IBM Intelligent Cluster

High Performance Computing solutions

Highlights

- Leading-edge technology with flexibility of choice

- High performance

- Energy and space efficient

- Easily deployed, operated and maintained

Leading-edge technology with flexibility of choice
IBM® Intelligent Cluster integrated solutions are built on the highly innovative IBM System x® rack, BladeCenter® and iDataPlex™ servers. Whether you are building a small departmental cluster or a super computer, IBM's broad portfolio of server solutions can be optimized to meet client-specific requirements.

High performance is paramount
High Performance Computing (HPC) workloads will benefit by up to twice the performance. Our integrated cluster solutions offer significant price/performance advantages for many high-performance workloads by harnessing the advantages of highly innovative servers. By design, a range of application environments will benefit, including those optimized for industrial design and manufacturing, financial services, life sciences, government and education.

Energy and space efficient
Intelligent Cluster solutions that integrate BladeCenter or iDataPlex servers can reduce power and cooling costs by up to 50 percent, while maximizing performance density, which is critical for HPC workloads.

Easily deployed, operated and maintained
Intelligent Cluster integrated HPC solutions include servers, storage and industry-leading OEM interconnects that are factory-integrated, fully tested and delivered to your door, ready to plug into your data center, all with a single point of contact for support.

Intelligent Cluster integrated solutions are built on the highly innovative System x rack, BladeCenter and iDataPlex servers.

New offerings for Intelligent Cluster portfolio

- **IBM Data Center Networking Solutions**—IBM's view of networking is an integral component of our dynamic infrastructure initiative, which helps customers manage the convergence of business and IT infrastructures. This offering includes easy network scalable Top-of-Rack Switches and End-of-Row Modular Director/Backbone switches for 1 Gb and 10 Gb Ethernet connectivity.

- **NVIDIA GPU Adapters**—Introducing NVIDIA's FX3800, M1060 and M2050 visualization and GPU compute accelerator adapters that leverage IBM's highly efficient power and thermal profile of iDataPlex for GPU applications optimized for today's data centers while maximizing performance for the next generation of high-performance workloads. Up to two GPU PCIe adapter cards are supported per server, while maintaining flexibility of choice for high-speed networking and storage for a solution that maximizes performance, density, efficiency and serviceability in the data center.

- **Mellanox InfiniScale IV QDR InfiniBand Switches**—
  High Performance Computing needs high bandwidth with
  low latency to get the highest server efficiency and applica-
  tion productivity. Mellanox switches deliver the I/O per-
  formance that meets these requirements while providing
  extensive I/O services such as bandwidth, consolidation and
  unification, and flexibility.
- **Mellanox ConnectX-2 QDR InfiniBand Host Channel
  Adapters**—Offered in both single port and dual port, these
  PCIe 2.0 x8 adapters consume up to 10 percent less power
  than the previous generation and demonstrate up to 30 per-
  cent improved performance, with 1us MPI ping latency and
  50 M messages/sec.
- **Force 10 Networks Ethernet Switches**—1 Gb and 10 Gb
  Ethernet Switches with scalable architectures for High
  Performance Computing that require wire-speed, low
  latency performance, with an ecoefficient power and cool-
  ing design to save on energy costs.
- **Mellanox 10 Gb Ethernet Adapters**—This "ConnectX 2"
  [dual-port] technology supports PCIe 2.0 x8 (5 GT/s),
  enabling high availability and high performance.
  ConnectX EN improves network performance by increas-
  ing available bandwidth to the CPU and providing
  enhanced performance.

Leading-edge technology with flexibility of choice

As an HPC clustering solutions provider, IBM offers numer-
ous choices in cluster configurations and platforms. Clusters
can be configured by IBM to meet a wide variety of client
needs and accommodate a huge array of technical workloads
with a broad range of server platforms (rack mounted or
blade servers), processor choices, accelerator options, robust
storage solutions, networking/communications fabrics and
operating systems. All Intelligent Cluster components are
thoroughly tested in IBM engineering and test laboratories
for integrated cluster functionality.

IBM works closely with software and hardware partners to
incorporate and rigorously test the industry's finest
components to uphold the high standards of the Intelligent
Cluster. Clients who choose IBM are working with a world
leader in HPC, as demonstrated by the continued leadership
by IBM of the "Top 500 Supercomputers" list published
twice per year.[1]

The Intelligent Cluster leverages the innovative technology
built into IBM System x rack servers, iDataPlex servers and
IBM BladeCenter servers. Since servers generally make up
the majority of any HPC cluster, the IBM technology leader-
ship is crucial to the performance, maintainability, energy
efficiency and reliability of the cluster. The System x rack
servers, iDataPlex servers and BladeCenter servers incorpo-
rate an impressive array of energy and thermal management
tools and technologies, delivering the benefits of this engi-
neering in power and cooling advantages to the Intelligent
Cluster.

High performance

IBM HPC clustered solutions offer significant price/
performance advantages for many high-performance work-
loads by harnessing the advantages of low-cost servers plus
innovative, easily available, open source and commercially
available software.

The Intelligent Cluster is designed to be an ideal solution for
a broad range of application environments, including indus-
trial design and manufacturing, financial services, life sci-
ences, government and education. These environments
typically require excellent price/performance for handling
HPC and business-performance computing workloads. It is
also an excellent choice for applications that require horizon-
tal scaling capabilities, such as Web serving and collaboration.

Energy and space efficient

IBM's server portfolio tackles the energy management challenge to increase power and thermal efficiency and help reduce costs on many levels.

System x rack 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.

iDataPlex servers are specifically designed to address data center power-constraint challenges by using up to 40 percent less power than similarly configured standard 1U servers. And, while traditional servers generate significant heat that leaves you struggling to keep the data center cool and running efficiently, the iDataPlex servers deliver better airflow, energy-efficient components and processing to reduce server heat exhaust by up to 40 percent.

BladeCenter-based clusters help 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 BladeCenter, less power per processor means more processing capacity per kilowatt. 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 Intelligent Cluster clients.

Easily deployed, operated and maintained

Intelligent Cluster solutions are shipped from the factory, thoroughly tested, assembled, cabled and ready for rapid deployment. IBM offers a variety of implementation services, often in conjunction with IBM Business Partners, to help provide the smoothest possible system set up at the client site.

IBM offers a single point-of-contact for the Intelligent Cluster including industry-leading OEM interconnects. Our clients benefit by streamlined resolution to questions, concerns and/or problems. IBM manages the solution, end to end, thus eliminating the need to contact multiple OEMs.

Summary

Creating a computing infrastructure is an exercise in balancing price and performance to deliver the appropriate solution for each client's specific business needs.

The Intelligent Cluster is a comprehensive solution that can help simplify and expedite deployment of a Linux® or Windows® HPC cluster. IBM combines all hardware, software, services and support into a single integrated product offering, providing clients the benefit of a single point-of-contact for the entire cluster rather than dealing with multiple vendors for individual components.

The Intelligent Cluster is an outstanding choice for any organization that recognizes the economic advantages of a reduced time to deployment of an HPC cluster but has concerns about the time and technical resources required for the end-to-end implementation.

IBM Intelligent Cluster Summary at a glance

Systems	Blade servers: HX5, HS22, HS22V, LS22, LS42, JS23, JS43 Enterprise servers: x3850 X5 iDataPlex servers: dx360 M3, dx360 M2 Rack servers: x3550 M3, x3650 M3	
Interconnects	Ethernet Switches	IBM Data Center Networking, BLADE Network Technologies, Cisco, Force10Networks, SMC, Voltaire
	Ethernet Adapters	Chelsio, Mellanox
	InfiniBand	Mellanox, QLogic, Voltaire
	Fibre Channel	Brocade Emulex QLogic

External storage

Storage servers	System Storage® DS5020, DS5100, DS5300, DS4800, DS4700, DS4200, DS3950, DS3500, DS3400, DS3200
Storage expansion	EXP5000 Storage Expansion Unit DS4000® EXP810 Storage Expansion Unit DS4000 EXP420 Storage Expansion Unit EXP3000 SAS JBOD, Single ESM
SAN switches	IBM System Storage SAN24B-4 Express IBM System Storage SAN40B-4

Software

Operating system	Red Hat Enterprise Linux (RHEL) 5 SUSE Linux Enterprise Server (SLES) 11 Microsoft® Windows HPC Server 2008
Cluster management software	xCAT (Extreme Cluster Administration Toolkit) Moab Adaptive HPC Suite Moab Adaptive Computing Suite IBM General Parallel File System (GPFS) for Linux

Rack cabinets

5000 42U Rack Cabinet	79.5" H x 25.2" W x 43.3" D (2020 mm x 640 mm x 1100 mm); 574.2 lbs (261 kg)[2]
5000 25U Rack Cabinet	49.0" H x 23.8" W x 39.4" D (1344 mm x 605 mm x 1001 mm); 221 lbs (100.2 kg)[2]
iDataPlex 100U Rack Cabinet	82.4" H x 48.6" W x 33.2" D (2093 mm x 1235 mm x 844 mm); 385 lbs (174.6 kg)
Power and cooling	Calibrated Vectored Cooling™, energy-efficient power supplies, low-voltage processors, IBM Systems Director Active Energy Manager™, IBM Power Configurator, Thermal Diagnostics
Scalability	One management node is required and one redundant management node for failover is optional. A minimum of two and a maximum of 1,024 managed nodes are supported (optional software may limit supported nodes). This total can include up to 64 storage nodes. The maximum configuration is 1,026 nodes including compute, storage and management nodes. Larger configurations are available through a special bid process.
Services	• Intelligent Cluster hardware installation is included at no charge on 100U, 42U and 25U racks. • HPC cluster software services and SupportLine for Linux and Windows Clusters are available as optional fee-based services. • Cluster Installation Support Services are available through the Cluster Enablement Team (CET) as optional fee-based services.
Warranty	3-year parts, customer replaceable unit (CRU) or on-site labor, limited warranty, with individual nodes retaining the warranty and service upgrade offerings for that IBM Machine Type; optional warranty service upgrades[3]

For more information

To learn more about the IBM Intelligent Cluster, contact your IBM representative or IBM Business Partner, or visit the following Web sites:

- **ibm.com**/systems/clusters
- **ibm.com**/systems/clusters/hardware/factsfeatures.html
- **ibm.com**/common/ssi
- **ibm.com**/systems/x/storage
- www.redhat.com/software/rhel
- www.suse.com/us/business/index.html
- www.microsoft.com/windowsserver2003/ccs/hpcplus.aspx

[1] www.top500.org/

[2] Weight is dependent on the nodes added and will vary when disks, adapters and peripherals are added.

[3] Standard one-year warranty applies for x3455 and QS21, individual nodes retain the warranty and service upgrade offerings for that IBM Machine Type. Enhanced warranty service plans are available.

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