

Peer Research

Cloud Computing Research for IT Strategic Planning

Intel's IT Manager Survey on Networking and Storage for the Next-Generation Cloud

Why you should read this document:

This report describes key findings from a survey of 200 IT professionals that can help you prepare your data center for the cloud, including:

- IT managers overwhelmingly agree on the importance of investing in your highly virtualized data center.
- Security, cost, and scalability are the biggest concerns about upgrading networks and storage.
- Adoption of 10 gigabit Ethernet, Fibre Channel over Ethernet, and Internet small computer system interface to simplify infrastructure and reduce costs continues to grow.
- More than 40 percent of IT managers plan to move large analytics and large NoSQL database workloads to the cloud.
- IT managers are utilizing intelligent technologies that scale out storage, reduce costs, and increase storage efficiency.

Peer Research

Cloud Computing Research for IT Strategic Planning

Intel's IT Manager Survey on Networking and Storage
for the Next-Generation Cloud

JANUARY 2012



Contents

- 3 About This Report
- 4 Executive Summary
- 8 Key Drivers for the Next-Generation Data Center
- 9 Current IT Environments
- 13 Networking Considerations
- 19 Storage Considerations
- 27 Your Peers Speak Out
- 28 Conclusion
- 29 Appendix: Methodology and Audience

About This Report

As organizations continue their journey to the cloud, IT managers face new challenges in their highly virtualized data centers. Increases in virtual machine (VM) density per server and bottlenecks with existing storage and networking architectures have led to greater capacity demands and increased network complexity. Despite a foundation of virtualized servers, this structure doesn't scale easily—reducing the flexibility and efficiency benefits associated with cloud environments.

The aim of this report is to provide benchmark data you can use for your own data center planning.

Intel surveyed 200 IT managers¹ to find out how they were handling the challenges associated with preparing their data centers for private and hybrid cloud deployments. We focused our research on understanding their network and storage challenges—two key areas where the demands on the infrastructure can significantly limit cloud benefits. We asked them about their current IT environments, key business and technology drivers, networking and storage usage scenarios, and investment in advanced networking and storage technologies.

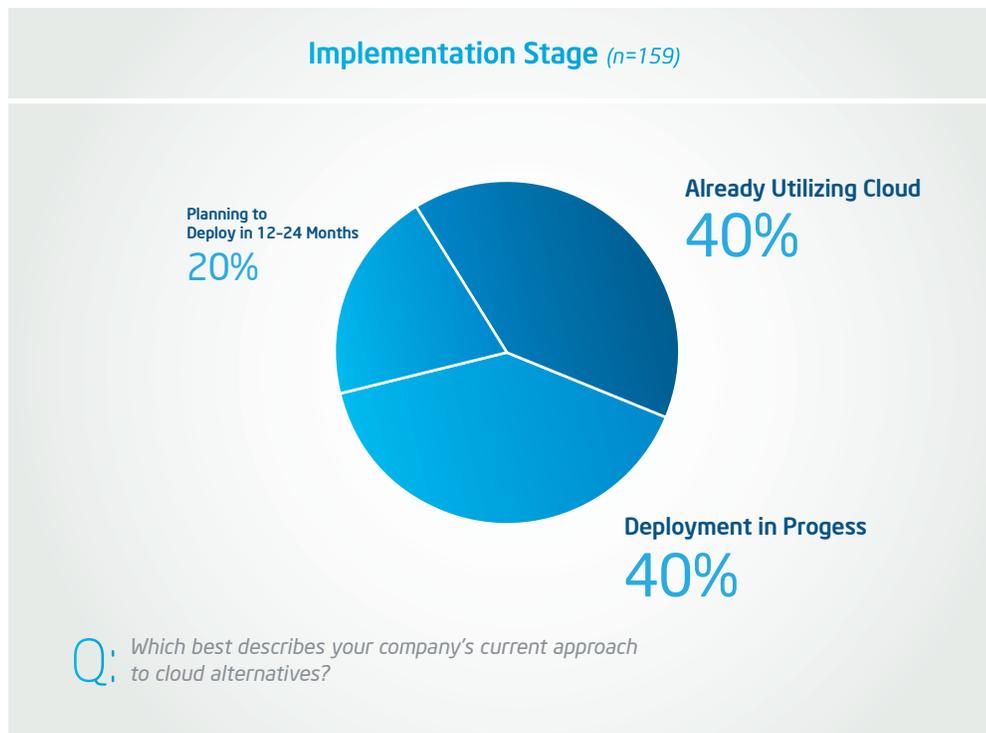
The results of our survey are detailed in this report. The goal is to provide you with data that can serve as a benchmark for how your peers are evolving their data centers to realize the full benefits from their private cloud environments. Consider using it for your own IT planning efforts.

¹ Respondents are IT managers in organizations of 100 to 1,000-plus employees across a variety of industries that have deployed, are in the process of implementing, or are planning to deploy a private or public cloud within the next two years. See "Appendix" for detailed information on the respondent profile.

Executive Summary

Invest in Your Data Center to Support Cloud Computing

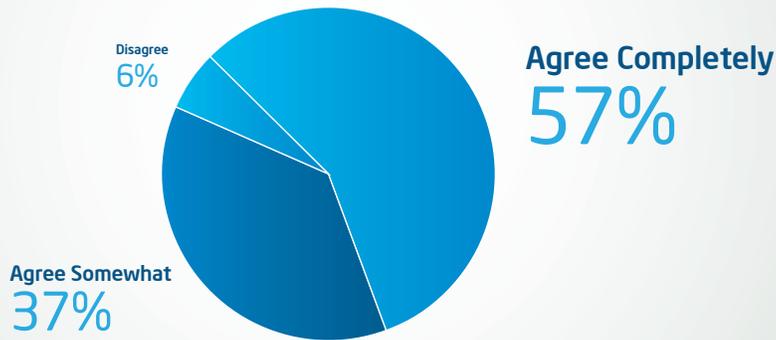
The IT managers surveyed for this report represent companies across the continuum of cloud computing from deployed services to planning for implementation.² Of those surveyed, 80 percent are in the process of deploying or have already deployed a private cloud and/or moved components of the IT environment to a public cloud. The remaining 20 percent plan to deploy within the next 12 to 24 months.



Almost all the IT professionals surveyed (94 percent) in our sample group agree that it's important to make investments in the data center and simplify their infrastructure before deploying a private cloud. Ninety-four percent indicated some level of agreement with this statement: "To implement and utilize a private cloud, it is important to make investments that reduce the amount of heterogeneity in your data center and simplify your infrastructure."

² Those who are not yet investigating cloud computing, are in the early stages of evaluation with no time frame for implementation, or have decided not to implement cloud computing were excluded from the survey sample.

Agreement with Importance of Investing in Data Center for Cloud Deployments (n=200)



Q: Please rate your level of agreement or disagreement with the following statement: To implement and utilize a private cloud, it is important to make investments that reduce the amount of heterogeneity in your data center and simplify your infrastructure.

Key Finding:

Nearly everyone agrees: Invest in your data center and simplify your infrastructure before deploying a private cloud.

Private Clouds Are Utilized More Often than Public Clouds

Today private clouds are the most common delivery model by a wide margin, with 62 percent of our sample group utilizing an internal private cloud and 54 percent utilizing an external private cloud. Forty-two percent are currently using a public cloud to support some applications. The picture changes, however, when we look at organizational planning for deployment in the next 12 to 24 months. During the next two years, plans for deployment are similar across all cloud environments; roughly a third plan to implement an internal private cloud, an external private cloud, or a public cloud environment.

How Do Networking and Storage Challenges Influence Next-Generation Data Center Investments?

Storage and archiving workloads moved into private internal clouds most often. Storage and archiving are the most common workloads in an internal (73 percent) or external (58 percent) private cloud, while real-time transactional services (45 percent) and collaboration and communications (45 percent) are the top workloads in a public cloud environment.

Cost a top challenge with existing networks. Three in four IT managers cite cost as a major issue when dealing with existing networks, including overall expenses (41 percent) and increasing storage costs (34 percent).

Data centers support a mix of network and storage network protocols and hardware. Nearly half of our sample group is deploying 10 gigabit Ethernet (10 GbE) connectivity to the server (47 percent), with another 42 percent planning to implement within the next year. Adoption of Ethernet-based storage is growing, with 83 percent of our sample already utilizing or planning to implement Internet small computer systems interface (iSCSI) and/

or Fibre Channel over Ethernet (FCoE) in the next 12 months. Of those surveyed, 63 percent connect their servers to the storage area network (SAN) using standard Ethernet adapters, while 58 percent use converged network adapters (CNAs).

Keeping up with data growth major storage challenge. Of our survey group, 64 percent cited keeping up with data growth as the biggest challenge in their current storage environment, followed by scaling capacity cost-effectively (50 percent) and managing storage in highly virtualized environments (49 percent).

Key Finding:

IT managers are moving workloads into private clouds more often than other cloud types.

Other Key Findings from the Survey Include the Following:

Virtualization is the norm. Seven in ten IT managers are utilizing virtualization capabilities in their server environments, such as virtualization of storage infrastructure (82 percent), virtualization to consolidate servers (76 percent), and VM mobility across multiple servers (70 percent).

Security-related issues are the biggest concerns in preparing data centers for the cloud. IT managers are most worried about deploying security technology that protects data and the server infrastructure and allows a trusted computing environment (60 percent) as well as protecting data in a hybrid cloud model (54 percent).³

Cost and security impede moving workloads to the cloud. Our sample group cited security and privacy concerns (38 percent) and cost and budget restraints (28 percent) as the biggest obstacles to moving workloads into the cloud.

Encryption is the most common storage technology. A variety of storage technologies are used in current storage environments, but encryption is currently used most often (78 percent), followed by storage virtualization (70 percent) and data compression (66 percent).

Interest is growing in virtualized storage and large object store usage models. A traditional model of application-based provisioning makes up a larger portion of storage infrastructures today, on average, than virtualized storage pools (52 percent versus 40 percent). However, as organizations get closer to deployment, it appears their storage infrastructures devote more space to virtualized storage pools than traditional models. In addition, large object store workloads such as large analytics and NoSQL databases are planned for cloud deployment by more than 40 percent of respondents.

Key Finding:

Virtualization is the norm in data centers deploying or planning to deploy private cloud environments.

³ Learn more about cloud security and Intel by visiting www.intel.com/cloudsecurity.

Key Drivers for the Next-Generation Data Center

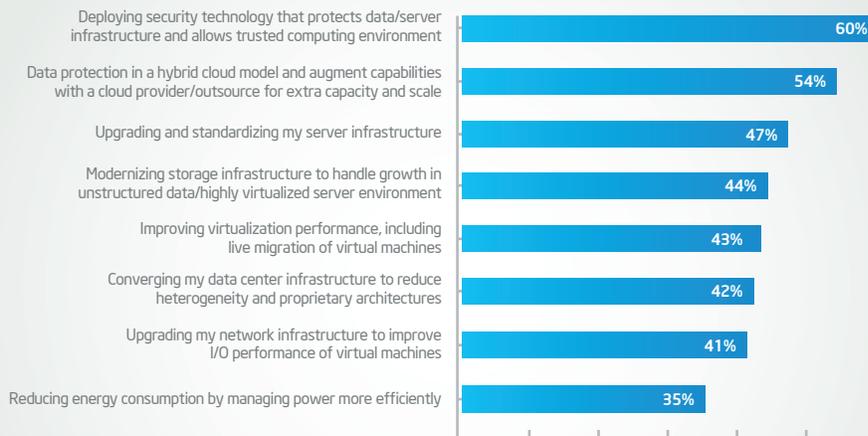
Multiple Concerns for Preparing Data Centers for Cloud Environments

We asked IT managers to rate their level of concern about several issues related to preparing the data center for private or hybrid cloud deployments. Security issues, including *deploying security technology* (60 percent) and *data protection in a hybrid cloud model* (54 percent), rank as the biggest concerns.

Almost half (47 percent) were very concerned about *upgrading and standardizing* the server environment, and just over 40 percent were very concerned about each of four other issues: *modernizing storage infrastructure*, *improving virtualization performance*, *converging data center infrastructure to reduce heterogeneity and proprietary architectures*, and *upgrading network infrastructure to improve I/O performance*.

Biggest Concerns Preparing Data Center for Cloud Deployment

(n=200) Responding with 6 or 7 concern ratings



Q: Please rate your level of concern with the following as it relates to preparing your data center to be able to support private and hybrid cloud deployments (1=not at all concerned, 7=extremely concerned).

Current IT Environments

We were interested in finding out how organizations were investing in cloud computing, including type of cloud environment, stage of planning or implementation, specific workloads that they are moving or planning to move to the cloud, and virtualization capabilities.

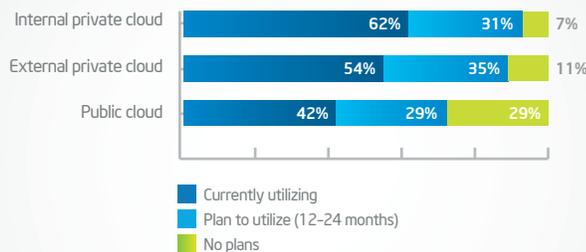
Internal and External Private Clouds Most Utilized

Today, private clouds (both internal and external) are being utilized more often than public clouds; internal private clouds are slightly more common than external private clouds (62 percent versus 54 percent). However, during the next two years the picture changes somewhat, and the percent of organizations planning for utilization is similar across all cloud environments. Roughly a third plan to deploy an external private cloud, an internal private cloud, or a public cloud environment. Because these environments are not mutually exclusive, organizations may be venturing into a mix of these deployment methods.

Key Finding:

Both internal and external private clouds are utilized more often than public clouds.

Cloud Environment (n=200)

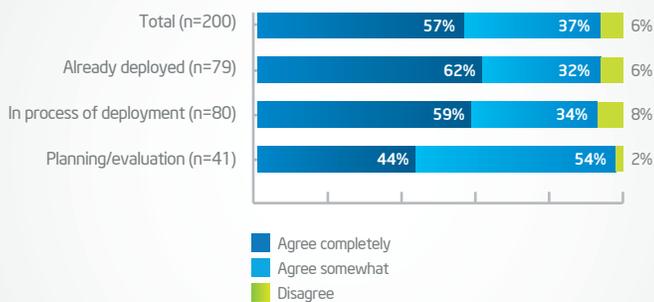


Q: Are you currently utilizing these cloud environments? Do you plan to utilize these cloud environments in the next 12 to 24 months?

Data Center Investment Crucial

With 94 percent agreement, nearly everyone in our survey recognizes the importance of simplifying infrastructure before deploying a private cloud. Agreement is strongest among those who have deployed or are currently in the process of deploying (60 percent versus 44 percent among those in planning stages).

Preparing for Private Cloud



Q: Please rate your level of agreement or disagreement with the following statement: *To implement and utilize a private cloud, it is important to make investments that reduce the amount of heterogeneity in your data center and simplify your infrastructure.*

What Makes It to the Cloud?

When we asked our sample group which workloads they moved or were moving to the cloud, we found that most organizations, regardless of cloud environment type, were moving *collaboration and communications* and *storage and archiving* workloads into the cloud. However, *storage and archiving* workloads are the most common in internal and external private cloud environments, followed by *disaster recovery and backup*. In public cloud environments, *real-time transactional services* and *collaboration and communications* workloads were the most common workloads, followed by *storage and archiving*.

Workload Type	Internal Private Cloud (n=184)	External Private Cloud (n=177)	Public Cloud (n=141)
Storage and archiving	73%	58%	41%
Disaster recovery and backup	63%	47%	26%
Collaboration and communications	62%	47%	45%
Desktop applications	57%	44%	37%
Development and testing	53%	35%	28%
Real-time transactional services	51%	40%	45%
Operating systems	51%	34%	30%
High-performance computing	51%	34%	29%
Analytics	49%	40%	34%
Batch processing applications	41%	34%	24%
Preproduction application staging	30%	23%	22%

Q: *What type of workloads have you moved or are you planning to move into an internal private cloud, an external private cloud, and a public cloud provider?*

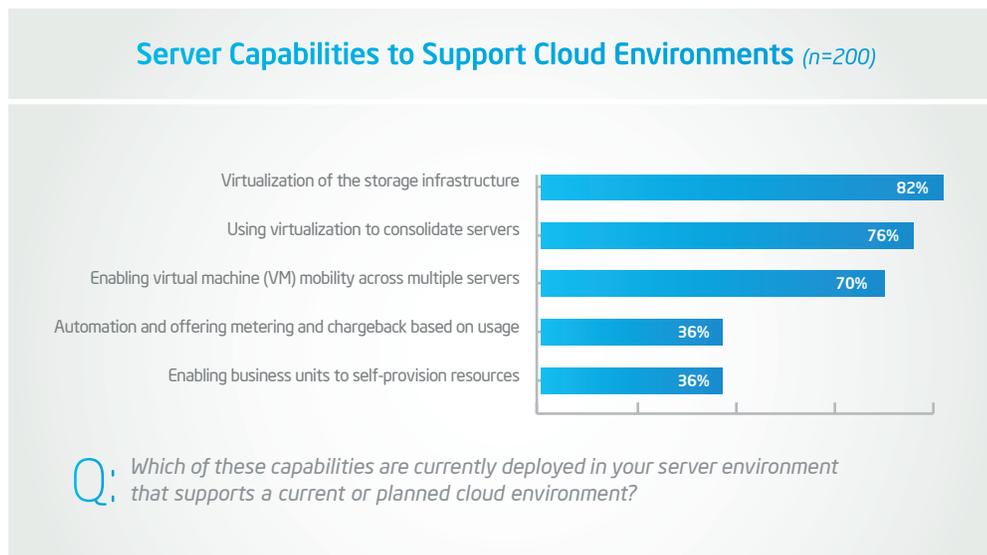
Our survey group reported that data security and cost are the greatest obstacles to moving workloads to the cloud. Security issues are the biggest hurdle for companies with less than 1,000 employees, but for enterprise-size companies, cost is just as big an obstacle as security. Of lesser concern, but still reported, are hurdles that include lack of time, compatibility, getting management support and approval, cloud storage constraints, and legacy systems and infrastructure.

Key Finding:

Storage and archiving are the most common workloads in private clouds.

Current Virtualization Capabilities Support Cloud Environments

Seven in ten organizations are utilizing virtualization capabilities in their server environments to support cloud initiatives. The three top virtualization capabilities include: *virtualization of storage infrastructure* (82 percent), *virtualization to consolidate servers* (76 percent), and *VM mobility across multiple servers* (70 percent).



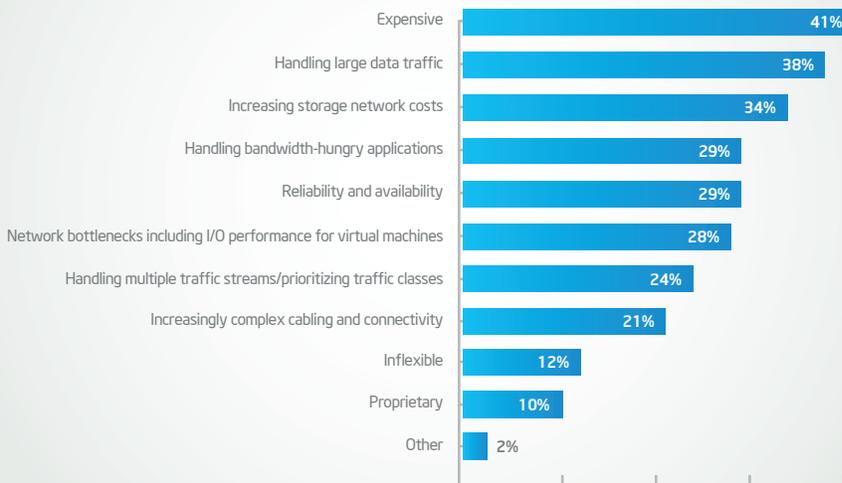
In smaller companies, virtualized storage infrastructure is not as common as in larger enterprises (68 percent in companies with less than 500 employees versus 85 percent in companies with 500 or more employees).

Networking Considerations

Top Network Challenges: Costs and Data Traffic

With network concerns high on the list of technology drivers for the next-generation data center, we dug a little deeper into the challenges facing IT managers for their existing networks. We found that costs are a significant challenge for three in four surveyed, with 41 percent reporting *overall expense* and 34 percent reporting *increasing storage network costs*. *Handling large data traffic* is cited by 38 percent as a major challenge.

Biggest Challenges with Existing Network (n=200)



Q: What are your greatest challenges with your existing network?

Key Finding:

Increasing costs and handling large data traffic are the most significant challenges for today's networks.

Increasing storage network costs are a significantly bigger challenge for companies with less than 250 virtual servers (41 percent versus 18 percent with 250 or more virtual servers).

A Mix of Technologies Supported by Existing Networks

The IT managers we surveyed utilize a mix of technologies for their networks, confirming the heterogeneity found in most of today's data centers. However, adoption of 10 GbE in our cloud-oriented sample is high, with 89 percent already utilizing or planning to utilize

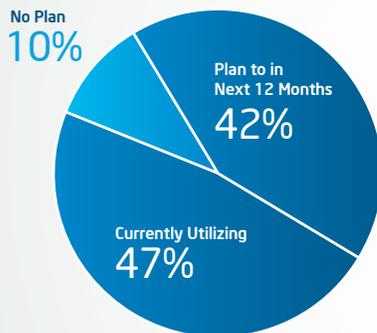
it in the next year. In addition, adoption of Ethernet-based storage is growing, with 83 percent of our sample using or planning to implement iSCSI and/or FCoE in the coming 12 months.

Growing Adoption of 10 GbE

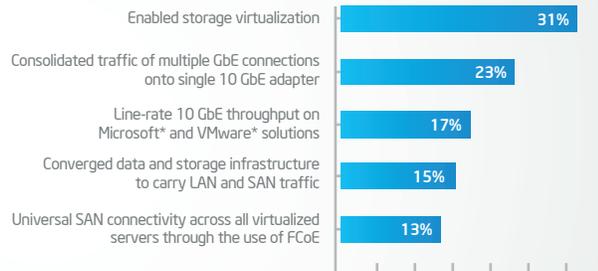
Adoption of 10 gigabit Ethernet is growing, with nearly half deploying 10 GbE for server-to-switch connections (47 percent) and another 42 percent planning to implement it within the next

year. The top reason for deploying 10 GbE for server-to-switch connections: *enabling storage virtualization*.

Utilization of 10 Gigabit Ethernet (10 GbE) (n=200)



Leading Reason for Deploying 10 GbE (n=179)

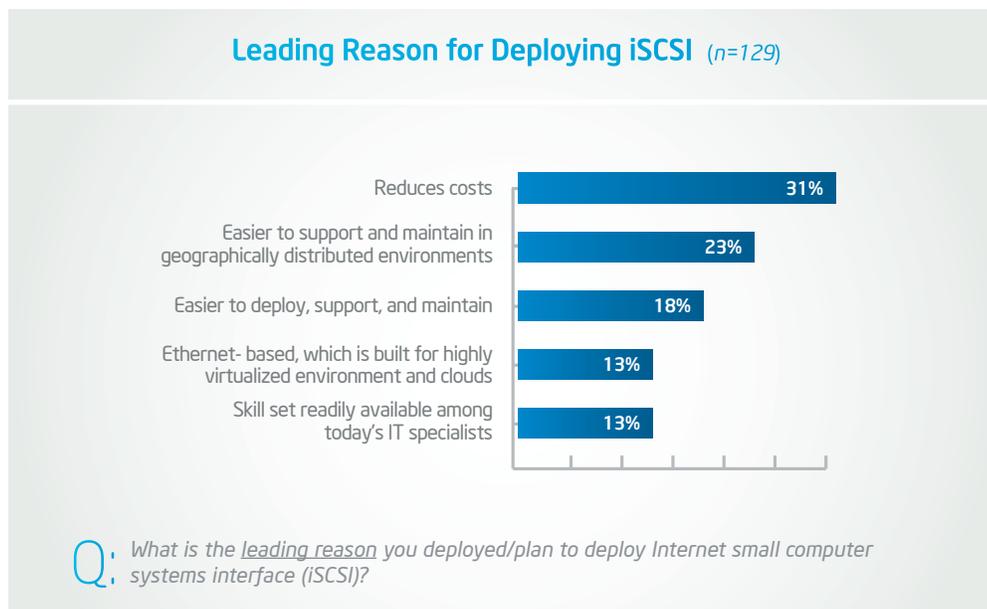


Q: What is the leading reason you deployed/plan to deploy 10 GbE at the server and the switch?

Reducing Costs Drives Utilization of iSCSI and FCoE

For those already utilizing or planning to implement iSCSI or FCoE in the next year, *reducing costs* was cited in both instances as the leading reason for their interest in using these standards for storage network traffic.

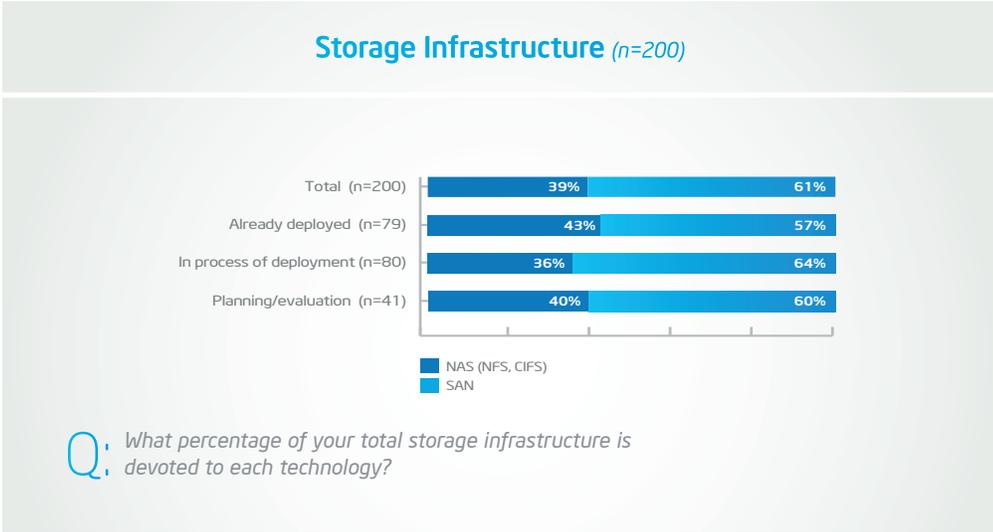
Of those IT managers currently utilizing or planning to utilize iSCSI in the next 12 months *reducing costs* (31 percent) is followed by *easier to support and maintain in geographically distributed environments* (23 percent) as the top reason for deployment.



Of those IT managers currently utilizing FCoE or planning to in the next year, 35 percent cited *reducing costs* as the leading reason to deploy FCoE, as well as reducing complexity in the data center. For those who haven't yet deployed a cloud environment, *cost* is an even greater factor for choosing FCoE (45 percent).

Multiple Block and File-Based Storage Protocols

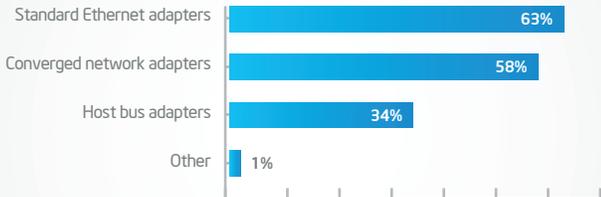
On average, the largest portion of a storage infrastructure is devoted to SAN (iSCSI, FCoE, and Fibre Channel [FC]) (61 percent), with the remaining infrastructure supporting network attached storage (NAS) [network files systems (NFS) and common Internet file system (CIFS) protocols] (39 percent). This result, combined with the high adoption of 10 GbE in our cloud-oriented sample group, again indicates a growing adoption of Ethernet-based storage protocols.



Multiple Ways to Connect to SAN

Most data centers use multiple methods to connect their servers to the SAN. *Standard Ethernet adapters* (63 percent) and *converged network adapters* (58 percent) are more commonly used than *host bus adapters* (34 percent), a result most likely due to the strong growth of iSCSI.

Server Connection to SAN (n=200)

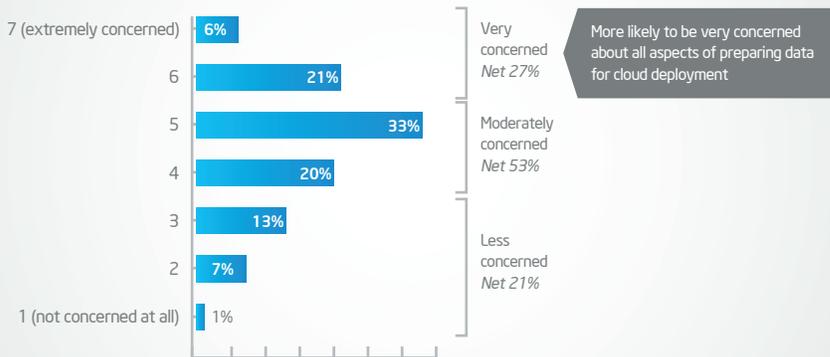


Q: Which do you use to connect servers to the storage area network (SAN)?

Concern for Networking Fabric Performance

The performance and scalability of networking fabric in a cloud environment is a moderate or major concern for 80 percent of our survey group, with 27 percent *very concerned* about this issue today. The highest levels of concern are found among IT professionals who are similarly concerned about the performance and scalability of their traditional storage environment in a private or hybrid cloud environment. This same group is also more likely to worry about all aspects of preparing their data center for cloud deployment.

Concern for Performance & Scalability of Networking Fabric (n=200)



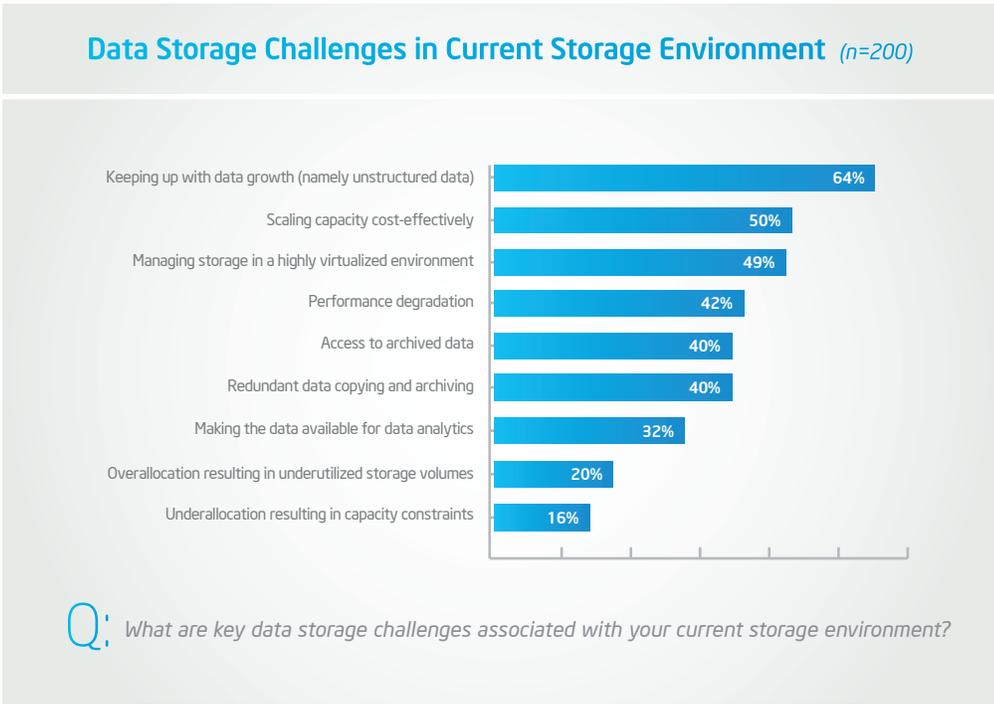
Q: Please rate your level of concern with respect to your current networking fabric performance and scalability in a cloud environment.

Key Finding:

IT managers worry about network fabric performance and scalability.

Storage Considerations

Not surprisingly, IT managers cited keeping up with data growth (64 percent) as the biggest challenge they face today with their current storage environment. *Scaling capacity cost-effectively* and *managing storage in a highly virtualized environment* were reported by half of those surveyed.



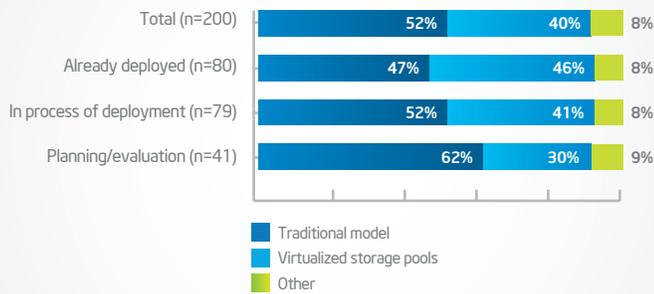
However, *data growth* is not as big a concern for those who have already deployed either an internal or external private cloud (57 percent of those who have deployed internal versus 75 percent not deployed; 56 percent of those who have deployed external versus 76 percent not deployed).

For companies with 500 or more employees, *performance degradation* is a significantly bigger concern (46 percent versus 25 percent) than for those in smaller companies.

Storage Infrastructure Still Mostly Traditional

Our sample group, on average, cited *traditional models* over *virtualized storage pools* (52 percent versus 40 percent) as making up a larger portion of storage infrastructures in today's data centers. However, the makeup of storage infrastructure appears to shift toward *virtualized storage pools* once an organization is in the process of deploying. Virtualized storage pools comprise more than two-fifths of storage infrastructure for those in the process of implementing or already deployed versus 30 percent for those in planning stages, indicating that storage is a major consideration for implementing cloud environments.

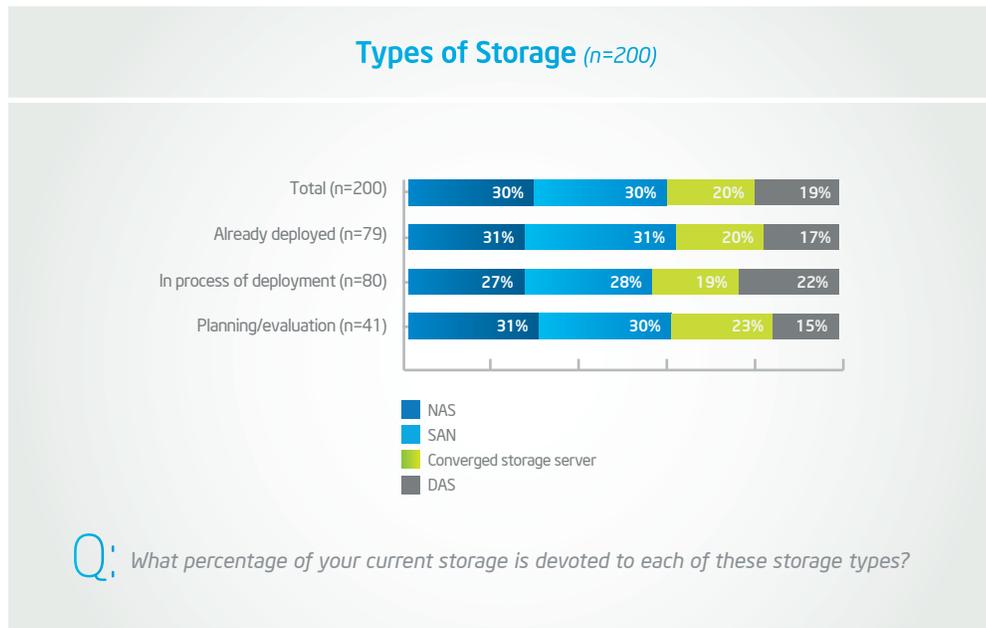
Storage Infrastructure (n=200)



Q: What percentage of your current storage infrastructure is devoted to the following?

Current Storage Types

On average, storage for the organizations in our survey is made up of roughly equivalent parts of *NAS* (30 percent), *SAN* (30 percent), *converged storage server* (20 percent), and *direct attached storage* (20 percent). Since converged storage servers can include data stored on SAN and NAS architectures, this result may indicate that data centers are evolving their storage infrastructures to support high-volume, multitenant environments required by cloud computing.



Of note, organizations with more than 500 virtualized servers have more NAS, on average, than those with fewer virtualized servers (38 percent versus 28 percent).

Common Cloud Storage Usage Models

Backup and archive (76 percent) and application data store⁴ (62 percent) workloads are currently being offered in a cloud environment more often than other types. However, at least half of our survey group offer cloud environments for online analytics processing databases, online transaction processing databases, and high-performance computing.

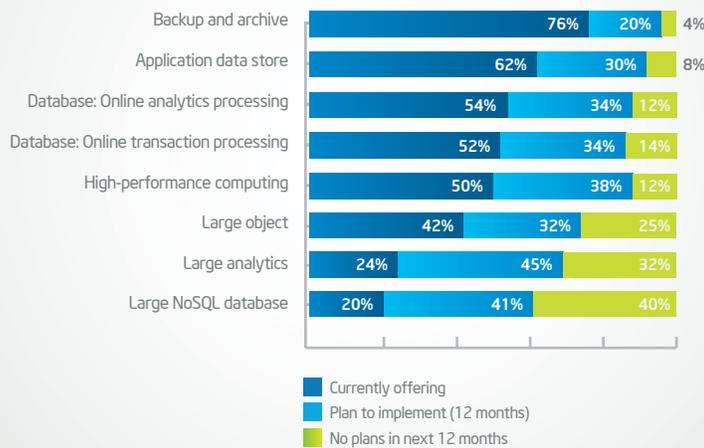
The majority of companies will be offering most types of these storage workloads in the cloud in the next 12 months. Application data store, high-performance computing, and large object⁵ workloads are being offered in the cloud more often by organizations that have virtualized at least half of their servers than by less virtualized organizations.

Large analytics⁶ and large NoSQL database⁷ storage lag behind other usage models that currently utilize the workloads in cloud environments during the next year. However, these two categories lead for workloads planned for implementation in the next 12 months (45 percent plan large analytics, and 41 percent plan large NoSQL databases).

Key Finding:

More than 40 percent of IT managers plan to implement large analytics and large NoSQL database storage in the cloud.

Utilization of Usage Models/Workloads (n=200)



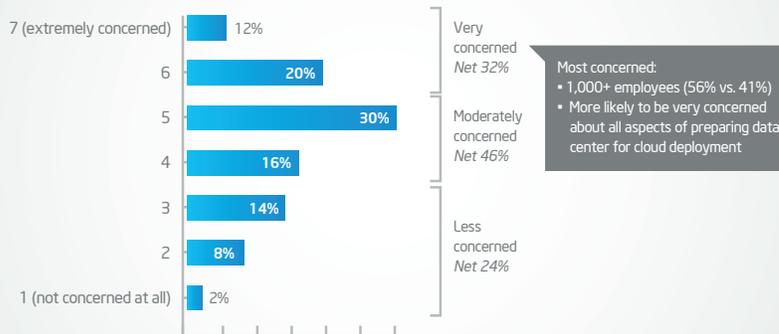
Q. Which of these usage models/workloads are you already offering or planning on implementing in a cloud within the next 12 months?

- 4 Includes applications such as voice, phone, instant messaging, e-mail, voice mail, conferencing, and document management.
- 5 Examples include videos and pictures.
- 6 Databases built on the Apache* Hadoop* open-source framework.
- 7 Data warehouse infrastructure such as Apache Cassandra* and Apache Hive*.

Concerns for Storage Performance and Scalability

IT managers surveyed (78 percent) are extremely or moderately concerned about the performance and scalability of their current storage environment. Today, almost a third of our survey group (32 percent) is very concerned about these issues, with the greatest concern found in companies of 1,000 or more employees (56 percent versus 41 percent of companies with less than 1,000 employees). Of note: The highest level of concern correlates with respondents who also reported that they were very concerned about the performance and scalability of their networking fabric in a cloud environment (64 percent very concerned versus 19 percent less concerned).

Concern for Performance & Scalability of Traditional Storage Environments (n=200)

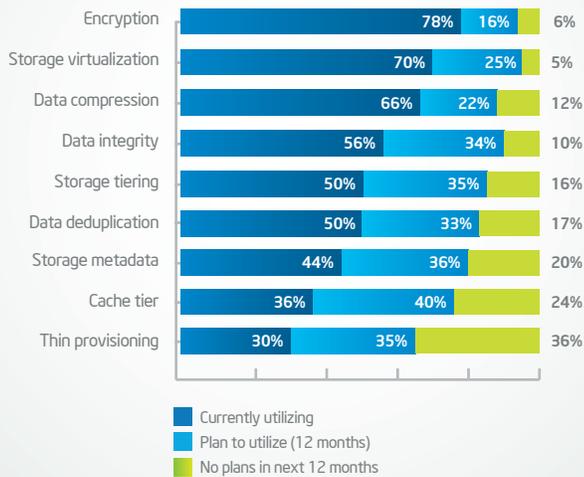


Q: Please rate your level of concern with respect to your traditional storage environment's performance and scalability in a highly virtualized data center or private/hybrid cloud environment?

Most Utilized Storage Technologies

Organizations are using a variety of storage technologies in their data centers. Today, *encryption* (78 percent) is most commonly used, followed by *storage virtualization* (70 percent) and *data compression* (66 percent). Organizations that have virtualized at least half of their servers use *data deduplication*, *data compression*, *data integrity*, *storage metadata*, and *storage virtualization* more often than do less virtualized organizations.

Utilization of Storage Technologies (n=200)



Q: Which storage technologies are you utilizing today or planning to utilize in the next 12 months?

Key Finding:

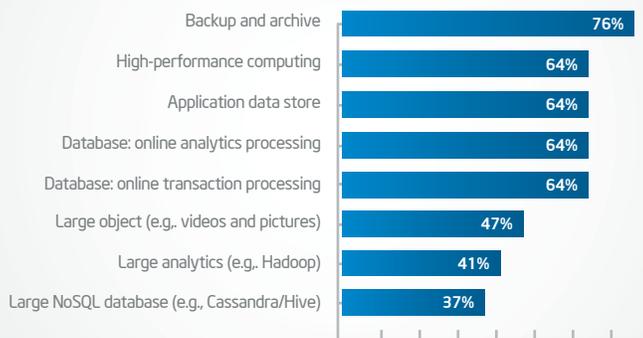
Highly virtualized data centers are using more advanced storage technologies, such as data deduplication.

Backup and Archive Most Crucial to Storage Modernization

Backup and archive usage models (76 percent) are the most important drivers for updating storage infrastructure for the cloud, followed by *high-performance computing*, *application data store* and *online analytics processing* and *transaction processing*—each reported by 64 percent of our sample group.

Application Usage Models/Workloads Importance (n=200)

Top-Box Score (6 or 7 rating)



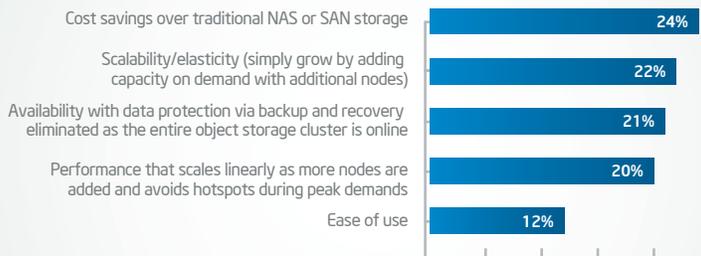
Q: Please rate the importance of these application usage models/workloads to the need to modernize your storage infrastructure for cloud computing or purchase external cloud storage services (1=not important at all, 7=extremely important).

Organizations that have virtualized at least half of their servers are more likely than their less virtualized counterparts to rate these usage models important—*database: online transaction processing*, *high-performance computing*, *large NoSQL database*, and *backup and archive*. Once again, there is a correspondence between those very concerned about network fabric performance and scalability and those most likely to rate these usage models as important.

Considerations for Evaluating Next-Generation Cloud Storage

Our sample group pointed to several important attributes to consider when evaluating cloud storage solutions for the next-generation data center. *Cost savings over traditional NAS or SAN storage* was cited most, by 24 percent, followed by *scalability/elasticity* (the ability to add capacity on demand with additional nodes) at 22 percent. *Availability* (21 percent) and *performance that scales linearly* (20 percent) round out the list of considerations, with *ease of use* (12 percent) considered not as critical.

Next-Generation Cloud Storage Solutions (n=200)



Q: What is the single most important attribute you are looking for in next-generation cloud storage solutions that support a highly virtualized environment or private cloud environment?

Your Peers Speak Out

We asked those we surveyed for the single most important piece of advice they could offer to other IT managers just beginning to prepare their data centers for the cloud and then grouped the answers under similar categories. Experienced IT managers most often encourage others to take a thorough, thoughtful, and well-researched approach. Specific advice suggests evaluating costs, as well as focusing on business needs, understanding infrastructure requirements, and prioritizing security and scalability. Those surveyed also recommended comparing vendors and using third-party recommendations. Below are samples of specific comments from IT managers in our survey group.

“Keep up the search for better technology.”

Sample Verbatim Responses

“Evaluate all aspects of this new technology. Read everything you can get your hands on. Talk to people that have implemented this technology.”

“Do your research and consult a cloud expert. Don’t spend too much time or effort trying to salvage pieces of your existing network infrastructure if they seem like they may be inadequate.”

“A lot of cost/energy/resources up front pay off in the back for sure.”

“Cost compare with multiple vendors. Make sure you have a solid ROI and always ask for references from vendors you send an RFP to.”

“Compare, ask questions, shop around.”

“Proper planning for scalability and security is priceless.”

“Do not make the mistakes I did. Access speed is of key importance.”

“Get ready for long work hours! It’s simply not as easy as companies would have you believe.”

“Just being organized and having a plan. Having your staff allocated and assigned what to do. I recommend doing this in stages because that worked well for us. Each time we reached a goal, we moved on to the next item on our list.”

“Performance and security. Take your time to do your research.”

“Make sure you know exactly what your needs are before you start spending money.”

Conclusion

Our benchmark report of 200 IT professionals in various stages of cloud deployment shows a marked preference for private clouds in today's IT organizations. Although all types of cloud delivery models commonly deploy collaboration and communications workloads, we found a difference in the types of other workloads moved to private versus public clouds. This result makes sense. In private clouds, IT managers can exercise greater control over network, storage, and security issues.

IT managers overwhelmingly agree that preparing for the cloud requires an investment to simplify the infrastructure in the data center. Most of the IT organizations in this study are highly virtualized, having taken steps to virtualize storage infrastructure, consolidate servers, and enable VM mobility across multiple servers. Nevertheless, our survey group reports that data security and cost remain significant challenges to moving workload into the cloud. Cost-effective solutions to better prepare your data center for cloud deployments exist today—for example, for networking and storage—and can help reduce this barrier. Both capital expenditure and operating expense costs can benefit.

Network performance is high on the list of concerns driving the evolution of the next-generation data center. However, IT managers are addressing their top concerns: costs and handling large data traffic. Adoption of 10 GbE solutions is growing, as is deployment of unified networking using FCoE and iSCSI to connect to storage. These three network technologies can help control network costs by standardizing heterogeneous infrastructure and connecting to storage less expensively. They can also significantly improve network speed and the capacity to transport, manage, and store data.

With 10 GbE solutions, storage and LAN traffic can share a single fabric that carries disparate traffic and connects servers to Fibre Channel SANs without requiring expensive SAN-specific hardware. Ten GbE also enables you to simplify the network by combining many gigabit Ethernet connections into a smaller number of 10 GbE connections. Fewer adapter ports, less cabling, and fewer switch ports deliver lower total cost of ownership and greater simplicity.

As the explosion of data continues, IT managers face storage challenges related to scalability, cost, efficiency, and data security. While today's data centers support more traditional storage over virtualized storage, that changes as organizations move from the planning stage to deployment. IT managers are dealing with inherited storage inefficiencies with technologies that increase volume and improve effectiveness, including thin provisioning, data deduplication, automated data tiering, cache tiering, and storage metadata. These are currently being applied most to backup and archiving usage models and application data-store usage models. However, a growing interest in implementing large analytics and large NoSQL databases in the cloud during the next 12 months means that data centers will have to rely heavily on intelligent solutions that can scale out storage using these advanced technologies.

Clearly, network and storage capabilities play a significant role in the successful implementation of cloud environments. As computing, networking, and storage continue to converge, IT managers are moving to support the underlying infrastructure of their virtualized data centers with advanced solutions that enable them to take advantage of the full benefits offered by cloud computing.

We provided the information in this report to help you learn from the experience of your peers as you prepare your data center to support cloud deployments. For a practical guide to help you plan upgrades to your network, storage, security, and power infrastructures, with recommendations from Intel, see [The Future of Cloud Computing Planning Guide: Preparing Your Virtualized Data Center for the Cloud](#) and visit intel.com to find more information about Intel and [next-generation data center design](#).

Appendix: Methodology and Audience

Responses to this survey were gathered via an online questionnaire; 200 surveys were received between September 15 and September 22, 2011. A sample size of 200 has a maximum sampling variability of ± 6.9 percent at the 95 percent confidence level.

Respondents were screened to ensure that they:

- Work in a company of 100-plus employees
- Are IT decision makers
- Are involved in decision making and strategic planning for clients in their organization
- Have implemented, are currently implementing, or plan to implement cloud environments in the next 12 to 24 months
- Represent what Intel terms a “tech enthusiast” company—that is, a company that considers IT to be a driver of its business success

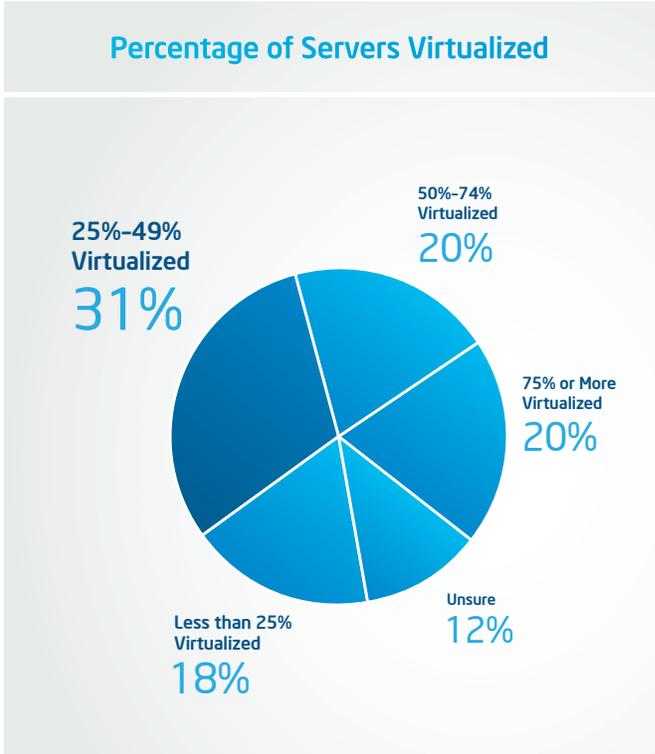
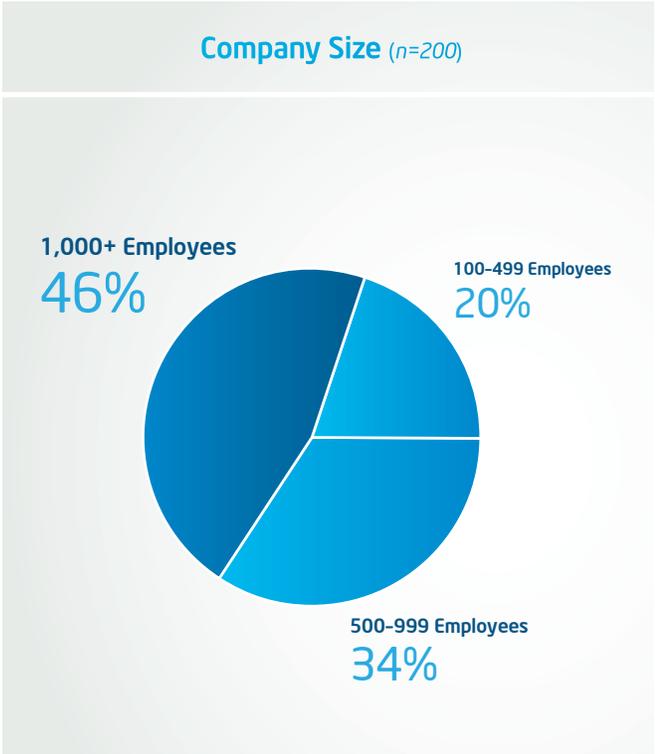
Being an Intel customer was not a consideration for inclusion in the survey. Quotas for company size and industry were enforced to ensure a representative sample.

Respondent Profile Information

Respondent Job Responsibilities

Responsibilities (multiple mention)	(n=200)
Participating in strategic technology planning	98%
Planning, implementation, maintenance of cloud technology	96%
Working with most senior IT management to set the strategic IT direction for the company	92%
Vendor selection for key components of cloud technology	90%
Leading a team of IT specialists to support business initiatives	90%
“Hands-on” implementation responsibilities	68%

Company Size and Percentage of Servers Virtualized



Worldwide Locations (n=200)

1 location	13%
2-4 locations	28%
5-9 locations	19%
10-14 locations	16%
15-19 locations	22%
Unsure	2%

Annual Revenue (n=200)

Less than \$500,000	1%
\$500,000-\$0.9M	< 1%
\$1M-\$3.9M	9%
\$4M-\$9.9M	14%
\$10M-\$49.9M	20%
\$50M-\$99.9M	20%
\$100M or more	32%
Unsure	4%

Industry (n=200)

Manufacturing	16%
Professional services	15%
Financial services	11%
Healthcare	11%
Computer-related business or service	10%
Retail	6%
Telecommunications	6%
Transportation & logistics	6%
Education	4%
Government	4%
Wholesale & distribution	2%
Construction	2%
Utilities	2%
Others	5%

More from the Intel IT Center

Peer Research: Cloud Computing Research for IT Strategic Planning is brought to you by the [Intel® IT Center](#), Intel's program for IT professionals. The Intel IT Center is designed to provide straightforward, fluff-free, unbiased information to help IT pros implement strategic projects on their agenda, including virtualization, data center design, cloud, and client and infrastructure security. Visit the Intel IT Center for:

- Planning guides, peer research, and vendor round tables to help you implement key projects
- Real-world case studies that show how your peers have tackled the same challenges you face
- Information on how Intel's own IT organization is implementing cloud, virtualization, security, and other strategic initiatives
- Information on events where you can hear from Intel product experts as well as from Intel's own IT professionals

Learn more at intel.com/ITCenter.

Share with Colleagues    

This paper is for informational purposes only. THIS DOCUMENT IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NONINFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE. Intel disclaims all liability, including liability for infringement of any property rights, relating to use of this information. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted herein.

Copyright © 2012 Intel Corporation. All rights reserved.

Intel, the Intel logo, Intel Sponsors of Tomorrow., and the Intel Sponsors of Tomorrow. logo are trademarks of Intel Corporation in the U.S. and/or other countries.

*Other names and brands may be claimed as the property of others.

Microsoft is a registered trademark of Microsoft Corporation in the United States and/or other countries.

