

IBM @server Cluster 1350



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Highlights

- **Can help reduce time and resources necessary to deploy Linux® clusters**
- **Provides single point-of-control to simplify management and enhance cluster availability**
- **Offers a highly scalable solution for high-performance or commercial computing workloads and server consolidation**

Outstanding price/performance

Clustering offers significant price/performance advantages for many high-performance workloads. Linux clusters can further extend these advantages by harnessing low-cost servers and Open Source software.

Today, many businesses are building their own Linux clusters using commodity hardware, standard interconnects and networking technology, Open Source software and in-house or third-party applications. Many discover that considerable resources must be dedicated to assemble, integrate, test, manage and support the cluster. As such, they often experience many of the problems frequently encountered during product development.

Leveraging its extensive experience with clustered UNIX® computers, IBM has designed the IBM @server™ Cluster 1350 to address each of these challenges. Using advanced IBM @server xSeries™ Intel® processor-based server nodes, proven cluster management software and optional high-speed interconnects, the Cluster 1350 brings together the best of IBM and third-party technology. As a

result, the installation of a Linux cluster can be greatly accelerated and its support simplified.

The Cluster 1350 is designed to be an ideal solution for industrial, financial services, life sciences, governmental and educational organizations requiring excellent price/performance for handling high performance computing (HPC) workloads. It is also an excellent choice for applications such as Web serving and collaboration or any situation requiring horizontal scaling.

A comprehensive solution

The Cluster 1350 is an integrated offering which includes all of the hardware necessary to create a comprehensive cluster system. Combined with the Linux operating system and IBM Cluster Systems Management (CSM) for Linux software, the Cluster 1350 is designed to be easy to configure and helps businesses deploy applications rapidly.

By reducing time and resources required for researching, assembling, integrating, testing and tuning a Linux cluster, the Cluster 1350 can help speed time-to-production. In addition, more servers can be added at any time to handle increasing workloads, consolidate more servers or add new applications.

IBM provides installation support for the Cluster 1350. Customers must separately purchase a Linux distribution supported by the Cluster 1350. They have the option of installing Linux and CSM themselves or contracting with IBM or IBM Business Partners. IBM installation services may also provide planning, installation and configuration of additional cluster software including IBM General Parallel File System (GPFS) for Linux. For even higher levels of support, the optional Support Line for Linux Clusters is staffed by experts who understand the entire cluster environment, not just the individual components. This includes Linux, CSM for Linux and GPFS for Linux software.

To further simplify the deployment effort, IBM can provide project management support to coordinate all

aspects of delivery and installation, including hardware and software setup services. Attractive financing and leasing terms are also available.

High-performance cluster management

IBM offers CSM for Linux, advanced cluster management software that allows a cluster of supported xSeries servers running Linux to be managed from a single point-of-control. This simplifies the management of the cluster and enables it to scale up easily, thus helping to improve the efficiency of the system administrator.

CSM includes an infrastructure that monitors both hardware and software events, triggering automated recovery action when appropriate. The highly reliable infrastructure and event monitoring capabilities of CSM help detect and resolve problems quickly, thereby enhancing availability of the cluster.

CSM for Linux is based on the architecture and design of the IBM Parallel System Support Programs for AIX® software product, which has been deployed on the IBM RS/6000® SPT™ — one of the world's most popular supercomputers.

CSM is also available for AIX, and allows non-switched clusters of both IBM @server pSeries™ servers running AIX and xSeries servers running Linux to be managed from a single point-of-control. Cluster nodes running CSM for Linux can also be monitored and controlled using IBM Director, the leading management software for xSeries servers.

CSM contains several components designed to make managing a Linux cluster easier:

- **Distributed management server:**
provides a persistent repository of information about each node in the cluster, and maintains the status of each node.
- **Event response resource manager:**
provides the ability to run commands or scripts in response to user-defined events. A rich set of predefined conditions and responses are provided. Many resources can be monitored, including nodes, adapters, file systems and processes.

- **Remote hardware control:**
utilizes the integrated systems management processor in Cluster 1350 nodes. This enables the administrator to remotely reset or power the node on or off.
- **Configuration file management:**
provides a repository for files that are common between the nodes. CSM synchronizes changes to configuration files across the cluster.
- **Distributed shell:**
allows commands or scripts to be run remotely on all nodes in the cluster with options for combining output from multiple servers. Distributed command execution manager is an optional graphical user interface that integrates with the distributed shell, allowing easier management of nodes and node groups.

CSM provides node grouping, which is a convenient way to apply different rules to subsets of servers in the cluster. This is an important consideration when supporting the consolidation of multiple applications on the cluster.

With node grouping, administrative commands can be applied to an individual node, the entire cluster as a unit, or to groups of nodes as defined by the system administrator.

By providing a single point-of-control for a cluster, CSM can dramatically simplify total systems management, thereby enabling a cost-effective approach to server consolidation solutions. By allowing scripts to run in response to common occurrences, CSM can help increase cluster availability.

Advanced server technology

The Cluster 1350 is based on exclusive X-Architecture™ technology from IBM, which incorporates some of the availability features of IBM @server zSeries™ servers and the scalability features of pSeries systems. As such, these industry standard Intel processor-based servers are designed to provide enterprise-inspired power, scalability, control and service at very attractive prices.

Cluster 1350 nodes include C2T Interconnect™ cable chaining technology, which is designed to significantly reduce the number of cables needed in each system, thereby helping to speed upgrades while lowering costs. In addition, an integrated systems management processor enables CSM to remotely manage the system nodes for enhanced server productivity. Through the use of CSM commands, system

administrators can specify which events to monitor and actions to take in the event of memory, processor, hard drive, fan or power issues. As a result, these commands help achieve peak performance and system availability.

Standard configurations of the Cluster 1350 include a management node, up to 512 cluster nodes and up to 32 optional storage nodes that provide shared file storage. A special order process is available for customers requiring larger or other non-standard configurations.

Each Cluster 1350 also includes a management Ethernet VLAN for highly secure internode communications, a cluster Ethernet VLAN for application internode communication and a terminal server network, which allows for remote console capability. The cluster comes standard with one 10/100 Mbps Ethernet switch for the management VLAN and a choice of 10/100 Mbps Ethernet switch, Gigabit Ethernet switch or Myrinet™-2000 switch for the cluster VLAN.

Feature	Benefits
Integrated and tested hardware supported by IBM	<ul style="list-style-type: none"> • Provides validated configuration with a single point-of-contact for continuing support • Can speed the time-to-production of high-performance Linux applications
Advanced IBM @server hardware	<ul style="list-style-type: none"> • Unique X-Architecture delivers a powerful, scalable and reliable Intel processor-based server
Industry leading components	<ul style="list-style-type: none"> • Provide a greater choice in configuration • Help keep costs down without sacrificing quality or performance
CSM for Linux	<ul style="list-style-type: none"> • Dramatically simplifies total systems management by providing a single point-of-control • Enables cost-effective server consolidation solutions
General Parallel File System	<ul style="list-style-type: none"> • Offers enhanced performance through concurrent access to files from multiple nodes.

Cluster nodes can be configured with either single or dual Intel Xeon™ processors, with 512MB to 4GB of memory. Each cluster node has either one or two disk drives for up to 440GB of disk storage per node. The management node also has dual Intel Xeon processors, from 512MB to 4GB of memory, up to 440GB of hot-swappable disk storage and the appropriate adapter cards for cluster management.

Additional disk storage is available through the use of optional storage nodes, which allow additional file system storage to be configured.

A storage node has single or dual Xeon processors, from 512MB to 4GB of memory and up to 440GB of hot-swappable disk storage. For increased capacity, these nodes can be configured to support externally

attached Fibre Channel RAID storage subsystems. For high availability, they can be configured to provide redundant paths to all data. The standard configuration can support up to 32 storage nodes.

A minimum of one Keyboard/Video/Mouse (KVM) switch is required with the system. Remote console support is provided through the terminal server.

Expanding possibilities

The Cluster 1350 offers a number of optional components to meet specific computing requirements, including a choice of interconnect technologies.

In addition to standard 10/100 Mbps Ethernet or Gigabit Ethernet, customers can select Myrinet-2000 — scalable interconnect technology from Myricom, Inc. Myrinet is a cost-

effective, high-performance packet communication and switching technology that has been widely used in Linux operating system-based clusters. It is particularly well suited for high-performance or high-availability clustering.

Companies can also take advantage of GPFS for Linux. GPFS is a high-performance, scalable, shared-disk file system that is designed to provide fast data access from all nodes in a Linux cluster environment. Parallel applications running across multiple nodes of the cluster as well as serial applications running on a single node can readily access shared files using standard UNIX file system interfaces. Furthermore, GPFS can be configured for failover from both disk and server malfunctions.

IBM @server Cluster 1350 at a glance

Building Block	IBM @server xSeries 345	IBM @server xSeries 335
Node type	Management/cluster/storage	Cluster
Packaging	Rack drawer (2U)	Rack drawer (1U)
Processor	2.0 and 2.4 GHz Xeon 2-way management node, 1- or 2-way cluster or storage node	2.0 and 2.4 GHz Xeon 1- or 2-way cluster node
L2 cache	512KB	512KB
RAM memory	512MB	512MB
Disk/media bays	Six (hot-swappable)	Two (hot-swappable SCSI)
Expansion slots	Five PCI-X (one 32-bit, four 64-bit)	Two PCI-X (64-bit)
Adapters	Integrated Ultra320 SCSI and dual Gigabit Ethernet	Integrated Ultra320 SCSI and dual Gigabit Ethernet
System connectivity Management VLAN	One 10/100 Mbps Ethernet switch standard	One 10/100 Mbps Ethernet switch standard
System expansion		
RAM	4GB ¹	4GB ¹
SCSI internal storage	18.2GB-440.4GB	18.2GB-146.8GB
IDE internal storage	—	40GB-240GB
System connectivity Cluster VLAN		Choice of 10/100 Mbps Ethernet, Gigabit Ethernet, Myrinet-2000
Adapters	Gigabit Ethernet SX Myrinet 133 MHz 10/100 Mbps Ethernet FASTT FC-2 Host adapter ServerRaid-4LX	Gigabit Ethernet SX Myrinet 133 MHz ServerRaid-4LX
Storage	FASTT200 storage controller with EXP500 expansion FASTT700 storage controller with EXP700 expansion	
Operating systems²	Red Hat Linux 7.3 SuSE Linux ³	Red Hat Linux 7.3 SuSE Linux ³
Systems mgt. software	CSM for Linux Versions 1.2 and 1.3 ⁴	CSM for Linux Versions 1.2 and 1.3 ⁴
System dimensions		
42U primary or expansion rack	79.5" H x 25.5" W x 43.3" D (2019.2 mm x 647.7 mm x 1099.8 mm), 575 lbs (260.9 kg)	
Management/storage node	3.36" H x 17.5" W x 27.5" D (85.3 mm x 444.2 mm x 697.4 mm), 62 lbs (28.1 kg)	
Cluster node	1.72" H x 17.3" W x 25.7" D (43.7 mm x 439.9 mm x 653.3 mm), 26 lbs (11.8 kg)	
Scalability	One management node is required with a minimum of 4 and a maximum of 512 cluster nodes. Additionally, up to 32 storage nodes can be configured. Therefore, the minimum configuration includes 5 nodes (1 management node and 4 cluster nodes). The maximum configuration would include 513 nodes (1 management node, 512 cluster and storage nodes). Larger configurations are available via a special bid process.	
Services	Linux cluster installation services and Support Line for Linux Clusters are available as optional fee-based service offerings.	
Warranty	Basic limited warranty on most IBM and non-IBM components: three year, next business day, on-site support. Some xSeries 335 models have a one year warranty. Enhanced warranty plans are available.	

¹8GB when 2GB SDRAM DIMMs become available

²Other Linux distributions may be available by special order. Customers must obtain the version of the Linux operating system specified by IBM; Linux and CSM may be installed by IBM, a qualified business partner or the customer

³Planned availability — 4Q 2002

⁴CSM for Linux also runs on the xSeries 335 and 345 with Red Hat 7.2 and 7.3

In short, GPFS for Linux offers world-class performance, scalability and availability for file systems. It scales with the size of the Linux cluster while providing NFS export capabilities outside the cluster.

Other optional cluster components include IBM FAStT200 storage subsystems with the FAStT EXP500 expansion unit and IBM FAStT700 storage subsystems with the FAStT EXP700 expansion unit. Fibre Array Storage Technology provides highly reliable data storage for business-critical applications that require high-speed transfer and large amounts of data.

Summary

Creating a computing infrastructure is an exercise in balancing price and performance to deliver the appropriate solution for any given task.

For some high-performance workloads, the most appropriate solution is clustering. By harnessing the power of many servers in parallel, it's possible to solve computationally intense problems with an excellent price/performance ratio. Clustering can also be an excellent approach for consolidating multiple workloads, which can provide enhanced manageability and high availability.

The advent of Linux has made it possible to build powerful clustered systems using affordable, Intel processor-based hardware. It also allows organizations to tap into the growing skill base and contributions of the Open Source community.

The IBM **@server** Cluster 1350 is a comprehensive solution that can greatly simplify and speed deployment of a Linux cluster. IBM provides a single point-of-contact for the entire cluster, not just individual components, thus reducing risk for deployment of a Linux cluster solution.

For any organization looking for the economic advantages of deploying a Linux cluster, but concerned about the time and technical resources necessary, the Cluster 1350 is the right choice.

For more information

To learn more about the IBM **@server** Cluster 1350, contact your IBM marketing representative or IBM Business Partner or visit the following Web sites:

- ibm.com/eserver/clusters
- ibm.com/ibmlink



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