

# **VAX and Alpha in 2010: Real Challenges, Solid Solutions**

**A detailed description and benefit analysis of hidden vulnerabilities and new proactive maintenance options to avoid system failure and extend the life and value of HP VAX and Alpha systems.**

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## Executive Summary

**OpenVMS is seen by many as a gold standard of reliability, availability and longevity.** Yet the hardware underlying many OpenVMS systems, VAX and Alpha, are aging and at real risk of hardware failure for a variety of reasons. For some owners of OpenVMS systems, these risks are hidden and even unanticipated. This paper describes those risks, the costs of ignoring them, and the solutions available to extend the operating life of VAX and Alpha. These solutions reduce cost of ownership and enhance the performance of mission critical applications. This paper shows that replacement of failed components with new ones is more cost effective than replacing them with used ones. It also shows that proactive replacement of these components is much more cost effective than the inevitable losses associated with unplanned downtime.

Worldwide a total of 500,000 Digital VAX and 250,000 Alpha systems were sold before these products were discontinued. HP invested considerable time and money to facilitate customers' transitions, first from VAX to Alpha, then from Alpha to HP Integrity. TechWise Research published several white papers including detailed analyses about these upgrade decisions. In most cases, an upgrade pays for itself in as little as 12-18 months. The initial hardware and installation costs are offset by ongoing savings in management, downtime, and service. Despite these benefits, many estimate that hundreds of thousands of VAX and Alpha systems remain in use today. These systems are susceptible to hidden vulnerabilities that, if not addressed, put them at risk for failure.

There are legitimate business and technical reasons why companies continue to use VAX and Alpha systems. First and foremost, they work. Thanks in no small part to OpenVMS, VAX and Alpha have earned reputations as reliable servers for business-critical applications. Other business-related reasons for staying with VAX and Alpha include: 1) Current economic uncertainty precludes "optional" IT investments, 2) Lack of funds for initial purchase, and 3) Contractual and/or certification requirements. Technical barriers to upgrade include: 1) Risk that the upgrade process and procedures will introduce technical problems, 2) Legacy third-party applications are not supported on Integrity, 3) Custom code would require extensive re-writing and testing, and 4) Lack of expertise to modify old custom code.

Past studies show that the average cost of downtime for companies using VAX or Alpha range from a few thousand dollars, to hundreds of thousands of dollars per hour. Downtime can result in lost worker productivity, lost sales, damages to a company's reputation, and in some instances loss of life. Despite their vaunted reputation for reliability, VAX and Alpha systems are not immune to the affects of time. **Physical components such as disk drives, fans, power supplies, and batteries can and do "wear out."** In addition, power supply problems can lead to voltage spikes that damage electronic components such as cache, memory, and the CPU.

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### Highlights

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**OpenVMS on VAX and Alpha is a gold standard of reliability, availability and longevity.**

**Yet aging hardware components make VAX and Alpha systems susceptible to failure.**

**This paper covers options to proactively prevent these failures.**

VAX and Alpha replacement parts are no longer available from the original OEMs. When a component fails, companies often turn to third parties to purchase replacement parts. Unfortunately, these parts are used and are often old. They typically come with very short warranties (e.g., 30 to 90-day) because there is the very real chance they will fail in a short period of time. Nemonix Engineering, an HP partner based out of Northborough MA, offers an alternative. Nemonix manufactures new replacement components for VAX and Alpha that meet, and often exceed, original factory specifications. This means a 20-year old VAX drive that just failed can be replaced with a new drive that was manufactured in the past few months that is covered under a three-year warranty. Perhaps the best testament to the quality of Nemonix products is that HP often uses them when repairing VAX and Alpha systems that are under extended break-repair service contracts.

In addition to disk drives, Nemonix offers many other newly manufactured components including flash drives, fans, power supplies, batteries, and networking boards. In fact, Nemonix is the only company in the world today that manufactures these components.

Given the risks of downtime, what can system managers do to keep their VAX and Alpha running? When it comes to avoiding downtime the best defense is a good offense. Nemonix's System Refresh gives companies multiple options to proactively prevent problems. These options range from a "do-it-yourself" upgrade to Nemonix shipping the customer a "brand new" system. Depending on the system, its age and condition, a System Refresh costs between \$2,000 and \$3,000. Enterprise-class Alphas or very complex systems may cost more. For most companies the total cost of a System Refresh is small compared to the cost of unplanned downtime. Nemonix offers a one year warranty with each System Refresh which can be extended up to 10 years for between \$1,500 and \$2,000\* a year. This warranty covers all components in the system (regardless if they were replaced) except the drives. Customers often replace their drives at the same time for an additional cost, and a separate warranty up to 10 years.

Any VAX still in production is at least 10 years old (since HP stopped selling the VAX in 2000). This is well past the MTBF for components such as fans and batteries. Replacing failed VAX components with used parts that are at least 10 years old is very risky. Similarly, HP stopped selling Alphas in 2007. Older Alphas may also have components that have exceeded their MTBF. When a VAX or Alpha component fails, most companies will be better off replacing it with a newly manufactured Nemonix part with a warranty. In addition, unless the costs incurred when the VAX or Alpha goes offline are very small, companies should seriously consider Nemonix's System Refresh to proactively avoid downtime. A System Refresh can improve system performance and extend the useful life of a VAX or Alpha for many years.

\* Extended warranties for Enterprise-class Alphas need to be quoted on a case-by-case basis. All pricing was provided by Nemonix for illustrative purposes. Companies should contact Nemonix for an actual quote. Nemonix prices are subject to change at any time.

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### Highlights

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**Hundreds of thousands of VAX and Alpha systems remain in use today, despite all the benefits of upgrading to HP Integrity servers.**

### Introduction

For over twenty years Digital VAX servers running OpenVMS were the "best-in-class" servers to run business critical applications. From 1977 to 2000 a total of 500,000 Digital VAX were shipped worldwide. After discontinuing the VAX, Compaq Computer encouraged companies to upgrade their OpenVMS environments to the then new 64-bit AlphaServer platform. For many companies the upgrade from VAX to Alpha was easy. A TechWise paper from 2000 entitled *Quantifying the Total Cost of Upgrading OpenVMS VAX Systems to HP OpenVMS AlphaServer Systems* provided a detailed analysis of this upgrade based on actual customer data. Roughly 250,000 Alpha systems were sold before this product was discontinued in 2007 and replaced by HP Integrity servers. HP invested considerable time and money to facilitate customers' transition from Alpha to Integrity. In May 2007 TechWise published another paper entitled *Quantifying the Total Cost of Upgrading HP OpenVMS AlphaServer Systems to OpenVMS on HP Integrity Servers*. Similar to the 2000 paper, this paper provided detailed analyses of the costs and benefits of this upgrade based on customer data. Both papers showed that the financial benefits of upgrading to the newer platforms are considerable. In terms of Alpha to Integrity upgrades, entry-level and midrange Integrity servers paid for themselves in less than a year. The enterprise-class Integrity rx8640 paid for itself in just over two years. In all scenarios studied, the initial costs of the hardware and installation are offset by ongoing savings in management, downtime, and service costs. Over three years have passed since HP stopped manufacturing AlphaServer, while the last VAX was manufactured ten years ago. Despite the well documented benefits of upgrading to HP Integrity servers, many estimate that hundreds of thousands of VAX and Alpha systems are still used in production environments. Clearly VAX and Alpha are not obsolete. Why do companies continue to use their heritage VAX and Alpha systems?

### Why do Companies Continue to Use VAX and Alpha?

There are legitimate business and technical reasons why companies continue to use and rely on their VAX and Alpha systems. First and foremost, they work. Thanks in no small part to OpenVMS, VAX and Alpha have earned a reputation as reliable servers for mission-critical, techno-critical, and/or business-critical applications. TechWise Research has published five different papers comparing OpenVMS systems to solutions from IBM and Sun. In all of these papers, customer data revealed that OpenVMS systems consistently offer better reliability and availability. The most recent paper was published in 2007 and entitled *Quantifying the Total Cost of Ownership for Entry-Level and Mid-Range Server Clusters*. Over the years, TechWise has interviewed a number of companies that continue to use VAX and Alpha servers. When asked why, many cited the old adage of "if it ain't broke, don't fix it." Most of these companies have purchased Integrity servers. Thanks to OpenVMS' support for mixed platforms, companies can continue to use their heritage VAX and Alpha systems alongside their new HP Integrity servers.

The following table summarizes the main reasons why companies continue to use VAX and Alpha systems.

Reasons Companies Continue to Use VAX and Alpha Systems	
<b>Business Reasons</b> <ul style="list-style-type: none"><li>• Lack of perceived need. VAX and Alpha continue to work!</li><li>• Economic uncertainty preclude "optional" IT investments</li><li>• Lack of funds for initial purchase</li><li>• Contractual and/or certification requirements</li></ul>	<b>Technical Reasons</b> <ul style="list-style-type: none"><li>• Risk the upgrade introduces technical problems: <i>Perturbation</i></li><li>• Legacy third-party applications are not supported on Integrity</li><li>• Custom code requires extensive re-writing and testing</li><li>• Lack of expertise to modify decades-old custom code</li></ul>

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## Highlights

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**There are a number of legitimate business and technical reasons why companies continue to use their heritage VAX and Alpha systems.**

**As reliable as they are, physical components in VAX and Alpha eventually do wear out.**

In addition to the lack of perceived need, there are other business and technical reasons why companies still use VAX and Alpha. From a business perspective, the uncertainty surrounding today's economy make it difficult to justify "optional" IT investments. Similarly, companies may not have the funds to purchase new Integrity servers. Many VAX and Alphas are deployed in very tightly regulated industries, such as government. In these situations, contracts and regulations may necessitate prohibitively long and expensive re-certification processes before any upgrade to Integrity. Often, this re-certification process takes decades.

From a technical perspective, the risk of disturbing the system during an upgrade (referred to as perturbation) is sometimes too great. Historically, VAX and Alpha have been used in very critical applications. Whether it is a stock exchange, nuclear reactor, or aircraft, downtime must be avoided at all costs. Some companies running older third-party applications may find that their applications were never ported to Integrity. Similarly, companies that run custom code on their VAX and Alpha may find it expensive to port to Integrity. If the code was written decades ago, companies may also lack the expertise to modify the code.

### Achilles Heel

Like the Energizer Bunny®, heritage VAX and Alpha systems just keep running and running. OpenVMS continues to be a robust operating environment for these systems. As of the writing of this paper, a new version of OpenVMS is in field testing, with a future version being planned. As reliable as these systems are, the VAX and the Alpha do have an Achilles Heel. Physical components can and do wear out.

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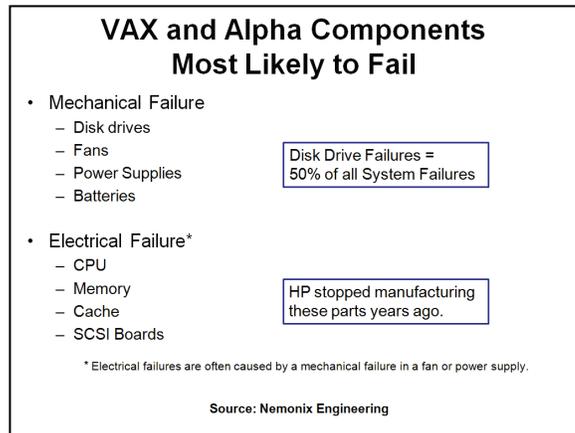
### Highlights

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**An old fan that slows down or fails can cause extensive damage. As heat builds up, power supplies begin to fail. This leads to voltage spikes that fry memory, CPU, cache and other electronic components.**

**The replacement parts for VAX and Alpha that are available from most sources are used, old, and may be unreliable.**

Nemonix Engineering, an HP partner based out of Northborough MA, has been supporting VAX and Alpha systems since 1975. Based on decades of experience, they have identified the physical components that are most likely to fail in these systems (see slide below). Disk drives, not surprisingly, top the list. In fact, Nemonix has found that disk drive failures account for 50% of all VAX and Alpha system failures. These drives are spinning 24x7, 365 days a year at 5,400 rpm. After 15 years this works out to 42 billion rotations. Given enough time, the ball bearings or other physical components will wear out and the drive will fail. In addition, although VAX and Alpha disk drives have the ability to dynamically adjust data writes to good sectors when a bad sector is encountered, eventually the drive runs out of alternate, good sectors and the drive fails. As good as OpenVMS is, it was not designed to notify the system owner when a drive self-corrects. So the only notice a customer gets is system failure and/or data loss.



Many VAX and Alpha customers already understand the risks of disk drive failure. The challenge is how to tell whether a disk drive is healthy or tending to failure. With this information, companies can focus their efforts and resources on replacing their most risk-prone drives. Until recently, there was no way for a company to assess the health of their VAX and Alpha disk drives. TechWise has learned that Nemonix recently developed such a tool for systems running OpenVMS. This program reads directly from drive diagnostics, and reports more detail than OpenVMS was designed to do. Companies interested in assessing the health of their drives should contact Nemonix for details.

Fans, power supplies, and batteries are among the other components that eventually wear out. A fan failure can prove particularly problematic. According to Nemonix, fan failures often lead to a cascading, catastrophic event with multiple component failures. VAX and Alpha systems do not have the early warning detection for fan failures that is built into newer Integrity servers - the technology did not exist back then. So there is no way to know that a fan is spinning slower than spec. Once a fan starts to fail, heat builds up in the system. When it gets hot enough, the power supply can be affected. Problems with power supplies can lead to failures of some of the key electronic components. This is because once a power supply starts to go bad, its output voltage starts to vary. These voltage spikes can "fry" the RAM, cache, and other system board components. Eventually, the server crashes.

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### Highlights

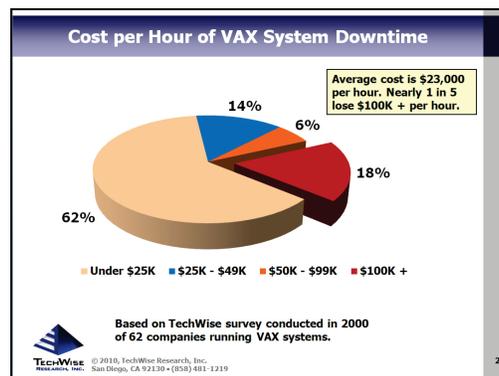
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**There are many potential costs that are associated with drive failure and unplanned downtime. Hourly downtime costs range from thousands of dollars to hundreds of thousands of dollars.**

When a component fails, replacements for the more common components (e.g., drives) are readily available for purchase on the open market. A simple internet search will turn up dozens of potential sources. The problem with these sources is that they are all used. HP stopped manufacturing VAX and Alpha parts years ago. Parts for sale today are all used and may be near the end of their useful life. In fact, some of these parts may have been recycled from another customer's system failure. Some sellers certify their used VAX and Alpha parts. This simply means the part was tested and it worked. The short (90 days or less) warranty period typically offered with "certified" components is an indication of their reliability. Nemonix has customers that have replaced a failed drive with a certified used drive, only to have the certified drive fail after a short period of time. Some of these customers have replaced their drive with another and another, each time experiencing drive failure with its attendant costs. Perhaps the best examples of the risks of buying old replacement parts are batteries. Over time batteries lose power even if they are never used. A 5-year old VAX battery will not last as long as a brand new battery. As a point of reference, original system batteries were warranted for 18-24 months.

### Cost of System Failure and Unplanned Downtime

There are many potential costs associated with system failures and unplanned downtime. The risk of data loss is one obvious cost. Unless the server is in a clustered environment, any new data created since the last back-up may be lost. Employees and customers may be affected by unplanned downtime. Employee productivity may drop if application performance stops (or slows down in the case of a cluster). IT staff will need to spend time to fix the server and bring it back online. Customers can lose money as a result of unplanned downtime, leading to lost sales, dissatisfaction, and a damaged reputation. Depending on the application, downtime could result in contractual penalties or even lawsuits. Finally, downtime can cause loss of limb or life in certain applications.



In 2000 TechWise conducted a survey of 62 companies using VAX systems. In that study the average cost per hour of downtime for standalone systems was \$23,000 (see chart to the left). Other studies conducted by TechWise about RISC-based servers such as Alpha found downtime costs ranging from \$1,000 per hour to over \$250,000 per hour.

What should Systems Managers do when their VAX and Alpha components fail? Is there a way to proactively prevent these types of problems? These questions will be answered in the next two sections.

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## Highlights

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**Nemonix sells newly manufactured Alpha and VAX parts that often exceed original system specifications. Nemonix backs these products up with a multi-year warranty.**

### New Solution for an Old Problem

Given enough time, every system is susceptible to component failure and unplanned downtime. Since HP stopped manufacturing parts for VAX and Alpha systems, companies must turn to third parties to find replacement parts. This is true even for systems still covered under an extended warranty from HP. If a VAX 4000 that is under warranty suffers a disk failure, HP would often replace it with a used drive from a third party. Typically these components come with very short warranty periods. They are certified to work at the time of sale, and nothing more. With some older VAX and Alpha models, the used parts may be more than 10 years old and close to failure themselves.

Nemonix offers a new solution for companies using VAX and Alpha systems. Nemonix sells brand new replacement / refresh parts. These replacement components are guaranteed to be system compatible. Compared to the typical 30-90 day warranty offered with certified used products, the multi-year warranties Nemonix offers with its new products are the clearest indicators of the superior reliability of Nemonix parts. As a further endorsement, HP has started using Nemonix products to repair VAX or Alphas that are covered under extended break-fix warranties.

Nemonix parts have an added extra benefit over used parts. Per Nemonix, their parts offer better performance than original specifications. Nemonix disk drives, for example, include faster disk access, larger capacity, lower power use and cooling requirements, and better reliability. Nemonix also offers Flash drives (SSD)

for VAX and Alpha systems. Compared to mechanical disk drives, Flash drives offer much faster I/O, no moving parts for cooler operation, lower power consumption, far longer expected life, and the ability to perform under extreme operating conditions. Some of these key benefits are summarized in the above chart. It is beyond the scope of this paper to cover all of the technical details of Nemonix products. Readers are encouraged to visit the Nemonix website at <http://nemonixengineering.com> for complete product specifications and data sheets.

#### Nemonix Drives vs. OEM Drives

- **Nemonix NXRZ Replacement Disk Drive**
  - **Faster disk access:** 33% faster due to 7200 rpm vs. 5400 rpm
  - **Lower power and cooling:** less than 5V vs. 5V & 12V
  - **Improved reliability:** modern materials, sealed drive & fan bearings
  - **Warranty:** 3 years vs. typically 90-days for used
- **NXEZ (Flash) Replacement EZ Disk Drives**
  - **Fastest performance:** 10x faster than Nemonix NXRZ
  - **Lower power and cooling:** less due to lack of moving parts
  - **Improved reliability:** far greater due to lack of moving parts
  - **Environment:** shock, pressure, and temperature resistant
  - **Warranty:** Also 3 years vs. typically 90-days for used

Source: Nemonix Engineering

### Refresh VAX and Alpha for 2010 and Beyond

Given the high cost of downtime, the more proactive a company can be to prevent downtime, the better. Nemonix's System Refresh program enables companies to proactively prevent downtime with VAX and Alpha systems.

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## Highlights

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**Nemonix can refresh many VAX and Alpha systems for between \$2,000 and \$3,500. "Refreshed" systems are backed by a one year warranty that can be extended for as long as 10 years.**

**Disk and tape drives are not included in a System Refresh. A newly manufactured Nemonix disk drive will cost around \$1,000 and is backed by a 3-year warranty.**

The logic behind System Refresh is quite simple. The best defense against downtime is a good offense against vulnerabilities. Rather than waiting for component(s) to fail from old age, Nemonix will help companies replace them with newly manufactured parts. Every System Refresh varies depending on the system's configuration, age, and condition. A typical installation may involve replacing the fans, capacitors, batteries, and power supplies. Other components such as CPU, system memory, system cache, SCSI and Ethernet are evaluated and replaced if necessary. Nemonix backs each System Refresh with a 12-month warranty that can be extended for up to 10 years. This warranty covers all system components, whether or not they were replaced by Nemonix. Disk and tape drives are treated as consumables and are not included in the System Refresh program. According to Nemonix, a System Refresh can be completed in from one to four hours, depending on project complexity. Enterprise-class systems may require more time. Companies may have the choice of doing the System Refresh themselves via a kit or hiring Nemonix to do the work.

The cost for a System Refresh also varies based on the configuration of the VAX or Alpha, its age, and its condition. Companies should contact Nemonix directly for an exact quote. The following table shows sample pricing from Nemonix for four typical systems:

Sample Pricing for System Refresh and Extended Warranty*	
VAX	Alpha
<ul style="list-style-type: none"><li>• <b>Entry-level Micro VAX:</b> \$2,199 with 1 year warranty and \$1,500 for each additional year.</li><li>• <b>Enterprise-class VAX 10000:</b> \$2,499 with 1 year warranty and \$1,800 for each additional year.</li></ul>	<ul style="list-style-type: none"><li>• <b>Entry-level Alpha DS20:</b> from \$3,199 with 1 year warranty and \$1,800 for each additional year.</li><li>• <b>Enterprise-class Alpha GS47:</b> from \$3,499 with 1 year warranty. Each additional year is quoted on a case-by-case basis.</li></ul>

In terms of disk drives, Nemonix sells a variety of different drives. A typical Nemonix drive costs around \$1,000. A certified used drive, on the other hand, usually costs from \$250 to \$1,200. System managers who need a replacement drive will be wise to trade-off the additional \$750 cost of the Nemonix drive against the benefits of having a newly manufactured drive with a three-year warranty. When the potential cost of downtime is added in, the extra \$750 will be a good investment for most companies.

\* Prices are for illustration and are subject to change at any time. Consumable (disks and tapes) are not included.



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### Conclusion

HP stopped selling the VAX and Alpha in 2000 and 2007, respectively. By many estimates, well over 200,000 VAX and Alpha systems remain in use today in companies throughout the world. For a variety of business and technical reasons, these companies chose to rely on these heritage systems as opposed to upgrading to HP Integrity servers. Although HP continues to offer extended break-fix warranties for VAX and Alpha, it no longer manufactures replacement parts. As reliable as these systems are, they are not immune to the affects of time. Physical components eventually wear out. By virtue of their last sale date, all VAX and many Alphas that remain in production today are now past their MTBF. Whether it is a disk drive, fan, power supply, or battery, some component is likely to fail, resulting in unplanned downtime.

When a VAX or Alpha component fails, most companies turn to third parties to purchase replacement parts. Unfortunately, these parts are used, old, and prone to failure. This is why they typically come with 30 to 90-day warranties. Nemonix Engineering manufactures brand new replacement components for VAX and Alpha that are backed by a multi-year warranty, meet or exceed original factory specifications, and deliver other performance benefits as well.

Nemonix's System Refresh program enables companies to proactively prevent problems with their VAX and Alpha systems. Under this program, Nemonix sends customers a complete kit of new components to replace parts prone to failure. Most VAX and Alpha systems, excluding enterprise-class Alphas, can be refreshed for between \$2,000 and \$3,500. For most companies, this cost is far less than the cost incurred during unplanned downtime. Nemonix offers a one year warranty with each System Refresh that can be extended up to 10 years. Custom contracts that extend multiple decades are also available. Nemonix's System Refresh may be a "no brainer" for companies that plan to continue using VAX and Alpha systems in 2011 and beyond.

TechWise Research is an independent primary market research firm that since 1998 has conducted hundreds of market research studies in the computer industry. To learn more about TechWise, visit <http://techwise-research.com>.

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