



# White Paper

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## **IBM System x-series M5: Infrastructure for the Cloud**

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## Creating an Enhanced Cloud Infrastructure

When was the last time the IT industry had a technology more evaluated, debated, and celebrated than cloud? Its impact is pervasive, game changing, and industry making. It forces everybody to think differently about what they have been doing, and what they will be doing. We've gone from virtualized data centers to private, hybrid, and public clouds, which are all rapidly moving up the list of must-have technologies to become an architectural standard for IT organizations around the world.

The cloud as a concept is like a car without an engine. Cloud infrastructure, that all-important engine, makes the difference between high-performance computing and "stalled-out IOPs" (infrastructure optimization projects). To take the analogy further, you don't want just any old engine for cloud, but a modern, high-tech engine. So you want a cloud infrastructure that will deliver not only high performance, but also security, efficiency, reliability, availability, and scalability—features that are important in order to stand the test of a true cloud environment. Cloud infrastructure—and virtualization, for that matter—have to provide both this power and a rich feature set to enable businesses to meet their goals and effectively compete.

The right infrastructure has to perform at cloud scale. The System x M5 line of servers is blazing a path to provide just such a powerful cloud infrastructure for both current practitioners and future converts. Its technologies are enabling customers to enhance their cloud environments and meet today's demands for business agility, and provide cost-effective and more efficient data center management.

### Cloud Computing Drivers and Benefits

ESG research shows that, in addition to demonstrating positive linear growth over a six-year period, cloud solutions have become vehicles for organizations to save money. For example, the percentage of organizations using cloud computing services as a way to control IT costs has more than doubled (31% in 2014, up from 13% in 2009).<sup>1</sup>

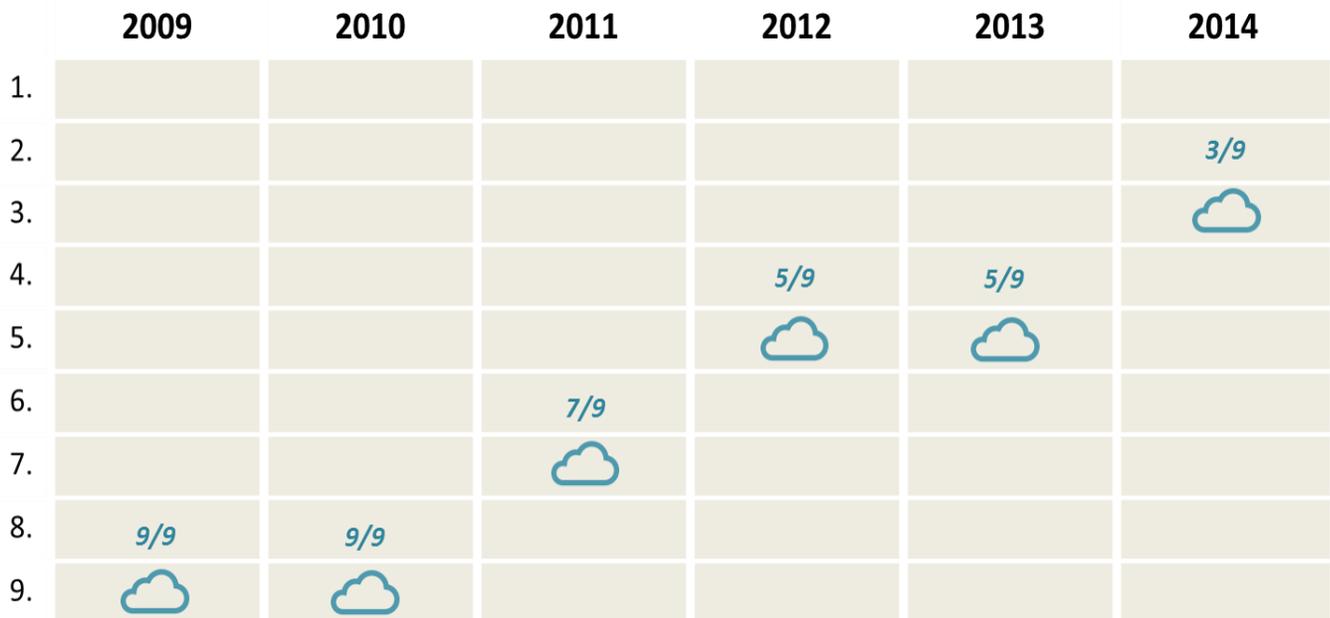
Perhaps more telling is the ascent of cloud computing as a cost-containment strategy relative to other options over the past six years. ESG has surveyed respondents on the same list of nine cost-containment/reduction methods since 2009, and since that time, the use of cloud computing services has moved from the least commonly selected technique for cost containment to the third most selected in 2014 (see Figure 1).<sup>2</sup>

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<sup>1</sup> Source: ESG Research Report, [2014 IT Spending Intentions Survey](#), February 2014.

<sup>2</sup> Ibid. Cost containment/reduction methods provided to respondents for selection include: Purchase new technologies with improved ROI, renegotiate contracts, increase the use of cloud computing services as an alternative to in-house applications and/or infrastructure, freeze hiring, postpone projects, increase IT outsourcing, reduce the number of vendors we work with, reduce headcount, cancel projects, and none of the above.

Figure 1. The Increasing Use of Cloud Computing to Reduce/Contain Costs



Source: Enterprise Strategy Group, 2014.

The increase in the use of cloud services in this capacity suggests that not only are net-new organizations leveraging cloud computing every year, but established cloud users also are deriving benefits from this approach and continuing to pursue alternative application and infrastructure deployment models solely for this economic purpose. ESG research has revealed that among current cloud computing users, 82% of those citing cloud as a cost-containment/reduction measure reported realizing *at least one* type of cost benefit from their usage.<sup>3</sup>

Cloud helps IT organizations simplify their data center environments and maximize the potential of their people and resources. For example, elasticity on demand—the ability to quickly scale up or down—is a major cloud benefit that also produces the additional result of freeing IT personnel to perform other value-added tasks. In 2014, 62% of IT budgets—on average—were expected to be devoted to ongoing operations and maintenance instead of new strategic initiatives.<sup>4</sup> In the age of “do more with less,” any ability to clear the way for IT to engage in other (possibly more strategic) endeavors is a big advantage for organizations: It can accelerate companies’ time-to-market and allow them to gain a competitive advantage.

Other important market drivers affect the decision of whether or not to adopt cloud IT. For an infrastructure to perform at cloud scale, it has to be up and running always. Servers must support more workloads and more applications in a reliable manner, with multiple applications or multiple workloads sharing one infrastructure. This means that in a multi-tenant environment typical of service providers, for example, being able to share the infrastructure among many users in a secure manner is important, and downtime is never an option.

### Cloud Computing Market Trends

In response to excessive spending, sluggish time to market, and a lack of business agility that plagues legacy IT infrastructures, clouds are gaining in popularity. This trend is substantiated by ESG research into organizations’ usage of public cloud computing services.<sup>5</sup> Over two-thirds of respondents (70%) said their organizations currently leverage at least one public cloud computing model, and another 20% reported having plans for or an interest in using the services. ESG also surveyed IT managers to determine to what extent their organizations’ 2014 IT spending for a host of technologies would change relative to 2013, and cloud computing services led the way, with

<sup>3</sup> Ibid.

<sup>4</sup> Source: ESG Research Report, [2013 IT Spending Intentions Survey](#), January 2013.

<sup>5</sup> Source: ESG Research Report, [2014 Public Cloud Computing Trends](#), March 2014.

72% of respondents saying their 2014 cloud spending would increase.<sup>6</sup> This result is in line with the increased adoption and use of these services that ESG has tracked over the last several years.

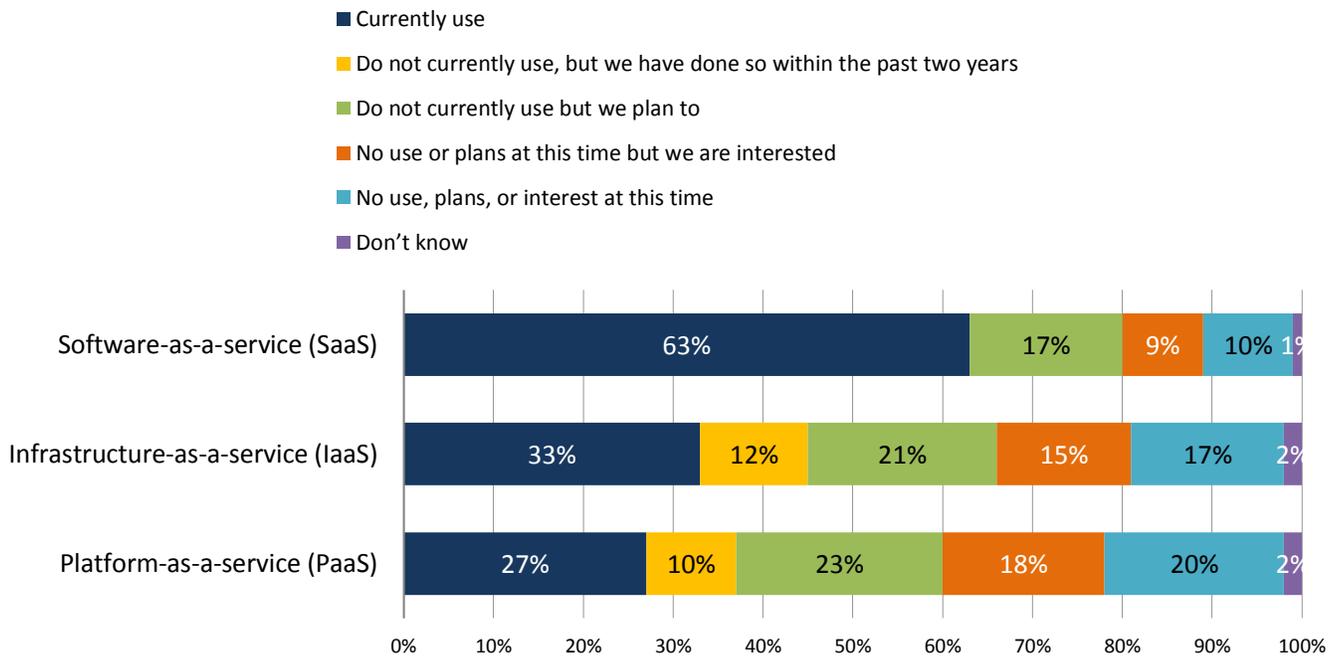
This data gives new meaning to the adage, “He who hesitates is lost.” The cloud is now a vitally important part of a strategy to improve business results, and competitive advantage will go to those who are most successful and timely in adopting cloud solutions. So for those stragglers who are “lost,” it is important to jump on the bandwagon and adopt cloud for its near term and long term advantages.

## Cloud Service Adoption

Software-as-a-service (SaaS) is the most established of the various cloud computing models available today, which should be expected in a time when IT staffs are turning to outsourced solutions so that they may more productively deploy their internal personnel. Therefore, it is not surprising that 63% of the organizations surveyed by ESG report they are already using SaaS in some capacity (see Figure 2).<sup>7</sup> Additionally, a combined 26% of respondents indicated that their organizations have plans for or an interest in SaaS-based applications.

Figure 2. Cloud Service Adoption Trends

Please indicate your organization’s usage of or plans for each of the following cloud computing services. (Percent of respondents, N=562)



Source: Enterprise Strategy Group, 2014.

Unlike SaaS, the usage of infrastructure-as-a-service (IaaS) that focuses on compute, storage, and network capacity has fluctuated in the four years that ESG has tracked it.

Platform-as-a-service (PaaS), which is targeted at the developers of applications via a cloud-consumption model, has also been around for several years. Twenty-seven percent of respondents to an ESG survey reported that they are currently using PaaS, while another 50% said they either have plans to deploy PaaS or are interested in it.

<sup>6</sup> Source: ESG Research Report, [2014 IT Spending Intentions Survey](#), February 2014.

<sup>7</sup> Source: ESG Research Report, [2014 Public Cloud Computing Trends](#), March 2014.

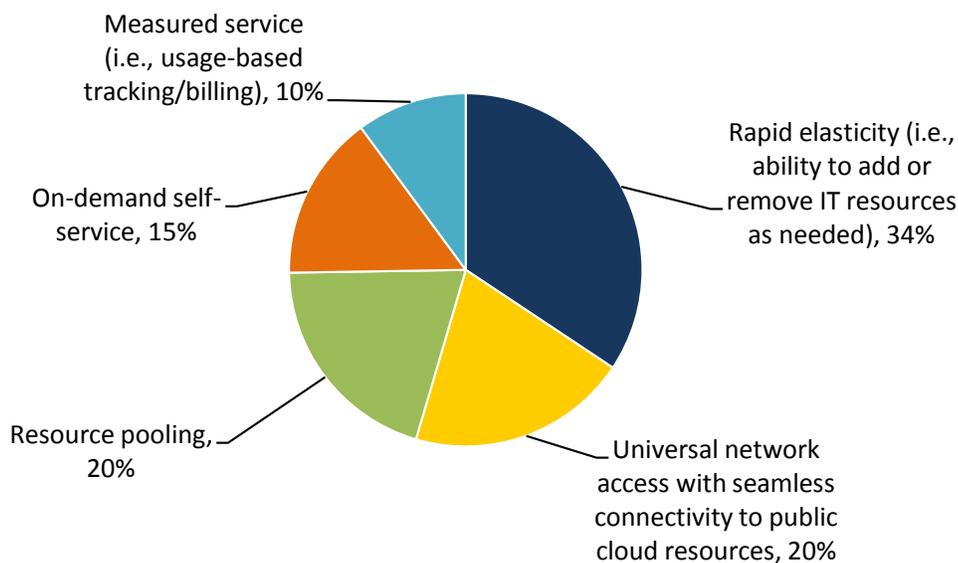
## Private Cloud: The On-premises Foundation for Hybrid Cloud

As organizations think through their cloud computing strategies they also consider the impact of their existing IT infrastructure. Organizations that have a private cloud infrastructure in place—as well as those with plans or interest in doing so—were asked by ESG to identify the most important attribute of such deployments within the context of the National Institute of Standards and Technology (NIST) list of five essential cloud characteristics.<sup>8</sup>

According to Figure 3, more than one-third (34%) of current or potential users identified the elasticity of IT resources—the ability to scale up or down—as the most important attribute of a private cloud infrastructure, demonstrating the requirement to quickly scale and gain access to resources in a timely, cost-effective manner.<sup>9</sup> Despite the fact that non-IT groups are becoming more involved in IT purchasing, only one-quarter of current and potential private cloud users rate self-service (15%) or usage-based billing/tracking (10%) as the most significant capabilities to be gained through such deployments. This result is consistent with the private cloud observations among businesses today, but ESG expects the prioritization to change over time as organizations strive to emulate the public cloud model within their own data centers, and self-service becomes more appealing because it reduces OpEx costs.

Figure 3. Most Important Attribute of a Private Cloud Infrastructure

Which of the five essential characteristics of cloud computing do you believe is the most important attribute of a private cloud infrastructure? (Percent of respondents, N=260)



Source: Enterprise Strategy Group, 2014.

## System x M5 Servers: Infrastructure Optimized for the Cloud

Putting together a complete cloud infrastructure is a significant undertaking. Although many factors will affect the overall solution, a number of architectural designs include the specific capabilities of the server hardware, which is central to the overall architecture.

<sup>8</sup> For more information on the NIST Cloud Computing Program, visit: [www.nist.gov/itl/cloud/index.cfm](http://www.nist.gov/itl/cloud/index.cfm).

<sup>9</sup> Source: ESG Research Report, [Trends in Private Cloud Infrastructure](#), April 2014.

System x servers are designed to address the growth in cloud and Managed Service Providers, as well as Web 2.0 infrastructure, technical computing, and enterprise-class workloads that require system resiliency, performance, and scalability. These attributes are increasingly on clients' minds as they contemplate moving production enterprise workloads to the cloud and they hear about outages and slowdowns on some very prominent public cloud sites.

To assist clients in designing and implementing cloud solutions, System x has built a variety of reference architectures around the leading cloud software stacks including VMware, Microsoft, OpenStack, and Citrix. These reference architectures provide pre-tested environments that can easily be scaled and document best practices for each. The solutions cover a broad set of environments including VDI, Infrastructure-as-a-service, DataBase-as-a-service, Managed Service Providers, Cloud Backup and Recovery, as well as a fully orchestrated cloud environment with IBM Cloud Orchestrator.

System x M5 servers extend the System x footprint into different types of configurations, depending on the specific needs in a cloud computing or service provider environment. These include not only economically favorable industry standard rack and tower configurations, but also dense systems for the large scale data centers and converged systems for those desiring a complete, integrated environment. Cloud users will be particularly interested in the latter two systems, both of which provide solid foundational infrastructures for cloud environments while reducing IT complexity.

To meet the aforementioned cloud growth trends and important cloud features sought by IT, the new System x3650 M5, x3550 M5, Flex x240 M5, and NeXtScale nx360 M5 servers have been designed to excel in cloud infrastructures and a range of other industry and workload environments by providing secure, efficient, and reliable processing that takes advantage of their expanded, high-performance capabilities.

## Key Features of the System x M5 Servers for Cloud

The 2U x3650 M5 and 1U x3550 M5 two-socket rack servers combine performance with reliability and security to support a wide range of enterprise workloads. In particular, because of their powerful processors, large core count, and large memory and storage capacity, they are optimized for cloud and virtualization environments. The servers provide a solid platform for both modern workloads and those that are born on the cloud.

**The following key features of the x3650 and x3550 M5 rack servers** ensure the reliability, efficiency, and security necessary for cloud environments to help keep these environments running smoothly, which is important to meet virtualization SLAs in cloud-scale environments. Enterprise IT organizations will benefit from servers that have up to 50% more cores and cache, up to twice the memory capacity, and up to twice the memory bandwidth over the previous generation for more virtual machines, enabling IT operations to address memory bottlenecks and target higher-tier applications. In addition to higher storage capacity and IOPS, the servers provide flexible storage configurations designed to support diverse workloads. Data center operators will appreciate the new Next Generation Light Path Diagnostic panel, which reduces labor costs and maximizes uptime with extensive status messages and error codes simply displayed. Like all of the System x servers, the x3650 M5 and x3550 M5 integrate industry-leading security with System x Trusted Platform Assurance, an exclusive set of security features and practices, which safeguards the system from low-level malware attacks. All servers undergo a secure development process and a rigorous, continuous validation cycle with controlled updates. All firmware is securely built, digitally signed, and verified each time prior to execution, so that only authorized firmware can execute. This establishes a secure foundation for workloads.

The x3650 M5 and x3550 M5 are architected and designed for cloud performance (running more virtual Machines and workloads), scalability, and flexibility. The systems support:

- Intel Xeon E5-2600 v3 processors, up to 36 cores per server.
- 2 socket, 1U and 2U rack servers.
- Up to 1.5TB of TruDDR4 Memory @ 2133 MHz.

- End-to-end 12Gbps RAID support—devices and infrastructure.
- Support for optional 40 Gbps network cards.
- Up to 26 dense 2.5” drives for analytics, and up to 14 3.5” drives for high-capacity storage for big data or cloud.
- Built-in industry-leading System x Trusted Platform Assurance, a set of security features and practices applicable to all System x servers that establishes a highly secure hardware and firmware foundation.
- Optional self-encrypting drives and IBM Security Key Lifecycle Management software to provide enterprise drive protection and centralized key management for data-at-rest.

### **System x3650 M5 and x3550 M5 Customer Benefits—Performance for Running More VMs and Workloads**

- Up to twice the memory capacity over the previous generation for more virtual machines.
- Higher IOPS with wide range of Flash solutions.
- Up to twice the memory bandwidth of the previous generation.
- Client choice, designed for optimal configurations of diverse workloads.
- Improved storage capacity.
- Next Generation Light Path Diagnostic Panel, which reduces labor costs & maximizes uptime with extensive status messages & error codes.
- System x Trusted Platform Assurance, leading-edge security features and practices, for establishing a secure foundation for cloud workloads.
- Proven Private and Public cloud solutions based on VMware, Microsoft, or Openstack Cloud Management solutions allows customers to easily implement into new or existing infrastructure.

The NeXtScale nx360 M5 addresses a list of pain points familiar to cloud architects, such as managing increasing workload demands and meeting the need for higher usable density without expanding physical space. This powerful server featuring Intel Xeon E5-2600 v3 processors helps resolve these challenges by doubling the amount of servers found in a standard 1U rack to handle a variety of workloads. When it comes to getting more out of the system, the nx360 M5 responds with increased performance that can benefit from parallel processing. For organizations facing budgets that strictly limit IT spending, NeXtScale slashes footprint and administrative costs via server consolidation, optimizes power and cooling, and includes onboard energy management tools.

For those who need to bring their storage close to compute, NeXtScale provides a wide variety of flexible storage options. And for those whose challenge is getting servers into the production environment ASAP, according to System x, the Intelligent Cluster achieves 75% faster time from arrival to production readiness. If the organization’s need is for an open platform that seamlessly fits into the data center without forcing staff to learn new tools or get locked in, NeXtScale is an open platform and a standard rack solution, meaning it is compatible with all standard x86 tools with no single point of contention across the system.

### **Key Features of the NeXtScale nx360 M5**

- ½-inch wide x86 rack server with greater performance and increased memory capacity.
- Intel Xeon E5-2600 v3 processors to deliver up to 432 cores per chassis (6U).
- 16 DDR4 DIMM slots, enabling twice the memory capacity of the previous generation.
- Choice of front hot-swap hard drives or front PCIe slot.

- Greater I/O and RAID flexibility with new ML2 slots for Infiniband/Ethernet and dedicated PCI slot for RAID.
- Supports existing native expansion nodes including Storage NeX and PCI NeX.
- No chassis changes required.

### Strategic Importance for IT Organizations Focused on Cloud Architectures

- Aligns with the highest growth areas of x86 market, including hosting/cloud and HPC.
- Provides the target market with new features, such as hot swaps, HDDs and additional DIMM slots.
- Gives NeXtScale users access to the newest technology within the existing infrastructure.
- Provides a smooth transition path for current iDataPlex customers.

## Flex System x240 M5

The Flex System x240 M5 is the newest member of the blade and integrated systems family. Combining balanced reliability, efficient performance, and flexibility, the M5 portfolio is an excellent fit for small and medium businesses and large enterprises. It provides outstanding uptime to keep business-critical applications and cloud deployments running securely. The Flex System x240 M5 is designed to help:

- Provide power savings using improved thermal and cooling design and more efficient components.
- Boost cloud performance with greater VM density and low latency flash storage.
- Reduce unplanned downtime by delivering industry-leading uptime.
- Mitigate attacks against boot firmware and management controllers through the most rigorous security testing and practices offered in market today.
- Protect data end to end in your business.

The 2-socket Flex System x240 M5 is the heart of new advances in hardware components, management software, and networking you need to help keep operating costs down without sacrificing efficiency, reliability, or security. For cloud workloads that require a balance of memory, processor, and I/O bandwidth, the variety of Flex System x240 M5 models give you the flexibility to optimize each resource to adapt to meet your workload's price/performance ratio target.

The Flex System x240 M5 supports up to two Intel E5-2600 v3 series processors, available with as many as 18 cores, each running at up to 2133 MHz designed to deliver improved performance without sacrificing energy efficiency. This family of processors features up to 45 MB L3 cache per socket, integrated PCIe 3.0, Intel Turbo Boost Technology 2.0, Hyper-Threading Technology, and two QuickPath interconnects. Also new is TruDDR4 Memory support which requires only 1.2 V of power each, compared to 1.35 V and 1.5 V for previous modules. In fact, each x240 M5 will be able to support up to 1.5 TB of memory in 24 DIMM slots running at up to 2133 MHz. TruDDR4 Memory portfolio includes RDIMMs with advanced error correction for reliability, performance, and maximum memory capacity. In addition, TruDDR4 Memory will support memory performance which exceeds industry standards.

## Optimized for Cloud and High-performance Computing (HPC)

Private and public cloud infrastructure workloads rely on System x servers because they offer a multitude of fine-tuned server characteristics, starting with processor performance and memory density for consolidating workloads and running more applications on a single system. This is accommodated by full Intel stack support with memory for performance and cost optimization. Other features include an optimized standard rack that fits into client data centers seamlessly, and right-sized I/O choice of networking options: 1Gb, 10Gb, or 40Gb InfiniBand, all of which

are ready for software-defined networking. Moreover, infinite scalability ranges from small to enormous grid deployments—all built on open standards—and high-energy efficiency with choice of high-speed fabric support.

For cloud environments, consider the x3650 M5 as a standalone Cinder (block storage) server for OpenStack environments. Both the x3650 M5 and x3550 M5 servers can also function as compute nodes and controller nodes. This is a new market that is applicable to both managed and cloud service providers, as well as large enterprises adopting OpenStack.

## The Bigger Truth

Multiple ESG research reports underscore the premise that cloud consumption is on the rise and providing enhanced value to a rapidly expanding body of use cases and workloads. For example, ESG found that 70% of respondent organizations are currently leveraging at least one of the three major cloud types: private, hybrid, and public. In order to maintain their momentum, however, cloud implementations must be built on ever-more-sophisticated infrastructures.

System x has a long and storied history of producing processors for frontline apps, and the new System x3650 M5, x3550 M5, and NeXtScale nx360 M5 servers are ideally suited not only for cloud infrastructures and big data/analytics applications, but other high performance computing use cases as well. The System x servers support cloud computing software from IBM and other Independent Software Vendors (ISVs).

It is important for IT organizations to understand the value of System x hardware over competing hardware in a market that includes very large, web-scale types of architectures. The fact is, the System x architecture is enterprise-proven and enterprise-class. This architecture optimizes the new System x M5 servers by significantly increasing their performance and ensuring the key characteristics of cloud computing are met—reliability, security, efficiency, cost effectiveness, and scalability. In short, the System x M5 servers create infrastructures that perform at cloud scale.



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