



## **IBM System x and IBM BladeCenter Servers and the IBM Systems Agenda for On Demand Business**



## Executive Overview

In 2005, IBM<sup>®</sup> announced the *Systems Agenda for On Demand Business* to articulate the company's evolving vision and commitment: To deliver innovative technology and expertise for business advantage. Taking advantage of IBM's collective IT expertise, the Systems Agenda fosters a synergy of servers, storage, IT infrastructure and related components—enabling them to be integrated into more complete systems. The IBM Systems Agenda provides a strategic commitment to help deliver systems around key imperatives that can help clients virtualize their IT resources, integrate open industry standards into their data center and find innovative solutions through collaboration.

In support of the Systems Agenda, IBM is unifying the mission as well as the naming conventions for our server and storage product lines, under the inclusive *IBM System* brand. Built on open standards, IBM Systems are designed to work with associated middleware, resulting in a synergy of best-in-class solutions for critical business applications.

We design our industry-standard IBM System x<sup>™</sup> and IBM BladeCenter<sup>®</sup> systems to support the Systems Agenda—systems that are open, that can easily interoperate with others and yet are secure and available when needed; systems that help simplify and optimize IT.

## Agenda for Enabling Change

A company's profit and growth are driven by its ability to innovate and grow—and to respond on demand to market conditions quickly, decisively and dynamically.

Using IT to make relevant, timely information available to employees, partners and clients helps drive that responsiveness and position a company to find new ways to innovate that uniquely matter to them. IT systems can become accelerators of that innovation by providing information on demand, helping to increase productivity, and enabling new thinking across the company and the business value chain. Companies can derive additional value by streamlining processes and better using technology to manage costs and enable new business capabilities.

The Systems Agenda for On Demand Business demonstrates IBM's commitment for delivering innovative technology and expertise to help clients achieve business advantage. At its core, it is a fundamental focus on leveraging the vast resources of IBM and its sustained history of technological innovation to deliver the next generation of systems based on the fundamental design principles of virtualization, openness and collaborative innovation.

- **Virtualization** — Optimize IT operations and dynamically respond to the priorities of the business by managing the IT environment more efficiently with proven IBM cross-platform virtualization capabilities. The move to increased virtualization throughout the data center—including local server resources and remote storage—can offer an improved approach to systems design, development and delivery. This, in turn, can dramatically enhance the ability to simplify IT and improve utilization.

**Openness** — IBM is committed to sharing technology with the industry and providing the industry's richest portfolio of interoperable server and storage systems. Openness means more than merely designing and building based on open and industry standards; it means sharing in such a way that systems—IBM and non-IBM—can integrate better and more easily.

**Collaborative innovation** — Working with clients and industry partners to implement IT solutions that can drive innovation and help transform businesses. Opportunities to collaborate extend from within a department to the entire company—even beyond, to industry-based communities.

With the Systems Agenda, IBM is helping to break down barriers between servers, storage, IT infrastructure and other components, enabling them to be integrated into more complete systems.

The intent is that the whole is greater than the sum of the parts. We chose the new *IBM Systems* name for our family of servers and storage products to highlight this synergy.

Top to bottom, IBM *System x* and IBM *BladeCenter* servers form a key part of the IBM Systems Agenda. As IBM *@server*<sup>®</sup> *xSeries*<sup>®</sup> servers transition to the IBM *System x* name, you will see the next-generation of open, industry-standard servers—servers that help simplify IT management and seamlessly integrate with the rest of IBM's product line to help you build a flexible and interoperable IT environment that can help your business succeed.

### ***Virtualization***

Businesses of all sizes continue to struggle with the overwhelming complexity created by the rapid growth of their IT environments. A business's increasing IT demands may appear to be a never-ending and costly spiral:

- As the business grows, more computing power is required
- Installation and maintenance costs and data center complexity increase as more servers are added
- Deployment of additional servers and applications may require additional IT personnel

Virtualization is the process of presenting computing resources in ways that allow for *more productive* IT, and IT that is *more responsive* to business goals. Previously, resources were presented only in the ways dictated by their implementation: geographic location or physical packaging. The move toward virtualization helps to improve resource utilization and simplify IT management.

Because virtualization is a more effective way to run IT, it is IBM's view that soon virtualization will be utilized across all environments, at all levels of server and storage implementation. Our servers, from entry level to high end to blades, are designed to be optimized for virtualization. For example, today, the IBM System x3950 (formerly xSeries 460 or x460) is the only server from a tier-1 vendor scalable from 2 to 32-processor SMP using Intel<sup>®</sup> Xeon<sup>®</sup> MP processors. It gives you one of the most powerful, yet cost-effective virtualization platforms in the industry. Similarly, BladeCenter, with its modular design, provides you with an extremely flexible solution for virtualization and scale-out growth—supporting multiple processors, operating systems and switches all in the same chassis. And System x tower and rack-based two-way servers with dual-core processing can provide a reliable, cost-effective virtualization solution for distributed and scale-out environments.

With one hardware platform, you can run your heterogeneous interactive business applications by day and your maintenance, inventory or computational programs at night. With our portfolio of System x and BladeCenter servers, your virtualization needs are covered, whether scale-up or scale-out.

### **IBM Virtualization Engine**

The IBM Virtualization Engine<sup>™</sup> platform contains all the ingredients needed to help reduce costs, increase resource utilization and simplify the management of infrastructure resources—all of which enable an On Demand Business infrastructure.

Virtualization Engine helps manage applications and resources, both within a single server and across multiple diverse server and storage platforms. Virtualization Engine:

- Removes barriers to increased utilization by creating end-to-end virtualization
- Maximizes IT spending by streamlining the management of hardware and virtual partitions on IBM systems

The move toward virtualizing everything expands the traditional view of virtualization beyond basic partitioning; it allows **Virtualized Management**, helps create **Virtual Resources** and offers **Virtual Access** to an end-to-end virtualized environment.

### **Virtualized Management: IBM Director**

IBM Director is a systems management tool for managing networks of homogeneous or heterogeneous hardware. Supplied at no additional charge with most IBM System x servers, it eliminates platform-unique approaches for the management of hardware and virtual partitions and provides a standards-based management infrastructure for servers, network components and storage. IBM Director 5.10 has a streamlined interface to boost productivity, with improved lightweight agents for easy deployment and software health check to simplify update management.

With IBM Director, you can manage your systems from a single, customizable console. The IBM Director Console lets you get started quickly and do more in less time. Among other features, you can:

- Deploy your systems remotely
- View and track the hardware configuration of remote systems in detail
- Monitor the usage and performance of critical components, such as processors and disks
- Optimize the performance and availability of your servers
- Analyze and troubleshoot your systems
- Maintain and update software
- Provide bridges to the IBM Virtualization Engine console; this enables the Virtualization Engine console to discover your environment and work with your existing management resources to integrate, leverage and harness their power into one experience

From a single Java™-based user interface, IBM Director enables monitoring and event management across a heterogeneous IT environment. From a single access point, users can monitor system resources, take hardware and software inventory, view and respond to events, perform task management, take corrective actions, issue distributed commands and remotely control both servers and storage.

With the second release of Virtualization Engine, IBM Director 5.10 broadened its operating system coverage to include not only Microsoft® Windows® and Linux® on x86, but also Linux on POWER™ and IBM System z™, as well as IBM AIX 5L™ and IBM i5/OS™. Supported systems now include IBM System x and IBM BladeCenter, IBM System i™, IBM System p™ and IBM System z.

### **Virtualized Resources: IBM X-Architecture Technology**

IBM X-Architecture™ technology provides increased server utilization with hardware and software system partitioning, making it possible to effectively run multiple mission-critical applications concurrently in an Intel processor-based system. IBM's third-generation X-Architecture (X3) chipset is optimized for virtualization. For example, X3-based System x servers reduce front-side bus contention to decrease the overhead required by virtualization. Incorporating the latest processor, memory, cache and I/O technologies in System x servers also serves the purposes of virtualization by boosting performance and reducing energy requirements.

IBM attacks the software requirements for virtualization as well, using multiple approaches. Embracing the principles of openness and collaboration, IBM supports virtualization software from both VMware and Microsoft. IBM also developed virtualization software that can be used with IBM System x and BladeCenter servers and non-IBM servers alike.

### **Virtualized Resources: VMware**

VMware GSX Server and ESX Server provide a virtualization layer that allows multiple virtual machines (VMs) to run simultaneously on a single physical server. "Virtual SMP" support allows VMs to span multiple physical processors. This makes VMs ideal for resource-intensive enterprise applications. Unlike physical servers, VMs can be created in a matter of minutes and can be moved from one physical server to another without reconfiguring the operating system or applications.

VMware provides IT administrators with complete control over the server resources allocated to each VM. It enables organizations to run from one to eight VMs *per processor* in servers with up to 16 processors.

VMware VirtualCenter management software is used to help manage VMs across many physical systems. VirtualCenter can help simplify the management of virtualized BladeCenter or System x server-based networks running Microsoft Windows, Novell NetWare, or Linux operating systems. In addition, VMware VMotion technology allows administrators using VirtualCenter to migrate a “live” VM to a different physical server without service interruption. This helps to make dynamic workload balancing and zero-downtime hardware maintenance possible.

#### **Virtualized Resources: Microsoft Virtual Server**

Virtual Server creates an environment on top of the Microsoft Windows Server 2003 operating system that allows multiple “guest” OS environments to operate simultaneously. This enables companies to better utilize hardware resources, support legacy operating environments or handle technology transitions more seamlessly. It enables organizations to run multiple VMs per physical processor on servers with up to 32 processors.

We continue to work with Microsoft to develop virtualization techniques that take best advantage of our hardware and their software.

#### **Virtualized Resources: IBM System Storage Virtualization**

IBM System Storage™ products can help transform the economics of enterprise storage by enabling users to simplify their infrastructure, protect their data and efficiently manage information. For organizations interested in increasing flexibility while reducing the cost of storage, the System Storage virtualization capabilities allow you to virtualize disk, file and tape. Our virtualization solutions for System x and BladeCenter include the SAN Volume Controller, SAN File System, Tivoli® Intelligent Orchestrator and Tivoli Provisioning Manager:

- **SAN Volume Controller (SVC)** permits disk level virtualization across IBM and non-IBM systems (including support for EMC, HP and Hitachi storage). SVC helps increase storage resource utilization and administrator productivity.
- **SAN File System (SFS)** is designed to virtualize file and data management across Windows, UNIX® and Linux servers in your network, using any SAN-attached storage. SFS automates routine file and data management tasks through customer-defined rules or policies, enabling the alignment of storage service with the value of your data.
- **Tivoli Intelligent Orchestrator (TIO)** can improve server utilization and help lower the total cost of ownership of your existing distributed systems by establishing shared pools of resources and dynamic provisioning as needed. By increasing the utilization of these servers, fewer are needed.
- **Tivoli Provisioning Manager (TPM)** works with TIO to automate the manual tasks of provisioning and configuring physical and virtual servers, operating systems, middleware, applications, storage and network devices (routers, switches, firewalls and load balancers). TPM allows you to create, customize and quickly utilize best-practice automation packages. You can provision and deploy a server from bare-metal to full production, in some cases with the push of a single button.

#### **Virtualized Access: IBM Virtual Machine Manager**

IBM Virtual Machine Manager (VMM) is an optional extension for IBM Director. VMM allows you to manage physical and virtual machines from a single console. Combining IBM Director and VMM, you can manage both VMware ESX Server and Microsoft Virtual Server environments. VMM also integrates VMware VirtualCenter and IBM Director for advanced virtual machine management.

The benefits of Virtual Machine Manager include:

- **“Single-glass” management of both physical and virtual systems** — Allows you to see the relationship between physical and virtual systems
- **Administering virtualized environments** — Access all VMware and Microsoft Virtual Server instances from one view
- **Predictive hardware health alerts trigger VMware's VMotion technology** — Helps to achieve higher availability by avoiding downtime
- **Static migrations of virtual systems** — For both VMware and Microsoft virtualized environments
- **Integration into IBM Director to leverage existing facilities** — Supports alerts, event action plans, security and system health

VMM, available to IBM customers at no charge, gives IBM leadership in the area of virtual machine management on x86-based servers. HP customers must pay for this capability, while Dell doesn't even offer it.

### **Openness**

Once upon a time, hardware and software from different vendors often didn't interoperate. Since then, the industry has evolved to the point where interoperability is essential. The advantages to both vendors and clients of open hardware specifications, open source software and industry standards are undeniable.

To this end, IBM designs and builds systems that not only are based on open and industry standards, but that also interoperate in such a way that they integrate better and more easily. IBM has undertaken numerous steps in support of openness. These include incorporating many industry-standard technologies in System x and BladeCenter products, providing resources to support open source endeavors and contributing hardware specifications, software code and intellectual property to the cause of openness.

Why do we support openness so strongly? We do it so the hardware and software vendors who form the ecosystem around System x and BladeCenter servers can add value to IBM servers. This provides our customers with the greatest possible flexibility in choosing software and hardware. More flexibility means you are more likely to find the best combination of IBM and non-IBM products to meet your needs.

For example, System x servers with Xtended Design Architecture™ technology and high-end System x servers with X3 technology incorporate a number of new and emerging industry standards. These include:

- **PowerExecutive** — Provides the ability to dynamically monitor and control power utilization in the data center helping to optimize performance and power consumption. Integrates into IBM Director software
- **TCP Offload Engine** — Provides a separate processor inside the Ethernet chip that offloads TCP/IP traffic from the server processor to help improve total system performance in heavy-traffic Ethernet environments
- **Serial-Attach SCSI (SAS) and Serial ATA (SATA) disk drives** — Provides higher throughput and less bus contention than the previous generation of parallel-attach ATA/IDE and SCSI drives, while also supporting more total devices with greater cable length than before
- **IPMI 2.0 highly secure remote access** — Uses rich security to perform systems management remotely and reduce administrator travel time

IBM staffs a **Linux Technology Center** with more than 600 developers in 40 locations around the world. Their objectives are to improve Linux, to expand the reach of Linux, and to bring IBM products to the Linux operating system.

Similarly, IBM has established six **Linux Centers of Competency** around the world to help clients and IBM Business Partners leverage Linux-enabled solutions to solve business challenges.

In addition, IBM has created a program to **certify Red Hat and Novell SUSE Linux distributions** across the System x and BladeCenter product lines.

- **IBM eXtended I/O** — Provides flexibility to choose the right system I/O mix for a workload
  - **HyperTransport technology** provides greater bandwidth between multiple processors and between memory and processors
  - **High-performance PCI Express** and **PCI-X 2.0 adapter slots** provide the higher performance needed for the next generation of high-speed adapters: 10Gb Ethernet, 12X InfiniBand®, etc.
  - **Slotless RAID** provides RAID 0 and 1 without taking up a PCI slot and the ability to upgrade to RAID 5 using the same slot
  - **IBM Remote Supervisor Adapter II** provides upgraded systems management functions without taking up a PCI slot
- **Dual-core 64-bit processors from Intel and AMD™** — Offers more performance per socket than single-core processors, while also potentially reducing overall software licensing fees

Leveraging industry standards, IBM then adds innovations that provide client benefits in the areas of flexibility, availability and cost-savings, including:

- **Light path diagnostics panel** — Allows quicker, easier identification of failed parts—via an externally visible drop-down panel—in many cases even without power to the server
- **Predictive Failure Analysis®** — Helps alert IT to potential failures *before* they happen, not only on hard drives and memory, like Dell and HP, but also on processors, fans, voltage regulator modules (VRMs) and power supplies
- **Simple-swap SATA interfaces** — Provides a hard drive that is easier to add or replace than a fixed drive and at a lower cost than a hot-swap drive
- **Calibrated Vectored Cooling™** — Provides more efficient cooling, which allows for more internal components (such as eight DIMMs in a 1U server) and the first 1U server with support for hot-swap fans
- **XpandOnDemand™ scalability** — Allows the addition of processors, adapters slots, memory and other system resources, simply by plugging an additional system chassis into the first
- **Memory ProteXion™ technology** — Provides an additional layer of memory protection beyond ECC and Chipkill™ protection
- **Advanced Connectivity Technology (ACT) KVM cabling** — Offers simpler, lower-cost cabling, to save administrators recabling time and promote better behind-rack airflow

IBM has instituted other initiatives to support an open BladeCenter ecosystem:

- The **BladeCenter Interoperability program** allows independent hardware vendors to have IBM test their products with currently announced and available IBM BladeCenter blades, switches and daughter cards.
- In November 2005, IBM and Sun announced support for running **Sun Solaris 10 on BladeCenter servers**.

IBM's commitment to openness goes far beyond simply implementing existing industry standards. In 2002, IBM entered the blade server market with a product codeveloped with Intel. Within a year, the **BladeCenter** product line was the number one seller in the industry. IBM's share of the industry has since increased to over 40%. Yet, with other incompatible entries in the market there is little consistency or compatibility across vendor products. IBM saw an opportunity to coalesce the industry around an open standard.

In the second half of 2004, IBM and Intel announced the **public availability of the BladeCenter design specifications**. Opening the design specs is intended to enhance the ecosystem by offering hardware developers the ability to more easily develop and build compatible options for the BladeCenter platform. Examples include networking switches, blade adapter cards and appliance and communications blades. More than 310 vendors have signed the licensing agreement with the intent of developing and bringing products to market to give customers more choices.

In another example of openness, the **IBM Director 5.10** systems management software has the ability to integrate with enterprise management solutions from a number of vendors. Unlike other hardware vendors—whose systems management software can only integrate with the same brand of enterprise software—IBM Director enables you to make the most of your existing enterprise management structure. It upwardly integrates with:

- IBM Tivoli Management Framework and IBM Tivoli NetView®
- HP OpenView
- Microsoft Systems Management Server (SMS) and Microsoft Operations Manager (MOM)
- CA Unicenter
- BMC Patrol

Now you can manage your entire heterogeneous environment—IBM and non-IBM systems alike—with the enterprise tools you already have in place. IBM Director 5.10 even includes a software developer toolkit to facilitate development of OEM plug-ins as extensions to the built-in functionality.

In August 2005, IBM opened more than **500 patents**<sup>1</sup> to open source software as a way to remove some of the obstacles to innovation that software patents can create. Why take this action? Simple. Spurring innovation in software development aids in industry growth. This is good for everyone. Moreover, IBM pledged not to assert any of its patents against the Linux kernel. This pledge potentially affects thousands of open source projects and programs.

Releasing software into open source, opening hardware specs, opening up patents, increasing interoperability—all of these moves promote the cause of openness as a means of spurring innovation and interoperability generally across the industry, and specifically in the areas of the System x and BladeCenter ecosystems.

### ***Collaborative Innovation***

Collaboration is based on the fundamental principle that working together enables better problem solving and decision-making than working in isolation.

IBM seeks to collaborate with its clients to help them utilize technology and solutions to drive innovation in their businesses. IBM's expertise spans servers, storage, software and technical support. We can help clients develop more unique solutions to meet business goals or the demands of the marketplace, sometimes in ways not previously thought possible. IBM also works with thousands of IBM Business Partners to deliver tested industry-based and cross-industry solutions for businesses of all sizes.

Collaboration as a means of innovating is at the very heart of System x and BladeCenter product development and the IBM Systems Agenda. IBM has participated in a number of industry collaborations over the years with the goal of delivering outstanding value to clients:

- **X3 chipset** — The third-generation chipset for our ultrascaleable System x3950 (formerly xSeries 460 or x460), as well as System x3850 (formerly xSeries 366 or x366) and System x3800

IBM Director 5.10 offers a **Partners in Management** program to provide customers with more choice and management capability. The open design and broad platform support enable you to manage heterogeneous environments from a single point of control. IBM Director can help you reduce administrative costs while improving system availability to support your on demand business environment. As your business grows, IBM Director helps support the growth of your IT environment.

Open since 1993, the **IBM Center for Microsoft Technologies** consists of more than 100 software engineers, test and quality specialists and enterprise solutions support staff, whose mission is to optimize IBM hardware for Microsoft products. The center continually compares the performance of Microsoft software running on IBM hardware to that of competitive hardware, and helps the development teams design IBM servers to be the best possible platforms for Microsoft operating systems.

<sup>1</sup> For a list of these patents, go to <http://ibm.com/ibm/licensing/patents/pledgedpatents.pdf>.

(formerly xSeries 260 or x260) servers. X3 was a collaboration between IBM and Intel to optimize the performance of multichassis servers to produce world-record performance for our clients.

**Blade.org** — A collaborative organization, Blade.org is focused on accelerating the expansion of next-generation solutions for BladeCenter to drive technology advances that help solve real business problems. Currently, more than 60 members have joined Blade.org, including such industry leaders in the blade community as Brocade, Citrix Systems, Intel Corporation, Network Appliances, Nortel, Novell and VMware.

- **BladeCenter Alliance Program** — A community of more than 350 technology and solution collaborators that design and deliver products and solutions based on the open BladeCenter specifications, to give clients more choices.
- **IBM Virtual Machine Manager** — A software collaboration between IBM and VMware. IBM Virtual Machine Manager was created using the VMware SDK. “IBM and VMware have been working together for several years to help enterprise companies fully leverage their IT infrastructure through virtualization,” says Dr. Steve Herrod, VMware Executive VP of R&D. “In fact, IBM was the first VMware ‘design partner’ for the initial SDK. Together, we provide customers with single-glass management of their virtualized physical machines, which maximizes IT resources and minimizes costs.”
- **Grid and Grow** — Grid and Grow™ is a packaged set of software, hardware and services—utilizing an open, scalable architecture—that will deliver the benefits of Grid computing to businesses large and small. Grid and Grow is a collaborative effort of IBM, independent software vendors and IBM Business Partners. It delivers a grid/virtualization solution that demonstrates the nature of the IBM Systems Agenda: a customer can virtualize the blades in a BladeCenter chassis and also connect via the grid to other virtual assets in an enterprise.
- **Virtualized Hosted Client Infrastructure** — Using VMware virtualization software, Citrix client access technologies and System x and BladeCenter servers, the virtualized hosted client infrastructure delivers full desktop functionality to a “thin” client. It can help increase the utilization of computing resources, allow quicker deployment of new users, improve security, and help reduce total cost of ownership for desktop environments.
- **IBM ServerProven program** — This program validates application solutions and hardware options in collaboration with vendors, to help reduce integration risks, enable smoother installation and reduce the need for post-implementation support. The ServerProven® program also compatibility-tests hardware options for System x and BladeCenter servers.

IBM has entered into other **industry collaborations** to benefit clients:

- IBM works with major application providers like **Oracle, SAP, SAS and Siebel** so their business applications run well on our servers.
- **Nortel and IBM** have entered into an agreement to jointly develop networking products for the telecommunications industry. The agreement initially will focus on the development of carrier-grade servers based on the BladeCenter design.

## Summary

IBM's System Agenda is a sweeping, far-ranging approach to providing clients with the solutions they need in the coming years. With industry-standard System x and BladeCenter servers, in-house IBM innovation combines with client and vendor collaboration and open source software to produce an environment where systems are open, can easily interoperate with others and yet are highly secure and available when needed. The ongoing goal of these systems is to simplify and optimize IT and drive a greater return on investment so you can focus on what's important: your business.

### **Additional Information**

To begin to transform your IT environment, please visit: <http://ibm.com/systems/agenda>.

For more information on IBM System x and BladeCenter products and services, visit our Web site at: <http://ibm.com/systems/x> and <http://ibm.com/systems/bladecenter>.



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Maximum internal hard disk and memory capacities may require the replacement of any standard hard drives and/or memory and the population of all hard disk bays and memory slots with the largest currently supported drives available. When referring to variable speed CD-ROMs, CD-Rs, CD-RWs and DVDs, actual playback speed will vary and is often less than the maximum possible.