as the hot-spare drive. By creating events within IBM Director, you can deploy an operating system to a hot-spare blade server automatically.

Processor

In a dual processor blade server, if a CPU fails, the following steps are taken by the system.

1. Force failed processor offline

2. Automatically re-boot server

3. Generate alerts

4. Continue operating with the working processor

Memory

There are four memory slots; memory must be installed in matching pairs. The following redundancy options are available:

► Chipkill™ ECC - provides correction for up to 4 bits per DIMM

► Memory hardware scrubbing - corrects soft memory errors automatically

► PFA - Creates alerts of imminent failure

Disk mirroring

Refer to Chapter 3, "Storage options for the BladeCenter" of the Redpaper *The Cutting Edge: IBM @server BladeCenter*, REDP3581 for hardware and software mirroring options of IDE and SCSI disks.

MidPlane

The middle plane provides connectivity between the blades and the modules at the rear of the BladeCenter unit. There are two connections on each blade server to independent middle planes for redundancy.

Hot-swap power and cooling modules

By sharing fans, power supplies, cables and other components within a BladeCenter unit and installing the redundant options for these, your organization can reduce the number of points of potential failure, thus increasing system availability.

Blowers

Two hot-swap blowers are standard in the IBM @server BladeCenter; the blower speed varies depending on the temperature. A failed blower needs to be replaced within 48 hours.

Note: An Acoustic Attenuation Module can be fitted to reduce noise.
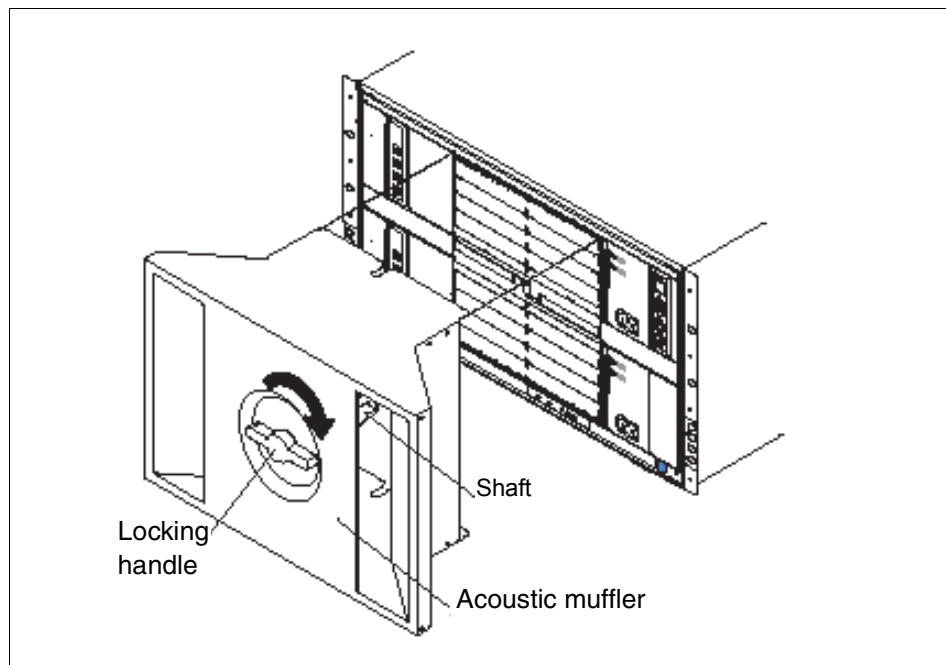

Figure 1-15   Acoustic Attenuation Module

Power

The IBM @server BladeCenter comes with two 220 volt 1200 watt hot-swap power modules in power bays 1 and 2. Table 1-4 outlines the power module bays and their functions.

Table 1-4   Power module bays

Power module bays	Power module function
1	Provides power to all the BladeCenter modules in server bay slots 1-6.
2	Redundancy for Power module bay 1.
3	Provides power to all the BladeCenter modules in server bay slots 7-14.
4	Redundancy for Power module bay 3.

Note: A blade server in bay 6 with a SCSI storage expansion option requires a power module in power module bays 3 and 4 to support the SCSI storage expansion.

Cabling modules

The IBM @server BladeCenter is capable of managing four switch modules of either Ethernet or Fibre, the minimum requirement being a single Ethernet switch.

Ethernet

Two hot-swap 1 GB Ethernet four port switch models can be installed in switch module bays 1 and 2.

Fibre

Two hot-swap Fibre channel network interface switch modules can be placed in switch module bays 3 and 4.

Note: The IBM @server BladeCenter also includes a hot-swap media tray, which includes the CD-ROM and floppy drive.

2

Planning and prerequisites for Microsoft Exchange

In this chapter, we will review the hardware and software requirements you will need for the installation of Microsoft Exchange 2000.

2.1 Typical installation of BladeServer

The version of Microsoft Exchange we will install onto the BladeServer is Microsoft Exchange 2000 Enterprise Edition. The operating system is Microsoft Windows 2000 Advanced Server.

2.1.1 Differences between Microsoft Exchange versions

Here are the differences between the Microsoft Exchange versions:

Microsoft Exchange 2000

The features of Microsoft Exchange 2000 are as follows.

► Individual databases are limited to a maximum size of 16 gigabytes.

► Only one storage group can be created on a server.

► Only one private information store and one public information store can be created on a server.

► Microsoft Exchange 2000 Standard Edition cannot be clustered on Microsoft Cluster Server Service.

► Microsoft Exchange 2000 Standard Edition cannot be used as a front-end server in a front end/back end configuration.

Microsoft Exchange 2000 Enterprise Edition

The features of Microsoft Exchange 2000 Enterprise Edition are as follows.

► Database size is limited only by hardware (with a maximum size of 16 terabytes.)

► Up to four storage groups can be created onthe server.

► Up to five information stores can exist in each storage group.

► Microsoft Exchange 2000 Enterprise Server can be clustered on the Microsoft Cluster Server Service.

► Microsoft Exchange 2000 Enterprise Server can be implemented as a front-end server for front-end/back-end configuration.

► The X.400 Connector is included.

2.1.2 Fix levels

At the time of writing, we used the latest application and operating systems and service packs, Microsoft Exchange 2000 Service Pack 3 and Microsoft Windows 2000 Server Service Pack 3, which is required for IBM @server BladeCenter.

There are certain facts about Service Pack 3 which should be considered:

► Microsoft requires that you install Windows 2000 SP2® or SP3 on your server before you install Microsoft Exchange 2000 SP3. Since this is an IBM @server BladeCenter installation, Service Pack 3 is mandatory.

► Microsoft supports running Microsoft Exchange 2000 SP3 on Windows 2000 SP3 servers in deployments with Windows .NET Server domain controllers.

► Microsoft does not support running Microsoft Exchange 2000 SP3 on computers running Windows .NET server operating systems.

► You must have Microsoft Exchange Full Administrator permissions at the organization or the administrative group level to install Microsoft Exchange 2000 SP3.

2.1.3 Hardware prerequisites for Microsoft Exchange 2000

Listed in this section are the hardware prerequisites for Microsoft Exchange 2000.

Minimum configuration
The minimum hardware requirements for running Microsoft Exchange follows:

► Pentium 166 MHz

► 128 MB of RAM

► NTFS partition with 4 GB or more

This has to be listed as an absolute minimum.

IBM @server BladeServer used in our lab
The IBM @server BladeServer used for this installation had the following elements:

► One 2.0 GHz processor

► Two 40 GB IDE hard drives

► 512 MB of RAM

► Gigabit Ethernet interfaces

2.1.4 Software prerequisites for Microsoft Exchange

Listed in this section are the software prerequisites for Microsoft Exchange 2000:

► Microsoft Windows 2000

► SMTP needs to be installed, included in IIS

► NNTP needs to be installed, included in IIS

► DNS

► Computer must be a member of a domain

► Active directory must be installed and configured for Microsoft Exchange

2.1.5 Scenario of IBM eServer BladeCenter running Microsoft Exchange

Since the IBM @server BladeCenter by default has one or two IDE disks internally, it is not the ideal disk subsystem on which to run Microsoft Exchange. There are two alternatives for this. The first alternative is to install the SCSI option. The other alternative is to install the Fibre option and connect to a SAN. The second option is probably the best. If the two IDE disks are used, mirroring the disks in Windows 2000 is recommended.

When you use only one blade server with the internal IDE disks, the disk subsystem is the bottleneck for the installation. This configuration will only give you 40 GB of total disk space if you mirror the disks, minus the operating system, applications, Microsoft Exchange 2000 server and similar items. If we calculate that each user has a limit of 50 MB per mailbox, this allows you about 600 users.

The rest of the hardware in the blade server is capable of handling a much larger number of users. For example:

- ► One blade server with Windows 2000, running DNS, DHCP, AD, WINS, etc.
- ► One blade server running Windows 2000 configured with:
  - – 2 GB of RAM
  - – Two XEON 2.0 GHz processors
  - – Fibre channel option with enough disk to hold the mailboxes and several different partitions
  - – 50 MB per mail user

This configuration could potentially handle approximately 4500 users

3

Suggested configurations and considerations

In this chapter, we discuss the different settings and tuning parameters and how to install Microsoft Windows 2000 and Microsoft Exchange 2000.

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3.1 Setup and tuning

In this section, we will discuss the following:

► How to set up and prep the machine for installation

► How to configure Windows 2000 for Microsoft Exchange

► How to change settings in Microsoft Exchange for tuning and performance

3.1.1 How to prepare the machine

First, we discuss how to prepare the machine or system you will use for installing Microsoft Exchange. There are a few settings in the server that can improve server performance and uptime:

► There are two Broadcom network cards in each blade server, each one connected to one network switch. Even if you do not have two network switches in your IBM @server BladeCenter, leave the unused network card enabled. Install both cards in Windows 2000 and disable it in the operating system. In the future, if you add another switch, you do not have to reboot the blade server and change the settings in the BIOS (see Figure 3-1).
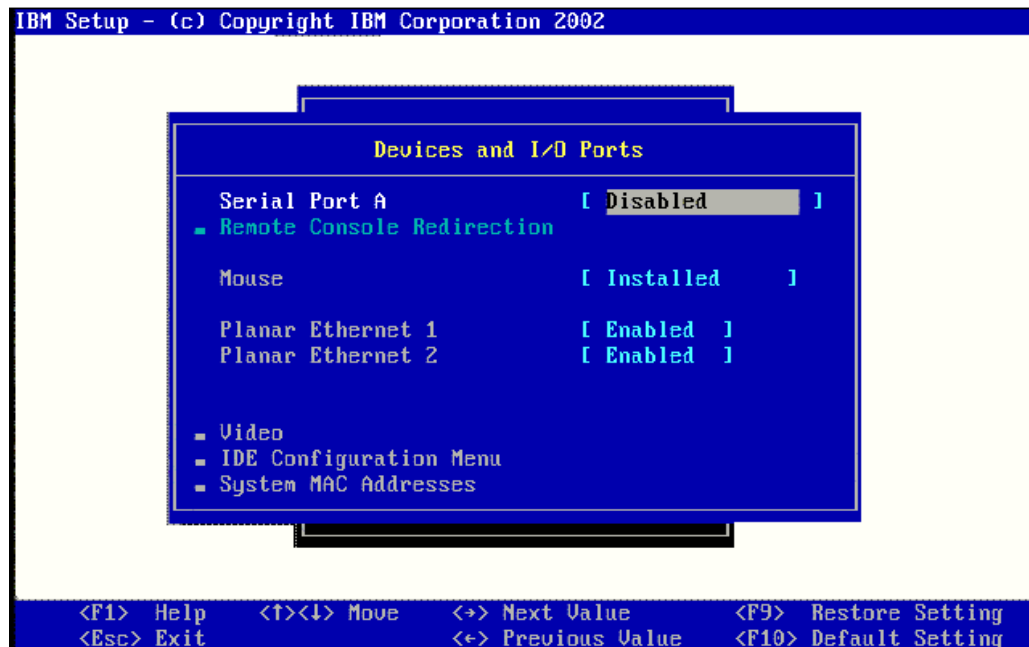
```
IBM Setup - (c) Copyright IBM Corporation 2002

                    Devices and I/O Ports

       Serial Port A                [ Disabled      ]
     ■ Remote Console Redirection

       Mouse                        [ Installed     ]

       Planar Ethernet 1            [ Enabled  ]
       Planar Ethernet 2            [ Enabled  ]


     ■ Video
     ■ IDE Configuration Menu
     ■ System MAC Addresses




    <F1>  Help      <↑><↓> Move     <→> Next Value       <F9>  Restore Setting
    <Esc> Exit                      <←> Previous Value   <F10> Default Setting
```

Figure 3-1   Settings for Ethernet adapters

► Regarding the startup sequence, if the machine was installed over the network with RIS, you probably do not need to boot from a diskette or CD-ROM and can disable these in the boot order. If you plan to use RDM, you should enable the Wake On LAN setting (Figure 3-2 on page 31) to be able to remotely start a blade server that has been turned off.
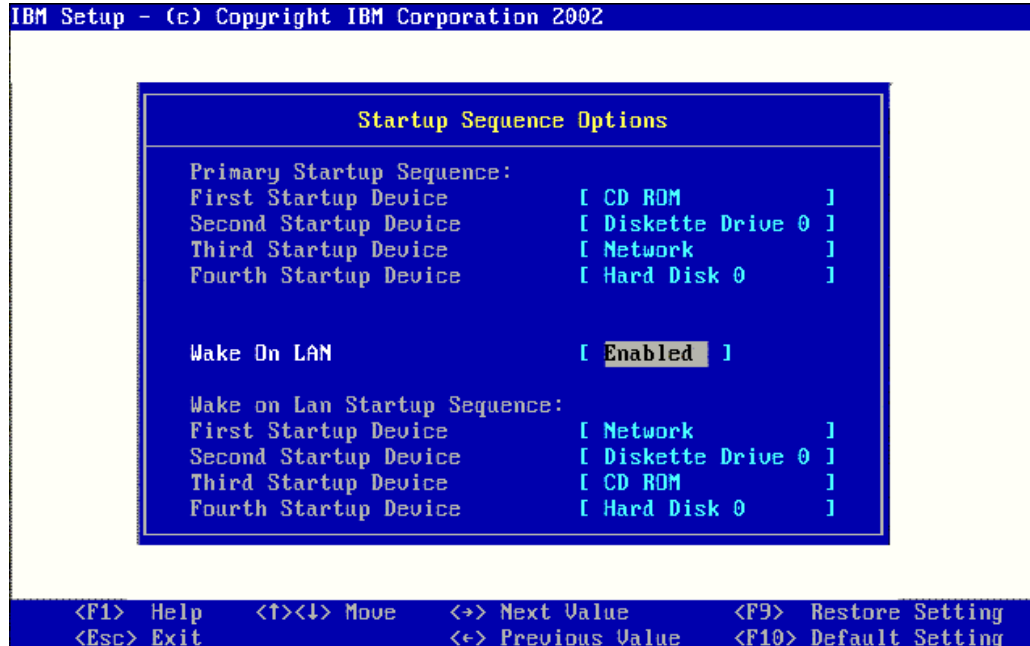
```
IBM Setup - (c) Copyright IBM Corporation 2002

                        Startup Sequence Options

        Primary Startup Sequence:
        First Startup Device              [ CD ROM            ]
        Second Startup Device             [ Diskette Drive 0 ]
        Third Startup Device              [ Network           ]
        Fourth Startup Device             [ Hard Disk 0       ]


        Wake On LAN                       [ Enabled  ]

        Wake on Lan Startup Sequence:
        First Startup Device              [ Network           ]
        Second Startup Device             [ Diskette Drive 0 ]
        Third Startup Device              [ CD ROM            ]
        Fourth Startup Device             [ Hard Disk 0       ]



     <F1>  Help      <↑><↓> Move      <→> Next Value        <F9>  Restore Setting
     <Esc> Exit                       <←> Previous Value    <F10> Default Setting
```

Figure 3-2   Boot sequence

► If the parameter *Boot fail count* is on, the machine will fail to boot if there have been more than three failed boots, and manual intervention will be needed.

► In the BIOS, make sure the Write-back setting is enabled in all processors in the blade server.

3.1.2 Disk mirroring

To set up disk mirroring on the internal IDE disks, you must change the disks to Dynamic Disks. Also, the mirror partner must have enough empty space to hold the partition being mirrored. Perform the following steps to mirror disks in Windows 2000:

1. Click **Start -> Settings -> Control Panel**. Next, click **Administrative Tools -> Computer Management -> Disk Management**.

2. Change disks to Dynamic Disks by right-clicking **Disk 0** and selecting **Upgrade to Dynamic Disk...**. You must right-click the actual icon of the disk.
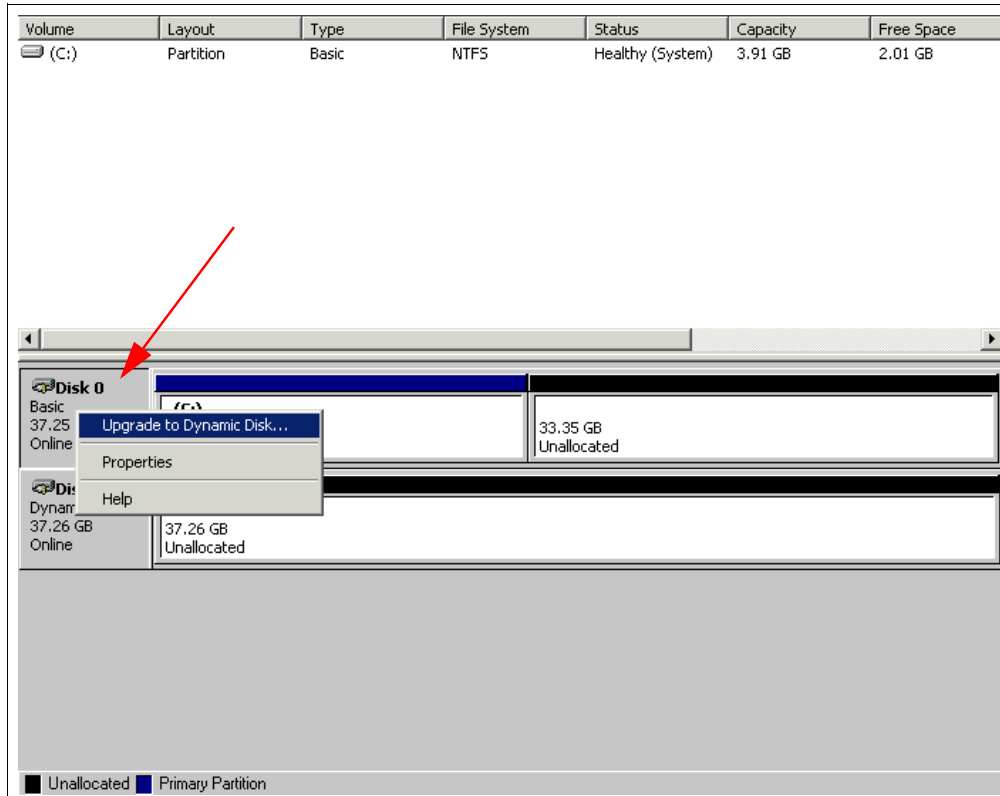
Figure 3-3   Upgrading to Dynamic Disk

3. Select the disk you want to upgrade and click **OK**. You will see a window similar to Figure 3-3.
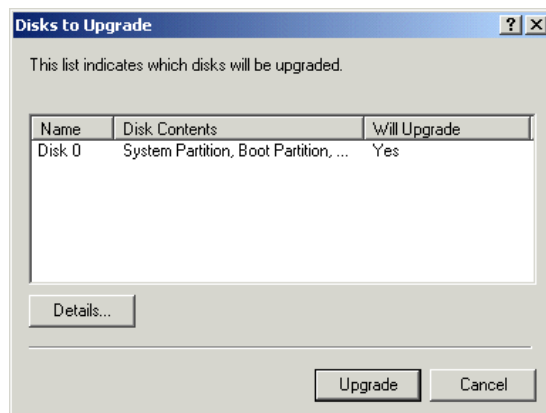

Figure 3-4   Upgrading the disk

4. You will get a response showing the disks about to be upgraded (Figure 3-4). Click **Upgrade.**

5. Click **Yes** to respond to the question `Are you sure you want to upgrade?`.

6. Click **Yes** to respond to the question `Do you want to continue this operation?`.

7. Click **OK** to respond to the statement `A reboot will take place to complete the upgrade process.`

8. When you log on after the reboot, the machine will have to rebooted again.

9. After the second reboot, repeat Step 1 to start Disk Management. You will see a window similar to Figure 3-5.
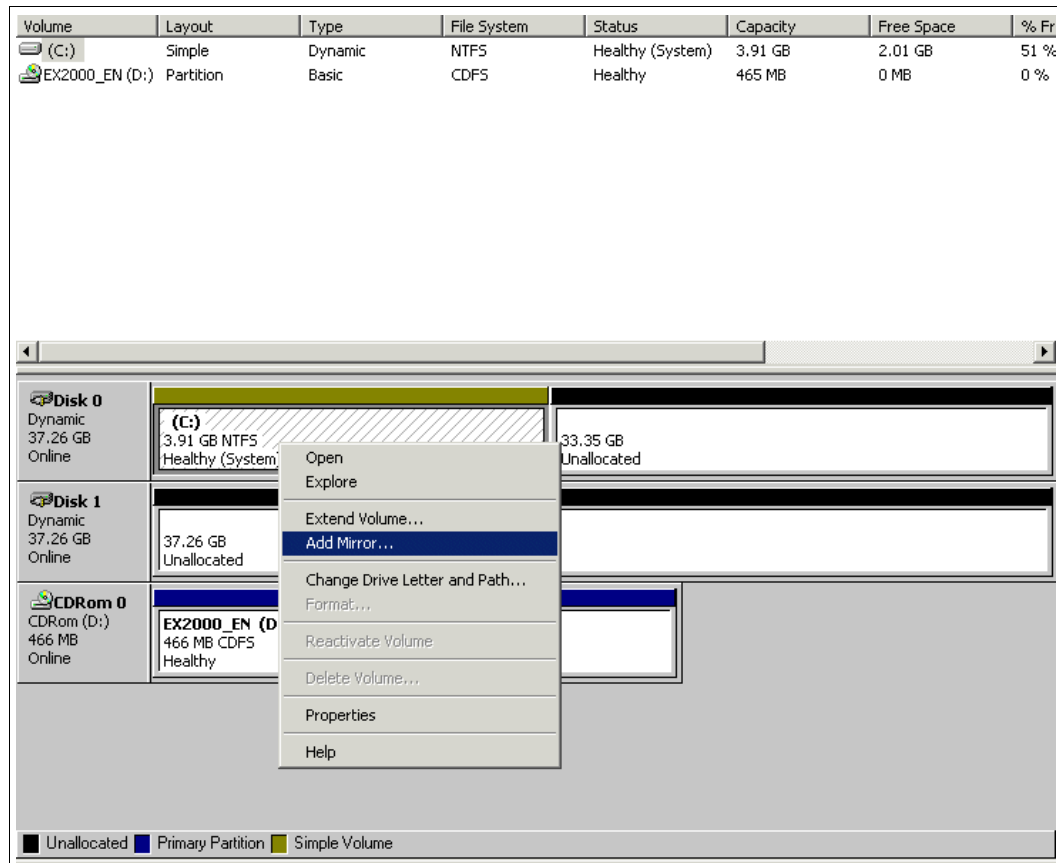

Figure 3-5   Adding the mirror

10. Right-click the partition you want to mirror and click **Add Mirror**.

11. Select the disk you want to mirror the data to and click **Add Mirror**.

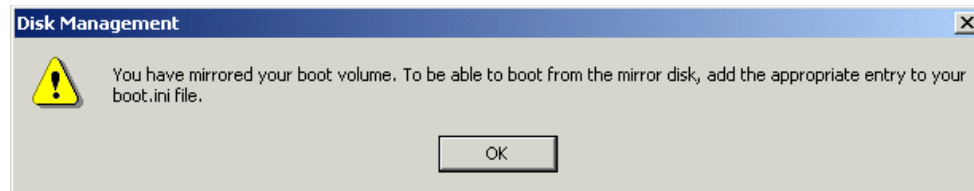12. When the mirror has started, you will get a response similar to the one shown in Figure 3-6.

Figure 3-6   Setup of mirroring finished

13. Click **OK**.

For more information on how to set up the boot.ini, see Microsoft Windows 2000 documentation.

3.1.3 Using CMDCONS (Recovery Console)

Follow the steps below to install the recover console on the Windows Server to aid in troubleshooting.

1. Insert the Windows 2000 Server CD into the CD-ROM drive.

2. From the Start menu, click **Start -> Run**, type `CMD` and click **OK**.

3. Change to the CD-ROM drive and type `\i386\winnt.exe /cmdcon`.

4. Click **Yes** to install the Recovery Console from the Windows 2000 Setup window.

Figure 3-7   Recovery Console setup

5. Click **OK**.

The recovery console has been inserted into the boot.ini file and will appear as a choice during startup.

3.1.4 How to partition disks in Microsoft Exchange

Following are some recommendations on how to partition disks in Microsoft Exchange 2000 for a mailbox and public folders server:

► Raid 1 for operating system, Microsoft Exchange binaries

► Raid 1 for Microsoft Exchange logs

► Raid 1 for operating system swap

► Raid 5 for Microsoft Exchange database files

These partitions should preferably be located on different physical drives or arrays. Note that you are unable to perform the above recommendations on the blade server if using the internal IDE disks. If using the internal IDE disks in the blade server, the best thing would be to mirror the drives within Windows 2000. However, the recommended path would be to place the operating system on the internal disks, either IDE or SCSI, and place the Microsoft Exchange files on a SAN through the optional HS20 Fibre Channel Expansion Card.

3.2 Tuning and performance

If you compare Microsoft Exchange 2000 with Microsoft Exchange 5.5, the tuning in Microsoft Exchange 2000 is very dynamic except for the hardware and operating system settings that Microsoft Exchange itself does not influence. There are still things that can be done to enhance performance and availability.

3.2.1 Hardware and software settings

Perform the following:

► Ensure that the BIOS in the system is configured for maximum performance.

► Update BIOS, service packs and drivers for the machine.

► Configure Microsoft Exchange by placing the different components in the best array or disk for that particular component.

► Do not place stores and log on the same disk or array.

► Fill out your storage groups to maximum before creating a new group; this saves memory.

► If the Microsoft Exchange server has 1GB of memory or more, you need to add the /3GB switch to the boot.ini.

► Defragment disk partitions to make data more contiguous.

► Run ESEUtil from the Microsoft Exchange CD-ROM to defragment databases. Use the /p switch to defragment the database in another location instead of rebuilding it in place.

3.2.2 Registry key settings

This section mainly addresses the setup of larger corporations with large numbers of users. For example, if you are running multiple servers, a mix of Microsoft Exchange 5.5 and Microsoft Exchange 2000 servers or message connectors, you should consider changing some of these parameters. Be careful when modifying the registry.

Message Transfer Agent Tuning

In scenarios where only Microsoft Exchange 2000 servers exist in an organization, the MTA does not perform any processing and therefore, does not need to have its performance tuned. However, when you are using both Microsoft Exchange 5.5 and Microsoft Exchange 2000, the MTA is used for all intra-site communications, and possibly, between sites if site connectors using remote procedure calls (RPCs) or X.400 connectors are deployed. The key and its parameters follow:

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\MSExchangeMTA\Parameters
```

DB data buffers per object
This value represents the number of database server buffers configured for each database object. More buffers require more memory, but make it less likely for a database object to be rolled out to disk because of a lack of buffer space.

► **Default setting**: 0x3

► **When to change**: adjust if this MTA communicates with multiple Microsoft Exchange 5.5 servers either within a site or between sites. Additionally, you should tune if a legacy messaging connector is homed on this server.

► **Recommend setting**: 0x6

Dispatcher threads

This value represents the number of MTA Dispatcher threads, which are responsible for the processing of messages. This is multiplied by three for the three subtypes (Router, Fanout, Result) of Dispatcher thread.

► **Default setting**: 0x1

► **When to change**: adjust if this MTA communicates with other Microsoft Exchange 5.5 servers. Additionally, consider tuning if more than five Microsoft Exchange 5.5 servers exist on the site, or if groups (that is, distribution lists) are heavily used.

► **Recommend setting**: 0x3

Kernel threads

This value represents the number of platform threads that handle the Presentation and Session level of the Open Systems Interconnection (OSI) stack. These threads are at the heart of MTA message processing.

► **Default setting**: 0x1

► **When to change**: adjust if this MTA communicates with other Microsoft Exchange 5.5 servers using RPC over slow or highly latent network connections.

► **Recommend setting**: 0x3 is the standard recommendation. 0x8 is recommended if the Microsoft Exchange 2000 MTA belongs to a site containing more than 15 Microsoft Exchange 5.5 servers. 0xC (12) is recommended if the Microsoft Exchange 2000 MTA belongs to a site containing more than 30 Microsoft Exchange 5.5 servers.

Max RPC Calls Outstanding

This value represents the maximum number of remote procedure call (RPC) threads. This limits the maximum number of RPC procedure calls that are guaranteed to be processed at one time.

► **Default setting**: 0x32 (50)

► **When to change**: adjust if you increase the number of Gateway In/Out threads in the Store.exe process (which is recommended in Microsoft Exchange 5.5 and Microsoft Exchange 2000 co-existence scenarios).

► **Recommended setting**: 0x80 (128)

MDB users

This defines the number of distinguished names (DNs) to cache from the directory.

► **Default setting**: 0x1F4 (500)

► **When to change**: adjust when your organization contains more than 1500 users. Change the value to one-third the size of the Global Address List, to a maximum of 5000.

► **Recommended setting**: 0x1388 (5000)

RTS threads

This stands for Reliable Transfer Service threads. This value represents the number of platform threads that handle the RTSE level of the Open Systems Interconnection (OSI) stack.

► **Default setting**: 0x1

► **When to change**: adjust if this MTA communicates with multiple Microsoft Exchange 5.5 servers either within a site or between sites.

► **Recommended setting**: 0x3

TCP/IP control blocks

This value represents the maximum number of concurrent RFC1006 (TCP/IP) connections that are supported. This setting controls the number of buffers available for X.400 connections.

- ► **Default setting**: 0x14 (20)
- ► **When to change**: adjust if hosting more than one X.400 Connector on the server.
- ► **Recommended setting**: ten control blocks for each hosted X.400 Connector, plus one control block for incoming connections.

Transfer threads

This value represents the number of MTA Transfer threads. This is multiplied by two for the two subtypes (Transfer In, Transfer Out) of Transfer thread.

- ► **Default setting**: 0x1
- ► **When to change**: adjust if this MTA communicates with multiple Microsoft Exchange 5.5 servers either within a site, or between sites.
- ► **Recommended setting**: 0x3

MSExchangeIS Registry Key Settings

When messages are received into the MTA from an Microsoft Exchange 5.5 server or legacy gateway, they are handed off to the Store.exe process, and then go to the advanced queuing engine. In environments where many messages are arriving into the MTA simultaneously, it is advantageous to increase the number of processing threads between the Store.exe process and MTA. You can monitor the MTA to Store.exe process queue build-ups using either Performance Monitor or Microsoft Exchange System Manager. The key and its parameters follow:

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\MSExchangeIS\server_name\
Private-database_guid
```

Gateway In Threads (REG_DWORD)

This defines the number of threads available for retrieving messages from the MTA process into the Store.exe process.

- ► **Default setting**: not present, but defaults to 0x1.
- ► **When to change**: adjust if this MTA communicates with multiple Microsoft Exchange 5.5 servers or legacy messaging connectors.
- ► **Recommended setting**: 0x3

> **Note:** Each of these threads will consume about 1 MB of virtual memory. Further, the actual number of threads created will be this value multiplied by the number of databases. This could be an issue on servers with a large number of private databases. If you have, for example, 10 private databases and increase this parameter and the following parameter from 1 to 3 (a total increase of 4 threads), you will actually create 4 x 10 = 40 threads, which together will consume 40 MB of virtual memory.

Gateway Out Threads (REG_DWORD)

This defines the number of threads available for sending messages from the Store to the MTA process.

- ► **Default setting**: not present, but defaults to 0x1.
- ► **When to change**: adjust if this MTA communicates with multiple Microsoft Exchange 5.5 servers or legacy messaging connectors.
- ► **Recommended setting**: 0x3

MTA File Directories

On servers acting as a bridgehead server, you might achieve a better performance if you move the directory to a faster disk array.

1. Stop the Microsoft Exchange MTA Stacks service. To do so, at the command prompt, type the following command:

   ```
   net stop msexchangemta
   ```

2. Edit the following value to reflect the new location for the MTA Database Path:

   ```
   HKEY_LOCAL_MACHINE \System\CurrentControlSet\Services
   MSExchangeMTA\Parameters\MTA Database Path
   ```

3. Explore the new path and create the new directory structure. You may omit the Mtacheck.out folder in the MTA Database Path because the MTA creates this directory automatically.

4. It is important to explore the installation drive and make a backup copy of the Program Files\Exchsrvr\mtadata directory.

5. Explore the original Program Files\Exchsrvr\mtadata directory.

6. On the View menu, click **Details**. On the View menu, point to **Arrange Icons**, and then click **by Type**. Select and then move all of the *.dat files to the new MTA Database path. Change the security for the directory to match that of the original directory.

7. At a command prompt, go to Program Files\Exchsrvr\bin directory.

8. In the new directory, run **mtacheck**; the task should report `Database clean, no errors detected.`

9. Start the Microsoft Exchange MTA Stacks service. To do so, at the command prompt type the following command:

   ```
   net start msexchangemta
   ```

4

Implementation and configuration of Microsoft Exchange 2000

This chapter will describe how to install and configure Microsoft Exchange and Microsoft Outlook onto an IBM @server BladeCenter server.

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4.1 Installation of Microsoft Exchange

It is assumed here that this is the first Exchange server installed in a Windows 2000 domain. The installed Windows 2000 server is located on one blade in the IBM @server BladeCenter and Microsoft Exchange is located on another one.

4.1.1 Installation of Microsoft Exchange 2000

Preparations to the forest

ForestPrep extends the Active Directory schema to include Exchange information. In a larger sized Active Directory, this might take considerable time. ForestPrep also prompts you to `set the name for your organization` during the Exchange 2000 installation in the Active Directory. When you run ForestPrep, it asks for a user which must be a member of Enterprise Admins and Schema Admins; in addition, the account needs administrative rights on the local machine from which you run the ForestPrep application. A good idea is to create a user in the Active directory for this, for example ExAdmin.

1. From the Microsoft Exchange 2000 CD, run `setup.exe /ForestPrep`.

2. At the Welcome page, click **Next**.

3. Click **I Agree** to accept the end user license.

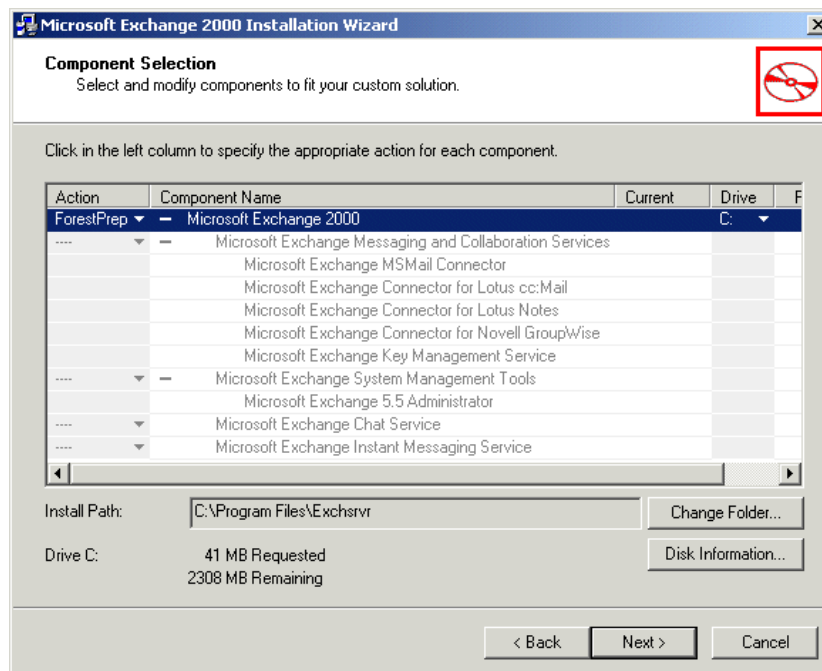4. Type the license number and click **Next**. You will see a window similar to Figure 4-1.

Figure 4-1   Running ForestPrep

5. At the Component Selection window, make sure `ForestPrep` is stated in front of the Microsoft Exchange 2000 installation or component name. Click **Next**.

6. At the Installation Type window, click to create a new Exchange 2000 Server Organization and then click **Next.**

7. Type in the name of the organization.

8. At the Exchange 2000 administrator account, type the name of the user responsible for installing Exchange 2000. This account will have permissions to create all levels of admin rights for Exchange 2000.

9. Click **OK** to update the schema.

10. When you are done, click **Finish**.

Preparation of the domain

When you run DomainPrep, you need to a member of the group *Domains admins security group* and have administrative rights on the local machine. Among other things, DomainPrep creates a global security group called Domain EXServers, a local security group called All Exchange Servers and adds the Domain EXServers group to the All Exchange Server group.

1. From the Microsoft Exchange 2000 CD inserted on one of the servers in the domain, run `Setup.exe /domainprep X`.

2. At the Welcome page, click **Next**.

3. Click **I agree** to agree to the terms of the end user license agreement and click **Next**.

4. Enter the license key and click **Next**.. You will see a window similar to Figure 4-2.
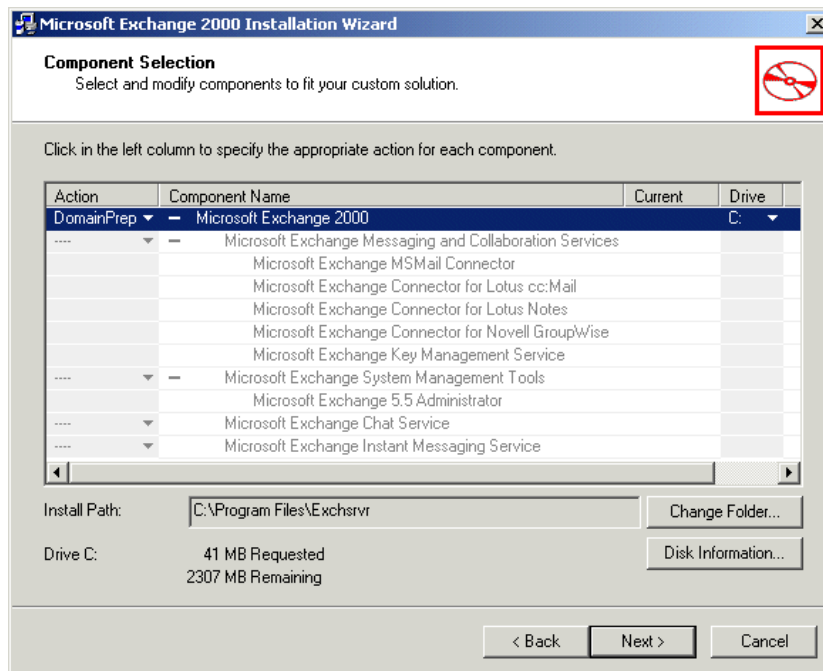

Figure 4-2   Running DomainPrep

5. In the Component Selection window, make sure `DomainPrep` is listed next to Microsoft Exchange 2000 server. Click **Next**.

6. On the recipient update server, type the name of the server that will act as the Microsoft Exchange recipient update server for this domain.

7. At the Complete page, click **Finish**.

Microsoft Exchange install

Complete the following instructions to install Microsoft Exchange 2000:

1. Insert the Exchange 2000 CD into the CD-ROM drive and run the Setup.exe program without any parameters.

2. At the Welcome page, click **Next**.

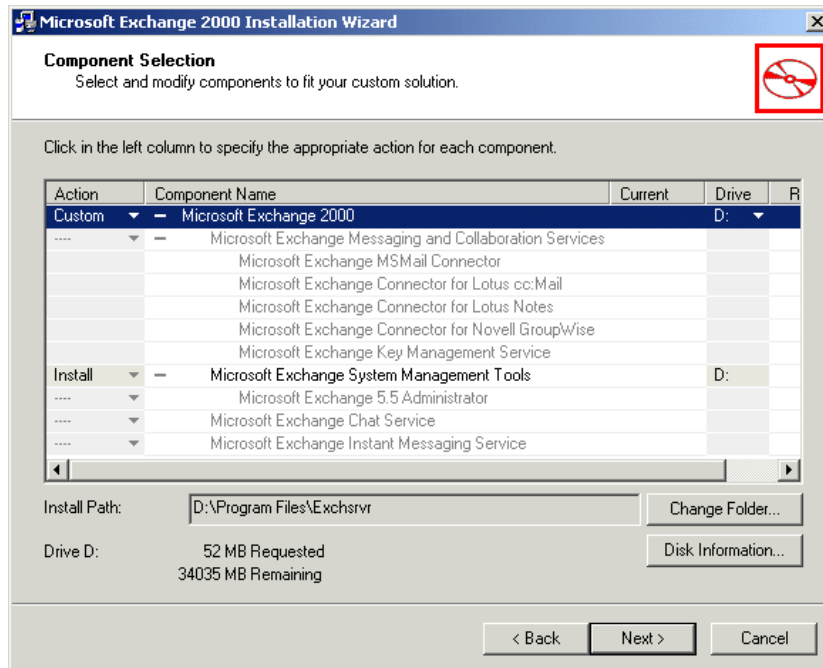3. Click **I agree** to accept the license agreement. You will see a window similar to Figure 4-3.

Figure 4-3   Component Selection window

4. At the Component Selection window, choose what components you want to install by clicking the action button to the left of the window.

5. To change the drive of the installation, click **Change Folder** next to the Install Path field.

6. On the Licensing Agreement window, click **I agree** and then click **Next**.

7. In the Component Summary window, verify your selections and click **Next**. The installation begins. Please note that this may take a few minutes to complete.

8. At the Completion window, click **Finish**.

Applying Service Pack 3 to Microsoft Exchange 2000

To install the Microsoft Exchange 2000 Service Pack 3, download the service pack from the following Web site:

   http://www.microsoft.com/exchange/downloads/2000/sp3/default.asp

Perform the following steps to allow the service pack to extract and update Microsoft Exchange 2000:

1. Execute the service pack application and choose a directory to unpack it.
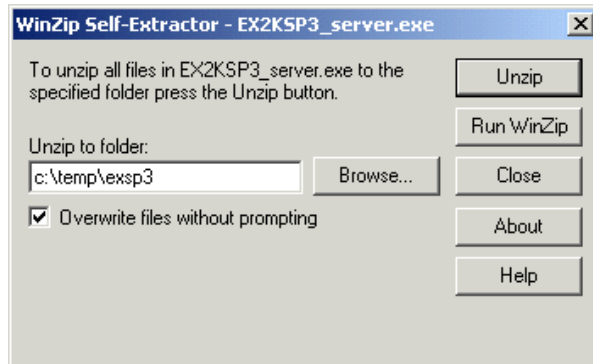

Figure 4-4   Unpacking the service pack

2. Click **Unzip** and when decompression is finished, click **OK**.

3. From C:\temp\exsp3\server\setup\i386\ directory, run `Update.exe.`

4. At the Welcome window, click **Next**. You will see a window similar to Figure 4-5.
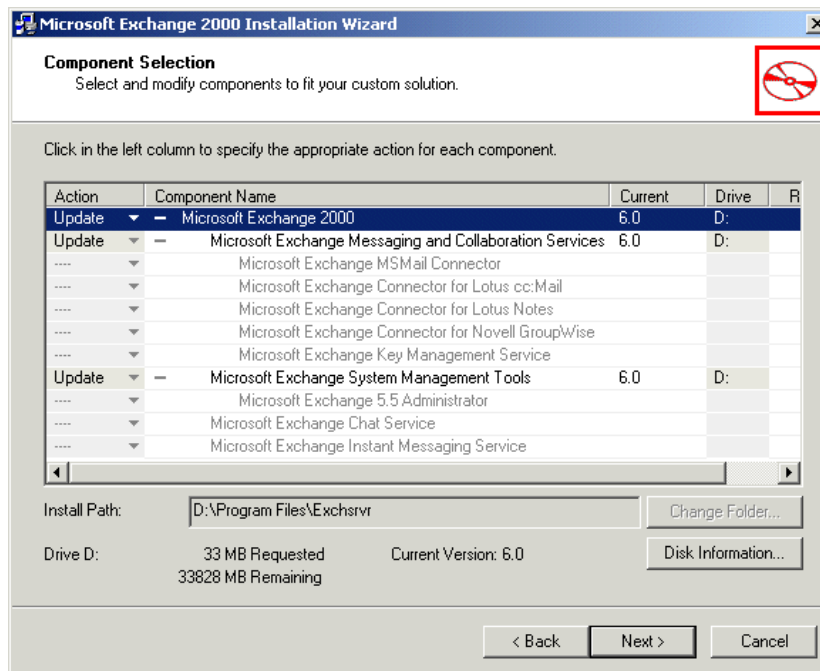

Figure 4-5   Updating Exchange

5. On the left side of the window, `Update` should be stated next to the installed products. Make sure the drive letter to the right of the installed components is correct. Click **Next**.

6. At the Component Summary window, verify the information is correct. Click **Next**.

7. Wait for the installation to complete and then click **Finish**.

4.1.2 Adding a user to the Microsoft Exchange environment

To add a user, launch the Active Directory Users and Computers:

1. Click **Users**.

2. Click **Actions -> New -> User**.

3. Enter the information about the new user, then click **Next**.

4. Click **Next**. In this dialog box, you can select whether this user should have an Exchange mailbox.

5. Click **Next** and then **Finish**.

4.1.3 Installation of Microsoft Outlook 2000

We will use Microsoft Outlook 2000 from the Microsoft Office 2000 CD in this example. Perform the following steps:

1. Insert the Microsoft Office 2000 CD in the CD-ROM drive. The installation application should auto-start. Wait for the initialization and click **Next**.

2. Enter the user name and the CD-key.

3. Accept the user agreement and click **Next**.

4. Click **Customize** and then click **Next**.

5. Choose the installation folder or accept the default by clicking **Next**.

6. Click **Next**.

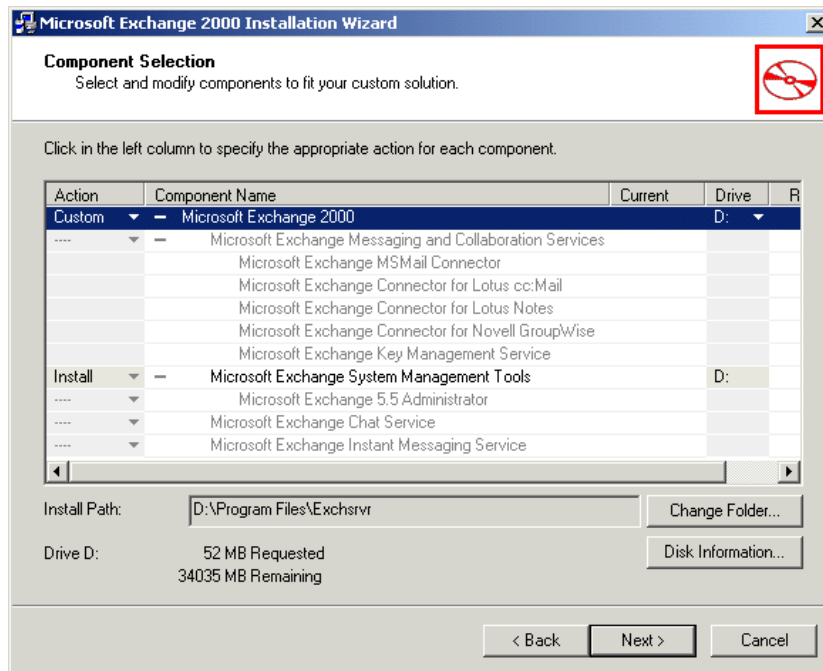7. Only enable Microsoft Outlook 2000 for installation.

Figure 4-6   Installing Outlook 2000

8. The installation start.

9. When the installation has completed, click **OK**.

Configuration of Microsoft Outlook
After the installation has been completed, you should have an Outlook icon on the desktop. Perform the following steps:

1. Right-click the **Outlook** icon and click **Properties**.

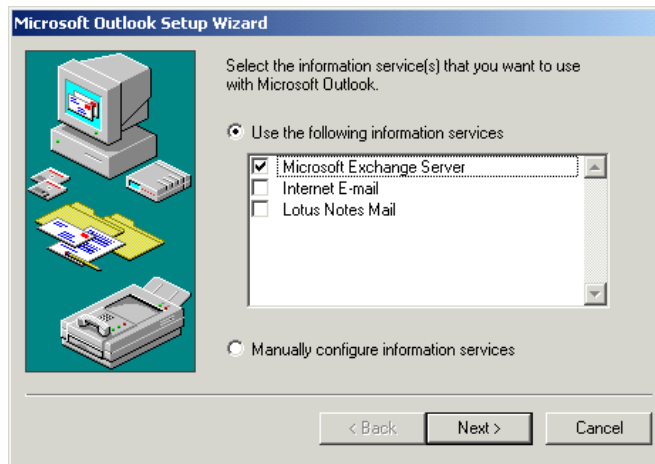2. Click **Add** in the dialog box. You will see a window similar to Figure 4-6 on page 44.

Figure 4-7   Microsoft Outlook Setup Wizard

3. Select **Microsoft Exchange** and click **Next**.

4. Enter the name of the Exchange server and the name of the user. Click **Next**.

5. Click **Yes** or **No** according to the type of computer you are installing.

6. Click **Finish**.

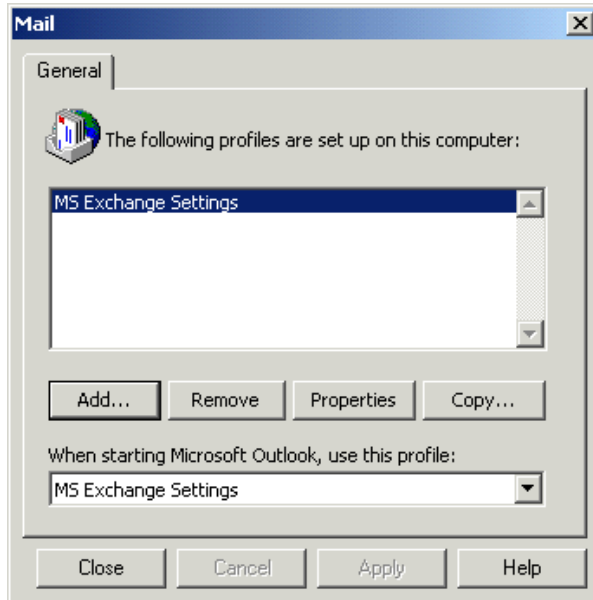7. The completed installation should look like that shown in Figure 4-8.

Figure 4-8   Setup complete

8. Click **Close**.

The installation is complete and you should now be able to send and receive messages between users on the Microsoft Exchange server.

Managing your Microsoft Exchange solution

This chapter provides information on what applications should be used to manage and administer Microsoft Exchange 2000.

These applications are listed as follows:

Microsoft Exchange manager

Included with Microsoft Exchange is the Microsoft Exchange manager. This is the basic administration application for setting up different tasks in Microsoft Exchange 2000.

MMC Console

The Microsoft Management Console does not by itself provide any management functionality but together with the Microsoft Exchange snap-in, you will get a complete graphical interface to all resources and components of an Microsoft Exchange installation. The MMC gives the administrator the possibility to delegate administrative tasks to other administrators or users, for example, allowing users to create users or public folders.

Active Directory

Users are managed through the Active Directory Users and Computers. When Microsoft Exchange is installed, the schema of Active Directory is extended with information for tasks such as creating e-mail addresses, moving mail-boxes and mail-enabling user groups.

Microsoft Operations Manager

The Microsoft Exchange 2000 Management Pack is part of the Microsoft Operations Manager Application Pack. It includes support for both clustered and non-clustered servers. This Management Pack is a module designed to detect every indication of a potential service interruption and to immediately send an alert to your Microsoft Exchange administrator if a service interruption occurs. Over 1,600 events and performance counters from Microsoft Exchange 2000 and related services can be monitored.

Install this module to contribute to a high-availability Microsoft Exchange 2000 deployment by monitoring select events and counters. This Management Pack also helps facilitate rapid

issue resolution by providing critical information and links to relevant Microsoft Knowledge Base articles. In addition, this Management Pack hosts an array of scripts designed to detect other potentially problematic conditions, monitor service and server availability, and track system usage to aid Microsoft Exchange administrators in trend analysis and capacity planning.

Using IBM Director to monitor Microsoft Exchange

One method to monitor the health of Microsoft Exchange is to use IBM Director to supervise the functions of the machine and the operating system such as memory, processor load, disk space on the Microsoft Exchange server to discover bottlenecks and minimize downtime. Also, by configuring the Director to monitor the different services that Microsoft Exchange starts, you can see whether certain processes stop responding and, if so, automatically restart them or send an alert.

IBM Director V4 includes support for your IBM @server BladeCenter server, enabling you to manage, deploy and monitor your system much more efficiently. IBM Director includes features such as self management and proactive and predictive tools, which provide higher levels of availability and reliability.The IBM Director software is made up of three components:

► IBM Director Server

► IBM Director Agent

► IBM Director Console

A different combination of these components is required for each of the hardware groups in your IBM Director environment. The management server must contain all three of these components. IBM Director Console must be installed on the management console or any system from which a system administrator will remotely access the management server. The IBM Director Agent must be installed on each system you intend to manage

Using Tivoli to monitor Microsoft Exchange

As with IBM Director, you can monitor processes that Microsoft Exchange 2000 uses and monitor the machine itself.

6

A brief introduction to Layer 4-7 Switching

This chapter provides a brief overview of how Layer 4-7 Switching works. The goals are to present an alternative to traditional network design and to provide enough background to understand how a Layer 2-7 switch can be beneficial to a network. While this chapter gives a brief overview of the features and benefits of Layer 4-7 Switching, it also mentions the Layer 2-7 GbE Switch Module or GbESM. For a more in-depth look at Layer 4-7 Switching, refer to the IBM @server *BladeCenter Layer 2-7 Network Switching* REDP3755.

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6.1 Layer 4-7 Switching

Most networks employ multiple servers without server load balancing. Each server usually specializes in providing one or two unique services. However, a server which provides applications or data that is in high demand can become overutilized. If this happens, network resources can become strained since when the server starts rejecting user requests, the users resubmit the requests for data.This often happens on networks where several other servers are sitting idle with resources available to service users.

Layer 4-7 Switching can harness these available idle servers without additional special equipment such as dedicated load-balancing servers. The term L4-7 is used because these switches are Layer 4 (TCP) aware. These switches use headers and data found at the OSI Layer 7 to accomplish many of their key features. Layer 2 and Layer 3 switches operate on and are aware of Layers 2-3 only.

Layer 4-7 Switching can be used to improve the reliability, scalability, and performance of a wide variety of applications and services. Layer 4-7 isolates the delivery of a service from a user's point of view from the physical reality of how that service is delivered. A Layer 4-7 switch is aware of the services provided by each server. Based on several load-balancing algorithms, a switch can direct user session traffic to an appropriate server. This means that in addition to using the available resources on otherwise idle servers, resources can be provisioned "on the fly". This lets network administrators add or subtract to the service delivery capability to react to server failures, meet demands during peak periods and scale back resources once demand is over. All of this happens with no knowledge or participation from the users of that service.

To take advantage of L4-7 Switching, services or applications advertise themselves using normal hostnames such as www.ibm.com® to the outside world. However, DNS resolution will resolve that hostname back to a Virtual IP Address(V_IP) assigned to an L4-7 switch. A service advertised by a V_IP is a Virtual Service. When application requests are sent from users to a V_IP, the L4-7 switch forwards the request to one or more real servers with real IP addresses.

The collection of real servers to which a request for a particular Virtual Service can be sent is called the Virtual Service Pool. By adding real servers to a Virtual Service Pool, the total application delivery throughput can be increased and application delivery times reduced. By moving real servers between Virtual Service Pools, shifting loads and demands between services can be dealt with without having to provision enough servers for each application to meet the peak demands (which would result in many unused servers in off-peak times). Figure 6-1 on page 51 shows how the Layer 2-7 GbE Switch Module installed in BladeCenter could be used to redeploy blades to service a few different applications according to demand.
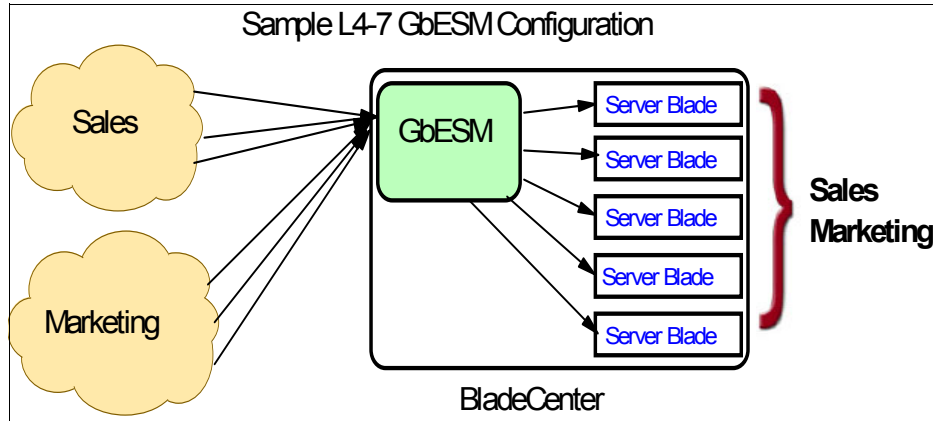
Figure 6-1   Sample L4-7 configuration

Figure 6-1 shows how services can be deployed using Layer 4-7 Switching. Using the GbESM in the BladeCenter, all server resources can be configured to support all applications, with the GbESM spreading the load among them at all times. As the loads on Sales and Marketing vary throughout the day or week or month, resources are automatically allocated in real time to meet the need.

In this scenario, to provide load balancing for any particular type of service, each server blade in the pool must have access to identical content, either directly (duplicated on each server) or through a back-end network (mounting the same file system or database server).

The GbESM acts as a front end to the servers, interpreting user session requests and distributing them among the available servers. Load balancing in the GbESM can be done in the following ways.

Virtual server-based load balancing

This is the traditional load balancing method. The switch is configured to act as a virtual server and is given a V_IP for each service it will distribute. Each virtual server is assigned a list of the IP addresses (or range of addresses) of the real servers in the pool where its services reside. When the user stations request connections to a service, they will communicate with a virtual server on the switch. When the switch receives the request, it binds the session to the IP address of the best available real server and remaps the fields in each frame from virtual addresses to real addresses. HTTP, IP, FTP, RTSP, IDS, and static session WAP are examples of some of the services that use virtual servers for load balancing.

Filter-based load balancing

A filter allows you to control the types of traffic permitted through the switch. Filters are configured to allow, deny, or redirect traffic according to the IP address, protocol, or Layer 4 port criteria. In filtered based load balancing, a filter is used to redirect traffic to a real server group. If the group is configured with more than one real server entry, redirected traffic is load balanced among the available real servers in the group. Firewalls, WAP with RADIUS snooping, IDS, and WAN links use redirection filters to load balance traffic.

Content-based load balancing

Content-based load balancing uses Layer 7 application data (such as URL, cookies, and Host Headers) to make intelligent load balancing decisions. URL-based load balancing, browser-smart load balancing, and cookie-based preferential load balancing are a few examples of content-based load balancing.

In the example in Figure 6-1 on page 51, virtual server load balancing is used. The switch has two different V_IPs configured which correspond to each of the services (Sales and Marketing). DNS responds with these V_IPs when these services are requested. The GbESM is also configured for the real IP addresses (R_IPs) which are owned by blades that support requests coming into each V_IP. In this case, all server blades can respond to requests for all services, so each V_IP is assigned the entire set of R_IPs.

A TCP connection consists of a series of packets sent back and forth from two destinations. If packets are misrouted and sent to the wrong destination, the session will slow down due to retransmissions and possibly fail if misrouting continues. Therefore, a Layer 4-7 switch needs to be TCP-aware in the sense that it needs to be able to:

► Identify the beginning of a new TCP connection
► Assign that connection to a real server
► Make sure that all ensuing packets related to that TCP connection continue to be sent to the same real server

This requirement is what puts the "Layer 4" in L4-7. The GbESM provides this capability. All arriving packets that are destined to a V_IP are inspected to determine whether they are associated with an existing TCP connection (in which case they are re-directed to the real server already assigned) or whether they are a request to set up a new TCP connection. If the received packet is a request to establish a new TCP connection (a TCP SYN packet), the GbESM will determine the best available server to which to re-direct that request and then do so. The "best available" consideration can be made based upon a number of factors that are beyond the scope of this chapter. It is enough to say that "best available" is based on a consideration of the present health and load of each of the candidate real servers.

This chapter introduces the concepts of Layer 4-7 Switching and how it benefits customers deploying applications on the IBM @server BladeCenter. For a more in-depth look at Layer 4-7 Switching, refer to IBM @server *BladeCenter Layer 2-7 Network Switching*, REDP3755. In addition to expanding on the concepts discussed here, this Redpaper is an excellent guide to deploying the GbESM in both Nortel and Cisco networking environments.

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this Redpaper.

IBM Redbooks

For information on ordering these publications, see "How to get IBM Redbooks" on page 54.

- ► *Installing and Managing Microsoft Exchange 2000 Clusters,* SG24-6265
- ► *IBM @server BladeCenter Systems Management,* REDP3582
- ► *The Cutting Edge: IBM @server BladeCenter,* REDP3581
- ► *Deploying Lotus Domino on IBM @server BladeCenter,* REDP3584
- ► *Deploying Citrix MetaFrame on IBM @server BladeCenter,* REDP3583
- ► *Deploying Apache on IBM @server BladeCenter*, REDP3588
- ► *Deploying Samba on IBM @server BladeCenter*, REDP3595
- ► IBM @server *BladeCenter Layer 2-7 Network Switching,* REDP3755

Other resources

These publications are also relevant as further information sources:

- ► *Microsoft Exchange 2000 server design and implementation for Woodgrove Bank - White Paper*
- ► *Microsoft Exchange 2000 Internals: Quick tuning guide*
- ► *Performance and tuning tip: Defragmenting Exchange 2000 server database*

Referenced Web sites

These Web sites are also relevant as further information sources:

- ► IBM sites

    http://www.pc.ibm.com/us/eserver/xseries/bladecenter_family.html (Main support)
- ► Microsoft Knowledge Base - Q264075

    http://www.microsoft.com/
- ► Microsoft Knowledge Base - Q262068

    http://www.microsoft.com/
- ► Microsoft Exchange 2000 SP3

    http://www.microsoft.com/exchange/downloads/2000/sp3/default.asp
- ► IBM ServerProven

    http://www.ibm.com/pc/compat/

- ► IBM @server BladeCenter - Power Module Upgrade Guidelines

  http://www-1.ibm.com/support/docview.wss?uid=psg1MIGR-53353

- ► IBM @server BladeCenter - Power Module Upgrade Guidelines

  ftp://ftp.software.ibm.com/pc/pccbbs/pc_servers_pdf/13n0308.pdf

How to get IBM Redbooks

You can order hardcopy Redbooks, as well as view, download, or search for Redbooks at the following Web site:

ibm.com/redbooks

You can also download additional materials (code samples or diskette/CD-ROM images) from that site.

IBM Redbooks collections

Redbooks are also available on CD-ROMs. Click the **CD-ROMs** button on the Redbooks Web site for information about all the CD-ROMs offered, as well as updates and formats.

Deploying Microsoft Exchange on IBM *e*server

Redpaper

Blazing new trails with IBM *e*server BladeCenter and Microsoft Exchange

Suggested configurations for Microsoft Exchange

Installing and configuring Microsoft Exchange on IBM *e*server BladeCenter

Considering how much data centers have grown with the proliferation of Wintel servers over recent years, it is important to note that rack space and floor space can be more efficiently taken up with the use of the BladeCenter HS20 servers. Attractive cost savings are also possible where a large number of rack installed servers are required, since the equivalent number of 1U servers would be much more expensive.

This IBM Redpaper describes how to set up and configure Microsoft Exchange 2000 on the BladeCenter and provides some pointers on what applications to use to manage the installation. It also describes the functionality of the BladeCenter in this type of environment.