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WHITE PAPER

IBM Director: Driving Efficiencies in Scale-Out Computing

Sponsored by: IBM

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IDC OPINION

As enterprises invest in IT infrastructure to support their growing and changing business needs, they are increasingly turning to industry-standard server hardware to deliver the functionality that they demand. "Scale-out" computing — or adding server capacity in incremental building blocks of industry-standard systems as part of a server farm, cluster, or grid — is becoming more and more the norm for many enterprise IT workloads. By delivering a homogeneous environment, impressive price performance, and increasingly sophisticated functionality, industry-standard servers have become the fastest-growing server platform category in the market.

The proliferation of these servers has brought challenges, however. One of the most important is efficiently managing large arrays of smaller servers. Many enterprise customers feel that they have traded lower hardware acquisition costs and flexibility for higher IT management and services expenses. This trend and these challenges have highlighted the need for better systems management and a more cost-effective way to manage hundreds, if not thousands, of industry-standard servers within an enterprise environment. IDC believes systems management is one of the fundamental capabilities that will be sought by the customers of industry-standard servers, and it represents one of the key competitive differentiators that set one supplier of the technology apart from another in the minds of many customers.

To get the most value out of their server technology investments, enterprise customers will need effective systems management solutions. IBM eServer xSeries with IBM Director represents one of the industry-leading solutions that will help save time and money by increasing availability, tracking assets, optimizing performance, and enabling remote maintenance and provisioning of server and software resources.

IN THIS WHITE PAPER

This white paper describes the important association between systems management and the growing challenges facing today's enterprise IT managers in building cost efficient and flexible server infrastructures. It highlights the capabilities of IBM Director as a tool helping enterprise IT managers address the challenge and illustrates a model for understanding the magnitude of cost savings that can be achieved through implementation of such platform management solutions. Finally, this white paper highlights IBM Director as an important product and essential piece of IBM's overall datacenter management and On-Demand portfolio.

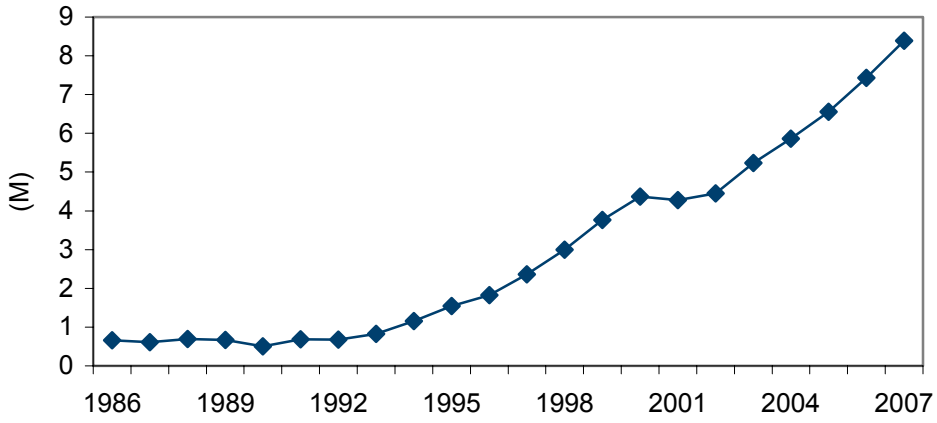
SITUATION OVERVIEW

The acceptance of industry-standard x86 servers in the market and their growth in addressing a number of user workloads — from security and Web serving to enterprise resource planning (ERP) suites and databases — have brought them to the forefront in many enterprise datacenter solutions. As enterprises build out new applications to support their growing and changing business needs, or as they migrate their infrastructures from more costly proprietary systems to x86 industry-standard server solutions, they have shifted the dynamics considerably in the systems and server marketplace.

The volume of x86 systems to manage has mushroomed and continues to grow. This shift can be illustrated by the change in server unit volumes delivered into the market on an annual basis. In 1993, fewer than 1 million servers were purchased worldwide in a market largely dominated by Unix and proprietary systems. In 2003, more than 5 million new servers were purchased worldwide, and nearly 90% of them were industry-standard x86-processor systems such as IBM eServer xSeries (see Figure 1).

FIGURE 1

Worldwide Server Unit Shipments, 1986– 2007



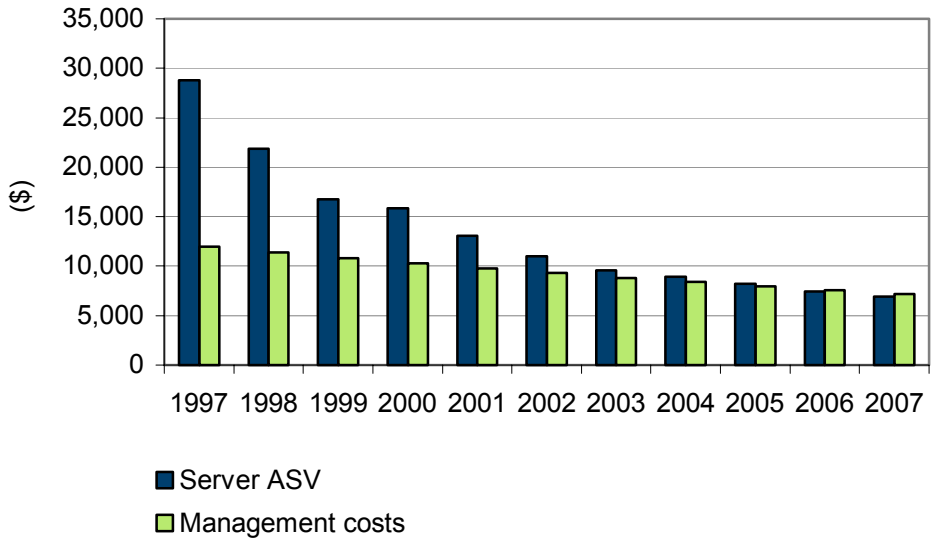
Source: IDC, 2004

This server proliferation is daunting, because the growing number of smaller servers requires a tremendous amount of IT resources for management and service. The challenge will only increase, as the growth in the number of systems demanded by enterprise customers continues. IDC estimates that new server shipments increased by nearly 18% in 2003 over the previous year and are expected to advance at least another 12% in 2004. As rack-optimized systems and, especially, server blades increase in functionality and capability, modular x86-based systems will continue to capture a larger and larger share of the workloads and applications deployed in enterprise datacenters and continue this high unit-growth-rate trend throughout our five-year forecast horizon.

The expansion of x86-based servers has had a profound effect on the average sales value (ASV) of servers in the market, which has declined considerably over the last five years. In 1997, when spending on x86-based servers represented just 24% of overall server spending, the ASV of a server was estimated by IDC to be approximately $28,767. In 2003, with x86-based systems representing nearly 44% of overall server market spending, the ASV of a server has fallen to $9,588 (see Figure 2).

FIGURE 2

Server ASV and Average Management Cost per Server, 1997– 2007



Source: IDC, 2004

Over the same time period, IDC believes the annual cost of managing a server has declined much more modestly and is comparatively flat. By 2007, with x86 and Intel-based systems representing nearly 60% of server market spending, IDC expects the cost of server acquisition to be eclipsed by the annual cost of managing that same server. As a share of total cost, therefore, administration costs per server have been rising and are expected to continue to rise over the course of the next five years.

In the past, it made sense to have a dedicated IT management staff responsible for large-scale servers that cost a half-million dollars or more. The rapid growth of x86 servers, however, demands a new approach to driving the efficiency of staff members who cost an enterprise $100,000 a year or more, as they manage servers that cost much less.

As cost of acquisition is overshadowed by the cost of managing an IT infrastructure over the hardware's life cycle, lowering cost of ownership is of growing importance

to customers. Historically, enterprises have approached this challenge with a variety of products from different vendors that were not integrated and, often, installed across multiple locations. Coupled with limited resources and constrained IT budgets, these conditions lead to limited effectiveness in efforts to monitor and operate hardware assets.

Increasingly, customers are looking for highly integrated, end-to-end management solutions. IBM has tapped its skills as a major system supplier and management software vendor to provide such a solution. While its Tivoli offerings provide powerful enterprisewide, cross-platform application and network management, the IBM Director product is geared toward detailed hardware configuration and health management.

Extension packages, like the Server Plus Pack and Software Distribution, include enhancements that further automate and simplify management tasks within IBM Director. The ability to increase availability, track assets, optimize system performance, and enable remote maintenance and the provision of new server and software resources can cut directly to lowering the costs associated with managing servers and lowering the green bar in Figure 2.

IBM Director Overview

IBM Director is the foundation of IBM's workgroup management solution for its x86 servers. It is hosted on a management server that acts as a focal point for remote, networked computers running management agents. At a minimum, a workgroup management solution should provide a strong foundation through agent discovery, alert reception and processing, hardware management and monitoring, and system inventory. It should also enable management tasks to be performed on entire groups of systems. IBM Director is one of the industry's leading workgroup managers, and it both automates standard tasks and provides advanced functionality, such as inventory, group management and RAID management, and help desk support functions such as remote control, file transfer, and real-time diagnostics.

IBM Director has an integrated SQL database that provides a rich list of software definitions (7,500+) as well as Field Replaceable Unit (FRU) numbers used to quickly identify hardware components that might need to be replaced, thus reducing service time. Customers can get a complete picture of assets from software to hardware down to components.

IBM Director is a fully integrated suite of systems management utilities designed to provide a consistent look and feel and a single point of control for hardware management. Each IBM Director management server is capable of managing up to 5,000 systems. IBM Director can act as the sole systems management application in an environment, complete with hardware features and settings, general system information, and proactive systems management capabilities. Its extensible architecture is enabled through leveraging of industry standards and allows for easy integration with other systems management tools and applications, such as Tivoli, HP OpenView, Microsoft SMS, Microsoft MOM, CA Unicenter, BMC, and NetIQ.

The key benefits of IBM Director are all aimed at reducing the annual costs associated with systems management (highlighted in Figure 2, above). By remotely managing and tracking IT assets, IBM Director saves labor costs associated with these manual tasks. The predictive and proactive capabilities associated with alerting and real-time system diagnostics help maximize server uptime and reduce service downtime costs. Finally, and perhaps most importantly, the product's ability to support IBM and non-IBM systems means customers can protect existing infrastructure investments and can manage heterogeneous environments.

IBM Director offers optional advanced server management tools to enhance performance and ensure high availability and server utilization. These "plug-ins" enable advanced systems management to further reduce costs and enable greater flexibility for IT infrastructure resources. These tools also integrate into IBM Director for a consistent look and feel and single point of management. For this reason, they can take advantage of the base IBM Director infrastructure, such as the scheduler, group management, and drag-and-drop features. The four IBM Director extensions and their benefits are described in the following sections.

IBM Director Server Plus Pack

IBM Director Server Plus Pack contains the following advanced management tools beyond the valuable core functionalities of IBM Director to enable better systems management for IBM x86 platforms:

- **Capacity Manager** monitors server performance and predicts potential server bottlenecks. It conducts trending analysis and makes recommendations to prevent downtime.

- **Rack Manager** offers the ability to create visual rack configurations by defining components as they appear in a rack by using a drag-and-drop interface. This enables better physical and location management through detailed health status records that are easily accessible.

- **Software Rejuvenation** helps reduce server outages by preventing an effect known as "software aging," in which errors and corruption accumulate over time within software, increasing its failure rate. Software Rejuvenation is an analytical tool that monitors and predicts certain software outages due to exhaustion. It can automatically refresh the software for optimal operation.

- **System Availability** accurately measures downtime and uptime to aid with systems management. It generates reports and graphical charts to help identify trends and patterns of availability.

- **Active PCI Manager** optimizes server throughput and performance by determining the best configuration of PCI adapters. Server performance can degrade considerably through failure to optimize a system's I/O. Active PCI Manager helps IT managers configure I/O for optimal performance efficiently.

Application Workload Manager

Application Workload Manager (AWM), also designed to be used with IBM xSeries systems, enables the consolidation of multiple applications onto a single server. AWM assigns precise allocation of central processing unit (CPU) and real and virtual memory to applications to improve quality of service and performance. It enables resource management policies to be set simultaneously on multiple servers for faster deployment. With AWM, enterprise customers can achieve higher system utilization by combining multiple applications on a server with limited resource contention, resulting in maximum throughput and performance.

Remote Deployment Manager

Based on industry-standard protocols, Remote Deployment Manager (RDM) is an integrated Director-based tool for deploying software images. RDM helps automate deployment such tasks as system firmware update, operating system installation, and retired systems disposal. It supports both customized and scripted deployments, and all tasks can be done through a drag-and-drop interface. The deployment and start-up time per system is reduced, driving efficiency and reducing costs.

RDM deploys operating systems and applications using either native or clone install capabilities. It supports industry-standard Preboot eXEcution (PXE) as well as Wake on LAN. It can import system firmware updates from UpdateXpress, IBM's automated facility for updating firmware and device drivers, or from local firmware/content file transfer protocol (FTP) servers. RDM can also restore system hard drives utilizing PowerRestore technology from PowerQuest.

RDM's remote deployment capability cuts down start-up time for new systems and upgrades, increases IT staff efficiency, and reduces travel and labor costs. It also lowers the costs associated with system downtime. It reduces planned downtime by minimizing the time needed to install or upgrade systems and reduces unplanned downtime through its rapid image restoration. By simplifying the configuration of computers' firmware, hardware RAID, and service processors, RDM reduces the costs associated with the deployment of 32-bit Windows or Linux operating systems and applications.

Software Distribution

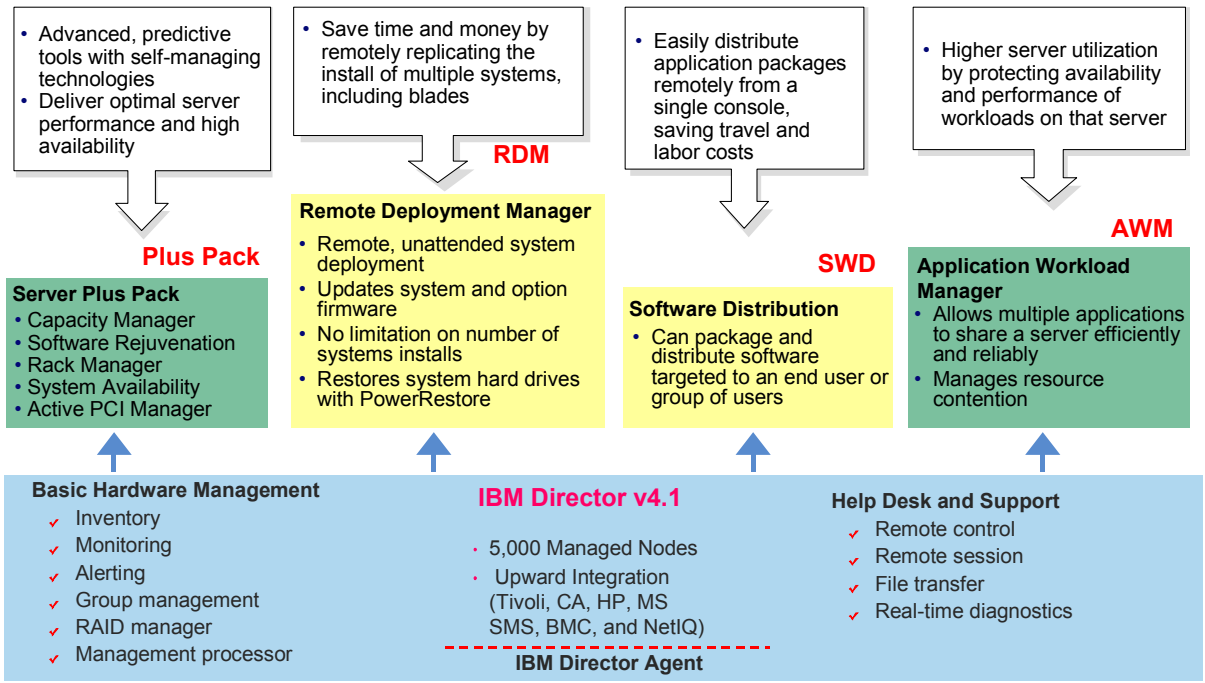
IBM Director's Software Distribution (SWD) tools enable enterprise IT managers to bundle, distribute, and install applications across a network. IBM offers two versions of SWD: a standard version that can distribute only IBM provided packages, and an optional premium edition that can distribute independent software vendor (ISV) or custom software packages. Like other IBM Director tools, SWD saves travel and labor costs by enabling a remote server or client to install software. Most importantly, SWD reduces the frustration and hassle of having to keep software up to date and increases simplicity and control by enabling the distribution of software from a familiar, single console.

IBM Director is a foundation for systems management and provides a portfolio for managing remote systems and provisioning tools to help reduce x86 industry-standard server IT management costs and lower the total cost of ownership (TCO). The Plus

Pack provides customers with predictive, self-managing technology that helps deliver increased server performance and availability, and AWM enables higher server utilization rates by protecting those qualities. RDM saves time and money by providing a tool for remotely deploying and replicating software to multiple systems, and SWD enables the remote distribution of application packages from a single console. Figure 3 illustrates the full IBM Director portfolio and the capabilities it provides.

FIGURE 3

IBM Director Portfolio



Source: IDC, 2004

THE ADVANTAGES OF SYSTEMS MANAGEMENT

In a recent IDC survey, the average U.S. enterprise with between 1,000 and 5,000 employees had 158 servers under management. The majority of these are x86-based systems. Other IDC survey-based research concluded that an employer's average annual cost for one IT manager is approximately $107,000, and that employee manages an average of 15 x86-based industry-standard servers. Taken together, enterprises in this class spend slightly more than a million dollars a year on server management alone — not including other related products and services.

Given this data, over a 3.5-year service life of an enterprise server, these enterprises would spend $3.9 million in server management alone — or more than two times the hardware acquisition costs of the average server in 2003 (referencing Figure 2, above, for 158 systems).

Table 1 references IDC survey-based research into how IT employees spend their time with respect to server management. By far, the largest single categories involve software deployment (18%) and maintenance and tuning (16%). Other tasks that rank among the top 10 include server monitoring (8%), server maintenance (7%), and hardware discovery (4%). While server management and provisioning tools such as IBM Director can contribute to nearly all of these different management tasks, IDC will illustrate, through two basic examples, how one may estimate potential savings by deploying a server management solution.

TABLE 1

IT Management Task and Time Allocation in Managing Distributed Server Environments

Task	Share of Time (%)
Initial software deployment	18
Software maintenance and tuning	16
Migration	14
Planning for upgrades, expansion, capacity	13
Upgrades	10
Server monitoring	8
Server maintenance	7
Reconfiguration	6
Hardware discovery	4
Service level management	4

n = 125

Source: IDC, 2004

Calculating the potential cost savings provided through IBM Director for server monitoring, maintenance, and discovery alone represents a significant benefit. Conditions between different datacenters and IT shops can vary considerably, but if a systems management solution such as IBM Director can reduce the time committed to these three tasks by 25%, given the assumptions listed above, the average enterprise in this category could save nearly $200,000 over the 3.5-year service life span of those servers. (158 servers under management divided by 15 servers per

employee times $107,000 per employee times 3.5 years equals $3.9 million, then divided by employee costs times 19% of employee time times 25% time reduction.)

Even more significant cost savings can be achieved by implementing products like IBM Director's Remote Deployment Manager and Software Distribution. Software deployment maintenance and tuning represent a combined 34% of the time committed by IT managers from this sample. If a systems management solution such as IBM Director could reduce the time committed to these tasks by 25%, the average enterprise in the category could save more than $300,000 over the 3.5-year service life span of the servers. (158 servers under management divided by 15 servers per employee times $107,000 per employee times 3.5 years equals $3.9 million, then divided by employee costs times 34% of employee time times 25% time reduction.)

Other IDC TCO research points to the value of such tools as IBM's Capacity Manager. Capacity Manager is an intelligent tool that monitors server resource utilization, does trend analysis to predict bottlenecks, and then makes recommendations on how to fix the performance issue. According to IDC research, companies experience an average of 4.4 server performance incidents per month. Each incident requires 3.5 hours of IT staff time to fix, for a total of 15.3 hours lost per month. At an average loaded IT salary of $32.02 per hour, the total annual cost attributed to performance incidents is $5,890.

While the cost reduction associated with these examples amounts to seemingly small amounts over the service life of the system, the real dollars potentially saved add up to a considerable amount. Moreover, these two examples are represented by a sample size that has, on average, only 158 systems to manage. Many enterprise deployments range into the thousands of servers under management. The advantages associated with a systems management and provisioning product like IBM Director become increasingly critical as the datacenter or server farm deployment grows larger.

These two examples in reducing costs in deployment, redeployment, and management may very well be only a fraction of the overall benefit an enterprise can achieve by investing in a robust systems management strategy. Unique tools found in the IBM Director Server Plus Pack such as Capacity Manager, Software Rejuvenation, and Real Time Systems Diagnostics all contribute to increased system availability and reduced system downtime.

IBM's Software Rejuvenator essentially conducts predictive failure analysis for software for unbounded resources to reduce outages caused by software. Real-time diagnostics aid in problem determination and isolation without taking the server out of productive work, which contributes to reducing downtime and keeping overall infrastructure utilization rates higher.

IDC survey research indicates that x86 server environments in the United States average approximately 26 hours of downtime a year. Across all workloads hosted on x86 server platforms, the average revenue lost per hour because of system downtime is approximately $25,000. This amounts to $650,000 per year per environment, including lost productivity for employees affected by the downtime and IT staff time committed to fixing the outage.

Of course, the costs associated with system downtime can vary considerably, depending on the application and the business importance associated with the service hosted by the servers. Costs and cost savings associated with system downtime can very easily dwarf the savings associated with more-tangible deployment and management concerns. By implementing tools such as IBM Director Server Plus Pack, customers are investing in the reduction not only of tactical management and deployment costs, but also of the occurrence and duration of service downtime, which in today's Internet-enabled business processes can be several times product procurement and management services costs.

As can be seen in these examples, IDC believes that systems management and provisioning tools such as those found in the IBM Director server management suite are fundamental tools for enterprises looking to address their server management costs. Potential time and cost savings will vary considerably depending on the specific IT and employee environment, but these examples provide some context for potential management benefit and a framework for assessing a specific organization's own situation.

CHALLENGES/OPPORTUNITIES

Systems management and provisioning will be two of the key competitive battlefields in the x86 industry-standard server market. Reducing management headaches will weigh much more significantly on an informed IT manager's mind than the costs associated with initial hardware acquisition. Unfortunately, in today's IT budget–focused environment, many customers are emphasizing short-term tangible cost reduction rather than the more strategic IT investment. As demonstrated in this document, the hardware acquisition costs are far outweighed by the cost of management. A 10%, or even 20%, cost saving in hardware acquisition is terribly small compared with the financial benefits that can be achieved through an effective server management solution.

One of the market's challenges will be for IT management to recognize the importance of systems management and to influence finance and purchasing decisions. Even when IT budgets begin to increase and the enterprise IT spending environment improves, this will remain an issue and a challenge as x86 deployments continue to increase.

Another key challenge facing IBM in this segment of the market is competition from other systems management platforms. HP's Insight Manager maintains a large installed base in the market and is one of the primary competitors to IBM's Director. Displacing and migrating this HP installed base represents a tremendous challenge as well as a market growth opportunity for IBM. In an effort to facilitate the migration from Insight Manager to IBM Director, IBM provides a variety of aids, from a migration toolkit and hands-on class to custom service offerings. These are intended to help lower the costs incurred during the migration and to provide customer sites with a robust management alternative.

It is important to note that IBM xSeries servers have outpaced the growth of the x86 industry-standard server market for all of 2003. As the company's market share expansion and investment in this space grows, so will the presence and investment in IBM Director as well as customer knowledge of the advantages it brings to enterprise environments.

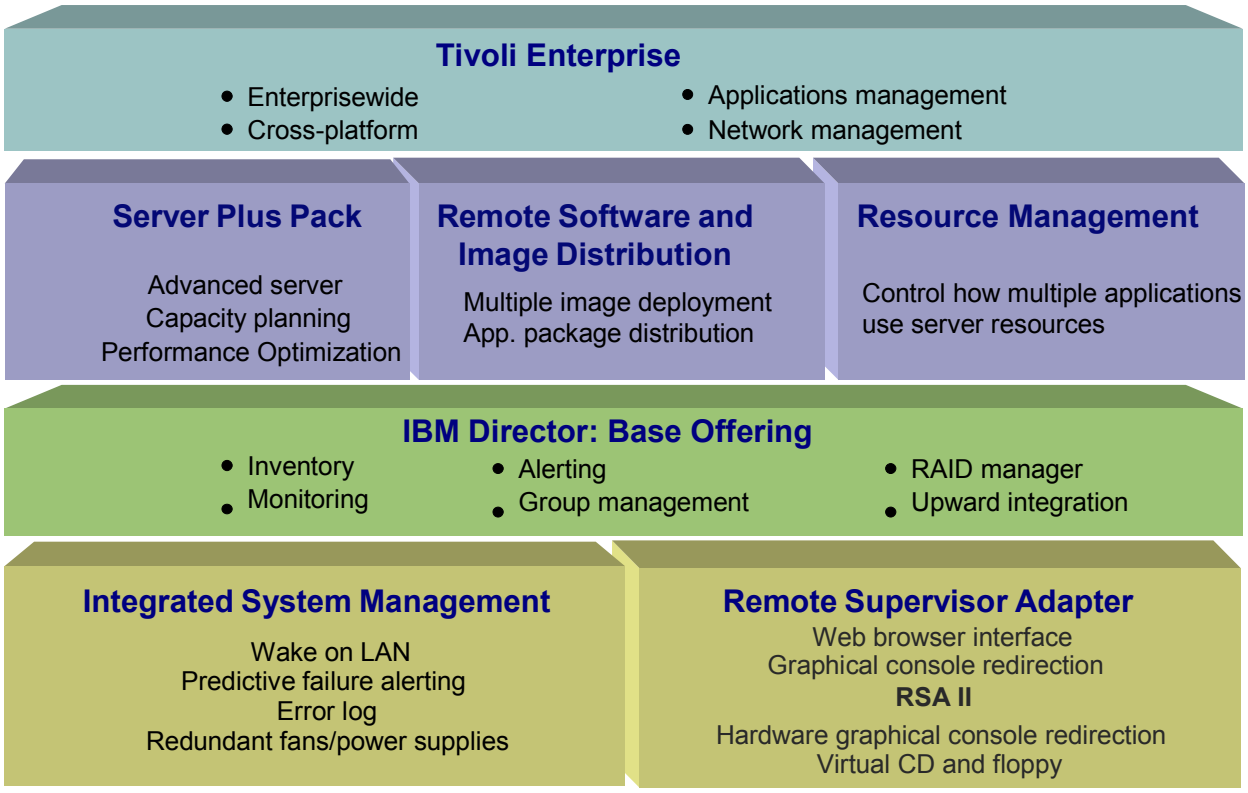
CONCLUSION

IBM's Director suite of systems management and provisioning tools reflects a shift in demand and the importance being placed on reducing cost of management and the occurrence and duration of system downtime in the market and increasing server deployment and migration flexibility. As more and more enterprise server workloads move toward arrays or industry-standard servers, managing these server farms, clusters, and grids efficiently becomes an ever-increasing priority.

Better server management, however, is only the first step in driving out costs and increasing flexibility in an enterprise server infrastructure. Leading adopters will look to virtualize and automate much of the server infrastructure in order to continue to improve their levels of management costs and service flexibility. A strong systems management foundation will be paramount in leveraging the On-Demand computing environment of the future. Figure 4 illustrates IBM's overall systems management portfolio, from server management and monitoring all the way through service virtualization found in IBM's Think Dynamics Orchestrator and Tivoli datacenter management products.

FIGURE 4

IBM System Management Offerings



Source: IDC, 2004

Beginning with Director, IBM has invested considerable resources in this full management stack to help customers reduce costs and increase flexibility for their enterprise IT server infrastructures. As the basis for competition and customer choice moves away from hardware components and differentiation and toward measuring and understanding the overall cost of the service IT provides, the IBM management suite and IBM Director in particular represent leading tools that will help enterprises build and manage their growing and changing datacenter environments, while making them more flexible in adapting to changing business requirements.