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Strategic Snapshot

Integrated Systems Management
The New Generation of IBM System x Servers

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ABSTRACT

The importance of systems management in the datacenter should not be underestimated. As deployment of all types and sizes of servers has continued unabated, IT organizations can no longer afford the manpower and resource expense of simply trusting that the vast server farm will operate efficiently without human intervention. While UNIX and mainframe operations have recognized this for some time, for many x86-based server installations, it is only recently that corporate realities have mandated the same degree of operational efficiency and efficacy for all IT servers.

In many organizations the sheer number of x86 servers exceeds that of other platforms, yet expectations for systems management are often not commensurate. Organizations that have begun to address the manageability and cost considerations of x86 deployments have likely come to realize that while there are many vendors of x86 server hardware, uniform systems management is a less developed craft in this market segment.

The need to remain competitive in today's marketplace has led organizations to demand greater flexibility in IT service delivery. In particular, virtualization of underutilized server assets is a method by which to improve the efficiency and cost-effectiveness of server investments, yet most system management approaches have remained bifurcated between the physical and virtual worlds.

In this paper, we examine the importance of IT's ability to deliver dynamic services that are closely aligned with business needs while maximizing the cost-effectiveness of all IT resources. We also review how IBM is advancing the Systems Management discipline in the x86 environment to be consistent with its other hardware platforms. With the total systems management experience, IBM has positioned itself to address the need for holistic Systems Management of x86-based servers as well as their virtualized brethren within the larger context of the data center.

Integrated Systems Management

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Introduction

Effective systems management is not achieved simply through add-on software; rather it demands a holistic point of view that is manifest through systemic innovation beginning with each component on the motherboard. Further, it must take a view beyond that of the local server that is inclusive of the greater IT environment. As operations and energy consumption continue to become the dominant expenses in the datacenter, accepting a less-than-comprehensive management solution for x86 systems is no longer an option. Given the historic underutilization of x86 servers, this issue becomes even more imperative.

To address this underutilization organizations have approached virtualization as a means to capture greater utilization of their x86 assets. While organizations may have originally limited forays into virtualization to a select set of non-critical services, virtualization is no longer just an experiment or toy; it is an essential component in maximizing IT value. The growth of virtualization dictates that systems management tools must manage both physical and virtualized resources in a unified fashion to reduce deployment, training, and management expense.

Competitive organizations recognize that x86 installations must deliver the same degree of industry-leading performance, virtualization, energy efficiency, and scalability as other platforms. As result, x86-based solutions must be based upon resilient architectures and management tools that deliver security and high availability. This includes a robust portfolio of hardware and software management solutions by which to meet current demands while delivering the scalability necessary to adjust capacity as business requirements change. In other words, solutions must improve service, reduce cost, and manage risk.

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The need to remain competitive has led organizations to demand greater flexibility in IT service delivery. Hence, there is a growing expectation for a dynamic infrastructure and dynamic management tools. The effective convergence of business and IT infrastructure into one dynamic infrastructure can enable new breakthrough service opportunities and provide the basis for business transformation. In the following sections, we examine many of the innovations that IBM has brought to x86-based server solutions in its quest to improve overall systems management and help create a dynamic, cost-effective IT infrastructure.

The IBM Total Systems Management Experience

The IBM System x Server and BladeCenter families offer a comprehensive approach to systems management that spans not only x86-based servers but other data center platforms as well. The latest systems management stack continues to improve upon the past in a way that delivers unique competitive value through cross-platform commonality, integration with existing higher-level management solutions, and integrated management of both physical and virtual servers.

Enhanced Standardized Hardware and Firmware

At the hardware and firmware level, IBM has introduced enhanced technologies that are standard across all new System x and BladeCenter offerings. This standardization helps customers quickly deploy and integrate new servers into their environments.

Unified Extensible Firmware Interface

Unified Extensible Firmware Interface (UEFI) is the next-generation replacement for the venerable BIOS that has been part of x86-based systems for decades. UEFI was designed in a modular, extensible, and architecture-independent fashion to allow operating systems to take full advantage of the underlying hardware. This proven technology provides the basis on which IBM System x enables a richer management experience through improved setup, configuration, and update capabilities.

System x servers provide simplified remote configuration through command scripts with the Advance Settings Utility having 100% coverage of settings with out-of-band access. This can lower TCO by reducing upgrade downtime and automating configuration as well as making platforms easier to manage. UEFI also provides consistent and simplified error handling through human-readable event logs and a single unified code base for all UEFI-based systems.

Windows 2008 Server and Linux are both UEFI-aware. Additionally, System x provides the required resources to boot a non-UEFI-aware operating system to provide full support for legacy operating systems. Since legacy systems often represent a considerable portion of an organizations IT investment, continued support of these operating systems obviates the need for costly and time-consuming upgrade of the software infrastructure.

Integrated Management Module

The Integrated Management Module (IMM) is silicon located on each system motherboard that combines multiple functions, including those of today's Baseboard Management Controller (BMC) and Remote Supervisor Adapter-II (RSA-II) at both hardware and software levels. IMM is the common service processor hardware providing consistent systems management hardware with consistent firmware across all new-generation IBM x86 servers.

IMM combines diagnostic processes, virtual presence, and remote control to manage, monitor, troubleshoot, and repair from any location. This helps system administrators to manage large groups of diverse systems as well as manage servers in a secure environment independent of the operating system state. A single administrator can configure and deploy a server from bare metal to operating system boot, reducing both personnel and logistical costs. Standards-based alerting enables upward integration into a variety of enterprise management environments from different vendors. IMM functions can also be selectively enabled and disabled on demand on certain System x models through the purchase of a Virtual Media Key option.

IBM ToolsCenter

The IBM ToolsCenter is a consolidated, integrated suite of server management tools for the deployment, update, configuration, and diagnosis of the System x and BladeCenter environment. ToolsCenter has been redesigned to reduce complexity and the need for user training. Key features include a common UI across the tool set, a single IBM web page that provides access to all needed tools, and a portfolio of system tools for single-system management and scripting. In addition, there is a scriptable command-line interface by which organizations can incorporate ToolsCenter within an existing management solution.

Bootable Media Creator

The Bootable Media Creator (BMC) allows organizations to create bootable media suitable for applying firmware updates on supported systems. Since each of the System x and BladeCenter tools has its own bootable CD, BMC can greatly simplify the consolidation and delivery of the various tools. Organizations can create a single bootable image on a CD, DVD, ISO image, or USB key, or a set of PXE files that bundles multiple UpdateXpress System Packs containing Windows and Linux firmware and device driver updates, along with the desired management toolset. The result is a single boot image that can detect machine type at boot time and deploy updates accordingly, thus streamlining the updating process while reducing the potential for incorrectly deployed updates.

IBM Systems Director

IBM Systems Director 6.1.2 is a platform-management foundation that streamlines the management of physical and virtual systems across a multi-system environment. Systems Director supports multiple operating systems and virtualization schemes on both IBM and non-IBM platforms. The same Systems Director foundation is used for the System x, Power Systems, System z and BladeCenter, storage, and virtualization management of PowerVM , z/VM and x86 hypervisors.

Through a single user interface, Systems Director provides consistent views for visualizing managed systems, determining these systems' relationships, and identifying individual status. Other features include simplified deployment, installation, and update processes through a web-based interface accessible from anywhere as well as enhanced automation including simplified discovery and automated configuration and resource grouping.

As part of IBM's initiative to improve management efficiency Systems Director focuses on making it easy to assess system health and status through intuitive health-summary scoreboards. It also provides a variety of event filters and automation plans that can be triggered by the monitoring of resources and thresholds. The ability to manage these functions through a single interface increases consistency and reliability across the enterprise.

Integrated Physical and Virtual Server Management

While physical and virtual servers historically have tended to be managed separately, this approach does not provide a holistic view of server operations.

Organizations deploying Systems Director can overcome this limitation through support for integrated virtualization management within a single console. Systems Director directly supports multiple hypervisors including VMware ESX and ESXi, Microsoft Hyper-V, Red Hat Xen, and Novell Xen.

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Organizations that have deployed VMware ESX or ESXi are able to link System x hardware events into software events in the VMware environment through a connection between Systems Director and VMware vCenter. As shown in Figure 1, for example, an IBM system hosting VMware ESX or ESXi server can issue a predictive failure analysis (PFA) alert that is received by Systems Director which in turn responds with an automation plan for the affected virtual machines. The automation plan can then migrate the virtual machines from the failing server through a call to VMotion.

For customers using Microsoft virtualization, IBM offers an IBM Hardware PRO pack to help integrate hardware information from System x and BladeCenter into Microsoft System Center Virtual Machine Manager to provide customers who choose to use a Microsoft management environment richer information on the underlying servers.

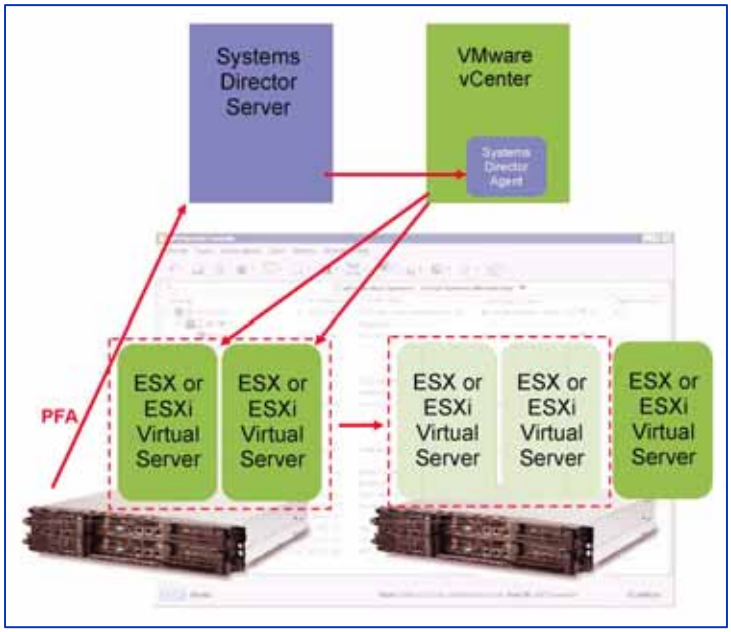


Figure 1: PFA Alert Initiates Migration of Virtual Machines

IBM Systems Director Plug-ins

There are several extensions, now known as plug-ins, available for IBM Systems Director. Plug-ins extend the scope of the product beyond its base functionality and generally are available for separate purchase.

Active Energy Manager V4.2 integrates energy-related data into platform management by monitoring, measuring, and managing the energy components built into IBM systems across all platforms. It provides clients with a single view of the actual power usage across multiple platforms in their infrastructure, power and thermal trending, and energy and temperature thresholding which can initiate a message or an automated response through Systems Director. Active Energy Manager also provides monitoring support for Power Distribution Unit energy usage, third-party power and temperature sensors, and data center facilities hardware to provide a more complete view of energy consumption within the data center. A fee-based license allows management of powe usage on System x and BladeCenter servers by enabling the capping of power use of servers or groups of servers. Users of IBM Tivoli Manager can also received aggregated server energy management data from Active Energy Manager. AEM 4.2, available in December 2009, is supported by Systems Director 6.1.2.

IBM System Director Server and Support Manager is a no-charge call-home plug-in that automatically reports hardware problems and collects system service information for monitored systems. From this, Electronic Service Agent can monitor, track, and capture system hardware errors and service information and report them directly to IBM support, saving valuable time in detection, reporting, and correction.

IBM Tivoli Provisioning Manager for Operating Systems Deployment is designed to provision an operating system through a library of disk images on any supported system on the network. This plug-in is integrated into System Director's user interface and is a replacement for the RDM extension previously available.

BladeCenter Open Fabric Manager advanced upgrade allows for the assignment and reassignment of Ethernet MAC and Fibre Channel WWN addresses used by the I/O ports on server blades in the IBM BladeCenter. BladeCenter Open Fabric Manager supports all Ethernet, Fibre Channel over Ethernet, and Fibre Channel switch modules; across all chassis and most Intel, AMD, and Power blade servers. BladeCenter Open Fabric Manager can also

automate I/O failover to standby blades within the BladeCenter and is available as a standalone utility as well as a Systems Director plug-in.

Integration with Systems Management Software Solutions

IBM Systems Director is a hardware platform management solution that can be deployed by itself or as a complementary adjunct to any broader enterprise management solution. IBM's open approach to systems management offers customers unique value as well as the flexibility to integrate with existing management solutions which can substantially reduce training and operational costs.

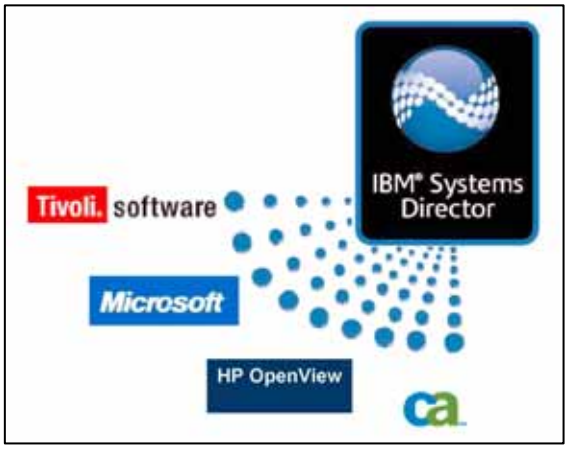
Systems Director provides upward integration into Tivoli Service Management for additional virtualization, energy, and availability management functionality. The Systems Director 6.1 Common Agent is shared with select Tivoli applications and supports common authentication and credential management. Tivoli management packages that can integrate with Systems Director to receive its management data are shown in Table 1.

Tivoli Enterprise Consoler 3.8 & 3.9	IBM Tivoli Manager 5.1.x
Configuration Manager 4.2.x	Software Distribution
Provisioning Manager	Inventory
Security Operations Manager	Distributed Monitoring
Tivoli NetView 7.1.x (Windows and Linux)	Tivoli Netcool/Precision IP (via SNMP)
Tivoli Netcool/Omnibus (via SNMP)	Tivoli Netcool/Monitoring (via SNMP)
Tivoli Netcool/ISM (via SNMP)	Tivoli Netcool/AEM (via SNMP)

Table 1: Tivoli Management Packages That Can Integrate with Systems Director

Systems Director agents can feed their extensive hardware data into higher-level management packages from other vendors including Microsoft, Hewlett-Packard, and CA. For example, users of Microsoft System Center can configure System Director Agents to forward events into Microsoft System Center Operations Manager. These upward integration modules (UIM) do not require the organization to have a System Director server. The UIM code allows the third-party packages to communicate with System Director agents on IBM servers.

The third-party management packages that support upward integration with IBM Systems Director are listed in Table 2.



CA Unicenter NSM 3.1 and R11 (Windows)
HP OpenView NNM 7.0.1 and 7.5.1 (Windows and Linux)
HP OpenView Operations for Windows 7.5.x
Microsoft System Center Operations Manager 2007

Table 2: Third-Party Management Packages Supporting Upward Integration with IBM Systems Director

Systems Management Considerations

The notion of Systems Management is not new, and there are many options available today for organizations seeking to deploy a Systems Management solution. In the UNIX and mainframe market segments, the discipline of Systems Management is a long-established expectation yet in the x86 marketplace, Many customers have been treating x86 servers equitably for a long time; however, for some the notion of commensurate system management on x86 servers is a new concept. This perception will undoubtedly begin to change as organizations increasingly focus on efficiency and cost management, and IT managers continue to develop holistic management strategies. For those who are ready to embrace a future-ready view, IBM's approach has several differentiators worthy of consideration.

Advantages in Commonality

IBM features Systems Management as an integral component of its x86 strategy which is only one part of a larger cross-platform systems management focus. All IBM server platforms are considered equal partners when it comes to Systems Management. There are operational and cost advantages in having a common management approach across server platforms:

- The IMM has a single, consistent firmware across all new generation servers from the smallest entry level x86 server to the largest enterprise solution.
- IMM uses standard operating system drivers, i.e., there are no unique IBM drivers required, and the IMM is configurable both in- and out-of-band.
- IBM ToolsCenter provides single source for all IBM tools which are organized around the common management tasks of deployment, configuration, update, and diagnosis.
- IBM Systems Director manages a broad portfolio of physical and virtual servers which can reduce staff training and operational expenses while providing a greater breadth of data center information within a single management console. It manages not only System x and BladeCenter servers, but other servers including UNIX (IBM Power Systems) and mainframe (IBM System z)...

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Ease of Training and Use

Most IT organizations realize that having the best technical solution is not necessarily the same as having the most cost-effective and efficient solution. Over the long term, training costs and ultimate ease of use can significantly impact the cost-effectiveness of any IT solution. With this in mind, IBM's approach to Systems Management treats ease of training and use as key factors in the overall design and hence usability of its management solution. Some ease of use considerations include:

- There is a standardized user interface across the System Management portfolio which reduces the overall training required as IT professionals can broaden the scope of their management coverage without learning new tools and methods.

- UEFI eliminates the obsolete "beep codes" for reporting boot time errors as well the non-standardized Control or Function key sequences to interrupt or alter the boot process. UEFI also creates human-readable event logs to simplify error detection and speed up corrective action.
- The IBM ToolsCenter through its single repository and functional organization reduces complexity and time required in finding, choosing, and learning management tools.
- IBM Systems Director provides a variety of wizard, tutorials, and online help.

New Functionality

The IBM System x and BladeCenter server families are incorporating new functionality to enhance Systems Management for x86-based servers and virtual servers deployed on the hardware. This new functionality includes:

- UEFI-based boot (with legacy BIOS support) to enable improved configuration support both in-band and out-of-band for all UEFI-aware operating systems.
- ToolsCenter supports the creation of custom bootable firmware on wide variety of media with the ability to acquire automatically firmware and driver updates from ibm.com. This multi-system single boot image can substantially decrease the administrative burden of installation and upgrade as well as reduce the potential for incorrect patches or configuration being applied to the servers.
- Systems Director delivers combined physical and virtual server management that allows IT professionals to gain a deeper understanding of the operating efficiency of both their hardware and virtual servers deployed thereon.

State of the Art and Future-Ready

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IT technologies are continually evolving. As such, the state of the art can change rather quickly. To avoid being locked in time, organizations must be as forward-looking and flexible as possible while maximizing the value captured in the present. This is especially true with respect to Systems Management as the environment to be managed will not only be heterogeneous by platform but by age of platform as well. This guiding principle is illustrated by IBM in its support of the following:

- Standardizing on UEFI as the boot method of choice moves IBM servers and blade into the forefront of the next-generation of manageability. This removes the limitations of the past and enables new functionality while also simplifying diagnosis of failed system components.
- A strong adherence to open standards enables upward integration of Systems Management data into a variety of enterprise management environments without additional configuration or administrative burden.
- The use of a shared, common agent in both IBM Systems Director and select Tivoli products enables simplified integration of Systems Management data into more broadly focused enterprise management solutions.

What It All Means

Effective systems management is manifest through systemic innovation that begins with each component on the motherboard and culminates with a view that is inclusive of the greater IT environment. The need to remain competitive in today's marketplace has led organizations to recognize that x86-based server installations must deliver the same degree of industry-leading performance, virtualization, energy efficiency, and scalability as other platforms in order to meet demands for greater flexibility in IT service delivery. Hence, there is a growing expectation for a dynamic infrastructure and dynamic management tools. This convergence of business and IT infrastructure can enable new breakthrough service opportunities and provide the basis for business transformation.

IBM's total system management experience is a leading component in delivering a dynamic infrastructure that brings about a convergent of business need and the IT infrastructure. IBM is leading the drive for heterogeneous environments through its consistent standards-based approach to Systems Management that supports dynamic IT infrastructures, reduces operating costs, and improves overall IT management. This aggressive approach raises the bar for systems management in the x86-based server marketplace. The next generation of the IBM System x and BladeCenter server families offers organizations the latest advances in Systems Management to increase application availability and performance as well as reducing the effort in managing both physical hardware and virtual servers.

IBM is uniquely differentiated by its investments in systems management for the next generation System x servers. The unique capabilities of the System x product family can meet the needs of organizations that have made strategic investments in x86-based server technologies. The ability to retain these investments and still operate at state-of-the-art performance levels represents a considerable advantage to organizations seeking to maximize performance of existing IT structures.

IBM's Systems Management approach offers simplified cross-platform management and leverages open standards to deliver a high ROI solution for target organizations. Organizations that have invested in x86-based server technologies are well advised to consider the potential benefits afforded by the systems management capabilities delivered by the IBM System x server family.