Lenovo's ThinkCentre M58p desktop PC: a leader in manageability, security and energy efficiency

Executive Summary

BACKGROUND

For TBR to develop this white paper, it was essential that we gained a clear understanding of Lenovo's goals in developing the M58p system and the specific functionalities and technologies incorporated to meet those objectives. To support the level of knowledge required, we conducted a series of interviews with Lenovo's M58p design and marketing managers.

The findings in this paper are also supported by a series of interviews we conducted with Lenovo customers through TBR's Customer Satisfaction program as well as targeted research in the areas of energy efficiency and ThinkVantage technologies.

Overall, TBR has found that Lenovo customers believe the company delivers innovation in the PC market through a unique combination of hardware, software and partner-driven technologies. TBR's *2Q08 Desktops: Corporate IT Buying Behavior & Customer Satisfaction* report reflects this, as Lenovo ranked No. 1 in the survey thanks to improved customer satisfaction. The company gained in critical areas including perception of value, which is directly related to the innovation the company brings to its ThinkCentre desktop PC models.

INTRODUCTION

Lenovo Group's latest business desktop, the ThinkCentre M58p, addresses IT managers' top four pain points when it comes to client PCs: The desktop delivers improved manageability, increases in reliability and security, as well as greater energy efficiency. In addressing these four areas, the ThinkCentre M58p assumes a leadership role among desktops in its class by combating the trend toward rising PC management costs.

The ThinkCentre M58p combats rising IT costs by offering:

- ✓ Energy efficiency, resulting in annual electricity cost savings of $40 per desktop when compared to previous ThinkCentre models
- ✓ Major improvements in manageability thanks to Lenovo ThinkVantage Technologies, including the ThinkVantage Power Manager, and Intel vPro technology
- ✓ Improved data security resulting from Lenovo Hardware Password Manager and the ability to disable its I/O ports
- ✓ Higher hardware reliability than previous ThinkCentre desktops due to the use of more durable internal components
- ✓ Increased eco-friendliness thanks to EPEAT Gold certification and the introduction of 100% recycled/recyclable packaging on the ThinkCentre M58p Eco Ultra Small Form Factor model
- ✓ Increased overall client security and manageability thanks to compatibility with Lenovo's Secure Managed Client platform

We attribute Lenovo's leadership role directly to decisions made by the company when it created the desktop. Lenovo sought to pursue gains in energy efficiency, manageability, reliability and security with the ThinkCentre M58p. As a result, the company chose to equip the ThinkCentre M58p with highly efficient power supplies and low power processors. Additionally, the combination of Lenovo's own ThinkVantage Technologies and Intel's vPro platform give the M58p desktop strong remote management features, allowing IT staff to administer software updates, track hardware configurations, perform system restoration and even reset passwords remotely, thereby reducing costly desk-side visits. To increase reliability and further reduce desk-side visits, Lenovo also utilized components such as solid capacitors within all of its ThinkCentre M58p desktop models. Meanwhile, the Hardware Password Manager (whose availability is scheduled for 2Q09) and I/O port controls improve the desktop's security by giving IT managers greater control over the ways in which data can be accessed, reducing the risk of data breaches.

Given its focus on achieving a leadership role in its class, TBR believes Lenovo took a significant step forward with the ThinkCentre M58p. The desktop's appreciable reductions in operating costs due to improved energy efficiency, management and reliability combined with its reduced environmental impact through lower electricity usage and recycled materials position it to deliver immediate impacts on customers' business operations and eco-friendliness.

Meet Lenovo's ThinkCentre M58p Eco Ultra Small Form Factor Desktop

Lenovo designed its ThinkCentre M58p Eco Ultra Small Form Factor (USFF) desktop to reduce ownership costs without any sacrifice in terms of performance. Although Lenovo designed the desktop to occupy a small footprint (less than 9.5-inches wide), it still allows for internal expandability and efficient airflow, giving businesses the reliability they desire along with the ability to customize a new machine or even upgrade one in the field.

Despite its compact nature, the USFF chassis fits standard desktop components, such as hard drives and optical drives, helping keep the desktop's price low. Lenovo also designed it to accommodate large memory allotments and powerful graphics cards, should customers desire them. Moreover, the machine's hinged casing makes it easy to service; opening like a clamshell, it allows for easy access to the motherboard and internal components. The motherboard can also be removed quickly and easily without any tools; it simply slides out. The M58p's processor and fan are at the back of the chassis, reducing noise and drawing air through the front for cooling. The result is improved acoustics. In fact, the ThinkCentre M58p Eco USFF is 4dB quieter than its predecessor, the ThinkCentre M57 Eco USFF.

The USFF desktop can also be combined with Lenovo's 24-inch ThinkVision L2440x Wide display, which consumes less power than others in its class, and with Lenovo's fingerprint-sensor-equipped keyboard to create a secure and power-efficient desktop platform.

Key Findings: The ThinkCentre M58p's combination of efficiency, manageability and reliability makes it a leader in its class

Lenovo set out to help business customers reduce the costs associated with operating large numbers of client PCs on a day-to-day basis. In so doing, TBR believes Lenovo has been able to deliver its greenest, most manageable and most secure business desktop PC to date. The

ThinkCentre M58p has arrived at an opportune time: Despite the fact that PC hardware prices continue to fall, PC management costs continue to rise. In fact, PC lifecycle cost estimates indicate an 80%/20% equation: Only 20% of the cost associated with operating a PC throughout its lifecycle comes from its purchase price; the remaining 80% is associated with deployment, maintenance and the eventual disposal of systems. Without any further effort to reduce management costs, TBR believes PC lifecycle costs will shift to a 90%/10% equation, with management expenses making up an even higher

percentage of a PC's lifecycle costs as the price of resources such as electricity continue to increase and offset PC hardware price declines.

Lenovo's ThinkCentre M58p works to reverse the trend toward higher management costs by attacking from four sides, including increasing PC manageability, improving PC reliability, boosting data security as well as delivering greater energy efficiency. Simply decreasing the amount of electricity each

ThinkCentre M58p Eco Ultra Small Form Factor Features

Energy Efficiency:
M58p Eco USFF with Energy Star 4.0 compliance and ThinkVantage Power Manager
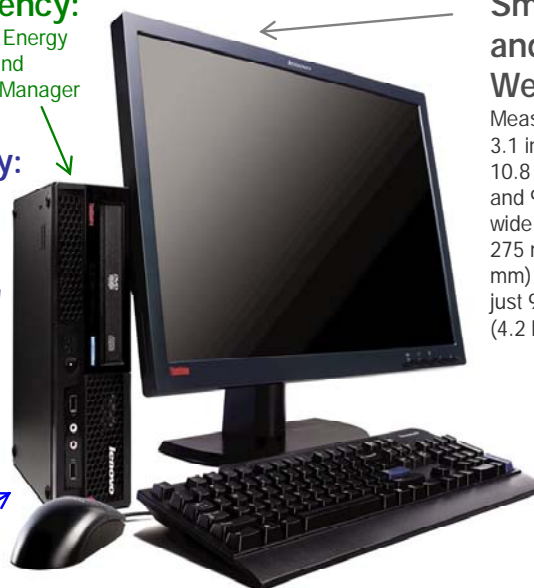
Manageability:
Lenovo TVT suite, Intel vPro and Lenovo SMC compatibility

Security:
Hardware Password Manager, TPM enrcyption, Individual I/O port disablement

Acoustics:
Only 24dB in idle mode

Small Size and Weight:
Measures just 3.1 inches high, 10.8 inches deep and 9.3 inches wide (80 mm by 275 mm by 238 mm) and weighs just 9.2 pounds (4.2 kg)

SOURCE: LENOVO

PC consumes helps combat rising costs by lowering electric bills. The ThinkCentre M58p's increases in manageability and reliability further reduce costs by trimming down the number of desk-side visits made by IT staff, thereby lowering IT labor costs.

At the same time, the desktop reduces the likelihood of data security breaches by improving the ways IT departments can protect critical data stored on each PC as well as the passwords that access it.

Lenovo's Environmental Commitment

Lenovo does not just build green products. The company has set out to reduce its own environmental impact by reducing its energy use and increasing the amount of materials it recycles. Specifically, Lenovo has set a goal to reduce its carbon emissions by improving carbon efficiency 10% by 2012 (measured against a baseline of its 2007 emissions). The company aims to maintain its non-hazardous waste recycling rate at 95% or more at its manufacturing sites, while increasing its recycling rate for non-manufacturing sites during 2008. Lenovo also aims to reduce electricity consumption at its facilities as well as to purchase electricity from renewable sources in the United States and China.

In addition to its own corporatewide initiatives, the company has also joined industrywide initiatives, such as the Climate Savers Computing Initiative. Lenovo sits on the board of Climate Savers, whose members commit to purchasing energy-efficient PCs and servers and to broadly deploy power management, all with the aim of reducing their energy consumption and, in turn, limiting carbon emissions.

Climate Savers is a nonprofit group of eco-conscious consumers, businesses and conservation organizations whose goal is to reduce global CO2 emissions from the operation of computers by 54 million tons per year, enough to match the annual output of 11 million cars or 10 or more coal-fired power plants. The initiative has begun to work toward its goal by setting voluntary standards for computing equipment. Lenovo's ThinkCentre M58p SFF meets Climate Savers' Silver standard thanks to its high-efficiency power supply.

TCO Benefits: The ThinkCentre M58p makes businesses more competitive by lowering IT costs

When combined, the remote management, energy efficiency and reliability features of the ThinkCentre M58p significantly reduce the cost of managing the desktop compared to previous ThinkCentre models.

80%-plus efficient power supplies, which essentially waste less electricity in the process of converting current to be used inside the PCs. Lenovo also offers power-efficient ThinkVision LCD monitors, which, when combined with the ThinkCentre M58p, deliver significant reductions in power consumption.

A ThinkCentre M58p desktop combined with Lenovo's ThinkVision 19-inch L1940p

ThinkCentre M58p's Energy Savings

	ThinkCentre M52 Desktop + 17" CRT	ThinkCentre M58p SFF + 19" LCD
Annual Electricity Consumption:	753 kwh	367 kwh
Annual Electricity Cost:	$77.78	$37.86
Annual CO$_2$ Emissions:	509 kg	248 kg

Impact of switching from M52 to M58p:

Annual Energy Cost Savings of M58:	$39.92 per desktop
Annual CO$_2$ Emissions Reduction of M58:	261 kg per desktop
Environmental Impact of CO$_2$ Reduction:	Equals *eliminating* the combustion of 703 liters of gasoline **or** matches the annual CO$_2$ *absorption* of 20.5 Trees

SOURCE: LENOVO.

TBR expects the ThinkCentre M58p's energy efficiency alone to deliver cost reductions of nearly $40 per PC unit per year relative to the ThinkCentre M52. Consequently, businesses that purchase the ThinkCentre M58p can reduce the total cost of maintaining their fleets of client PCs on an annual basis, leading to even more significant reductions over the lifespan of the desktop. Lenovo achieved these improvements through careful consideration when it came to designing the ThinkCentre M58p desktop. For example, to reduce power consumption the company selected energy-efficient components, including Intel's 65-watt Core 2 Quad quad-core processors, more efficient Double Data Rate 3 memory, and

consumes less than half the electricity of a ThinkCentre M52 and 17-inch CRT monitor. Moreover, by combining this hardware with the new green-friendly Lenovo ThinkVantage Power Manager, businesses can save at least $40,000 per year when operating just 1,000 ThinkCentre M58p desktops.

The M58p's lower electricity use could also have a major impact on the global environment. If businesses in the United States were to deploy 250,000 ThinkCentre M58p desktops in 2009 – an attainable figure given the sheer size of the U.S. business market – they could expect to collectively save $10 million on electricity in the first year. Moreover, they would reduce

ThinkCentre M58p Plays a Key Role in Lenovo's Secure Managed Client

Lenovo's ThinkCentre M58p desktop is also compatible with Lenovo's Secure Managed Client platform, which means the desktop is capable of operating as a managed client device. A specialized version of the M58p can operate as a Lenovo Secure Managed Client (SMC).

Lenovo's SMC platform works to reduce the cost of managing desktop clients by centralizing their administration. SMC clients' user profiles, including data, applications and operating system environment, are hosted remotely, allowing for a range of tasks to be centralized – from administering individual user accounts, to troubleshooting hardware issues and updating software.

The SMC platform ties the desktop client to a remote SMC Storage Array via the network. One array hosts numerous SMC user images. Thanks to its centralized model of hosting from a secure location, the platform delivers the added benefit of higher security.

At the same time, SMC reduces a company's overall power consumption by eliminating the hard drive (and its electricity usage) from each client. However, the SMC platform delivers cost savings and security improvements without sacrificing performance or compromising the user experience of a Windows-based desktop by utilizing the ThinkCentre M58p as the basis for its desktop clients.

carbon dioxide emissions by 65.25 million kilograms that same year – the amount of carbon dioxide emitted by 11,951 automobiles in a 12-month period (Sources: Lenovo figures and the U.S. EPA, Greenhouse Gas Equivalency Calculator. See: www.epa.gov/cleanenergy/energy-resources/calculator.html).

But Lenovo set out to do more than just reduce energy consumption with the ThinkCentre M58p. As part of its effort to alleviate IT managers' biggest pain points, the company also improved remote management capabilities. Using Lenovo ThinkVantage Technologies and Intel's vPro platform, Lenovo brought remote management capabilities to the ThinkCentre M58p, including hardware and software asset tracking and remote diagnostics and repair.

When it came to improving reliability, Lenovo also selected more robust internal components, including solid capacitors, which have a longer lifespan than the fluid-filled or electrolytic capacitors used in most desktops.

The improvements in manageability, reliability as well as greater data security all help reduce costs by limiting desk-side visits made by company IT technicians. Fewer desk-side visits deliver significant savings in IT labor costs and allow companies to operate with smaller IT staffs. They also prevent end-user downtime. Because companies that use ThinkCentre M58p machines spend less of their operating budgets on running and maintaining their client PCs, they have more resources to invest in new IT projects, research and development, marketing and other vital operations. Therefore, TBR believes Lenovo's ThinkCentre M58p can provide an ancillary benefit of allowing businesses to become more competitive in marketing and product design.

Key Customer Benefits: ThinkCentre M58p boosts businesses' green quotients

by reducing their environmental impact

The green factor: TBR believes Lenovo's use of green technologies for the ThinkCentre M58p helps make the desktop, and the businesses that deploy it, a leader in energy efficiency and green friendliness. In consuming less energy than its predecessors, the M58p can bring significant relief from rising energy costs. However, TBR views the rising cost of electricity as only one reason that businesses are seeking to reduce power usage; businesses are also recognizing they will be under increasing pressure from both their customers and local government agencies to reduce their impact on the environment. Not only will increasing energy efficiency work to lower costs, it will also reduce the environmental impact of a business due to the close connection between power generation and greenhouse gas emissions. Moreover, we believe energy efficiency is quickly becoming a strategic differentiator, and, since we expect customers to become even more selective when it comes to purchasing products, we anticipate that they will increasingly seek out products that are produced with a low environmental impact, as well as partners whose operations are green. At the same time, concerns about global warming are beginning to inspire legislation that will increasingly regulate businesses' greenhouse gas emissions. And one of the simplest ways for a business to reduce its impact is to use less electricity. Given these factors, TBR believes companies that view information technology as a competitive advantage will quickly embrace improvements in energy efficiency offered by products such as the ThinkCentre M58p.

Lenovo incorporated several green-friendly and energy efficiency measures into the ThinkCentre M58. For one, the company created its **ThinkVantage Power Manager** to allow IT managers to develop and remotely deploy client power usage profiles to individual ThinkCentre M58p desktops. These profiles can direct PCs to

Lenovo's ThinkVantage Technologies Play a Key Role in Reducing Businesses' Total Cost of Ownership for PCs

Lenovo's ThinkCentre M58p will come equipped with the full range of the company's ThinkVantage Technologies (TVTs).

Lenovo's ThinkVantage Technologies include a series of lifecycle management tools that support and enable image creation and ongoing image management; system migration and deployment; support of PC users; and disposal of PCs in a way that protects sensitive company and customer data.

Most of these tools are included free with every Lenovo system, representing just a small portion of the overall savings. Customers who implement these tools report significant time savings and productivity improvements in managing their PC environments. For example, in many cases, ThinkVantage Technologies reduced the time associated with a PC management task from 50% to 80% compared with previous methods.

Customers experience other business benefits that are even harder to quantify but will positively impact their companies' bottom lines, such as reduced downtime for revenue-generating salespeople and consultants, improved end-user productivity and satisfaction and the ability to avoid reputation-damaging leaks of confidential customer information.

automatically perform tasks such as switching to sleep mode when idle for more than a few minutes or shutting down at a given time each evening or over a weekend. By Lenovo's calculations, which compared the same ThinkCentre desktop with and without the Power Manager enabled, the tool can reduce a PC's power consumption by as much as 69%. The ThinkVantage Power Manager tool, provided for free, will work with all Lenovo client PCs introduced in 4Q08 or later. The tool is also compatible with the Lenovo Power Analyzer, which provides Lenovo customers with an additional level of power management as it allows IT departments to track each end user's PC usage patterns and resulting electricity consumption. Businesses can use the Power Analyzer to create enterprisewide power consumption policies and monitor their success. The tool is also useful in helping IT managers track the total savings achieved by reducing PC power consumption.

The M58p is not Lenovo's sole green product offering; the computer maker is offering the desktop as part of a range of green products, including many more than it has offered in its past. As a result, customers will be able to pair the ThinkCentre M58p with other highly efficient offerings, such as ThinkVision displays, and with products that are composed of a high percentage of recycled materials, including a new Green Fingerprint Keyboard, 35% of which is made up of recycled materials.

Energy Star 4.0 compliance: Given the fact that electronic products' collective power consumption can quickly add up, the U.S. Environmental Protection Agency created Energy Star, a program that provides voluntary standards by which companies can certify their products as energy efficient. Lenovo designed the ThinkCentre M58p to comply with Energy Star 4.0, the U.S. Environmental Protection Agency's latest set of guidelines for product energy consumption. Lenovo ThinkCentre customers who choose Energy Star 4.0 certified models are assured that each

desktop they buy utilizes a highly efficient power supply and comes with power management capabilities to consume less electricity than non-Energy Star 4.0 desktop PCs. To meet the specifications, desktop PCs must meet minimum guidelines and pass a certification test. The guidelines call for desktop PCs to utilize a power supply that is at least 80% or more efficient under loads of 20%, 50% and 100% of their rated capacities, to be power management enabled, and to consume two watts or less of power while in standby or when switched off, four watts or less of power in sleep mode and 50 watts or less when idling. In the case of the Eco Small Form Factor M58p, its power supply is up to 85% efficient.

Lenovo's Energy Star 4.0-compliant ThinkCentre M58p models are also friendlier to companies' internal environments; they are certified to meet standards for indoor air quality by the Greenguard Environmental Institute, which has developed standards for chemical or particle emissions for indoor areas such as office buildings. Greenguard certification shows that Lenovo's M58p models meet standards for low emissions.

Green components: Lenovo carefully selected the components it uses to build each ThinkCentre M58p, as well as the peripherals it pairs the PCs with, for their energy-efficient characteristics. The company selected low-power hardware such as Intel's energy-efficient Core 2 Quad quad-core processor, 80% to 85% efficient power supplies, and utilized as many recycled materials as possible when creating the desktop's chassis. For example, the energy-efficient Core 2 Quad uses 65 watts of power, far fewer than the 95 watts of a standard Core 2 Quad desktop chip, according to Intel.

Lenovo also chose to utilize DDR 3 DRAM (Double Data Rate 3 Dynamic RAM) for its lower power consumption than its predecessor, DDR 2. The company also created an option for customers to equip the ThinkCentre M58p tower and small form factor models with an SSD (solid state

ThinkVantage Technologies, (cont.)

Lenovo's ThinkVantage Technologies portfolio includes:

- **ThinkVantage Power Manager:** Allows IT departments to monitor and manage individual M58p desktops' power usage and set policies that optimize energy efficiency.

- **ImageUltra Builder:** ImageUltra Builder (IUB) is a portfolio of tools that allows an IT organization to build, manage and deploy corporate system images. With IUB, a module is created for each image component including applications, operating systems, language requirement and hard drives. When a module needs to be updated, it can be easily replaced without going through the long process of creating a brand-new image. A new single user license for IUB costs $50.

- **System Migration Assistant:** SMA provides users or IT managers with a tool to migrate user data from old systems to new systems. SMA will easily transfer user data and personality settings (including Windows settings, application-specific settings, and connectivity settings), applications, data files and IDs.

- **Client Security Solution:** The combination of Lenovo's Client Security Solution with its hardware-based Trusted Platform Module provides an integrated software/hardware solution that protects both the security of the network and data residing on individual PCs. CSS utilizes different forms of authentication including a password, pass phrase or fingerprint, for access to protected data, and allows IT managers to customize the level of authentication required.

disk drive), which offers greater performance and consumes less power than a traditional magnetic hard drive. When combined with the highly efficient power supplies, these components all serve the goal of increasing the ThinkCentre M58p's energy efficiency.

The power supplies chosen by Lenovo for the M58p are also better at converting electricity from alternating current (AC), the form in which it arrives to the desktop via a wall outlet, to direct current (DC), the form of electricity the machine uses internally. The 85% efficient power supply found in the Eco Small Form Factor ThinkCentre M58p desktop converts 85% of the electricity it receives from AC to DC, with only 15% escaping as heat. The result is far less waste than in a standard desktop PC, whose power supply might only be 50% efficient.

The M58p's small size and low weight have the added benefit of being less costly to ship – with an associated reduction in carbon emissions and overall waste due to smaller packaging.

Recyclability: Lenovo designed the ThinkCentre M58p to have the lowest-possible environmental impact, including through the use of recycled materials and/or materials that are easily recyclable. For example, the desktop's front bezel is made from recycled plastics. In addition, Lenovo created 100% recycled (and recyclable) thermal plastic packaging for its M58p Eco USFF desktop. The packaging makes large orders of Eco USFF M58ps easier to manage as they are less bulky, and makes the packaging material easier to collect and dispose.

Lenovo's ThinkCentre M58p desktop has also been certified as meeting the Electronic Products Environmental Assessment Tool (EPEAT) Gold standards for environmental impact and ability to be easily recycled. This level of certification means the machines have the lowest energy consumption, contain the lowest amounts of hazardous materials such as mercury and have the highest level of

recyclability as measured by EPEAT standards. In addition to the 23 criteria required to reach EPEAT Gold certification, the ThinkCentre M58p received the highest score in the optional segment of its EPEAT assessment class, according to Lenovo, meeting 20 of 28 optional criteria.

Finally, the company offers Lenovo Asset Recovery Service with its ThinkCentre M58p, allowing customers to contract with Lenovo to manage their end-of-life hardware and includes PC take-back, data destruction, refurbishment and recycling services.

Green peripherals: Lenovo has developed several green peripheral devices, including keyboards and monitors, to pair with its ThinkCentre M58p. Its ThinkVision LCD monitor line, for one, which ranges in size from 19 inches to 24 inches, delivers a combination of green components and lower ownership costs; the monitors use almost 60% less electricity than standard widescreen LCD monitors. The flagship monitor, the L2440x Wide, also eliminates mercury and arsenic content, reduces halogen content and comes in 65%-recycled packaging material. The ThinkVision L1940 Wide's lower power consumption compared to that of a 17-inch CRT monitor means that the L1940 alone contributes as much as $6.45 to the total of almost $40 in annual electricity cost reductions delivered by the ThinkCentre M58p. Further, Lenovo offers a Green Keyboard that is constructed of 35% recycled materials. In addition, the keyboard includes a fingerprint sensor, boosting the security of the ThinkCentre M58p it is attached to. Lenovo is also focusing on green within its overall business. As part of its commitment to the environment (see sidebar on page 3) Lenovo has become one of the Climate Savers Computing Initiative's board members.

ThinkCentre M58p Innovations: Increases in Reliability, Manageability and Security

ThinkVantage Technologies, (cont.)

- **Rescue and Recovery:** Rescue and Recovery is a one-button backup and recovery tool built into every Lenovo system at no charge. It allows users or IT administrators to bring systems back online after a crash on their own or remotely. Whether due to a virus, worm, software or hard drive failure, Rescue and Recovery can retrieve files, restore the entire system or allow for connection to the Internet if the operating system has failed. The Antidote Delivery Manager is a feature built into Rescue and Recovery that allows IT managers to deliver critical updates and patches to systems under a variety of circumstances.

- **Productivity Center:** Productivity Center provides end users with a self-help portal to manage their ThinkVantage tools and utilities. The Productivity Center is also highly customizable; it allows IT administrators to add internal help files, applications and links and provides end users with a single interface for managing a range of self-help options for their PC.

- **System Update:** System Update provides end users and IT managers with a tool to ensure the latest system and software updates are installed on the PC, keeping the system running more smoothly and reducing IT support costs. System Update is also capable of automatically receiving PC BIOS and driver updates and installing them. Company IT departments can set the application to download these updates from Lenovo or from their own internal servers.

Reliability: The ThinkCentre M58p's energy efficiency not only saves on electric bills, it also translates into savings for businesses in the form of lower component failure rates. The M58p's lower-power processors and more efficient power supplies produce less internal heat than a traditional desktop. Cooler temperatures translate to higher reliability for components such as hard drives. Moreover, fewer component failures mean fewer desk-side visits by IT staff and improved overall productivity for end users.

Lenovo built several additional reliability features into the ThinkCentre M58p. The company added an additional heat sink to the motherboard of the ThinkCentre M58p Eco Ultra Small Form Factor to help cool

Lenovo also added a high level of electrostatic charge protection to eliminate the likelihood that an electrostatic discharge via the PC's front ports could cause a short circuit.

The company's decisions to enhance reliability through the use of these features slightly increased the ThinkCentre M58p's costs for Lenovo. But TBR believes the combination of the three features will result in fewer failures, reducing costs associated with downtime borne by its customers. We expect these features to allow the Lenovo desktops to stay in service for longer than the standard three-year lifecycle for those companies who wish to maximize the lifespan of their desktop client hardware.

Manageability: The ThinkCentre M58p

Lenovo's ThinkCentre M58p is more secure and more manageable than its preceding ThinkCenters due to:

Security:
Hardware Password Manager – Centralized password management and administration
TPM encryption chip – Onboard data encryption capabilities
I/O port disablement – Shuts down USB ports' access to data

Manageability:
ThinkVantage Technologies and Intel vPro – Combines the two technologies to increase the remote management capabilities of ThinkCentre M58p
SMC Support – Allows customers to create a secure client environment with ThinkCentre M58p and SMC

Source: Lenovo

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the chipset's I/O controller chip. The heat sink lowers the chip's temperature by about 5 degrees Celsius. Lenovo also chose to utilize a higher number of solid capacitors, devices that store electrical charges to moderate current fluctuations, in order to reduce the possibility of motherboard failures. Solid capacitors last six-times longer than fluid-filled electrolytic capacitors, which are used widely by desktop PC manufacturers (Source: Gigabyte Technology Co. See: www.gigabyte.com.tw/FileList/NewTech/ 2006_motherboard_newtech/article_02_all _solid.htm).

also provides improvements in manageability, combining the portfolio of Lenovo ThinkVantage Technologies (TVTs) with Intel's vPro platform. The combination of the two gives the ThinkCentre M58 its remote monitoring and problem resolution capabilities for both hardware and software, and allows for the enforcement of security protocols using a series of manageability agents and system defense filters.

TVT capabilities: Lenovo equips each ThinkCentre M58p with its entire suite of TVTs, which comprise a fully integrated suite of PC management tools, including capabilities for PC backup and system

Intel vPro Technology Reduces PC Management Costs

Intel created vPro platform technology to provide businesses with a powerful onboard management engine that automates many of the day-to-day tasks required to manage PCs. Intel also equipped the vPro with capabilities to remotely manage each individual PC by simplifying tasks, such as taking an inventory of a PC's hardware or applying a software patch. The technology ultimately aims to reduce costs related to PC management by decreasing the level of interaction required by IT staff, significantly reducing the need for desk-side visits for maintenance and repair.

The vPro platform accomplishes several jobs simultaneously. It allows IT managers to remotely boot and administer a PC that is switched off, even if its operating system is compromised. At the same time, it can monitor changes in each individual PC's software image, preventing end-users from removing critical software such as antivirus. At the same time, the platform can help prevent external attacks by monitoring for computer viruses and worms.

The basis of the vPro platform is Intel's Active Management Technology (Intel AMT). AMT serves as the conduit for remote management, such as remote boot or power down, as well as remote diagnosis and resolution of problems. AMT consists of a hardware/software management engine built into the company's business desktop PC platform.

recovery, software updates and image management as well as data protection. *(Note: Please see the ThinkVantage Technologies sidebar on page 6 for additional information.)*

vPro support: Lenovo's use of Intel's vPro platform lends the desktop many of its remote diagnosis and repair capabilities, for example allowing IT managers to remotely administer to one of the machines if it is powered down or the OS is inoperable. The result is a reduction in desk-side visits and associated IT costs as some problems are automatically addressed, while others can be dealt with remotely. Consequently, IT staffs can focus efforts elsewhere. The basis of vPro is Intel Active Management Technology (Intel AMT), a hardware management engine built into Intel's chipsets. AMT serves as the conduit for remote management tasks, such as remote boot or power down, as well as remote diagnosis and problem resolution. vPro also has the benefit of being supported by a range of PC management software, inducing that of Lenovo partner LANDesk.

Security: Lenovo equipped the ThinkCentre M58p desktop with a full range of security technologies, including the its own Hardware Password Manager, a TPM (Trusted Platform Module), the ability to individually manage all Input/Output ports via the PC BIOS (basic input/output system) and a chassis intrusion switch. These features work together to safeguard critical data by decreasing the likelihood of unauthorized access.

The ThinkCentre M58p's Hardware Password Manager, which will be available in 2Q09 for an additional fee, works with the M58p's BIOS and Microsoft's Active Directory to provide a system for centrally managing hard drive, BIOS and supervisory passwords. The HPM can be used in conjunction with optional encrypted hard drives to allow companies to centrally manage the protection of the data on their ThinkCentre desktops. Lenovo also provided the capability for files residing on the ThinkCentre M58p machines' hard drives to be encrypted, with the aim of preventing access by unauthorized personnel, and added the I/O port controls so that files may be blocked from being copied onto portable storage devices. Lenovo augments the I/O port control feature with a PS/2 port option, allowing customers shut off the USB ports in ThinkCentre M58p desktops and utilize PS/2 peripherals instead, including keyboards and mice. Unlike a USB port, the PS/2 port serves only to connect peripheral devices and is incapable of transferring data, so the option enhances data security.

> TBR believes that businesses that are serious about driving lower IT management costs as part of their overall efforts to reduce operating costs must consider the ThinkCentre M58p desktop.

Additionally, Lenovo has added several layers of security for its ThinkCentre M58p desktops by working with partners to create a security ecosystem around the desktop. For example, the company is supporting software provider Safend's endpoint security technology, which works to protect businesses' computer networks from being compromised. The technology centralizes businesses' abilities to prevent unwanted devices from tapping into their computer networks from one of several network endpoints. Vulnerable endpoints include computer USB ports, Firewire ports and PCMCIA slots as well as corporate Wi-Fi networks, according to Safend. Safend also provides auditing, monitoring and even blocking of any device that can be connected to a network via a network endpoint, preventing unauthorized file copying.

Finally, Lenovo is also helping customers recover stolen assets. The ThinkCentre M58p supports Absolute Software's

Intel vPro Platform, (cont.)

The vPro platform brings the added benefit of being supported by a wide range of PC management software, including Lenovo partner LANDesk. Top features of Intel's vPro platform include:

- **Uninterruptible Access to PCs:** The vPro AMT is built into the chipset, allowing unhindered access to the PC by IT professionals even when the PC is switched off, the OS is absent or software is disabled.

- **Remote PC Management:** vPro allows for remote monitoring, diagnoses and repair of network connected PCs, resulting in fewer desk-side visits by IT professionals and cost savings related to PC management.

- **Automatic Security Monitoring:** vPro automatically ensures that a PC's management and security programs are updated and running; IT professionals will be automatically notified if they are not running. This feature enhances the ability of IT managers to prevent issues such as PC virus infection before it becomes a problem.

- **"Call for Help":** IT managers can be solicited with a "call for help" from a user's PC directly to an IT management console. The PC can then be repaired remotely even if it is located outside the corporate firewall or unresponsive.

Computrace technology. By placing the Computrace Agent software application on a PC, the agent, located on the hard drive and integrated with the PC's BIOS, can be made to automatically report its location each day. Therefore, if a machine is reported stolen Absolute Software's Recovery Team can track its location the next time it connects to the Internet. Upon locating a machine, the recovery team works with local law enforcement agencies to recover it.

CONCLUSION: Lenovo's ThinkCentre M58p addresses pressing business needs

With the ThinkCentre M58p's high levels of energy efficiency, manageability, reliability and eco-friendly features, TBR believes Lenovo has achieved a leadership role in the business desktop space. The energy efficiency of the M58p allows for annual cost savings of $40 compared to previous ThinkCentre models. Additionally, the improved manageability that results from the inclusion of Lenovo's ThinkVantage Technologies, and the M58p's increased data security thanks to items such as Lenovo's USB controls, PS/2 port option and forthcoming Hardware Password Manager, both offer marked improvements from predecessors.

The ThinkCentre M58p's more durable internal components also result in higher reliability than previous ThinkCentre desktops, while its EPEAT Gold

certification and the introduction of 100% recycled/recyclable packaging on ThinkCentre M58p Eco Ultra Small Form Factor models reflect an eco-friendly design.

Given the number of significant improvements to the ThinkCentre M58p desktop, TBR believes that businesses that are serious about driving down IT management costs as part of their overall efforts to reduce operating costs must consider the desktop in addition to other energy-efficient Lenovo products like the ThinkVision L2440x display. TBR notes that the ThinkCentre M58p will also contribute to companies' broader efforts to reduce overall impact on the environment, both through a reduction in carbon emissions as well as via efforts such as increased recycling of non-hazardous materials. Businesses that move quickly to embrace technology such as Lenovo's ThinkCentre M58p, in combination with other green investments, will gain in standing among customers, generating a potential advantage in the marketplace. Companies that demonstrate a commitment to efficiency not only improve their own profitability by lowering operating costs, they are also better capable of serving their customers, which prompts greater customer loyalty, higher revenue and profitability.