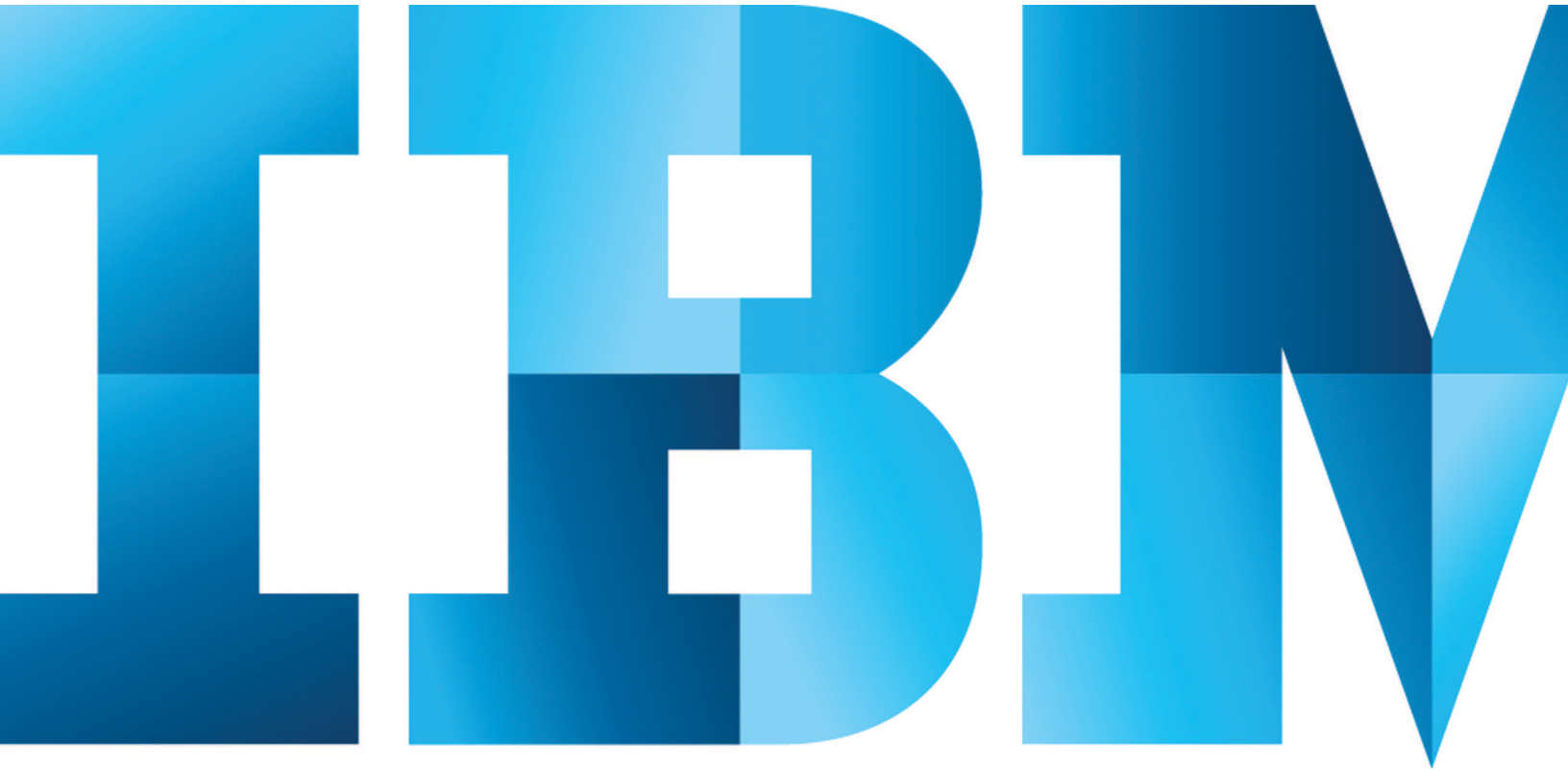
PureSystems

IBM Flex System

The next evolution of blade technology is here



IBM

Highlights

Management integration with IBM® Flex System Manager™

- Simple user interface and automation capabilities helps you bring new components online faster
- Cross resource integration to manage applications and workloads instead of components

Compute nodes that go beyond blades

Price-optimized entry nodes to performance-optimized 4-socket nodes for your most demanding applications

- Available with the latest Intel processors and industry-leading memory capability for x86 based systems—up to 50 percent more memory than HP[1]
- Configurable with the latest POWER and POWER7+ processors for maximum performance and efficiency

Storage capabilities optimized for efficiency and performance

- Optional IBM Flex System™ V7000 Storage Node offers storage virtualization, Real-time Compression to reduce capacity needs, and IBM Easy Tier® to optimize data placement
- Up to 300 percent more dedicated storage for compute nodes compared to Dell[2]

Networking capabilities designed for virtualization and cloud

- Ethernet options, including Fibre Channel over Ethernet (FCoE) switch to fit into your current infrastructure while supporting next generation capabilities—up to 200 percent more networking bandwidth than HP[3]
- Fibre Channel switches ranging from low-cost 8 Gb solutions to highly scalable 16 Gb switches for maximum performance

You know your business and your IT needs. You want to build a solution tuned for your applications and services. You need the most advanced blade technology available, and a flexible architecture to support your needs today—and tomorrow. And you need simple, integrated management to keep operational costs down. But you also want a no-compromise design and long-term investment protection.

If you need to transition or migrate an existing infrastructure to simplify management and improve performance and flexibility, IBM Flex System can meet your needs. And because IBM Flex System provides the elements for the IBM PureFlex™ System, you can begin your transformation toward expert integrated systems.

IBM Flex System compute, storage and networking offer performance and capacity to support your most demanding applications. IBM Flex System technology delivers the performance and flexibility you need now and is designed to support multiple generations of future technologies.

Systems management

Modern IT system administrators face extraordinary system management demands. They must identify system capacity requirements, maximize current assets, save money and speed deployment. These demands are complicated by the need to meet existing demand, maximize current performance and allow for future growth—all while integrating an IT infrastructure that increasingly blends physical and virtual assets. What's more is that monitoring such a complex infrastructure often requires multiple, nonintegrated tools that offer limited automation.

IBM Flex System Manager is designed to integrate into your existing infrastructure, provide for future growth and minimize system management demands while maximizing your IBM PureFlex System or your IBM Flex System. Flex System Manager integrates your physical and virtual compute, storage and networking resource management to improve system performance while simultaneously minimizing system administration.

To realize these performance gains, Flex System Manager:

- Improves resource utilization through consolidation of system resources that are treated as a single virtualized pool.
- Uses intelligent workload management to help give business applications the right level of dedicated system resources.
- Provides dynamic workload mobility based on user performance and availability policies.
- Applies automation and dynamic provisioning of new virtual workloads to scale a resource pool.
- Incorporates fabric optimization—QoS and network profile configuration.

Realizing these performance gains can help maximize existing resources. But if realizing performance gains requires additional oversight by system managers, financial and personnel resource constraints may prevent those gains from occurring. Flex System Manager helps reduce system management oversight by implementing an easier-to-use, next generation interface that allows the system administrator to manage the storage, network and compute nodes from a single, integrated UI.

In addition to providing an integrated view of the system infrastructure and its health, Flex System Manager reduces system management oversight by:

- Centralizing security and user management including user IDs and passwords across nodes and chassis
- Allowing for mobile monitoring via a smartphone or tablet (iPhone, Android and Blackberry)
- Including configuration profiles that integrate device configuration and update steps into a single interface for improved out-of-box configuration
- Providing integrated end-to-end storage management with auto discovery and provisioning
- Supporting bare metal deployment of hypervisors (VMware/ESXi, KVM) thru centralized managed images
- Incorporating update and compliance management as well as virtual image management for compute nodes

Chassis

The IBM Flex System Enterprise Chassis is a simple, integrated infrastructure platform for your system that supports a mix of compute, storage, and networking resources to meet the demands of your applications. The solution is easily scalable with the addition of another chassis with the required nodes. With Flex System Manager, multiple chassis can be monitored from a single screen. The 14 node, 10U chassis delivers high speed performance complete with integrated servers, storage, and networking. This flexible chassis is designed to deploy simply now and to scale to meet your needs in the future.

IBM Flex System Enterprise Chassis at a glance	
Height	440 mm (10 EIA rack standard units)
Width	447 mm (EIA 19-inch rack standard width, minus 3 mm clearance)
Depth	800 mm (measured from front bezel to rear of chassis)
	847 mm (measured from ITE latch handle to the power supply handle)
Rack-mount weight	505 lbs
Minimum loadout weight	218 lbs
Maximum loadout weight	493 lbs
Voltage nominal	200-240 VAC + 10%
Frequency nominal	50/60Hz
Power minimum	400 W (estimate)
Power maximum	12,900 watts (12.9 kW)
Maximum Input Current	13.85 A per supply
Node bays	14 standard node bays (7 full wide)
Power supplies**	2/6 2500W
	200 - 240 VAC
Fabric bandwidth	10 Gb
Switch modules	Optional
80 mm fans	4/8
40 mm fans	2/2
CMM	1/2

Compute nodes

Taking advantage of the full capabilities of the latest Intel, POWER and POWER7+ processors, Flex System compute nodes are designed to offer the performance you need for your critical applications. With support for a range of hypervisors, operating systems and virtualization environments, the compute nodes provide the foundation for:

- Virtualization solutions
- Virtual desktop solutions
- Business and database applications
- Infrastructure support

The **IBM Flex System x440 compute node** is an Intel-processor based server optimized for high-end virtualization, mainstream database deployments, and memory-intensive high performance environments. The Flex System x440 is price-performance optimized and designed to help you match system capabilities and cost to workloads without compromise. A four-socket compute node, it features no compromise compute, memory and I/O capacity to meet your needs.

The Flex System x440 is designed to deliver an outstanding combination of performance, built-in capabilities, and cost-effectiveness, featuring automated power management with onboard sensors to give you more control over power and thermal levels across the system. Combined with memory capacity up to 1.5 TB, the Flex System x440 compute node is designed to help you get the most out of your systems.

The **IBM Flex System x240 compute node** is optimized for virtualization, performance and highly scalable I/O designed to run a wide variety of workloads. The Flex System x240 compute node delivers maximum performance—up to 80 percent performance boost over previous generation servers.[4] This helps you get more out of your compute environment for a broad set of workloads. Features such as automated power management with onboard sensors give you more control over power and thermal levels across the system. Offering up to 50 percent more performance per watt than previous generations, the new Flex System x240 is designed to improve energy efficiency.[5] These capabilities, combined with memory capacity up to 768 GB, helps you get the most out of your compute environment.

	x440 Compute Node	x240 Compute Node	x220 Compute Node
Processor	4 Intel Xeon E5-4600 Series Processor	2 Intel Xeon E5-2600 Series Processor	2 Intel Xeon E5-2400 Series Processor
Cache	Up to 20 MB per core	Up to 20 MB per core	Up to 20 MB per core
Form factor	Flex System double-wide node	Flex System standard node	Flex System standard node
Memory	48 DDR3/DDR3L LP, 1.5 TB (32 GB LRDIMMs)	24 DDR3/DDR3L LP, 768 GB Max with 32 GB LRDIMM	12 DDR3/DDR3L LP, 192 GB Max with 16 GB RDIMMs
Internal storage	2 x HS 2.5-inch (SAS/SATA/SSD)	2 x HS 2.5-inch (SAS/SATA/SSD)	2 x HS 2.5-inch (SAS/SATA/SSD)
Internal RAID	Hardware RAID, RAID-0, -1; optional RAID-0, -1, -5, -6, -10, -50	Hardware RAID, RAID-0, -1; optional RAID-0,1, -5, -6, -10, -50	Software RAID, RAID-0, -1; optional RAID-0, -1, -5, -6, -10, -50
Internal USB	2 x Standard USB Flash Key + 1 x Front Access USB Key	2 x Standard USB Flash Key + 1 x Front Access USB Key	2 x Standard USB Flash Key + 1 x Front Access USB Key
Ethernet	4 x 10 GbE	Dual 10 GbE	Dual 1 GbE
Chassis support	Flex System Enterprise Chassis	Flex System Enterprise Chassis	Flex System Enterprise Chassis
Power management	Active Energy Management	Active Energy Management	P-state Capping, Power Maximizer
Warranty	3 year	3 year	3 year
Management	iMM V2, RTMM KVM Dongle	iMM V2, RTMM KVM Dongle	iMM V2, RTMM KVM Dongle
Operating systems	Microsoft Windows Server, SUSE, Red Hat Enterprise Linux, VMware	Microsoft Windows Server, SUSE, Red Hat Enterprise Linux, VMware	Microsoft Windows Server, SUSE, Red Hat Enterprise Linux, VMware
RAS features	Chassis redundant/hot- plug power and cooling	Chassis redundant/hot-plug power and cooling	Chassis redundant/hot-plug power and cooling
	Front panel and FRU/CRU LEDs	Front panel and FRU/CRU LEDs	Front panel and FRU/CRU LEDs

	p460 Compute Node	p260 Compute Node	p24L Compute Node
Form factor	Flex System double-wide node	Flex System standard node	Flex System standard node
Processor cores	16 or 32 cores, POWER7 64-bit processors with AltiVec SIMD and Hardware Decimal Floating-Point acceleration Configuration Options: 4-core 3.3 GHz, 8-core 3.2 GHz, 8-core 3.5 GHz	8 or 16 cores, POWER7 64-bit processors with AltiVec SIMD and Hardware Decimal Floating-Point acceleration 8 or 16 cores, POWER7+, 64-bit processors with VSX, Memory Expansion acceleration and Encryption acceleration Configuration Options: 4-core 3.3 GHz or 4.0 GHz 8-core 3.2 GHz or 3.6 GHz 8-core 3.5 GHz or 4.1 GHz	8 or 16 cores, POWER7 64-bit processors with AltiVec SIMD and Hardware Decimal Floating-Point acceleration Configuration Options: 4-core 3.7GHz or 8-core 3.2 GHz or 8-core 3.5 GHz
Level 2 (L2) cache	256 KB per processor core	256 KB per processor core	256 KB per processor core
Level 3 (L3) cache	4 MB per processor core	4 MB per processor core on 3.3, 3.2 and 3.5 GHz offerings 10 MB per processor core on 3.6, 4.0 and 4.1 GHz offerings	4 MB per processor core
Memory (min/max)	16 GB up to 1 TB node, 32 DIMM slots, ECC IBM Chipkill DDR3 SDRAM running at 1066 MHz	8 GB up to 512 GB, 16 DIMM slots, ECC IBM Chipkill DDR3 SDRAM running at 1066 MHz	8 GB up to 256 GB, 16 DIMM slots, ECC IBM Chipkill DDR3 SDRAM running at 1066 MHz
Internal disk storage	Up to two 2.5-inch hard disks or two 1.8-inch Solid State Drives (SSDs)	Up to two 2.5-inch Hard Disks or two 1.8-inch SSDs	Up to two 2.5-inch Hard Disks or two 1.8-inch SSDs
Networking/Expansion	Four PCIe expansion slots	Two PCIe expansion slots	Two PCIe expansion slots
Systems management	Integrated systems management processor, light path diagnostics, Predictive Failure Analysis, Cluster Systems Management (CSM), Serial Over LAN, IPMI compliant	Integrated systems management processor, light path diagnostics, Predictive Failure Analysis, CSM, Serial Over LAN, IPMI compliant	Integrated systems management processor, light path diagnostics, Predictive Failure Analysis, CSM, Serial Over LAN, IPMI compliant
RAS features	Chassis redundant/hot plug Power & Cooling Front Panel & FRU/CRU LEDs Concurrent code update Processor deallocation ITE hot plug Dual AC Power Supply Auto reboot on power loss Internal and chassis-external temperature monitors 64B Marking ECC code supporting x8 IS DDR3 DIMMs System mgmt alerts IBM Chipkill ECC detection and correction	Chassis redundant/hot plug Power & Cooling Front Panel & FRU/CRU LEDs Concurrent code update Processor deallocation ITE hot plug Dual AC Power Supply Auto reboot on power loss Internal and chassis-external temperature monitors 64B Marking ECC code supporting x8 IS DDR3 DIMMs System mgmt alerts IBM Chipkill ECC detection and correction	Chassis redundant/hot plug Power & Cooling Front Panel & FRU/CRU LEDs Concurrent code update Processor deallocation ITE hot plug Dual AC Power Supply Auto reboot on power loss Internal and chassis-external temperature monitors 64B Marking ECC code supporting x8 IS DDR3 DIMMs System mgmt alerts IBM Chipkill ECC detection and correction
Operating systems	AIX 6.1 AIX 7.1 IBM i 6.1 and 7.1 RHEL 5.7, 6.2 SLES11 SP2	AIX 6.1 AIX 7.1 IBM i 6.1 and 7.1 RHEL 5.7, 6.2 SLES11 SP2	RHEL 5.7, 6.2 SLES11 SP2
Energy management	EnergyScale™ energy management	EnergyScale energy management	EnergyScale energy management

The **IBM Flex System x220 compute node** has a versatile, cost-optimized design for infrastructure and entry virtualization workloads. The Flex System x220 compute node features a no-compromise design for processor, memory, and networking resources to allow your business to do more. Features such as automated power management with onboard sensors to give you more control over power and thermal levels across the system. These capabilities, combined with memory capacity up to 192 GB are designed to help you get the most out of your systems. Optional Virtual Fabric allows you to take advantage of up to 32 ports of virtual networking capabilities with multiple protocols, including Ethernet, Fibre Channel over Ethernet and iSCSI. The system also allows you to enable features on demand for a more flexible I/O solution.

The **IBM Flex System p460 compute node** is a POWER7 processor based server that delivers high performance, reliability and availability in AIX, IBM i and Linux environments. The Flex System p460 compute node is built for your most critical and demanding backend workloads—all while providing savings through reduced hardware, software, energy and administrative overhead. Features like built-in predictive failure analysis allow the system to proactively analyze situations that indicate an impending failure, in many cases removing the questionable component from use before it can cause a threat to system stability. These capabilities, combined with a 16 or 32 core configuration, up to 1 TB of memory, four PCIe expansion slots and networking and storage options that fit your existing infrastructure, provide you with a high-performing, high-efficiency cornerstone for your enterprise computing needs.

The **IBM Flex System p260 compute node** comes with either POWER7 or POWER7+ processors to deliver mainframe-inspired reliability and optimized performance for AIX, IBM i and Linux operating environments. EnergyScale™ energy management and the Active Energy Manager work together up to provide flexible performance-energy profiles including the ability to customize by partition for maximum performance, maximum energy savings or a mixture of both. When configured with the POWER7+, the Flex System p260 compute node can leverage its faster frequencies and larger L3 cache to improve performance while the embedded memory compression accelerators help reduce memory requirements without penalizing performance. Configured with 8 or 16 cores, up to 512 GB of memory and two PCIe expansion slots, these capabilities supply available-now power and efficiency while enabling the ability to handle increasing demands during the system lifecycle.

The **IBM Flex System p24L compute node** delivers the outstanding performance of the IBM POWER7 processor in a dense, highly efficient form factor for Linux customers. It is ideal for running multiple Linux infrastructure and application workloads virtualized with PowerVM®—and doing it more economically than traditional Linux servers. These workloads benefit from POWER7 processor performance, virtualization efficiencies, unique workload optimizing features. Available in 8 or 16 core configurations, up to 256 GB of memory and two PCIe expansion slots, you can immediately experience the industry-leading reliability and availability with the security of a system that can scale as your needs grow.

The **IBM Flex System PCIe Expansion Node** is an element of the IBM PureFlex System family designed to support additional PCI express adapters, fabric mezzanine adapters and next-generation graphics processing units (GPU) to an IBM Flex System compute node, which expands the compute node's capability.

Storage

The IBM Flex System storage capabilities allow you to gain advanced storage nodes functionality in your system while taking advantage of your existing storage infrastructure through advanced virtualization. Your Flex System simplifies storage administration with a single storage management user interface that is incorporated into the integrated system manager. This allows you to virtualize third-party storage with non-disruptive migration of the current storage infrastructure.

The **Flex System V7000 Storage Node** is built on the industry-leading storage virtualization and efficiency capabilities of IBM Storwize® V7000 while being physically and logically integrated into the Flex System. The Flex System V7000 enables external virtualization, consolidation and tiering, and is designed to improve application availability and resource utilization for any size organization. Offering you easy-to-use, efficient and

cost-effective management capabilities for new and existing storage resources, Flex System V7000 delivers a no-compromise storage design combined with integrated virtualization, efficiency and performance capabilities. This helps simplify and speed deployment by automating and streamlining provisioning for greater responsiveness and lower costs. And because it can be used in conjunction with the Storwize V7000 system, the Flex System V7000 allows you to progress while maximizing your current storage investments.

	IBM Flex System PCIe Expansion Node
Supported bus widths	1x, 2x, 4x, 8x and 16x*
Adapter capacity	Two full-length, full-height x16 Two half-length, half- height x8
Adapter sizes	Standard-height adapters, 4.20-inch (106.7 mm) Low-profile adapters, 2.536-inch (64.4 mm) Half-length adapters, 6.6-inch (167.65 mm) Full-length adapters, 12.283-inch (312 mm)
Adapter quantities	Up to two low-profile adapters Up to two full-height adapters Up to one full-height, doublewide adapters
PCIe standards	Supports 1.1 and 2.0
Generation	Generation 1- and Generation 2-compliant adapters†
Power	Supports greater than 75 W PCIe adapters using standard PCIe auxiliary power connectors±
Form factor	Flex System standard node
Chassis support	Flex System Enterprise Chassis
I/O expansion	2x Mezz adapters (x8+x4)
Warranty	3-year customer replaceable unit and onsite service, next business day 9×5, service upgrades available
Management	iMM V2, RTMM KVM Dongle

IBM Flex System V7000 Storage Node at a glance	
Host interface	SAN-attached 8 Gbps Fibre Channel, 10 Gigabit Ethernet (GbE) Fibre Channel over Ethernet and iSCSI host connectivity
Cache per controller/control enclosure/clustered system	8 GB/16 GB/64 GB
Supported drives	2.5-inch disk drives • 500 GB, 1 TB 7.2k nearline SAS • 146 and 300 GB 15k SAS • 300, 600 and 900 GB 10k SAS 200 and 400 GB E-MLC SSD
Maximum drives supported	240 per control enclosure; 960 per clustered system
Rack support	IBM Flex System Enterprise Chassis
Management software	IBM Flex System Manager
Advanced features included with each system	Easy Tier, IBM FlashCopy®, internal virtualization and thin provisioning, data migration, system clustering
Optional features	Remote mirroring, real-time compression, external virtualization

IBM Flex System Storage Expansion Node at a glance	
Feature on Demand	ServeRAID M5100 Series RAID 6 Upgrade ServeRAID M5100 Series SSD Caching Enabler ServeRAID M5100 Series Performance Accelerator
HDD support	SAS 2.1 at 6 Gbps and SATA
PCIe support	x8 PCIe Gen 3, 8 GTps
Drive modes	JBOD and RAID
RAID modes	RAID-0, -1, -5, -6, -10, -50 and -60
Cache options	512 MB and 1 GB with cache-to-flash super capacitor offload
Form factor	Flex System standard node
Chassis support	Flex System Enterprise Chassis
Limited warranty	3-year customer replaceable unit and onsite limited warranty, next business day 9×5, service upgrades available
Systems management	iMM V2, RTMM KVM Dongle

The **IBM Flex System Storage Expansion Node** provides dedicated hard disk drives (HDDs) or solid state disk (SSD) storage to an IBM Flex System x220 and x240 compute node, which expands the compute node's capability. Supporting up to 12 SAS/SATA hot-swappable drives, the Flex System Storage Expansion Node is ideal for a variety of application environments, including unstructured data analytics within a distributed database environment and network Attached Storage infrastructure solutions.

Networking capabilities

IBM Flex System Fabric is the interconnect technology for the IBM Flex System. IBM Flex System Fabric optimizes your networking resources for maximum performance, automates network deployment and offers integrated management. The network resources in IBM Flex System are tightly integrated into the system to support virtualization and simple, integrated management. That means you can move from managing a physical network to managing a logical network in a virtualized environment—supporting business services instead of network components. With integrated management tools based on open standards, these resources are easy to provision and deploy so you can reduce the cost of managing your virtual fabric. You have fewer elements to manage, but still get port and bandwidth flexibility with highly scalable switches. With scalable components, you can buy a base product and purchase and enable additional ports without adding new hardware.

In addition to IBM Flex System Fabric, the IBM Flex System networking capabilities provide a choice of multiple fabrics on standards-based protocols. Clients can choose Ethernet (1 Gb, 10 Gb or 40 Gb), Fibre Channel (8 Gb or 16 Gb), FCoE using a pass thru 10 Gb transit switch or 10 Gb converged switch as well as InfiniBand (QDR or FDR). All modules are built using industry standards and enterprise class features that have a record of seamless interoperation with existing infrastructures. When coupled with pay-as-you-grow scalability so you can add ports and bandwidth when needed, the IBM commitment to your needs is clear.

	IBM Flex System Fabric CN4093 10 Gb Converged Scalable Switch
Use	Unsurpassed convergence flexibility, scalability and performance, while delivering networking innovations to help clients address today's converged networking requirement and their potential future needs. The switch is designed to simplify network resource provisioning and resource optimization based on application requirements.
Ports	Up to 42 downlink ports: up to 16 uplink ports (2 x 10 Gb SFP+, 12 x OmniPorts, 2 x 40 Gb QSFP+)
Technology	4 Gb and 8 Gb Fibre Channel 40 Gb, 10 Gb and 1 Gb Ethernet

Converged scalable switch

Many clients today are connecting Ethernet and Fibre Channel from their servers upstream into their LAN and SAN. The IBM Flex System Fabric CN4093 10 Gb Converged Scalable Switch was created to fit into existing infrastructure, provide the ability to converge these needs and still scale to satisfy future system demands.

This switch supports multiple protocols such as Ethernet, FCoE, Fibre Channel and iSCSI. With multi-protocol support it can connect directly to the IBM integrated storage node—offering an integrated solution that is easy to setup and manage—or to an external SAN. When combined with the on board LOM or the CN4054 Virtual Fabric adapter, this switch offers a cost effective simple solution that combines the benefits of IO convergence (FCoE or iSCSI) and Virtual Fabric while providing 40Gb uplinks for maximum performance and low latency and support for enhanced features like IBM Virtual Fabric and VMready.

	IBM Flex System Fabric EN4093R 10 Gb Scalable Switch	**IBM Flex System EN2092 1 Gb Ethernet Scalable Switch**	**IBM Flex System EN4091 10 Gb Ethernet Pass-Thru Module**
Use	Supports 10 Gb Ethernet scalability and performance help address a number of networking concerns today and providing capabilities that will better prepare you for the future.	This 1 Gb Ethernet Scalable switch provides outstanding flexibility allowing you to buy one switch today and enhance its functionality in the future.	Get simple connectivity of the Flex System Chassis to any external network infrastructure.
Ports	42 internal 10 Gb ports and 22 external 10 Gb ports. Eight of these 10 Gb uplinks can be used as two 40 Gb uplink ports.	Base configuration: 14 × 1 Gb server ports and 10 × 1 Gb uplinks Switch upgrade 1: additional 14 × 1 Gb server ports and 10 × 1 Gb uplinks Switch upgrade 2: Enables 4 × 10 Gb uplinks	14 internal 10 Gb links 14 external 10 Gb SFP+ uplinks
Technology	10 Gb and 1 Gb Ethernet Includes stackable FCoE transit switch capability	IBM Ethernet	1 Gb and 10 Gb Ethernet, 10 Gb Fibre Channel over Ethernet

Ethernet adapters

	IBM Flex System CN4054 10 Gb Virtual Fabric Adapter	**IBM Flex System EN4132 2-port 10 Gb Ethernet Adapter**	**IBM Flex System EN2024 4-port 1 Gb Ethernet Adapter**
Use	Supports multiple advanced protocols for Intel processor-based IBM Flex System compute nodes. It can run in a physical, virtual or switch independent modes, and helps provide a way to reduce data center costs by using a common infrastructure for Ethernet and storage networks.	Supports RDMA and RoCE technologies, helping provide application acceleration and low latency for specialized applications. This adapter will work with the 10 Gb Flex System Fabric Switch and the 10Gb Ethernet Pass-Thru Module.	Supports IO virtualization features like VMware, NetQueue and Microsoft VMQ technologies. When combined with the Flex System EN2092 1Gb Ethernet Scalable Switch, you get an end-to-end 1 Gb solution in Flex System chassis.
Ports	Four 10 Gb ports, each port supports up to four virtual ports, upgrade to run FCoE or HW iSCSI	Two 10 Gb Ethernet ports	Four 1 Gb ports
Technology	1 Gb and 10 Gb Ethernet, 10 Gb Ethernet, FCoE and HW iSCSI, based on Emulex BE3 ASIC	10 Gb Ethernet based on Mellanox Connect X3 ASIC	1 Gb Ethernet

Ethernet switches and pass-thru modules

IBM Flex System offers intelligent, integrated and flexible network architecture that can fit with your existing or future environment. IBM Flex System Ethernet offerings support current network technologies along with the latest high-performance offerings and are available with on demand scalability to give you an easy way to scale as IT requirements grow.

Fibre Channel switches and pass-thru modules

Fibre Channel is the dominant choice for storage connectivity today. The IBM Flex System portfolio offers both 8 Gb and 16 Gb SAN-connectivity offerings for easy integration with your SAN environment. Supporting a range of technologies and performance levels, these offerings are designed to help you manage the LAN and SAN network via a single integrated tool. Advanced licensing features enable advanced SAN functions and monitoring. High-performance, scalable offerings are designed for simple and cost-effective scalability for future growth. And advanced virtualization features enable both physical and virtual SAN setup and management.

	IBM Flex System FC5022 8/16 Gb SAN Scalable Switch	**IBM Flex System FC3171 8 Gb SAN Switch**	**IBM Flex System FC3171 8 Gb SAN Pass-Thru Module**
Use	Market-leading 16 Gbps Fibre Channel technology as well as expert optimized, automated and integrated capabilities. The switch is designed to support highly virtualized computing and SAN environments with high performance, reliability and usability.	Provides an integrated, simple connection to existing SAN fabrics and storage. Based on QLogic's proven Fibre Channel expertise. The switch is designed to set up quickly and be easy to manage. Minimize time and risk and support faster access to your data faster and quicker and better business decisions.	Enables 8 Gb connectivity to storage from the Flex System chassis and offers enhanced Fibre Channel functions like network port aggregation, auto stream guard, Enhanced N_Port ID Virtualization (NPIV) and automatic failover.
Ports	Up to 48 total physical ports: 28 internal, 20 external. 48 virtual channels per port	20 ports (14 internal, 6 external SFP+)	14 internal 8 Gb ports and six external 8 Gb ports. Works at 4 Gb and 8 Gb speed
Technology	Brocade	QLogic	QLogic

Fibre Channel adapters

	IBM Flex System FC5022 2-port 16 Gb Fibre Channel Adapter	**IBM Flex System FC3052 2-port 8 Gb Fibre Channel Adapter**	**IBM Flex System FC3172 2-port 8 Gb Fibre Channel Adapter**
Use	Enables high-speed access for Flex System compute nodes to external Storage area network (SAN). Offers end-to-end 16 Gb connectivity to your SAN. It can auto-negotiate, and also work at 8 Gb and 4 Gb speeds. It has enhanced features like N-port trunking, as well as increased encryption for security.	Works with any of the 8 Gb or 16 Gb Flex System Fibre Channel switch modules. When compared to the previous-generation 4 Gb adapters, the new generation 8 Gb adapters double throughput speeds for Fibre Channel traffic. As a result, it is possible to manage increased amounts of data.	Works with any of the 8 Gb or 16 Gb Flex System Fibre Channel switch modules. When compared to the previous generation of 4 Gb adapters, the new 8 Gb adapters double the throughput speeds for Fibre Channel traffic. As a result it is possible to manage increased amounts of data.
Ports	Two 16 Gb Fibre Channel ports	Two 8 Gb Fibre Channel ports	Two 8 Gb ports
Technology	Brocade	Emulex	QLogic

Infiniband switches

High performance computing or financial services solutions require maximum bandwidth and low latency. To support these demands, IBM offers the next generation InfiniBand solution at both Fourteen Data Rate (FDR) and Quad Data Rate (QDR) speed. The options support Host Channel Adapters (HCA) and switches to connect servers with remote storage and networking devices, and with other servers.

SmartCloud Desktop Infrastructure

The dynamically changing workplace presents additional complications. Employees and managers alike have adopted an available anytime, anywhere expectation for their work and their data. Add to that the proliferation of mobile devices—including users' personal smartphones and tablets—and the following challenges become clear:

- Complexity and costs rise because there are more systems to coordinate, more applications to support and more connections to maintain.
- Security and compliance becomes more complex because of the need to secure data on devices that are more vulnerable to loss, theft and failure as well as comply with corporate, regulatory and governmental rules over a larger network and on devices that mix personal and enterprise data.

As a result, many organizations are turning to virtual desktop infrastructure (VDI) to support employees with flexible, secure and productive ways to work. The Flex System hardware serves as the foundation for IBM SmartCloud™ Desktop Infrastructure and offers a robust virtual desktop solution to meet these challenges while increasing staff productivity and organizational flexibility. Designed in close cooperation with leading vendors including Citrix, VMware and Virtual Bridges, the Flex System reference architecture is fully supported across applications, software, hardware and services to help streamline IT administration and take the guesswork out of transitioning to a virtual desktop.

These virtual desktop solutions include VDI, integrated offline VDI for disconnected and mobile use as well as remote branch support. The solutions can also provide more flexibility and choice by supporting virtual Windows desktops (Microsoft Windows XP and Microsoft Windows 7 platforms), Linux desktops (including Ubuntu, Red Hat and Novell platforms) and a variety of storage, peripherals and remote display protocols.

	IBM Flex System IB6131 InfiniBand Switch
Use	Designed to offer the performance you need to support clustered databases, parallel processing, transactional services and high-performance embedded I/O applications, reducing task completion time and lowering cost per operation. Virtual Protocol Interconnect also simplifies system development by serving multiple fabrics with one hardware design.
Ports	14 internal ports
Technology	Mellanox

	IBM Flex System IB6132 2-port FDR InfiniBand Adapter
Use	Designed to meet your critical performance needs. Supports switch-embedded subnet managers and host-based subnet managers.
Ports	2 FDR ports for 56 Gbps bandwidth
Technology	Mellanox

Why IBM?

IBM has taken knowledge, expertise and technology gained from decades of experience and investment in IT solutions for business problems and incorporated it into the IBM Flex System. With a commitment to open standards you can integrate IBM solutions with other elements of your own environment with your network of partners, customers and suppliers.

With a broad ecosystem of partners with technical and industry expertise, and the unique ability and skill to integrate it all together for you—along with an unwavering commitment to your success—you can rely on IBM and your IBM Flex System.

For more information

To learn more about the IBM Flex System visit: **ibm.com**/systems/flex/ or contact your IBM representative or IBM Business Partner.

Additionally, IBM Global Financing can help you acquire the IT solutions that your business needs in the most cost-effective and strategic way possible. We'll partner with credit-qualified clients to customize an IT financing solution to suit your business goals, enable effective cash management, and improve your total cost of ownership. IBM Global Financing is your smartest choice to fund critical IT investments and propel your business forward. For more information, visit: **ibm.com**/financing

* PCIe mechanical connectors limit larger lane add-in cards from being inserted into smaller mechanical connectors.

† Generation 3-compliant adapters will operate using Generation 2 compliance.

‡ Contact your IBM representative for additional information on other high-wattage adapters that can be supported.

** 2100W power supplies are also available as an option for select compute node configurations.

IBM Systems and Technology Group
Route 100
Somers, New York 10589

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[1] IBM Flex System x240 (768 GB) compared to HP BL 460c Gen8 (512 GB).

[2] IBM Flex System Flash on the x240 supports up to 3.2 TB compared to Dell M610 with 800 GB.

[3] IBM Flex System Fabric 10 Gb switch 240 Gb compared to HP 10 Gb switch 80 Gb.

[4] Comparisons are top bin 5600 to top bin 2600 two-socket configuration. For more details, visit www.intel.com/content/www/us/en/benchmarks/workstation/xeon-e5-2600.html.

[5] Performance comparison using SPECint*_rate_base2006 benchmark result divided by the processor TDP. For more details, visit www.spec.org/cpu2005/results/res2011q4/cpu2006-20111121-19037.html.

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