IBM System Cluster 1350 features new System x and System p servers and the QS20 Cell Blade

At a glance

- The System Cluster 1350 is built on:
  - Rack-optimized and blade-based servers from IBM
  - Industry-leading interconnects
  - Robust cluster-management software
  - IBM service options: Three-year on-site limited warranty
- Easy-to-order, robust factory-built configurations are supported by IBM.

For ordering, contact:

Your IBM representative, an IBM Business Partner, or the Americas Call Centers at

800-IBM-CALL Reference: YE001

Overview

The latest enhancement to the Cluster 1350 portfolio combines IBM servers with industry-leading hardware, clustering software, and services. Hardware includes:

- System x3455 AMD Opteron 1 U rack server (7984) with up to two dual-core Opteron processors and PCI-Express or HTX slots
  - 1.8, 2.6, and 3.0 GHz 95W
  - 2.8 GHz 120 watt
- System x3755 Opteron 4 U rack server (8877) with up to four dual-core processors
  - 2.0, 2.2, 2.4, 2.6, and 2.8 GHz Rev F3 95 watt
  - 3.0 GHz Rev 3, 120 watt
  - Seven I/O slots: four PCI-Express, two PCI-X, and 1 HTX
- System x3550 Intel® 1 U rack server (7979) with up to two Quad-core Intel Xeon processors
  - 1.6 and 1.86 GHz, 1066 MHz front-side bus (FSB)
  - 1.6 and 1.8 GHz, 50 watt 1066 MHz FSB
- System x3550 Intel 1 U rack server (7979) with up to two Quad-core Intel Xeon processors
  - 2.0, 2.33, and 2.66 GHz Intel Xeon processors with 1333 MHz FSB
- System x3650 Intel 2 U rack server (7978) with up to two Quad-core Intel Xeon processors
  - 1.6 and 1.86 GHz, 1066 MHz FSB
- 1.6 and 1.86 GHz 50 watt LV, 1066 MHz
- 2.0, 2.33, and 2.66 GHz 1333 MHz FSB

- System x3655 Opteron rack server (7985) with up to two dual-core processors
  - 2.8 GHz (Rev F) 95 watt
  - 2.0, 2.33, and 2.66 GHz Intel Xeon processors with 1333 MHz FSB

- AMD Opteron LS21 for IBM BladeCenter® (7971) with up to two dual-core AMD Opteron processors for BCH
  - 2.8 GHz 95 watt
  - 2.6 GHz 68 watt

- AMD Opteron LS41 for IBM BladeCenter (7972) with up to four dual-core 2.80 GHz 95 watt AMD Opteron processors for BCH

- BladeCenter HS21-XM (7995) with up to two dual-core Intel Xeon Processors
  - 2.13 GHz, 1066 MHz FSB 35 watt
  - 2.33 GHz, 1333 MHz FSB 40 watt
  - 1.6 and 1.86 GHz, 1066 MHz FSB 65 watt
  - 1.6 and 1.86 GHz, 1066 MHz FSB 80 watt
  - 2.0, 2.33, and 2.66 GHz, 1333 MHz FSB 65 watt
  - 2.0, 2.33, and 3.0 GHz, 1333 MHz FSB 80 watt

- BladeCenter HS21 (8853) with up to two dual-core Intel Xeon Processors
  - 1.6 and 1.86GHz, LV 1066 MHz FSB 65 watt
  - 2.0, 2.33, and 2.66 GHz, 1333 MHz FSB 65 watt
  - 2.0, 2.33, and 3.0GHz, 1333 MHz FSB 80 watt
  - 2.66 GHz 1333 MHz FSB 120 watt (BCH only)

- Total Storage
  - DS3400 SAS/SATA Fiber Channel Host Interface (1726)
  - DS3200 SAS Host Interface (1726)
  - EXP 3000 (SAS/SATA) (1727)

- CISCO HPC-E-2960G 24-port Ethernet Switch Bundle (4670030)
- CISCO HPC-E-4948-10GE 48-port Ethernet Switch Bundle (4670031)
- CISCO SFS 7000 Family of DDR Infiniband Switches
  - Cisco SFS 7000D 24-port DDR IB Switch Bundle (4670 025)
  - Cisco SFS 7012/7024 Switch Fabric Module — w/Mgmt (4670 029)
  - Cisco SFS 7012D 144-port DDR IB Switch Bundle (4670 026)
  - Cisco SFS 7012P/7024D 12-port 4X DDR IB Line Card (4670 028)
  - Cisco SFS 7024D 288-port DDR IB Switch Bundle (4670 027)

- Voltaire 9024S 24-port Ext. Managed SDR IB Sw Bundle (4669 021)

- SMC 8024L2 24-port Gb Ethernet Switch Bundle (4668 016)
- Tyco 48-port 1Gb Ethernet Angled Patch Panel (0564 010)

1 You may be asked certain diagnostic questions before a technician is sent.
2 For information on IBM's Statement of Limited Warranty, contact your IBM representative or reseller. Copies are available upon request.
Key prerequisites

- Supported operating system
- Device drivers, as required

Planned availability date

August 3, 2007

Description

Computing applications or environments often have more requirements than an individual computer or server can address. These requirements may be best addressed by several computers Working Together®. A cluster is a group of interconnected individual computers, working together on a single problem, or consolidating workloads from multiple servers. Although these computers can operate individually, they are managed from a single point of control using cluster management software.

The Cluster 1350 offering, a high-performance scalable cluster, is built on Intel Xeon-based, IBM POWER™, IBM Cell, and AMD Opteron-based rack-optimized and blade-based servers.

The Cluster 1350 supports SUSE Linux™ Enterprise Server (SLES) 9 and 10 (64-bit) and Red Hat Enterprise Linux 4.0 (64-bit). All hardware components are configured and integrated into racks in the factory prior to shipment. You must obtain the prerequisite version of the Linux operating system and device drivers as specified by IBM.

- Either you or a qualified IBM Business Partner can install the required software.
- You can use the optional installation services to have IBM install the operating system, device drivers, and General Parallel File Systems™ (GPFS™) and Cluster Systems Management (CSM) software.

IBM provides a single point of contact for service of all the cluster hardware components and IBM software during the applicable warranty period. This warranty support does not include support for the Linux operating systems. Support for Linux is available through an optional IBM Support Line service.

Additional enhancements

For a listing of hardware components, refer to the Overview.

New OEM technology and hardware

- Cisco 4948-10GE 48-port switch
  
  The Cisco Catalyst 4948-10GE delivers wire-speed throughput with low latency for data-intensive applications using a 136-Gbps switching fabric with a 102-million packets per second (mpps) forwarding rate in hardware for Layer 2-4 traffic. High-performance switching is delivered regardless of the number of route entries or Layer 3 and 4 services enabled. Hardware-based Cisco Express Forwarding routing architecture allows for increased scalability and performance.

- Cisco 2960G 24-port switch
  
  The Cisco Catalyst 2960G offers entry-level, enterprise-class, fixed configuration switching, optimized for access layer deployments requiring intelligent services, such as Fast Ethernet and Gigabit Ethernet to the desktop configurations, and it is ideal for entry-level enterprise, mid-market and branch office environments, and compact switches for deployments outside the wiring closet.

- Cisco SFS 7000 Series IB Server Switches
  
  Cisco SFS 7000 Series InfiniBand Server Switches provide an ideal server interconnect for distributed application environments, such as high-performance computing. The Cisco SFS 7000 Series meets the performance demands of distributed applications by offering:
The unprecedented bandwidth of InfiniBand

- Superior latency characteristics
- Enterprise-class high availability and management features

The latest evolution of the Cisco SFS 7000 Series supports dual-speed InfiniBand 4X double data rate (DDR) and single data rate (SDR) interfaces that deliver 20Gbps and 10Gbps bandwidth respectively, per port. The low latency and high bandwidth offered by Cisco SFS 7000D InfiniBand Server Switches enable a new class of distributed applications and systems that deliver greater business agility and competitive advantage.

- The Cisco SFS 7000D (4670-025) provides:
  - 24 dual-speed InfiniBand 4X ports that can operate in either 20-Gbps double data rate (DDR) or 10-Gbps single data rate (SDR) mode for server and interswitch connectivity
  - Nonblocking 480-Gbps cross-sectional bandwidth with less than 200 nanoseconds of port-to-port latency
  - Supports DDR-to-SDR switching capability for investment protection and higher server densities
  - Command-line interface (CLI), Web, and Java™-based systems management options
  - Powered ports to enable flexible copper and optical interface configurations

- The Cisco SFS-7012D (4670-026) provides:
  - Up to 144 ports of nonblocking, InfiniBand 4X that can operate in either 20-Gbps double data rate (DDR) or 10-Gbps single data rate (SDR) mode for server and interswitch connectivity
  - Supports DDR-to-SDR switching capability for investment protection and higher server densities
  - Command-line interface (CLI), Web, and Java-based systems management options
  - Powered ports to enable flexible copper and optical interface configurations
  - Hot-swappable components, including online insertion and removal (OIR), redundant fans, and power supplies
  - InfiniBand 1.0a and 1.1 compliant

- The Cisco SFS-7024D (4670-027) provides:
  - Up to 288 ports of nonblocking, InfiniBand 4X that can operate in either 20-Gbps double data rate (DDR) or 10-Gbps single data rate (SDR) mode for server and interswitch connectivity
  - Supports DDR-to-SDR switching capability for investment protection and higher server densities
  - Command-line interface (CLI), Web, and Java-based systems management options
  - Powered ports to enable flexible copper and optical interface configurations
  - Hot-swappable components, including online insertion and removal (OIR), redundant fans, and power supplies
  - InfiniBand 1.0a and 1.1 compliant

- SMC8024L2 (4668-016) TigerSwitch 10/100/1000

  The SMC8024L2 is a feature-rich 10/100/1000BASE-T standalone managed switch. This gigabit edge switch is designed to handle high bandwidth applications and capable of reaching up to 48Gbps with a non-blocking single chip switching architecture. It provides cost-effective, gigabit Ethernet switching for bandwidth-intensive networks that require easy-to-use management functions for optimizing configuration and performance. The switch includes Quality of Service features (four queues, prioritization, weighted fair queuing) for smooth data transmission, critical security features (802.1x, IP filtering, ACLs), layer 2 management features (VLANs, Spanning Tree, IGMP snooping), and helpful debugging options (Cable diagnostics, statistics, RMON), which are configured through an easy to use Web interface or command line console interface. A flexible gigabit switch with 4 combo ports in a 1 U high box.

- Voltaire 9024S 24-Port Externally Managed SDR IB Switch Bundle (4669-021)

  This bundle features a high-performance, low latency, non-blocking switch for
high-performance clusters and grids, and is built for business-critical applications with redundant hot-swappable, power supplies and fans. It also serves as a fully, non-blocking 24-port solution for small-to-medium sized systems, or as a cost-effective building block for larger clusters and grids.

Software

- Linux Cluster Install Tool (LCIT) V5.1 (Intel and POWER™ p5)

Optional:

- GPFS for Linux Multiplatform V3.1
- GPFS for Linux on POWER V3.1
- CSM for Linux Multiplatform V1.6
- CSM for Linux on POWER V1.6
- Red Hat Enterprise Linux 4.0 (64-bit) (drop in box available)
- SUSE 9 (64-bit) (drop in box available)
- SUSE 10 (64-bit) (drop in box available)

These components are combined with a terminal server, a monitor, cabling, power supplies, power distribution units, racks, and other elements. When you obtain the prerequisite versions of the Linux operating system and device drivers, the 1350 offers an integrated cluster solution.

Supported operating systems include Red Hat Enterprise Linux 4, and SLES 9 (64-bit) for Opteron, POWER, and Intel servers. Additional Linux operating systems may be available via special bid.

IBM offers optional fee-based services to install all supported Linux distributions, required device drivers, GPFS, and CSM onto the Cluster 1350. Also, IBM offers optional Support Line for Linux Clusters for an enhanced level of integration and maintenance support.

IBM System x™ and BladeCenter servers running Windows™ Compute Cluster Server (CCS) 2003 enable a High-Performance Computing (HPC) platform that is simple to deploy and operate and provides the technology to scale as workloads demand. IBM offers you the choice of processors from AMD and Intel along with architecture options to meet the needs of your business. For more details, visit

http://www-03.ibm.com/systems/x/solutions/os/windows/clusters.html

Linux Cluster Installation Tool (LCIT)

The System Cluster 1350 offering includes LCIT, an application used in the deployment and management of Linux clusters. Additionally, LCIT is used during the life of the cluster for ongoing customer and diagnostic tasks.

Customer utility

LCIT can assist in ongoing maintenance and administrative tasks. The systems administrator can realize significant time savings as well as efficiencies in setup and management.

Diagnostic tool

LCIT can verify hardware. Personnel and administrators can diagnose issues at a cluster level instead of the traditional node-level diagnostics.

For example, during site installation, service personnel can validate the cluster by comparing the configuration files generated during the manufacturing phase. During the operational phase, the system administrator can take a quick snapshot of the cluster configuration and analyze the topology for future configurations.

LCIT features

- Immediate node and RSA verification
- Complementary function to CSM and xCAT
Cluster inventory management functions
Verification of network connections
Remote power on/off and chassis identification
Automatic discovery of nodes and MAC addresses
BMC, ISMP, BladeCenter management module support
Shorter repair time
Higher level of fix confidence
Warranty validation with use of configuration files generated by IBM at time of manufacture
Potentially reduced downtime

All System Cluster 1350 orders are shipped with an LCIT CD. IBM service representatives and other field personnel can order a CD (ZK3T-9168) via the PUBORDER process.

Cluster racks

42 U Enterprise Rack (1410-4RX)
This specially designed 42 U rack is one of two racks that can be used in Cluster 1350 configurations.

This rack features base stabilizers to enable shipment from the factory with Cluster 1350 components, such as power units, nodes, switches, cables, and consoles mounted in position and with intrarack cabling installed according to applicable Cluster 1350 racking rules.

The Enterprise Rack is designated as IBM-installed for easy on-site installation. This designation, coupled with the factory integration services and optional on-site installation and verification of software, results in a ready-to-run cluster system. The cost of the hardware installation is included in the price of the rack. The cost of software installation by IBM or a qualified IBM Business Partner is not included.

25 U Standard Rack (1410-2RX)
This 25 U rack addresses the requirements of smaller departmental cluster configurations.

It is shipped from the factory with Cluster 1350 components, such as power units, nodes, switches, cables, and consoles mounted in position and with intrarack cabling installed according to applicable Cluster 1350 racking rules.

The 1410-2RX rack is designated as IBM-installed for easy on-site installation. This designation, coupled with the factory integration services and optional on-site installation and verification of software, results in a ready-to-run cluster system. The cost of the hardware installation is included in the price of the rack. The cost of software installation by IBM or a qualified IBM Business Partner is not included.

Power and cooling advantages
The IBM energy management portfolio tackles the challenge to increase power and thermal efficiency and help reduce costs on many levels. First, inside the system, all IBM System x and BladeCenter servers start with Calibrated Vectored Cooling technology. This feature allows dual paths of air to each component, improving uptime and longevity, and reducing wasteful air movement and heat generation. Coupled with more-energy-efficient power supplies, IBM BladeCenter and IBM System x servers can generate less heat in the critical ac-to-dc power conversion than many of the competition's alternative systems.

For clusters within a rack, IBM System x servers are designed to work at full density in a well-planned rack solution. They are also designed to operate at extended temperature ranges to keep the system up and running, even in extreme temperature and failure conditions. IBM rack-based cluster solutions are engineered to optimize air flow and prevent undesirable recirculation within the rack, so servers can run in optimal temperature conditions.

IBM blades-based clusters help enable you to pack more processors into the same power and cooling envelope as well as better utilize floor space and "right size" data-center design. With IBM BladeCenter, less power per processor means more processing capacity per kilowatt. The BladeCenter runs cooler to deliver greater reliability.

For dense data center environments, IBM provides smart rack-level heat solutions like the super-efficient IBM Rear Door Heat eXchanger. The water-cooled door is designed to dissipate
heat generated from the back of the rack to reduce the overall room temperature. With this combination of benefits at the server and data center level, IBM systems can provide strong power and cooling benefits to Cluster 1350 customers.

**IBM Rear Door Heat eXchanger (32R0712)**

The Rear Door Heat eXchanger for IBM Enterprise Racks helps keep your growing data center at a safer temperature without adding air conditioning units. This unobtrusive solution brings more cooling capacity to areas where the heat is greatest, around racks of servers with multiple, more powerful processors.

Design simplicity delivers chilling results. The size and appearance of the Rear Door Heat eXchanger are similar to those of a standard rack acoustical 66-cm (26-inches) wide door and it adds a mere 10 cm (4-inches) to the depth of a rack, yet a single door may remove up to 50,000 Btu of heat (or approximately 15 kW). The door is designed to attach to a 42 U-high IBM Enterprise Rack and swings wide to provide unrestricted access to electrical components. Sealed coils, filled with above-dewpoint, chilled water, passively remove a significant amount of the heat generated in a fully populated rack. This cooling efficiency may help eliminate the need for additional ac power and the associated construction cost.

**Cluster Enablement Consulting**

Cluster Enablement Consulting is available at a flat rate price per day that includes resource, travel, and expenses for predefined engagements.

The fee covers expenses for cluster enablement engagements of the following type:

- Staging and integration of cluster hardware and software components at the manufacture site or another location
- Cluster integration into an existing cluster or cluster upgrades
- Customer acceptance testing
- Software installation and integration, including operating system, management software, file system, compilers, or customer applications
- Instructor-led on-site training
- Project management

**Factory integration — Product customization services**

The Cluster 1350 features several hardware validation and test services collectively referred to as product customization services. These services include the integration of hardware and software on AMD, eServer®, and xSeries® servers in state-of-the-art manufacturing facilities. You can deploy systems in almost any IT environment. This means your IT resources can be better used elsewhere.

This statement is especially true for Linux cluster solutions. Given the complexity of a Linux cluster, you want the confidence that the solution arrives properly configured and ready to integrate in your datacenter. These options are integrated into the servers. xSeries also offers a Blade Integration Service, which, for a flat fee, includes installation of:

- Hardware options on the blades
- Options in the BladeCenter chassis
- Blades in the chassis

IBM can install the chassis in an Enterprise Rack and have it shipped to you. Performing the same services on-site would take hours or even days.

In addition, Cluster 1350 manufacturing offers specific services for the Cluster 1350 called Cluster Systems Validation and Test to confirm that all system settings are enabled and tested to enable smooth on-site deployment:

- Enable BIOS management
- Configure BIOS on each node
- Provide ASM and RSA setup
- Create disk partitioning
Configure (network, firewall, language, and time zone)
Configure services
Set up storage
Install terminal server
Set up DNS
Test, debug, and confirm that cluster is ready for operation

IBM has the skills and technology to offer this type of service. The Cluster 1350 manufacturing product customization portfolio offers a tremendous value, especially for customers interested in complex offerings such as Linux cluster.

Services
Installation and deployment services
The Cluster 1350 solutions deployed in the 1410-4RX and 1410-2RX rack enclosures include an on-site hardware installation service:

- Basic installation planning services
- On-site installation of hardware

Optional on-site software installation and customization services include Linux and CSM for Linux customization and skills transfer for system administration personnel.

Additional optional on-site software installation and customization services include:

- Linux and CSM for Linux customization and skills transfer for system administration personnel
- Installation and configuration of GPFS for Linux

Growth possibilities
You can extend the capabilities of the Cluster 1350 by adding optional storage and compute nodes. Support is available for the IBM Cell Blade and System x and System p™ servers.

DS4700 storage can be optionally integrated in the offering.

Use backup shared disk servers to enable applications to continue to operate without interruption in the event of server or adapter failure.

Support of Fibre Channel, SCSI, and SATA disks is available for up to 64 nodes. SAN support is available by special bid.

The Cluster 1350 scales up to 1,024 nodes. Larger scale systems are available from IBM by special bid.

Section 508 of the U.S. Rehabilitation Act
"IBM makes no representation about the Section 508 status of the third party electronic and information technology product in this offering. Contact the vendor for specific, current information on the Section 508 status of this product."

Product positioning
The Cluster 1350 is positioned within the IBM System x family of offerings as the platform of choice for high-value and high-performance scalable Linux cluster solutions.

Reference information
Refer to:

- Services Announcement 602-023, dated September 24, 2002 (IBM Product Customization Services)
• Software Announcement 206-095, dated April 25, 2006 (GPFS for Linux Multiplatform v3.1)
• Hardware Announcement 107-170, dated April 10, 2007 (Total Storage DS3xxx)
• Hardware Announcement 107-168, dated April 10, 2007 (System x3755)
• Hardware Announcement 107-177, dated April 10, 2007 (System x3455)
• Hardware Announcement 106-824, dated November 14, 2006 (BladeCenter HS21)
• Hardware Announcement 107-027, dated January 16, 2007 (BladeCenter HS21)
• Hardware Announcement 107-164, dated April 3, 2007 (BladeCenter HS21)
• Hardware Announcement 106-117, dated February 9, 2006 (BladeCenter Chassis)
• Hardware Announcement 106-161, dated February 9, 2006 (BladeCenter H Chassis)
• Hardware Announcement 106-838, dated November 14, 2006 (System x3550)
• Hardware Announcement 107-159, dated April 3, 2007 (System x3550)
• Hardware Announcement 107-132, dated April 10, 2007 (System x3655)
• Hardware Announcement 106-470, dated June 27, 2006 (BladeCenter HS21)
• Hardware Announcement 106-837, dated November 14, 2006 (System x3650)
• Hardware Announcement 107-030, dated January 16, 2007 (System x3650)
• Hardware Announcement 107-157, dated April 3, 2007 (System x3650)
• Hardware Announcement 105-257, dated July 26, 2005 (2005-B16 SAN Switch)
• Hardware Announcement 107-103, dated February 13, 2007 (AMD Opteron LS21 and LS41 for IBM BladeCenter)
• Hardware Announcement 107-156, dated April 3, 2007 (AMD Opteron LS21 and LS41 for IBM BladeCenter)

Business Partner information

If you are a Direct Reseller - System Reseller acquiring products from IBM, you may link directly to Business Partner information for this announcement. A PartnerWorld ID and password are required (use IBM ID).

BP Attachment for Announcement Letter 107-353


Trademarks

POWER5, General Parallel File Systems, GPFS, POWER, System x, and System p are trademarks of International Business Machines Corporation in the United States or other countries or both.

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Windows is a trademark of Microsoft Corporation.

Java is a trademark of Sun Microsystems, Inc.

Linux is a trademark of Linus Torvalds in the United States, other countries or both.

Other company, product, and service names may be trademarks or service marks of others.

IBM software that runs on the System Cluster 1350

CSM for Linux™ Multiplatform and CSM for Linux on POWER™: CSM software is a parallel systems-management solution for servers or nodes that run on the Linux operating system. CSM for Linux is an optional, field-installable product. It offers robust centralized management for
Linux clusters from a single point of control and includes the following features:

- Installs and updates software on nodes
- Runs distributed commands
- Synchronizes files across the cluster
- Monitors events and generates automated responses
- Controls hardware remotely (power on, power off, reset)
- Controls and monitors groups of nodes
- Performs diagnostics and automatic security configuration

Enhanced cluster tools augment CSM and offer additional functions. These tools are provided as-is and free of charge; optional support is available with Support Line for Linux Clusters. For more information, visit


CSM benefits the system administrator with:

- Greater manageability and reliability for the cluster
- Simplified management tasks
- Potential lower cost of ownership

Automated installation and configuration of security and predefined node groups enable quick cluster setup. Centralized control of configuration files decreases the time required to make configuration changes and upgrades. The highly reliable infrastructure and event monitoring enable automated error detection, leading to fewer problems, rapid resolution, and rapid recovery. This improves the time the cluster is available for productive use.

**GPFS™ for Linux Multiplatform and GPFS for Linux on POWER:** GPFS for Linux is a scalable, high-performance, parallel file system designed for Linux clusters. GPFS can support hundreds of nodes and over 1000 disks comprising hundreds of terabytes of storage. Because most UNIX® file systems are designed for a single-server environment, adding more file servers typically does not improve the file access performance. GPFS is designed to deliver higher performance, scalability, and failure recovery by accessing multiple file system nodes directly (no single file server) and in parallel. This allows for the expansion of file system throughput and capacity, as service demands increase, and the aggregate bandwidth requirements surpass the capacity of existing industry file systems.

GPFS allows parallel applications simultaneous access to a set of files (even a single file) from any node that has the GPFS file system mounted, while providing a high level of control over all file system operations. GPFS uses sophisticated lock management which prevents collisions/conflicts and ensures data consistency. GPFS increases aggregate bandwidth of the file system by spreading reads and writes across multiple disks. You can export GPFS data using NFS V3 and export the same data from multiple nodes.

GPFS provides high-performance I/O by "striping" blocks of data from individual files across multiple disks (on multiple storage devices) and reading/writing these blocks in parallel. In addition, GPFS can read or write large block of data in a single I/O operation, thereby minimizing overhead. You can add or delete disks while the file system is mounted. You can also configure GPFS with multiple copies of metadata (the file system data that describes the user data), allowing continued operation should the paths to a disk or the disk itself malfunction.

GPFS creates separate logs for each node. These logs record the allocation and modification of metadata, aiding in fast recovery and restoration of data consistency in the event of node failure. GPFS also enables automated recovery from events that would normally interrupt data availability. With automatic recovery of GPFS file systems, applications and users can survive component failures without interruption.

GPFS for Linux is an optional, field-installable product that supports up to a 200 TB file system and clusters with 512 nodes. It delivers enhanced performance for larger data objects with benefits for large aggregates of smaller objects. Serial applications can be dynamically assigned to processors based on availability, but the scheduling is not a GPFS function. They can obtain high-performance access to data from wherever they run.
You can add or delete disks while the file system is mounted. In addition, you can configure
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For more information on GPFS, visit the GPFS Web page at


GPFS frequently asked questions at


GPFS documentation at


Software: The following IBM software is provided through the IBM Passport Advantage®
program and shipped directly to you. For information about Passport Advantage, visit

http://www.ibm.com/software/passportadvantage

For information about Passport Advantage enrollment, visit

http://www.Lotus.com/services/passport.nsf/WebDocs/Passport_Advantage_Home

For information about Passport Advantage by country, visit


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<th>Software description</th>
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<td>IBM Cluster Systems Management for Linux 10 Value Units License + SWMA 12 months</td>
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<tr>
<td>IBM Cluster Systems Management for Linux 10 Value Units Annual SWM Maintenance Renewal</td>
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<td>IBM Cluster Systems Management for Linux 10 Value Units SWM Reinstatement 12 months</td>
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<td>IBM CSM HA MS Optional Feature for Linux Multiplatform V1.6 EN Media Pack</td>
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IBM Cluster Systems Management for Linux Multiplatform V1.6 EN Media Pack

GPFS base Media Package for Linux Multiplatform V3.1 BH02ZIE

GPFS for Linux Multiplatforms + Processor LIC+SW MAINT 12 MO D53G2LL

GPFS for Linux Multiplatforms + Processor SW MAINT REV E016TLL

GPFS for Linux Multiplatforms + Processor SW MAINT REI NSTATE 12 MO D53H0LL

Service is required for both GPFS and CSM and is available from


For BladeCenter® JS21 servers, CSM and GPFS are not available via Passport Advantage. They must be ordered through the AAS/CHW fulfillment system. The licensed products to be ordered are:

- CSM for Linux on POWER (5765-G16)
- GPFS for Linux on POWER (5765-G67)

Product customization services

The following product customization services are included with Cluster 1350.

For information, refer to the following and contact your IBM representative.

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<tr>
<th>Description</th>
<th>Part number</th>
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<tr>
<td>Rack Assembly -- 25U Rack</td>
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<td>Rack Installation of 1U Component</td>
<td>25R4168</td>
</tr>
<tr>
<td>Rack Installation of greater than 1U Component</td>
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<tr>
<td>BladeCenter Chassis Configuration</td>
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<tr>
<td>Cluster Hardware and Fabric Verification -- 42U Rack</td>
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<tr>
<td>Cluster Enablement Consulting -- 1 Day</td>
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</table>

Applicable quantities are configuration-dependent and will be determined in the configuration process.

Education support

Online training for Cluster 1350 is provided at


Publications

The Preinstallation Planning and Installation and Service Manual are available from


Services

Global Technology Services

IBM services include business consulting, outsourcing, hosting services, applications, and other
technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an On Demand Business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For details on available services, contact your IBM representative or visit

http://www.ibm.com/services/

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit

http://www.ibm.com/services/continuity

For details on education offerings related to specific products, visit


Select your country, and then select the product as the category.

**xSeries® & BladeCenter support services**

**Recommended core technical support:** When you buy IBM xSeries technology, include the support services you need to help keep both your hardware and software working for you, day after day, at peak performance. It's your first step toward helping to protect your investment and sustain high levels of system availability. We offer service-level and response-time options to fit your business needs, and we'll help you get started with a core support package that includes:

- **Continuous system monitoring**
  Exclusive electronic monitoring that helps speed up problem-solving with automated, early detection of potential problems and system errors.

- **Hardware maintenance**
  World-class remote and on-site hardware problem determination and repair services.

- **Software technical support**
  Unlimited help line calls for fast, accurate answers to your questions during installation and throughout ongoing operations.

For more information, refer to

http://www.ibm.com/servers/eserver/xseries/services.html

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**Technical information**

**Specified operating environment**

**Physical specifications**

- Primary or expansion rack (1410-4RX):
  - Width: 647.7 mm (25.5 in)
  - Depth: 1099.8 mm (43.3 in)
  - Height: 2019.2 mm (79.5 in)
  - Weight:
    -- Empty: 333.8 kg (736 lb)
    -- Maximum configuration: 1002.9 kg (2,211 lb)
Primary or expansion rack (1410-2RX):
- Width: 605.0 mm (23.8 in)
- Depth: 1000.0 mm (39.4 in)
- Height: 1344.0 mm (49.0 in)
- Weight:
  - Empty: 82.0 kg (180 lb)
  - Maximum configuration: 466.0 kg (1,025 lb)

Standards

**EMC compliance strategy:** Typical configurations of the Linux cluster will be tested under the Class A requirement plus jurisdictional regulations for offer of sale in all target markets identified by marketing.

- Title 47 CFR Part 15 Subpart B: U.S.
- EN 55022; EN 55024: Europe
- AS/NZS CISPR 22: Australia/New Zealand
- VCCI: Japan
- ICES-003: Canada
- GB9254-1998: China
- MIC Notice No. 2000-79 & MIC Notice No. 200-80: Korea
- CISPR 22
- CISPR 24
- CNS 13438: Taiwan
- GOST: Russia

**Product safety regulatory compliance strategy:** The Cluster 1350 will meet the jurisdictional regulations for offer of sale in all traditional and targeted markets.

- U.S.: Certification to UL 60950, Third Edition
- Canada: Certification to CSA C22.2 No. 60950
- U.K., Germany, France, Australia, New Zealand, Japan, Italy, Spain, Switzerland, Austria, Netherlands, Sweden, Norway, Belgium and Korea: Certification to IEC 60950 3rd Edition: 1999
- Eastern Europe: CB scheme report and certification to IEC 60950 3rd Edition: 1999
- Russia and the CIS: GOST certification (delivered by IBM Russia based on documentation provided by Rochester)

Linux will also meet the NEC and regional code requirements identified in N-B2-4700-037, Power Systems National Requirements.

Operating environment

- Temperature: 16° to 32°C (60.8° to 89.6°F)
- Relative humidity: 8% to 80%
- Maximum wet bulb: 23°C
- Sound power: 7.5 bels LwAd (operating)*, Category 1A (with four BladeCenters and an acoustics module) (for more configurations, refer to BladeCenter Planning and Installation Guide)

* If Option M/T 4671-001 is selected, sound power is 8.3 bels.
• Sound pressure: No operator position
• Maximum altitude: 2133.6 m (7000 ft)

**Power requirements (per rack)**

• Operating voltage: 200 to 240 V at 50/60 Hz
• Electrical output: 36 kW (maximum)
• Power source loading: 22 kVA (maximum)
• Thermal output: 20.9 kJ/s (71,400 Btu/hr) (maximum configuration)

**Hardware requirements:** A Cluster 1350 offering consists of the following:

• 1410-4RX or 1410-2RX, rack assembly with power distribution units (PDUs)
• System x3655, System x3650, or System p5™ management node
• At least two compute nodes using IBM System x™ (3550, 3455, HS21, LS21, JS21, x3650, x3655, x3755, LS41, HS21-XM), System p™ 505, or IBM QS20 Cell Blade
• Rack-mounted monitor
• Keyboard
• KVM switch
• Terminal server (not applicable for BladeCenter)
• Ethernet VLAN

**Software requirements**

• System x3755:
  – SLES 9 (64-bit)
  – SLES 10 (64-bit)
  – Red Hat Enterprise Linux 4 (AS, WS 64-bit)
• IBM LS21, LS41 blades:
  – SLES 9 (64-bit)
  – SLES 10 (64-bit)
  – Red Hat Enterprise Linux 4 (AS, WS 64-bit)
• System x3550, x3650, HS21, and HS21-XM:
  – SLES 9 (64-bit)
  – SLES 10 (64-bit)
  – Red Hat Enterprise Linux 4 (AS, WS 64-bit)
• BladeCenter QS20 blades:
  – Fedora Core5 (Linux operating system)
Other Linux distributions may be supported by special bid.

For detailed information on server hardware and operating system compatibility, visit


• CSM for Linux V1.6
• GPFS for Linux V3.1

**Note:** Service is required for both GPFS and CSM and is available from
Compatibility: All components of the Cluster 1350 are compatible when purchased as a supported Cluster 1350 solution.

Note: If the BladeCenter JS21 or System p5 is included in your Cluster 1350, you need to order a different CSM for Linux and GPFS for Linux product. To support BladeCenter JS21 or System p5, you can order CSM for Linux on POWER (5765-G16) and GPFS for Linux on POWER (5765-G67) from the AAS/CHW fulfillment system.

Limitations: Operating system and CSM

- CSM is required when an System x OpenPower® node is part of the cluster.
- Different distributions of Linux cannot be mixed in a cluster.
- Some components supported on the Cluster 1350 are supported only by CSM on particular Linux distributions. Refer to the CSM material for a matrix of components and supported distributions.

Hardware

- Cluster 1350 Options are only supported when deployed in a Cluster 1350 solution. They will not be supported when installed outside a 1410 Rack.
- Use of the 1410-4RX or 1410-2RX Linux Cluster Rack outside of the Cluster 1350 offering is prohibited.
- When the heat exchange door is part of the 1350 Cluster Solution, IBM will attach the door to the rack. You are responsible for filling the heat exchange door with fluid and hooking up all plumbing connections. You are also responsible for draining the heat exchange door and disconnecting all plumbing connections prior to an IBM servicer coming on-site for replacement of the door assembly. After the servicer has replaced the heat exchange door assembly on the rack, it is your responsibility to refill the heat exchange door and reconnect all plumbing connections. All preventative maintenance on the rack is the sole responsibility of the client.

Planning information

Customer responsibilities: Installation of hardware components is provided by IBM on the 1410 machine type. Customers are responsible for preparing their site for installation. These responsibilities are specified in the Preinstallation Planning Guide.

http://publib.boulder.ibm.com/cluster/

You must obtain the prerequisite version of the Linux operating system and device drivers as specified by IBM. You can install the required Linux operating system, device drivers, and GPFS and CSM software, use optional Linux cluster installation services to have IBM install it, or have a qualified IBM Business Partner perform the service.

You are expected to review the Installation Planning Guide before the delivery of your Cluster 1350. Customer's responsibilities must be verified as complete before scheduling an IBM installer to come on-site.

Visit

http://publib.boulder.ibm.com/cluster/

Cable orders: All cables are supplied with the Cluster 1350. Depending on the applications, the cables may be fully installed, partially installed (plugged at one end and packaged for shipping), or included as part of a shipment group.

Installability: Setup and installation of the Cluster 1350 hardware are provided by IBM on the 1410 machine type.

When the heat exchange door is part of the Cluster 1350 Solution, IBM will only attach the door to the rack.
Packaging
System Cluster 1350 Shipping Contents:
- CD/Pubs Pack
- Cluster 1350 information
- IBM International License Agreement for Non-Warranted Programs
- IBM Statement of Limited Warranty
- IBM Warranty Information Sheet for IBM Cluster 1350
- IBM International Program License Agreement
- LCIT Setup
- Poly bag -- generic
- Installation Information Flyer
- Safety manual

Supplies: None

Security, auditability, and control
This offering uses the security and auditability features from standard IBM offerings and supported Linux distributions.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

Terms and conditions

IBM credit corporation financing: Yes

System Cluster 1350: To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM.

In the United States, call 800-IBM-SERV (426-7378), or write to:

Warranty Information
P.O. Box 12195
Research Triangle Park, NC 27709
Attn: Dept. JDJA/B203

Warranty period
- System hardware — Three years
- IBM machine types supported as part of the Cluster 1350 solution carry their own warranty terms.
- Optional features — One year

Optional IBM features initially installed in an IBM system carry the same warranty period as the system. If installed after the initial system installation, they carry the balance of the system warranty or the optional feature warranty, whichever is greater.

Warranty service: If required, IBM provides repair or exchange service depending on the type of warranty service specified below for the machine. IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, and additional charges may apply outside IBM’s normal service area. Contact your local IBM representative or your reseller for country and location specific information.

CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive) service and on-site service for other selected parts.
CRU service: IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request. CRUs are designated as being either a Tier 1 or a Tier 2 CRU. Installation of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU, at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service specified below, on-site service.

Based upon availability, CRUs will be shipped for next business day (NBD) delivery. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with the replacement CRU, and you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of the replacement.

The following parts have been designated as Tier 1 CRUs:

- Cisco SFS 7012/7024 Fan Tray
- Cisco SFS 7012/7024 350w Power Supply
- Cisco SFS 7012/7024 Power Supply Blank Panel
- Cisco SFS 7012D/7024D DDR Switch Fabric Module — w/Mgmt
- Cisco SFS 7012/7024 Switch Fabric Module Blank Panel
- Cisco SFS 7012/7024 Line Card Blank Panel
- Cisco SFS 7012/7024 Fan Tray
- Cisco SFS 7012/7024 350w Power Supply
- Cisco SFS 7012/7024 Power Supply Blank Panel
- Cisco SFS 7012D/7024D DDR Switch Fabric Module — w/Mgmt
- Cisco SFS 7012/7024 Switch Fabric Module Blank Panel
- Cisco SFS 7012/7024 Line Card Blank Panel
- Cisco SFS 7000P Power Supply/Cooling Unit
- Cisco SFS 125v 10a Line Cord — NA
- Cisco SFS 7012P/7024D 12-port 4X DDR IB Line Card
- Cisco SFS 7012D/7024D DDR Switch Fabric Module — w/Mgmt
- Cisco SFS 7012/7024 350w Power Supply
- Fan Unit (FN-24)
- Power Supply Unit (PS-24)

On-site service: IBM on-site repair (IOR), 9 hours per day, Monday through Friday excluding holidays, NBD response. IBM will repair the failing machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose. On-site service is not available in all countries, and some countries have kilometer or mileage limitations from an IBM service center. In those locations where on-site service is not available, the normal in-county service delivery is used.

Call IBM at 800-IBM-SERV (426-7378), to assist with problem isolation for hardware to determine if warranty service is required. Telephone support may be subject to additional charges, even during the limited warranty period.

International Warranty Service (IWS): International Warranty Service (IWS) is available during the warranty period to customers who travel or relocate to countries where their computer is sold and serviced by IBM or IBM resellers authorized to perform warranty service. Eligible IBM computers are identified by their four-digit machine type.

You can obtain IWS through the method of service, such as CRU, depot, carry-in, or on-site, provided in the servicing country. Service methods and procedures vary by country, and some service or parts may not be available in all countries. Service centers in certain countries may
not be able to service all models of a particular machine type. In addition, some countries may have fees and restrictions that apply at the time of service.

To determine the eligibility of your computer and to view a list of countries where service is available, visit


For more information on IWS, refer to Services Announcement 601-034, dated September 25, 2001.

Note: Due to the earth's magnetic field, cathode ray tube (CRT) monitors are manufactured to work in northern, southern, and equatorial regions of the earth, and may not produce a satisfactory image when moved between them. Any required adjustment (if possible) is not covered under IWS and may be subject to a chargeable action. The magnetic field does not affect Flat Panel LCD Monitors and ThinkPad® LCD displays.

Licensing: Programs included with this product are licensed under the terms and conditions of the License Agreements that are shipped with the system.

Maintenance services

ServicePac®, ServiceSuite™, and ServiceElect: ServicePac, ServiceSuite, and ServiceElect provide hardware warranty service upgrades, maintenance, and selected support services in one agreement.

Warranty service upgrade: During the warranty period, warranty service upgrade provides an enhanced level of on-site service for an additional charge. A warranty service upgrade must be purchased during the warranty period and is for a fixed term (duration). It is not refundable or transferable and may not be prorated. If required, IBM will provide the warranty service upgrade enhanced level of on-site service acquired by the customer. Service levels are response time objectives and are not guaranteed.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability.

CRUs will be provided as part of the machine's standard warranty CRU service except that you may install a Tier 1 CRU yourself or request IBM installation, at no additional charge, under one of the on-site service levels specified below.

IBM will repair the failing machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

The following warranty service upgrade options are available:

• On-site service — IOR, 9 hours per day, Monday through Friday excluding holidays, 4 hour average response.
• On-site service — IOR, 24 hours per day, 7 days a week, 4 hour average response.
• On-site service — IOR, 24 hours per day, 7 days a week, 2 hour average response.

Maintenance service: If required, IBM provides repair or exchange service depending on the type of maintenance service specified below for the machine. IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed.

CRU service: If your problem can be resolved with a CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive), IBM will ship the CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request.

IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with
IBM United States Announcement 107-353

the replacement CRU, and you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of the replacement.

**On-site service:** IOR, IBM will repair the failing machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

The following on-site service options are available:

- On-site service — IOR, 9 hours per day, Monday through Friday excluding holidays, NBD response.
- On-site service — IOR, 9 hours per day, Monday through Friday excluding holidays, 4 hour average response.
- On-site service — IOR, 24 hours per day, 7 days a week, 4 hour average response.
- On-site service — IOR, 24 hours per day, 7 days a week, 2 hour average response.

**Maintenance service (ICA)**

Maintenance services are available for ICA legacy contracts. The preferred go-to-market offerings are ServiceElect. However, ICA legacy contracts will still be available for current customers until they are withdrawn.

**Alternative service (warranty service upgrades):** During the warranty period, warranty service upgrade provides an enhanced level of on-site service for an additional charge. A warranty service upgrade must be purchased during the warranty period and is for a fixed term (duration). It is not refundable or transferable and may not be prorated. If required, IBM will provide the warranty service upgrade enhanced level of on-site service acquired by the customer. Service levels are response time objectives and are not guaranteed.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability.

CRUs will be provided as part of the machine's standard warranty CRU service except that you may install a Tier 1 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service specified below, on-site service.

IBM will repair the failing machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

The following warranty service upgrade option is available:

- On-site service — IOR, 24 hours per day, 7 days a week, 4 hour average response.

**Maintenance service:** If required, IBM provides repair or exchange service depending on the type of maintenance service specified below for the machine. IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. You must follow the problem determination and resolution procedures that IBM specifies. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed.

**CRU service:** If your problem can be resolved with a CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive), IBM will ship the CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request.

IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with the replacement CRU, and you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of the replacement.

**On-site service:** IOR, IBM will repair the failing machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well lit, and suitable for the purpose.

The following on-site service options are available:
• On-site service — IOR, 9 hours per day, Monday through Friday excluding holidays, NBD response.
• On-site service — IOR, 24 hours per day, 7 days a week, 4 hour average response.

Non-IBM Parts Support

Warranty service: IBM is now shipping machines with selected non-IBM parts that contain an IBM field replaceable unit (FRU) part number label. These parts are to be serviced during the IBM machine warranty period. IBM is covering the service on these selected non-IBM parts as an accommodation to their customers, and normal warranty service procedures for the IBM machine apply.

Warranty service upgrades and maintenance services: Under certain conditions, IBM Integrated Technology Services repairs selected non-IBM parts at no additional charge for machines that are covered under a warranty service upgrade or maintenance services. IBM Service provides hardware problem determination on non-IBM parts (adapter cards, PCMCIA cards, disk drives, memory, and so forth) installed within IBM systems covered under warranty service upgrade or maintenance services and provides the labor to replace the failing parts at no additional charge. If IBM has Technical Service Agreements with the manufacturers of the failing part, or if the failing part is an accommodations part (a part with an IBM FRU label), IBM may also source and replace the failing parts at no additional charge. For all other non-IBM parts, customers are responsible for sourcing the parts. Installation labor is provided, at no additional charge, if the machine is covered under a warranty service upgrade or maintenance services.

IBM hourly service rate classification: One

Field-installable features: Yes

Model conversions: No

Machine installation

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Graduated program license charges apply: No. This product does not contain Licensed Internal Code or Licensed Machine Code.

Educational allowance: None

Prices

Contact your IBM representative for prices information for this announcement.

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Internet: callserv@ca.ibm.com
Mail: IBM Americas Call Centers
      Dept. Tel eweb Customer Support, 9th flour
      105 Moatfield Drive
      North York, Ontario
      Canada M3B 3R1

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Note: Shipments will begin after the planned availability date.

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