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## Highlights

- Leading-edge technology with flexibility of choice
  - High performance
  - Energy and space efficient
  - Easily deployed, operated and maintained
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# IBM Intelligent Cluster

*High Performance Computing solutions*

### **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 System Networking 10 GbE and 1g TORS**— BNT G8264 top-of-rack switch is the first production 40 GbE for the data center with proven, standards-based and interoperable, tested with Ixia. 40 GbE at data center price points. First single-chip switch to pass the 1 Tbps barrier 64 ports, 10 Gigabit Ethernet = 1.28 Terabits (full duplex). BNT G8052 top-of-rack switch offers 52 1g ports with an option for four 10 GbE uplinks

- **LG Ericsson Ethernet Switch**—The LG-Ericsson ES-4550G features GbE edge ports, Two 10 GbE uplinks, redundant power options, and management software supporting both IPv4 and IPv6 management at no additional software upgrade cost. The buffer memory enhancements are able to provide better handling of bursty data at speed boundaries by providing larger memory pools and more elastic buffer management. The ES-4500 Series is the next generation in cost-effective performance switching focused on ROI

- **Chelsio T4 Adapters**—Chelsio’s 4th Generation Unified Wire Solution - T4 for convergence of clustering, storage, and networking. Runs IB applications unmodified using iWARP, runs FC applications unmodified using iSCSI and FCoE and supports ESX, Xen, Oracle VM, Hyper-V, SR-IOV, DCB, VEB, VNTAG, VEPA, Flex10, TOE
- **Force10 40 GbE line card**—High-density line card provides industry-leading density of up to 560 10 GbE ports in a single chassis. Provides 6 MB per port dedicated input buffers to absorb temporary oversubscription. Full L2 switching and IPv4 routing, IPv6 and MPLS
- **Voltaire Grid Director 4036E and 4036E LM**—Introducing Voltaire’s InfiniBand to Ethernet gateway switches with very low latency (< 1.5 us QDR to 10 GbE) that provides faster access to storage, simplifies infrastructure and reduces TCO by eliminating the need for a separate Ethernet switch.

### Leading-edge technology with flexibility of choice

As an HPC clustering solutions provider, IBM offers numerous 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.<sup>1</sup>

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 leadership is crucial to the performance, maintainability, energy efficiency and reliability of the cluster. The System x rack servers, iDataPlex servers and BladeCenter servers incorporate an impressive array of energy and thermal management tools and technologies, delivering the benefits of this engineering in power and cooling advantages to the Intelligent Cluster.

### High performance

IBM HPC clustered solutions offer significant price/performance advantages for many high-performance workloads 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 industrial design and manufacturing, financial services, life sciences, 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 horizontal 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 Enterprise servers: x3850 X5 iDataPlex servers: dx360 M3 Rack servers: x3550 M3, x3650 M3, x3690 X5, x3755 M3	
Interconnects	Ethernet Switches	IBM System Networking - BLADE Network Technologies, Cisco, Force10Networks, LG Ericsson, Voltaire
	Ethernet Adapters	Chelsio, Mellanox
	InfiniBand Switches and Adapters	Mellanox, QLogic, Voltaire
	Fibre Channel	Brocade, Emulex, QLogic
<b>External storage</b>		
Storage servers	System Storage® DS5020, DS5100, DS5300, DS3950, DS3500, DS3512, DS3524	
Storage expansion	EXP5000 Storage Expansion Unit EXP 2512 Storage Expansion Unit EXP 2524 Storage Expansion Unit EXP 520 Storage Expansion Unit EXP 395 Storage Expansion Unit	
Graphic Processing Units (GPUs)	NVIDIA Tesla M1060 , M2050, M2070 and M2070-Q Computing Modules	
Operating systems	Red Hat Enterprise Linux (RHEL) 5 SUSE Linux Enterprise Server (SLES) 11 Microsoft® Windows HPC Server 2008	
Cluster management software	xCAT (Extreme Cloud Administration Toolkit) Moab Adaptive HPC Suite Moab Adaptive Computing Suite IBM General Parallel File System (GPFS) for Linux	
<b>Rack cabinets</b>		
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) <sup>2</sup>	
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) <sup>2</sup>	
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 Vectors Cooling™, energy-efficient power supplies, low-voltage processors, 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	<ul style="list-style-type: none"> <li>Intelligent Cluster hardware installation is included at no charge on 100U, 47U, 42U and 25U racks.</li> <li>HPC cluster software services and SupportLine for Linux and Windows Clusters are available as optional fee-based services.</li> <li>Cluster Installation Support Services are available through the Cluster Enablement Team (CET) as optional fee-based services.</li> </ul>	
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 <sup>3</sup>	

## For more information

To learn more about the IBM Intelligent Cluster, visit [ibm.com/systems/clusters](http://ibm.com/systems/clusters) or contact your IBM representative or IBM Business Partner.

- [ibm.com/systems/clusters/hardware/factsfeatures.html](http://ibm.com/systems/clusters/hardware/factsfeatures.html)
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- [www.suse.com/us/business/index.html](http://www.suse.com/us/business/index.html)
- [www.microsoft.com/windowsserver2003/ccs/hpcplus.aspx](http://www.microsoft.com/windowsserver2003/ccs/hpcplus.aspx)



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All performance estimates are provided "AS IS" and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of a system they are considering buying.

<sup>1</sup> [www.top500.org/](http://www.top500.org/)

<sup>2</sup> Weight is dependent on the nodes added and will vary when disks, adapters and peripherals are added.

<sup>3</sup> 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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