White Paper

Business-Class Servers for a PC Budget

IBM System x3100 M4 and x3250 M4 Servers and Microsoft Small Business Server Solutions

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Executive Summary

In an organization running office or franchise IT workloads, an x86-based server often plays a role more critical to the business than a high-end server in a large data center. This is true whether the organization itself is small or part of a larger one with smaller distributed facilities. If the server fails or must be shut down for any reason, business activities at an entire site may come to a standstill. If the organization is a small business relying on a single server, the company's entire operation might effectively come to a halt.

Edison Group interviewed a number of business owners running office or franchise workloads and consultants/resellers who cater to them, to assess the server-related challenges faced by these organizations, and the server features they most frequently required. The challenges and solutions cited for these businesses include:

- *Onsite management and services*—Small businesses operations often have limited technical expertise on-premises. This can be a particularly onerous pain point for larger operations with many small distributed facilities, such as insurance companies, where a problem can result in extensive downtime at a branch office. Solutions mentioned include using vendors that have highly reputable technical support organizations available, and implementing remote administrative capabilities.

- *Component failure*—This can bring down a server until the problem is resolved. Addressing this challenge includes having component redundancy, and hot-swappable components (such as disk drives), which can be removed for servicing or replaced without shutting the server down.

- *Data protection*—This challenge includes protection against data corruption or loss due to technical malfunctions, as well as against data theft and/or compromise. Small businesses are particularly vulnerable to damage from such cyberattacks. Approximately 43 percent of small businesses that suffer a serious data breach never recover. Requirements designed to address data protection include RAID, Error Correcting Code (ECC) memory, and built-in security designed to thwart unauthorized access to data or malicious web-based vandalism.

Broadly speaking, many of the challenges cited involve keeping the server up and running 24x7. Thus most of the server requirements mentioned involve functionality or features that support that goal, directly or indirectly. More specifically, criteria for servers in operations running office or franchise workloads include (in order of how frequently they were mentioned):

- Low cost

- Reliability/availability

- Speed and performance

- Vendor reputation and level of service

- Scalability (ability to adapt to changes and grow the operation)

Clearly, most standard x86-based desktop PCs—designed for media, gaming, and the like—lack all or most of the business-grade features and functionality cited by the Edison survey participants. Nevertheless (perhaps believing that they must sacrifice performance, reliability, and availability in order to contain costs), small operations commonly have their entire business relying on one or more standard desktop PCs. In some cases, they may convert an older PC to function as a makeshift server.

Organizations running such operations are limiting themselves unnecessarily and putting their operation and/or their entire business at risk.

A server solution offered by IBM now delivers true business-grade server capability at prices comparable to the latest desktop PCs on the market. Designed from the ground up for businesses, the IBM System x3100 M4 tower and x3250 M4 rack servers offer up to 32 percent greater performance than one-socket servers released just a year ago and nearly six times the performance of a four-year-old desktop.

With simple deployment and setup, these systems are made specifically to be used as servers. They come fully equipped with business-grade features and functionality previously available only on two-socket servers at a much higher price. They include such features and functionality as multiple PCIe slots, redundant power supplies, multilevel RAID, simple and hot-swap drives, integrated and remote management, Error-Correcting Code memory, and built-in security features.

In partnership with Microsoft Corporation, the System x3100 M4 tower unit offers Windows Small Business Server as a pre-installed and configured component, with the option of Windows Small Business Server 2011 Standard, including the key workloads office or franchise businesses need to be productive and competitive, or Windows Small Business Server 2011 Essentials, which enables access to cloud-based services.

To help keep businesses running around the clock, System x3100 M4 and x3250 M4 servers are made with the same attention to quality and given the same stringent business server operating system validation as every other IBM server. In addition, they come with the same level of support.

Introduction

Objective

This paper presents the results of a survey of organizations running small operations, as well as IT consultants who cater to them. Edison Group questioned participants about the server requirements of such organizations. The paper also discusses the advantages of deploying the entry-level IBM System x3100 M4 and System x3250 M4 tower and rack servers, and discusses the disadvantages of using standard desktop PCs as servers to run a business.

Audience

This paper presents information that will be useful to executives or technical officers at any organization whose small office or franchise functions include file storage and printing, line-of-business applications, e-mail, and Point-of-Sale (POS) operations, as well as third-party consultants to such organizations. The insights apply to both a small business and to large enterprises with branch offices, franchised businesses, etc.

Contents of this Report

This white paper contains the following major sections:

- **Servers for Small Office or Small Shop Workloads**—Presents and discusses the findings of a modest survey of organizations running small operations, as well as IT consultants who cater to them. The survey looked at requirements for a server running office or franchise business workloads, as the participants see them.

- **Why Purchase an IBM System x3100 M4 or System x3250 M4 Server?**—Describes how these entry-level servers meet the needs described in the previous section at a cost comparable to standard desktop PCs.

- **Key Drawbacks of Using Desktops as Server Solutions**—This section explains why the common practice of using a desktop PC as a business server could be a mistake.

Servers for Office or Franchise Workloads

The server forms the heart of almost any business organization's Information Technology environment. Employees and customers rely on it for the front-end productivity-related applications running on it, such as e-mail, databases, storage/file/print, line-of-business and POS applications. At the back end, the server runs various security, manageability, and backup applications to keep running reliably.

Servers in large enterprise-scale IT operations may, additionally, be supporting vast, sophisticated, or highly specialized applications. However, the tasks mentioned above remain the core functions of most servers.

Business operations running office or franchise workloads have specific requirements when it comes to servers. This is true whether the business has a small staff or is a large enterprise, such as a nationwide restaurant chain or insurance company that runs multiple smaller, distributed operations.

Requirements of Businesses Running Office or Franchise Workloads

Edison Group surveyed a number of organizations running small operations and IT consultants who serve them in order to assess the businesses' general server requirements. It became clear that those requirements are defined far more by the workload a server would take on than by the size of the company or a given operation within that company. A consultant provided two examples that illustrate this point. The first example was a customer with 150 employees, running a small office workload. This company runs two small business servers for Microsoft Office applications and some cloud-based accounting services. The second example was a much smaller company with only five employees that runs enterprise resource planning (ERP) services for numerous companies on its servers. This second company actually runs enterprise-scale IT workloads from a fully loaded data center.

General Server Attributes

Organizations running servers to handle office or franchise workloads cited cost as the most significant factor in server selection. These organizations wished to keep their IT acquisition budgets to a minimum. At the same time, nearly all named some business-class technology as either essential or highly desirable. Other than cost, the requirements named (in order of frequency) are:

- **Speed and performance.** While these attributes impact on employee productivity and were highly desired, a number of participants surveyed nevertheless seemed resigned to having to sacrifice them because of budget limitations.

- **Reliability/availability**. These two attributes were mentioned and equal number of times. Together they are arguably the most critical characteristics of a server in an office or franchise operation. As such, they are the main reasons for choosing a trustworthy vendor with a superior level of service.

- **Vendor reputation and level of service.** More than one participant felt this was the single most important factor. They trusted the technology from a reputable vendor (such as IBM) to be more dependable. In particular, they felt the response time for service from such vendors is superior, resulting in reduced downtime and the rapid resolution of problems. Downtime can have much greater adverse impact on a small operation, in which a single server often comprises the entire IT platform, than for an operation with a data-center server farm. Moreover, the staff's IT skill sets onsite in an office or franchise operation—for example, a bank's branch office—are typically limited.

- **Scalability.** Organizations running office or franchise operations want their investment to last, so they want servers that can change and grow with their business. Flexibility was also mentioned as a desirable attribute.

Important Server Features

Along with the general server attributes, survey participants also named additional server features they considered either essential or highly desirable. Again in order of frequency, these are:

- **Around-the-clock operation**. Even small businesses frequently want their staffs able to access files, use e-mail, etc. at any time. In fact, most of the other features named are primarily related to reliability, availability, and serviceability (RAS) and are intended to help ensure continual operation of business-related processes.

- **Remote management and service capabilities**. Larger organizations running distributed office or franchise operations, in particular, want to be able to perform routine maintenance and address issues from a central point, rather than sending technicians to scattered locations.

- **Redundancy.** This is an excellent example of a feature designed to support RAS for continual operation and minimizing downtime. Redundant components are considered indispensable by some. "I refuse to sell my customers equipment that has no redundancy," said one consultant. "The primary components on which to get redundancy are power supplies and hard drives. My philosophy is to get as much redundancy as you can afford."

- **RAID disk striping.** This feature was mentioned frequently and was regarded by some as a mandatory requirement for a business server. In those cases, the ability to provide fault-tolerance for data via mirrored disk drives was a key consideration—yet another feature supporting continual uptime and availability.

- **Security**. While security features were mentioned, businesses running office or franchise workloads probably do not think about the security of their servers as much as they should. For the fifth year running, costs of data breaches in business have continued to rise.[1] Small businesses, as well as small locations in distributed enterprises, typically lack the fortress-like physical security of large facilities and data centers. If the business itself is small, damage incurred from a data security breach can be particularly devastating. According to a study conducted by the University of Texas, 43 percent of small businesses that suffer a serious data breach never re-open. Despite this, a survey of 685 respondents by Symantec found that among small businesses adopting virtualized servers, only 40 percent secure their data completely. [2]

- **Hot-swap capabilities**. Companies want servers that ensure RAS by allowing faulty components such as hard drives to be swapped out without having to be shut down.

- **Error Correcting Code.** ECC automatically detects and corrects memory errors that can cause system crashes or data corruption, thus contributing to RAS.

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[1] *Ponemon Institute, 2010 Annual Study: U.S. Cost of a Data Breach* – March 2011
[2] *Small Business Virtualization Poll, 2010,* Symantec Corp.

Why Purchase an IBM System x3100 M4 or System x3250 M4 Server?

Many organizations that run office or franchise workloads feel that they require nothing more than a PC enlisted in the role of a server. While a desktop PC and a small x86-based business-class server are similar in fundamental architecture, they are not the same thing. The businesses and resellers who participated in Edison's survey cited several requirements—such as component redundancy and hot-swapability, RAID, and ECC—that are typically found only on servers.

A true business-class server is specifically designed for serving business workloads, with its resources dedicated to that purpose. Costs impacting the acquisition price that might otherwise go into (for example) expensive sound cards or Graphics Processing Units are instead invested in functionality and features that support business processes.

IBM Server Technology at Costs Comparable to PC Desktops

With the System x3100 M4 tower and x3250 M4 rack servers, IBM offers high-caliber business-class server technology at costs comparable to those of desktop PCs. These robust entry-level one-socket servers offer nearly as many features as a two-socket server, but at a much lower price. With significant cost advantages over other IBM System x servers, they are nevertheless designed with the mainframe-inspired reliability features that underlie the entire IBM X-Architecture blueprint, and leverage functionality built into the next-generation Intel processors.

The System x3100 M4 and x3250 M4 servers represent the lowest-cost server offerings ever available from IBM. They deliver low-cost storage and low-cost memory plus IBM's quality and reliability, global reach, and support—some of the most important factors cited by participants in Edison's survey for servers handling 24x7 office or franchise workloads. With a small footprint and quiet operation, these servers are shipped ready to install, offering simplicity, security and reliable uptime, featuring hardware scalability that far outstrips what is ordinarily available in a PC at this price range, including:

- SS SATA and HS SATA
- Fast DDR3 memory
- Four DIMM slots for 32GB maximum memory capacity

- Four 3.5" drives for 12TB maximum storage capacity [3]

- Four PCI slots

- Redundant power supply for failover to ensure continued operation in the event of power supply failure.

- Intel Xeon Processor E3-1200v2 product family Intel Microarchitecture

- Microsoft Small Business Server 2011 Standard or Essentials [4]

The tables below show how the IBM System x3100 M4 server delivers higher value at costs comparable to a desktop. The first table below shows the price comparison, configured to be as comparable as possible. The second table on the following page shows the added business-class value provided with the IBM System x3100 M4 that is not provided by the desktop solution.

IBM System x3100 M4	Comparable Desktop Tower System
- Slots: 4 PCIe Gen 2 (x16, x8, x4, x1) - Drive Bays: 4 Serial ATA (SATA) - Maximum Internal Storage: 12 TB (with 3 TB HDD) - Out-of-Band Management: IBM Integrated Management Module (IMM) - CPU: Intel Xeon E3-1220v2 - Processor Speed: 4C/3.1GHz - RAM (installed/Max): 4GB/32GB ECC - RAM Slots Total: 4 - RAM Slots Available: 3 - Hard Drive Size: 1TB - Interface Type: SATA - Optical Drive: IBM HH Multiburner DVD - Network Interface Embedded: Dual 1GB Ethernet - Additional Network interfaces: Optional - Microsoft Small Business Server 2011, Essentials 25 users	- Slots: 1 PCI, 1 PCIe X16 (x1) - Drive Bays: 2 - Maximum Internal Storage: 2TB with TB drives (only option offered by vendor) - Out of Band Management: Intel Standard Manageability - CPU: Intel Core i5 2500 - Processor Speed: 4C/3.3GHz - RAM (installed/Max): 4GB/16GB standard - RAM Slots Total: 4 - RAM Slots Available: 2 - Hard Drive Size: 1TB - Interface Type: SATA - Optical Drive: 16X DVD-ROM SATA - Network Interface Embedded: Single 1GB Ethernet - Additional Network interfaces: 2nd port: Broadcom 5722 10/100/1000 GbE NIC - Windows 7 Professional 64Bit (non-business-class operating system)
Total System Price: $1,804[5]	**Total System Price: $2,160[4]**

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[3] System x3100 M4

[4] Bundled with the System x3100 M4 (tower) only; requires separate purchase and deployment for the System x3250 M4 (rack)

[5] Pricing for both products was derived from each vendor's respective website.

Added Business-Class Value Provided with IBM System x3100 M4

- Validated for server operating systems
- Redundant power supplies
- Dual integrated Gigabit Ethernet
- Additional PCIe slots
- Additional drive bays
- Embedded RAID support w/ optional HW RAID -0, -1, -5
- Intel Hyper-Threading Technology
- Greater memory capacity
- ECC memory support
- Integrated server-class systems management tools
- Windows Small Business Server – 20 seats

Business-Grade Reliability

IBM System x3100 M4 and x3250 M4 servers have features designed to help ensure 24x7 operation. Advantages such as server-class OS validation, redundant power supplies, RAID, and hot-swappable hard drives all help to keep the business server running continuously.

Server-Class Operating System Validation and Testing

Any server carrying the IBM brand must undergo extensive system-level testing, amounting to thousands of hours, on server-class operating systems and leading virtualization software. This helps ensure that business workloads run optimally and are trouble-free. The testing helps enable System x3100 M4 and x3250 M4 servers to be deployed rapidly and be ready to take on an office or franchise workload immediately.

Strong Data Protection

Embedded RAID—ServeRAID C100—comes standard with System x3100 M4 and x3250 M4 servers, a feature available for the first time in System X servers. This allows data to be stored across multiple hard drives, providing fault tolerance, so the data can be recovered quickly if one drive fails, thus avoiding downtime.

IBM offers "Feature-on-Demand" tiered pricing that allows customers to purchase the level of RAID they require. The default ServeRAID C100 offers RAID 0 or RAID 1 for all SATA HDD models; purchase of a software key upgrade enables RAID 5. The RAID feature provides a simple GUI interface for configuration, a consistent look and feel between operating systems for management tools, and common tools between different levels of RAID. An e-mail alerting feature can be configured to send e-mail notification of failed hard drives, which is especially useful in a distributed-facilities scenario.

Efficient and Flexible Management

Included in System x3100 M4 and x3250 M4 servers is the newest version of IBM's Integrated Management Module, IMM2. This is the interface that enables the server to be managed using IBM Systems Director or any standard system management software. As with ServeRAID C100, Feature-on-Demand lets customers purchase additional management functionality according to their needs, including remote control to facilitate server maintenance and to address other issues that were frequently mentioned by Edison's survey respondents.

Increased Availability

Two other features additionally help to ensure availability in the System x3100 M4 and x3250 M4 servers:

- Redundant power supplies, providing downtime protection through fault tolerance.
- Simple and hot-swap drives, which allows replacement of a faulty hard drive without requiring the server to be shut down. The server's tool-less design,[6] allowing removal of a hard drive without the use of tools, is also a plus for office or franchise operations, where onsite technical support is typically limited.

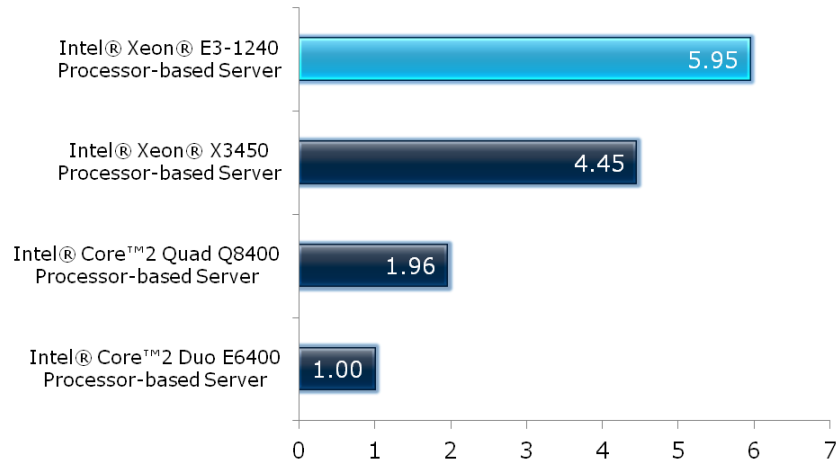## Key Features and Strengths of an IBM Solution

IBM and Intel have formed a powerful symbiosis to leverage the best technology of both world-class vendors. This results in servers that exceed the sum of their parts. The System x3100 M4 and x3250 M4 servers are no exception.

Speed and Performance

These new servers, coming in at a price point comparable to that of desktop PCs, soundly refute the notion that organizations running office or franchise workloads must satisfy themselves with lower performance because of budgetary constraints. This is especially true for any business operation that relies on a server consisting of a computer that is a few years old, since Intel regularly raises the bar on processor performance. The following chart presents the comparative performance levels of available Intel processors, going back four years.

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[6] Available on the x3100 M4 only.

Average Normalized Performance of Three Small Office/Small Shop Workloads (Email, Database, Web)

Processor-based Server	Normalized Performance
Intel® Xeon® E3-1240 Processor-based Server	5.95
Intel® Xeon® X3450 Processor-based Server	4.45
Intel® Core™2 Quad Q8400 Processor-based Server	1.96
Intel® Core™2 Duo E6400 Processor-based Server	1.00

This means that a business replacing a four-year-old computer with a System x3100 M4 or x3250 M4 server might see nearly a six-fold increase in performance - which is sure to translate into increased productivity.

Office or Franchise Ready

Fully tested and self-contained, IBM System x3100 M4 and x3250 M4 servers offer true business-class server performance, features, and value. With Microsoft Windows Small Business Server as a pre-installed, cost-effective option, they are shipped ready to be deployed as quickly and easily as any comparably priced desktop, designed for reduced noise level, making them well suited for operation within the production environment.

Microsoft Small Business Server Software

Office or franchise operations—whether actual small businesses or branches of a larger organization—face challenges in managing their IT infrastructures, which takes away from the focus they must maintain on their core business competencies. There is a constant need to achieve real business benefits and mitigate costs against a backdrop of time pressures and limited technical skills.

Microsoft Windows Small Business Server has long served as an industry leading solution that includes all the key workloads small businesses need to be productive and competitive, with configuration based on best practices of small business operations. Included with the IBM System x3100 M4 are the latest versions of the software: Windows Small Business Server 2011 Standard or Essentials.

Both build upon the Microsoft Windows Small Business Server foundation with easier setup, installation, and migration experiences, a simplified management experience, and better network-wide security features for the small business customer. They incorporate the latest Microsoft technologies for networking, data storage and backup, security, and document and printer sharing, as well as providing on-premise solutions for advanced e-mail and calendar capabilities, with database and line-of-business support.

Windows Small Business Server 2011 Essentials offers integrated cross-premise ability for cloud-based workloads, allowing small business customers the flexibility to choose the best environment for their line-of-business and collaboration solutions. The Small Business Server product has always been about providing a core set of pre-configured, out-of-the-box functionality. Having pre-installed and preconfigured core Windows features and application integration decreases the time for setup and enables a business to start realizing immediate benefits.

Even though Windows Small Business Server 2011 Standard and Essentials may appear to be quite different products, they are both built using the same set of Small Business Server principles in place for over 10 years. Both provide:

- An operating system layer, in this case Windows Server 2008 R2, including most of the functionality this can provide

- Effortless file and print sharing

- Backup capabilities

- Identity protection through Active Directory integration

- Remote access for anywhere anytime access to files and applications

- A Simplified Management wrapper using a pre-configured console for day-to-day management.

Where the two products mainly differ from each other is that Standard provides onsite integrated support for Exchange, SharePoint, and Windows Software Update Services—on-premise deployment, integration, and management of core collaboration and security products. Essentials, on the other hand, is focused on using the cloud to deliver these types of services, and provides an effortless connector, and amalgamation of cloud service management into a single dashboard.

Ideal as a first server for small businesses, Windows Small Business Server 2011, either Standard or Essentials, provides an easy to use solution to help protect data with automated backup features. It helps organize and access business information from virtually anywhere, and supports the applications needed to run a business. Essentials can also help quickly connect to online services that the business can acquire separately.

Key Drawbacks of Using Desktop PCs as Server Solutions

Controlling costs is one of the most important considerations for businesses when selecting a server for running office or franchise workloads. So, it is hardly surprising that many of them deploy ordinary desktop PCs as servers. To save money, many smaller businesses simply enlist an old, currently idle PC they have on hand as a server and live with the poor performance that results. They also live with a higher Total Cost of Ownership, due to the susceptibility of older PCs to downtime and required maintenance, as shown in the chart here.
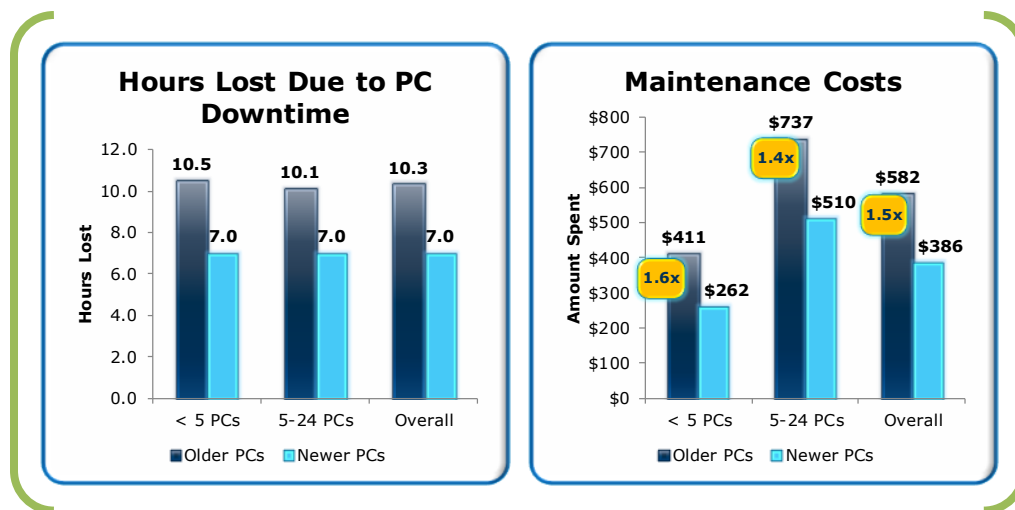
Even large companies deploying servers to distributed locations (while typically purchasing new equipment) frequently deploy PCs designed for the desktop. This is primarily due to the perception that servers are costly and more complex than desktop machines.

The fact is that it can be a mistake to deploy a standard desktop PC in a role as critical as that of a business server. This would be true even if a business-class server came at a price premium. But IBM offers high-quality Intel Xeon processor E3 family-based servers at the same cost of a new desktop PC. Any business requiring a server to run office or franchise workloads should reconsider their choices. A few of the comparative pitfalls to using desktop PCs in place of business-class servers include:

- *Unproven compatibility*—PCs for the desktop are not subject to the rigorous and thorough testing and server OS validation that business servers undergo. IBM servers are put through thousands of hours of testing on server-class operating systems and leading virtualization software.

- *Reduced reliability and limited availability*—Few desktop PCs support hot-swappable hard drives, which can reduce downtime in the event of disk failure or the need to replace, update, or service a hard drive. For a small operation relying on a single server, downtime can be a real hardship. Redundant components, such as power supplies, are also not typically found on PCs for the desktop.

- *Restricted scalability*—Standard PCs for the desktop ordinarily feature only a single PCIe slot, which typically is dedicated to the video display. Along with four 3.5" drives, IBM System x3100 M4 and x3250 M4 servers each feature four PCIe slots.

- *Limited data protection*—The RAID options in desktop PCs are typically limited, with no built-in accommodations for hardware RAID. Neither do typical desktop PCs ordinarily feature ECC memory—yet another feature found on IBM System x3100 M4 and x3250 M4 servers that helps prevent potentially disastrous data corruption.

Conclusions

The server is the heart of nearly every IT operation, whether in the largest enterprise data center or the smallest retail shop. Often, for small businesses or small business facilities that are part of a larger enterprise (such as a national grocery chain), a single x86-based server is essentially the entire data center, For that business or facility, whether it resides in a closet or on a table beside the printer and fax machine, the server is the lifeblood of all the IT processes that support its core business activities. Poor performance in that server means reduced productivity. A crash or maintenance shut-down can all but halt business for the duration.

Yet, because the budget allocated to operations running office or franchise workloads is usually modest, many such businesses sacrifice performance and forego many other features that a business-grade server really should provide. Many companies have their business depend on ordinary desktop PCs—sometimes even older, unused ones that just happen to be on hand.

This is never a good idea. But with IBM System x3100 M4 and x3250 M4 servers available at a price point comparable to that of standard desktop PCs, there is simply no justification for it today. Unlike desktops, these servers undergo stringent server operating system validation tests. While they are as easily deployed as a desktop system and ready to go, they come fully equipped with business-grade features and functionality not found on an ordinary off-the-shelf PC for the desktop. These include multiple PCIe slots, redundant power supplies, multilevel RAID, simple and hot-swap drives, integrated and remote management, ECC memory, and built-in security features. And they are backed by IBM's reputation for quality and excellent, highly available support.

On the software side, the IBM System x3100 M4 includes either Microsoft Windows Small Business Server 2011 Standard, or 2011 Essentials—small operation solutions that incorporate best-of-breed 64-bit product technologies to deliver a complete server solution environment ideal for small businesses or small operations. These product technologies include Exchange Server 2010, SharePoint Foundation 2010, and Windows Server Update Services. Additionally, Windows Small Business Server Essentials is tailored to online services, providing a cross-premise solution that allows small operations to retain core infrastructure and enables simple, single sign-on experiences with cloud-based services.

Unlike desktop PCs, the System x3100 M4 and x3250 M4 servers are unquestionably designed for business from the start.