

Lenovo x86 Servers Top ITIC 2020 Global Reliability Survey

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Lenovo Servers Score Top Reliability Marks; Best in Class Security Among all x86 Platforms

Users rate Lenovo ThinkSystem servers highest in every x86 Reliability category; 26x more reliable; 34x more economical than least reliable White boxes

ITIC Position

For the seventh straight year, Lenovo's ThinkSystem servers scored the highest reliability and uptime among all Intel Corp. x86-based platforms in ITIC's 2020 Global Server Hardware Server OS Reliability Survey.

ITIC's latest 2020 Reliability and Security survey data finds that Lenovo ThinkSystem family of servers delivers up to 26x more uptime and availability than the least reliable unbranded "White box" servers(See Exhibit 1).

The superior uptime of the Lenovo mission critical hardware makes the ThinkSystem platform up to 34x more economical and cost effective than the least stable unbranded White box servers depending on individual customer server configurations, overall network environment and specific use case scenarios.

Additionally, corporate customers consistently gave the Lenovo ThinkSystem servers the best scores in every category in ITIC's 2020 Global Reliability among all x86 based platforms, including:

- **Highest overall reliability** and uptime among all x86 server distributions
- **Least amount of unplanned downtime** of over four hours among x86 server platforms
- **Most economical:** lowest cost of per minute/per server hourly downtime among x86 machines
- **Lowest failure rate** of x86 server hardware or components during first year of usage
- **Highly rated customer satisfaction** for seven straight years
- **Security:** Lowest percentage of servers that experienced downtime due to security or data breach

ITIC's 2020 Global Server Hardware, Server OS Reliability Survey results indicate that the Lenovo ThinkSystem server portfolio provides businesses with inherently superior reliability and uptime; security and manageability. Survey respondents also report that Lenovo delivers excellent service and support and technical documentation.

Information Technology Intelligence Consulting



Audience

Corporate enterprises, CEO, CIO, CTO, VP/Manager of IT, Network and Security Administrators, Compliance Professionals, Vendors, system integrators and consultants.

Relevance

High Reliability, uninterrupted data access and strong security are essential for productivity, revenue and safeguarding Intellectual Property and sensitive data. Outages and data breaches increase risk and imperil the firm's reputation. Downtime is expensive. One hour of downtime now exceeds \$300,000 for 88% of businesses.

Introduction

Today's businesses have no tolerance for unplanned server downtime.

Organizations' need for continuous, uninterrupted data access to servers and key line of business applications is central to daily business transactions and operations. When servers fail for any reason, productivity is disrupted and business grinds to a halt. Downtime jeopardizes revenue; heightens the potential for customer dissatisfaction and increases the risk for litigation. Server and application outages have a domino effect: they potentially damage the company's reputation and could result in lost business opportunities.

Server hardware, server operating systems and applications are among the most important foundational elements of the entire network ecosystem. ITIC survey data finds that 87% percent of businesses now require a minimum of "four nines" - 99.99% reliability - for their firms' server hardware, operating systems and main line-of-business applications. Reliability of "four nines" – 99.99% -- is the equivalent of 52.56 minutes of per server/per annum downtime (taking into account all outage causes), while "five nines" – 99.999% uptime equates to just 5.26 minutes of per server annual downtime.

Ninety percent of Lenovo servers have consistently achieved 99.99% and 99.999% reliability/uptime and availability since the company purchased IBM's x 86 server business in 2014, according to ITIC Reliability survey data.

The Lenovo server line is a bastion of stability.

ITIC survey data and first person customer interviews find that this is due to Lenovo's continuing commitment to upgrade the entire server line *as well as* its PCs and laptops, with advanced functionality, performance and manageability features. Additionally, Lenovo is able to maintain its status as the most reliable x86 server platform – despite intense competition – owing to its investment in security functionality via its ThinkShield security solutions for PCs. This in turn, bolsters overall system and network security.

Lenovo ThinkSystem Servers Score Highest Uptime Rankings

ITIC's latest 2020 Global Server Hardware, Server OS Reliability survey results found that Lenovo ThinkSystem hardware reliability improved by an average of 24 seconds over the average recorded downtime of 1.88 minutes in ITIC's 2019 poll. In 2020, Lenovo ThinkSystem Servers averaged 1.64 minutes of per *server unplanned downtime due to inherent flaws* in the underlying hardware or component parts (See Exhibit 1).

It is important to note that corporations may experience additional server downtime due to a variety of other internal and external reasons. This includes planned downtime to upgrade the servers and apply patches and fixes. Servers may also crash due to unanticipated manmade and natural disasters (an employee accidentally unplugging the server; extended power outages and weather related incidents like floods, tornadoes and hurricanes); the organization's failure to "right-size" servers to accommodate increased workloads; human error and successful, targeted security hack or prolonged data breach. ITIC's Global Server Hardware, Server OS Reliability Survey tracks the inherent causes of server downtime. ITIC's reliability polls also provide

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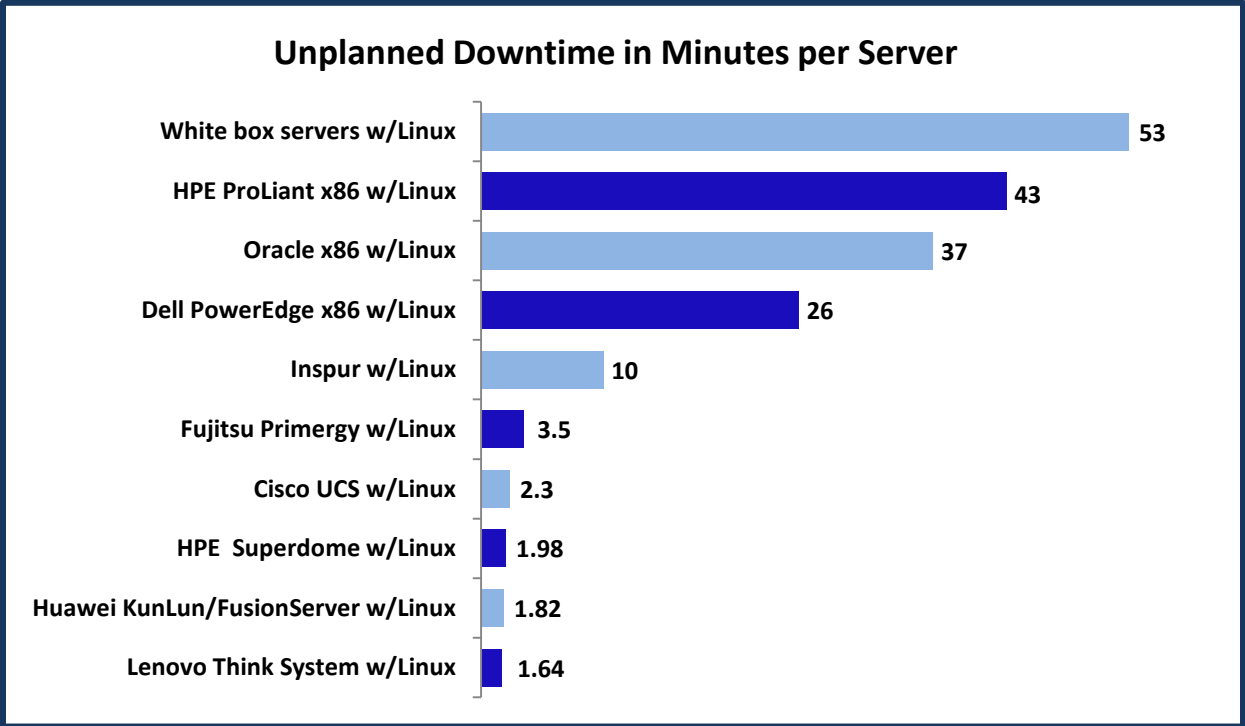
Page 2 of 10

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businesses with all metrics associated with reliability such as the time (minutes, hours and seconds) associated with three, four, five and six nines of downtime as well as the specific cost of per minute/per server outages and overarching price of a single hour of downtime. ITIC research indicates that the average mid-size and large enterprise will have two or three different server platforms within their organization. By providing the pertinent downtime costs, timetables and percentages, ITIC endeavors to enable corporate enterprises to calculate the downtime associated with each platform and do an informed cost/comparison.

Exhibit 1 illustrates minutes of downtime associated with the most popular x86 servers.

Exhibit 1. Lenovo ThinkSystem Servers Deliver Record Uptime



Source: ITIC 2020 Global Server Hardware/Server OS Reliability Survey

The Lenovo ThinkSystem’ 1.64 minutes of unplanned per server downtime due to inherent flaws in the hardware or components sharply contrasts with the reliability of the least consistent hardware - unbranded White box servers, which worsened compared to the ITIC 2019 survey. In the most recent ITIC 2020 reliability poll, the White Box servers recorded an average of 53 minutes of unplanned per server downtime due to problems or failures with the server or its components (e.g. hard drive, memory, cooling systems etc.) This is an increase of four (4) minutes from the 49 minutes of downtime White box servers saw a year ago.

The superior economics of the most reliable versus least reliable servers is even more apparent for businesses that estimate or calculate their hourly downtime losses to be \$300,000; \$500,000 or \$1,000,000 or higher.

Servers are the bedrock upon which the entire network infrastructure and extended network ecosystem rests. When servers fail, data access is denied. Business stops. Productivity ceases. Revenue suffers.

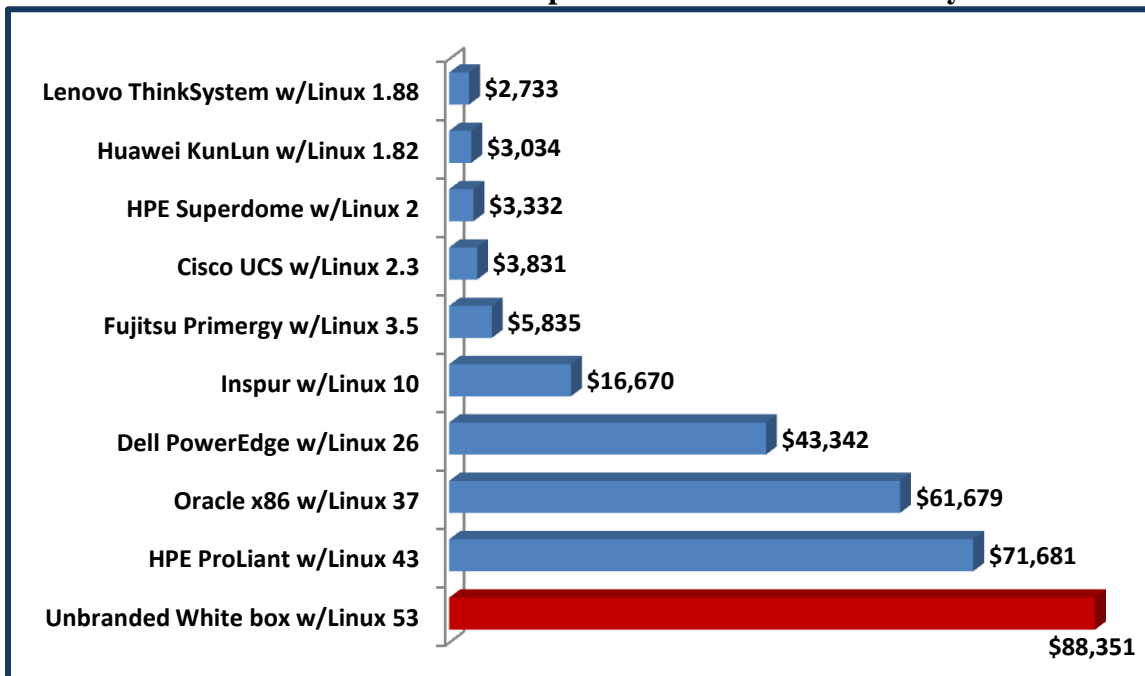
Lenovo Reliability Improvements Save Customers \$400 per minute

The stability and reliability of the server hardware and its component parts has a tangible and immediate effect on corporate transactions and revenue.

A single hour of downtime calculated at \$100,000 equates to \$1,667 lost per server, per minute.

Exhibit 2 below illustrates the baseline cost of a single minute of unplanned per server downtime by each vendor server platform. Lenovo ThinkSystem Servers were best in class among all Intel x86-based systems. To reiterate, the Lenovo ThinkSystem hardware reliability cut downtime by **24 seconds** from an average of 1.88 minutes of per server downtime in ITIC's 2019 Reliability Survey to an average of 1.64 minutes of per server downtime due to inherent flaws in the hardware in ITIC's 2020 poll.

Exhibit 2. Lenovo Servers: Lowest Cost per Minute/Per Server Hourly Downtime of \$100,000



Source: ITIC 2020 Global Server Hardware, Server OS Reliability Survey

The financial savings are evident.

The Lenovo ThinkSystem unplanned downtime of 1.64 minutes per server due to inherent hardware flaws equals **\$2,733** for a single server. The additional 24 seconds of per server uptime saves Lenovo ThinkSystem Server customers **\$399 for each minute of downtime calculated at an hourly cost of \$100,000!**

The cost savings are even greater when you multiply the \$399 by the number of company servers. For example, that extra 24 seconds of uptime (using an hourly downtime cost of \$100,000) would save a small business with five servers **\$1,999**; a larger company with 50 servers could expect to net **\$19,950** in savings and an enterprise with 100 servers could realize **\$39,900** in cost savings.

By contrast, a corporation running Fujitsu Primergy with Linux, which averaged 3.5 minutes of per server downtime, could expect their per minute downtime costs to be **\$5,835** for a single server (calculated at \$100,000 per hourly downtime). This is approximately 50% higher than the Lenovo ThinkSystem server.

Meanwhile, the least reliable unbranded White box servers whose annual 49 minutes of server outages cost their users an estimated \$81,683 in the 2019 survey potentially could see downtime costs increase by close to eight percent this year. Unbranded White box server downtime increased by four (4) minutes to 53 minutes of per server downtime in ITIC's 2020 Global reliability survey. Those additional four minutes equate to an extra **\$6,668 per server, per minute unplanned downtime, for a cost of \$88,351 per minute, per server** calculated at \$100,000 an hour.

ITIC used a conservative statistic of \$100,000 for a single hour of downtime to calculate the commensurate cost of a single minute of downtime associated with each specific server platform. The price tag will be considerably higher when multiple servers experience an outage, or, if a single hour of downtime exceeds \$100,000. Similarly, downtime costs will be higher for any organization that has virtualized servers (on-premises or in the cloud). In that scenario, users would have to multiply the baseline per server, per minute downtime figures to reflect the number of affected server/application instances running on a single virtualized server. Also of note: the aforementioned per server/per minute downtime statistics do **not** include the cost of any potential litigation or civil or criminal penalties that may arise if customers or business partners sue because they were negatively impacted by an outage.

The cost of a Tier 1, Tier 2 or the most severe and prolonged Tier 3 outages are not set in stone. Individual businesses must determine their specific downtime costs. Ultimately, the final tally will depend on the customer's usage scenario. Corporations must consider many factors. They include:

- Individual organizations' server and application environment
- The duration, severity, type and number of outage(s)
- The costs associated with specific, *affected* work functions and transactions and time of occurrence
- The number of employees impacted by productivity disruptions
- The length of time and number of administrators involved in remediation/restoration of operations
- Calculating whether data was lost, stolen, damaged, destroyed or changed due to the outage
- The impact on customers, business partners or suppliers' operations
- The potential cost of litigation and/or liability (e.g. fines, civil or criminal penalties)

Hourly downtime costs are increasingly expensive.

ITIC's 2020 latest reliability survey results found that 98% of corporations' hourly downtime losses now exceed \$100,000 (**See Exhibit 1**). And an 88% majority of enterprise survey respondents report hourly downtime costs exceed \$301,000 to \$400,000.

Organizations may rack up hourly downtime costs due to one or two more serious Tier 2 or Tier 3 outages of 30 minutes or one, two, three or four hours or more. Alternatively, businesses may experience multiple instances of minor Tier 1 hardware outages of one-to 15 or 20 minutes duration over the course of a year. Costs quickly add up when businesses factor in additional servers and in situations where hourly downtime costs exceed \$100,000. Many corporations today have virtualized server farms in their on-premises data centers and nearly all cloud computing environments are virtualized.

For example, a corporation that experienced one minute of downtime involving a single Lenovo ThinkSystem server running three or four mission critical applications could anticipate incurring outage costs of \$10,932 per minute for every minute the server and its applications were unavailable. Similarly, a company that experienced a single minute of server downtime on 10 corporate servers (running one key application), calculated at an hourly rate of \$100,000 would rack up \$16,670 in losses.

The longer the outage; the higher the cost will be. The Lenovo ThinkSystem high reliability statistics make the platform highly desirable for cost conscious and risk-averse enterprises.

Lenovo Security Survey Highlights

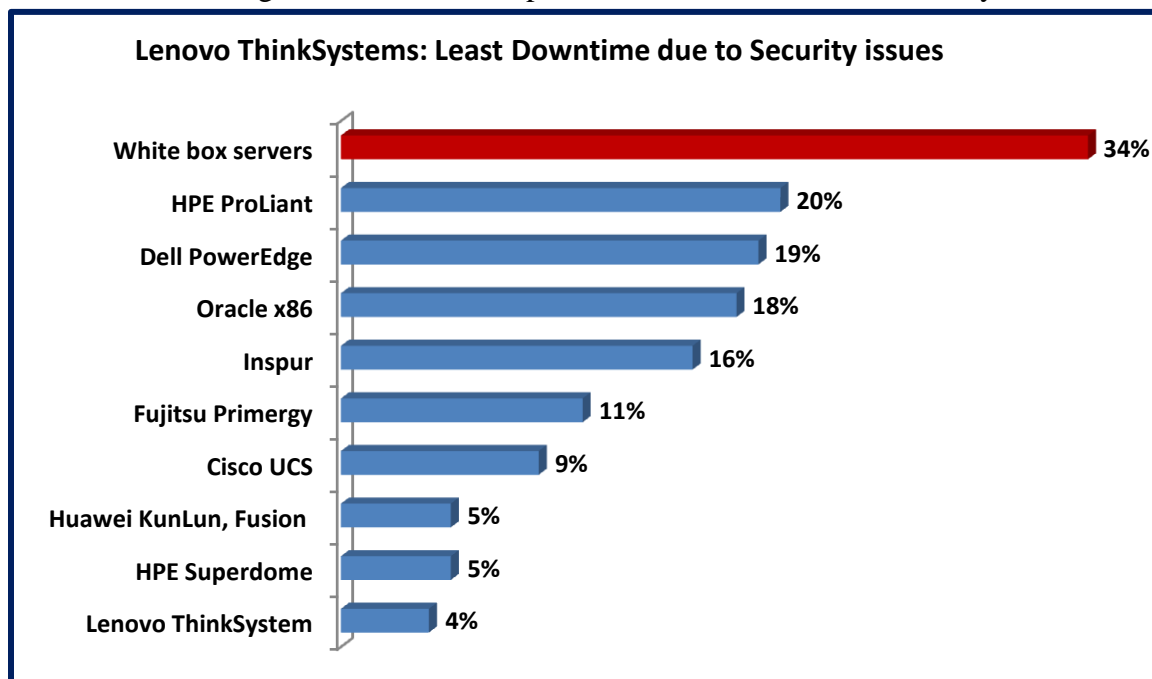
Security is now the top issue that most negatively impacts reliability and results in downtime for server hardware, server operating systems and applications. Some 64% of the 1,200 ITIC survey respondents cited security and data breaches as the top cause of downtime, followed closely by human error at 60% and 40% of firms that say software bugs and flaws is the third leading cause downtime, according to the latest ITIC's 2020 Global Server Hardware, Server OS Reliability Survey findings.

Once again, Lenovo ThinkSystem servers demonstrated excellent security (**See Exhibit 3**); they registered the lowest percentage among all x86 server distributions – four percent (4%) - that suffered downtime due to an attempted or successful security hack or data breach.

Strong, embedded security and inherent reliability are absolutely essential to ensure ongoing daily transactions and uninterrupted access to crucial main LOB server-based applications. As everyone knows, security hacks are more targeted, pervasive and pernicious. In addition to ITIC's own security survey findings, research firm, [Statista](#), headquartered in Hamburg, Germany, which tracks the number of data breaches and records exposed, reported that hacks rose exponentially in the last 19 years. In 2005 for

example, Statista¹ reported 157 cyber security incidents in the U.S. that exposed 66.9 million records. By 2014, that number increased 500%; there were 783 data breaches reported that exposed 85.61 million total records. The most recent 2019 Statista study, found that the U.S. experienced 1,244 data hacks exposing over 446.5 million records. And the latest [Federal Bureau of Investigation \(FBI\) statistics](#) reveal that Email BEC and Phishing scams caused \$26 billion in losses from 2013 to 2019².

Exhibit 3. Percentage of Servers that Experienced Downtime due to Security Issues



Source: ITIC 2020 Global Server Hardware Server OS Reliability Survey

Security issues have a direct, negative impact on reliability. In the Digital age of “always on” and interconnected systems and networks, there are more points of vulnerability that hackers are only too eager to exploit. Embedded security is more important than ever to bolster server, server operating system and application availability. Lenovo wisely continues to bolster the inherent security of its servers, PCs and laptop hardware.

¹ Statista, “**Annual** number of data breaches and exposed records in the United States from 2005 to 2019 (in millions).” URL: <https://www.statista.com/statistics/273550/data-breaches-recorded-in-the-united-states-by-number-of-breaches-and-records-exposed/>

² FBI, Public Service Announcement, September 10, 2019, Alert No. I-091019-PSA “Business Email Compromise, the \$26 Billion Scam.” URL: <https://www.ic3.gov/media/2019/190910.aspx>

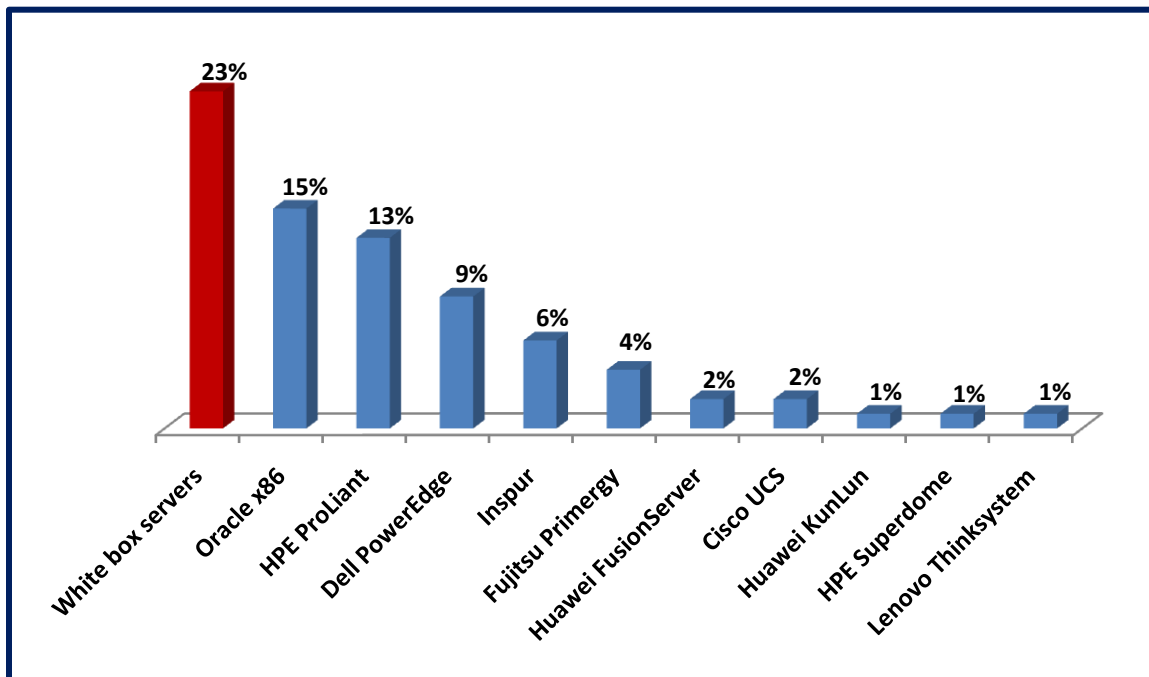
Other Lenovo Reliability Survey Highlights

- **Lenovo Servers Have Lowest Percentage of Hard Drive Failures:** Lenovo ThinkSystem servers continue to record the lowest percentage of hard drive quality or failure issues among all x86 server distributions within the first one, two and three years of service. Just one percent of Lenovo ThinkSystem enterprises experienced technical problems with their hard drives in the first year of usage.
- **Customer Satisfaction:** Some 86% of ITIC survey respondents rated Lenovo customer service and support as “Excellent,” “Very good” or “Good.” Only one percent of respondents gave Lenovo a “Poor” rating for technical service and support.

Server Reliability by Vendor Platform

As **Exhibit 4** shows, Lenovo ThinkSystem servers also experienced the lowest percentages of unplanned downtime lasting over four hours. Prolonged Tier 3 outages of over four hours are typically the most severe and costly.

Exhibit 4. Unplanned Annual Server Downtime of >4 Hours by x86 Server Platforms



Source: ITIC 2020 Global Server Hardware, Server OS Reliability Survey

Exhibit 4 reinforces the strong reliability of the Lenovo x86 server hardware. Only one percent (1%) of Lenovo ThinkSystem, HPE Superdome and Huawei KunLun servers suffered over four hours of unplanned downtime due to underlying problems with the core hardware or any of its component parts. This makes them not only highly reliable but also very economical to run and maintain.

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Page 8 of 10

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Analysis: Lenovo Server Reliability and Security

ITIC's 2020 Global Server Hardware, Server OS Reliability Survey results show that Lenovo servers maintains the same high level of performance, reliability, security and after-market technical service and support for the seventh straight year. Lenovo has been unwavering in its commitment to reliability/uptime, availability and security. Lenovo's tactical and strategic security strategy likewise continues to evolve. In 2018, Lenovo unveiled its ThinkShield end-to-end security technology for its PCs and laptops. As ITIC stated in its 2019 Mid-Year Update Report, published in October 2019, the ThinkShield technology is a key component in the ThinkSystem SE350. This model is Lenovo's first purpose-built edge server, targeted at the network edge to deliver optimal bandwidth, bolster security, and reduce downtime. The ThinkSystem SE350 is a small-footprint server. It measures 1.75 inches high, 8.1 inches wide and 14.9 inches deep and can be mounted on a wall, stacked on a shelf or installed in a rack. The ThinkSystem SE350 is also designed as a high-performance server. It's based on Intel's Xeon-D processor and comes equipped with 256GB of RAM and 16TB of internal solid-state storage. Additionally, Lenovo fortified the ThinkSystem SE350 with enhanced physical security features like a locking bezel, intrusion detection, tamper detection and encrypted storage.

This is all part and parcel of Lenovo's long-term direction to weave innovation with reliable, flexible, and secure data center systems. Lenovo's open server, storage, networking, and system management platforms seamlessly integrate with existing and legacy environments.

This is a savvy move that also has far reaching ramifications for Lenovo's servers, networks and ultimately its corporate customers. Security and Human Error are the two biggest cause of server downtime. And they are inextricably linked. Corporate end users are among the weakest links in the security chain. Lenovo is wise to use ThinkShield solutions to strengthen both desktop as well as server security. Lenovo enforces rigorous security standards, policies and procedures at its manufacturing facilities and global supply chain. Lenovo's Quality Engineers retain the right to audit the company's Trusted Suppliers at any time, giving the company even further control and insight into the security of its devices' components.

ThinkShield also delivers design level security. This includes secure BIOS and firmware, as well as privacy screens and laptop camera shutters into its devices to help minimize "visual hacking" when mobile users are in public places. ThinkShield is designed to protect users' identities and credentials, offering FIDO-certified authenticators and integration with Intel Authenticate (offering up to 7 authentication factors). ThinkShield also features BIOS-based Smart USB protection, which functions by configuring USB ports to only respond to keyboards and pointing devices.

Lenovo also emphasizes that its open server, storage, networking and system management platforms seamlessly integrate with existing and legacy environments. In first person interviews with ITIC analysts, Lenovo customers cited the ease of deployment and ease of integration and backwards compatibility as contributing to the underlying reliability and stability of the ThinkSystem platform. Lenovo users also lauded

the vendor's after-market service and support. Lenovo's system design supports mission-critical databases, enterprise applications, big data analytics, and cloud and virtualized environments.

All of the new additions to Lenovo's server portfolio are designed specifically to handle customers' evolving, data-intensive workloads such as video security, software-defined storage and network intelligence. They also support virtualized and network edge environments – where security is paramount. The result is a solution that packs power along with efficiency for customers who place a premium on balancing throughput and security with easy scalability. Lenovo claims the two new ThinkSystem servers “provide the performance of a dual-socket server at the cost of a single-socket” and have the potential to lower customers' software licensing costs by up to 73% and cut TCO by up to 46%.

Conclusions

Reliability is among the most crucial elements and metrics in every organization. Improvements or declines in reliability and availability can raise or lower costs and mitigate or exacerbate organizational risks.

Reliability is fluid, not static. No server, no component part – hard drive, memory or CPU; operating system; application, device or connectivity mechanism is immune from inherent problems or failure. No servers or software are immune to security hacks and data breaches. Therefore, corporations should test and choose the most reliable and secure distributions.

In summary, the ITIC 2020 Global Server Hardware and Server OS Reliability Survey findings indicate that for the seventh straight year, Lenovo ThinkSystem servers are the most reliable x86 hardware platforms. Each registered four and five nines - 99.99% and 99.999% - for well over nine-out of-10 corporate survey respondents. The Lenovo ThinkSystem servers are up to 26x more reliable, recording just 1.64 minutes of unplanned downtime due to problems with the server hardware than the least reliable unbranded “White box” servers, which registered 53 minutes of per server unplanned downtime.

Lenovo ThinkSystem servers were also among the most inherently secure servers: only four (4%) experienced downtime as the result of a security issue or data breach in the last year.

In another noteworthy achievement, Lenovo maintained its first place rankings in every reliability and availability category or, tied for first or second place in every Intel x86-based reliability, security, manageability and customer satisfaction metric in the survey.

The inherent reliability and security of the Lenovo ThinkSystem servers deliver demonstrably better uptime and availability resulting in lower TCO and accelerated ROI.