

Innovating in a Time of Change

Investment and Technical Trends
in the Data Center

Commissioned by:



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INTRODUCTION

Data centers are prime movers in the universal drive for greater productivity and efficiency. By leveraging centralized IT resources to accelerate processes, transactions and access to information, they can deliver continuous improvement and a competitive edge. In times of economic recession, their performance can tip the balance between survival and terminal decline.

As the data center's role in business and government has grown, so have users' expectation of fast, reliable, economical services. Recently, there have also been calls for them to reduce their environmental impact. Innovative technologies and approaches are emerging to help data centers respond to all these pressures.

Higher processing capacity in server cores, virtualization and consolidation, for example, enable data centers to deliver more and better services from the same space using less power. However, these developments have ramifications for the entire infrastructure and management of the data center.

This report on the 2009 Data Center Survey is designed to reveal how data centers are responding to the new challenges and opportunities. More than 730 IT professionals from 54 countries with responsibility for their organizations' data centers were questioned to discover their priorities, actions and plans to adopt new technologies and techniques.

SUMMARY OF FINDINGS

Despite the economic climate, 83% of the organizations researched have ongoing projects and 32% are building or planning new data center facilities. This indicates that CEOs, CIO's and CFOs recognize data centers as drivers of performance improvement that can help their organization deal with the economic downturn.

Funded projects cited by respondents include server consolidation (cited by 37%), implementing virtualization (39%), improving data security (37%), ensuring business continuity (41%) and enhancing backup and recovery (37%). The investment in security, continuity and recovery reflects the vital role data centers now have in many organizations.

Investment in consolidation and virtualization indicates a move to increased density in the data centers, delivering more services from each square meter of space. Among respondents worldwide, 85% required higher density to reduce costs and simplify operations.

Higher density is also seen as an energy reduction strategy. Virtualization (adopted by 62% of respondents) and server consolidation (adopted by 59% of respondents), were the most often implemented means of cutting energy consumption.

Consolidation and virtualization demand high performance servers able to run many applications at the same time. The organization can only benefit from this if the whole data center infrastructure has reliability and performance to match that of the latest servers.

Priorities in the selection of network topologies and equipment show that the importance of infrastructure performance is widely recognized. When questioned on their selection of network switching, connectivity and topology, 62% of respondents put performance among their top two priorities. Only 50% of respondents selected price in their top two.

The two biggest concerns expressed about existing IP LAN infrastructure were reliability, cited by 26% of respondents, and performance, cited by 20%.

Respondents cabling choices reflect an acknowledged need for high bandwidth and reliability. Globally 54% said they would choose 10Gb/s Category 6A cabling for new copper cabling installations.

Globally 30% were already using 10 Gigabit Ethernet over twisted pair connections in the network backbone. A further 46% plan to do so within three years. In horizontal network segments, 21% are using 10GbE over copper; another 48% plan to upgrade within three years.

The priority given to performance factors over price was confirmed by a question on factors influencing choice of data center infrastructure equipment. Quality of product was cited by 82% of respondents as a factor and performance by 69%.

Questions on network architecture revealed that most data centers (83%) deploy full cross connects for some copper connections between servers and switches. Almost half (46%) of the respondents use a cross connect on more than half of switch to server connections. The equivalent figures for fiber are 83% and 41%.

When questioned on the location of switches supporting IP network traffic, 46% of respondents said these were centralized and 33% zoned. For switches supporting SAN traffic, 42% were centralized and 27% zoned. The figures for top-of-rack switches were 29% for IP networks and 25 % for SAN traffic.

Globally, 82% of respondents said that less than half their servers were connected to a SAN.

On the subject of Fiber Channel over Ethernet (FCoE), 20% of respondents said they had evaluated or deployed this technology and another 43% said they intended to evaluate or install it within two years. Given a choice of how to implement FCoE technology, 79% said they preferred switch locations that were not top of rack.

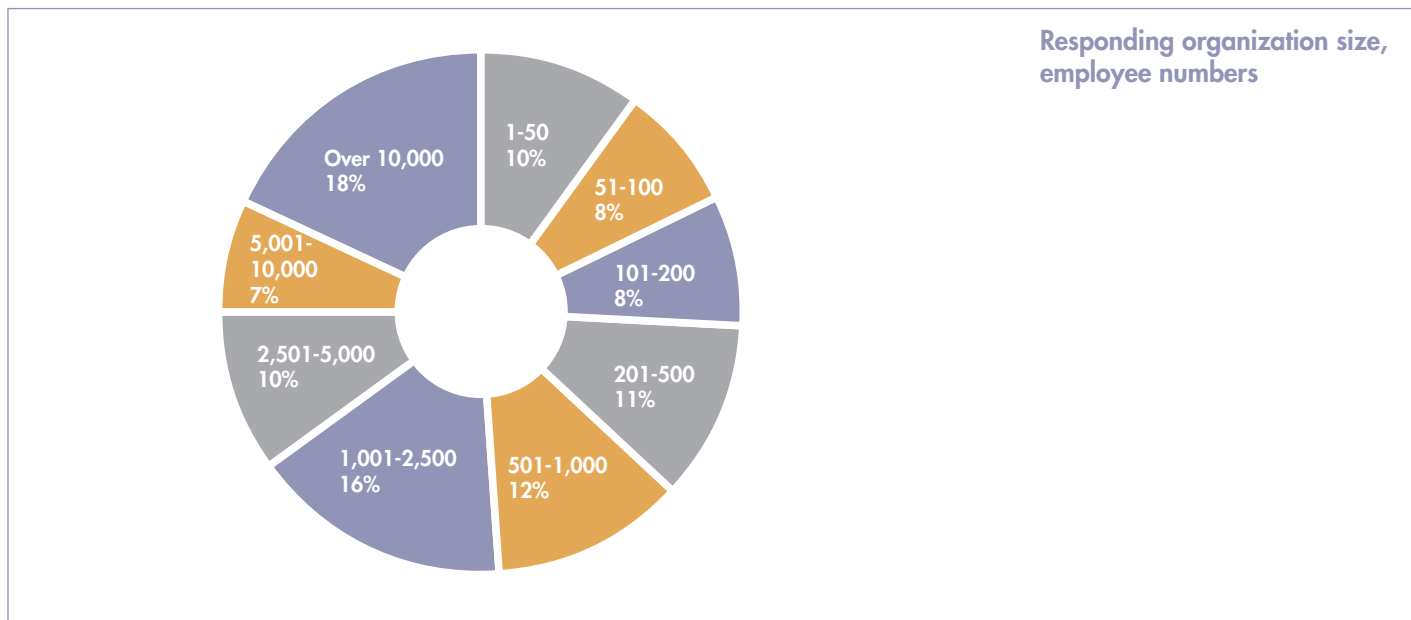
When questioned on environmental issues, 78% of respondents cited reduction of data center power and cooling costs as an area of most concern. Globally 48% said they aimed to reduce power consumption by 20% or more; 64% said they wanted to implement their energy consumption reduction strategy within 24 months.

A wide variety of approaches to energy saving had already been tried. In addition to server consolidation and virtualization, methods used by respondents included blade servers (46%), storage virtualization (40%), energy efficient storage (30%), and energy efficient UPS (27%).

METHODOLOGY

Data center professionals worldwide were invited to participate in the research using an on-line questionnaire, available in 9 languages. During the first half of 2009, more than 730 managers from 54 countries (see Appendix A for detail) responded from sectors ranging from education to finance and insurance, and from government to entertainment and leisure.

Respondents represented a full spectrum of data centers of all sizes, and represented companies with an even spread of sizes from less than 50 employees to over 10,000.



RESEARCH FINDINGS

Investment - Which Projects are Being Funded

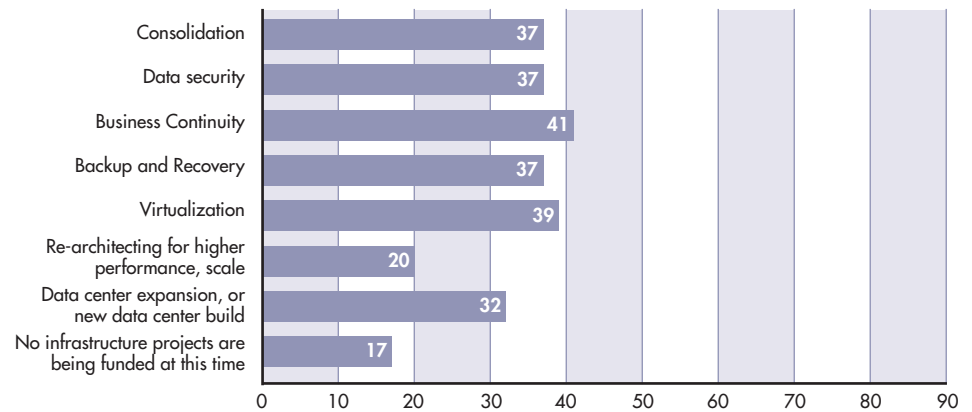
Nearly a third (32%) of all respondents said their organization was building or planning to build new data center facilities. In the Europe, Middle East and Africa Region (EMEA) 40% of respondents said they had new data center build projects while in the Central and Latin America Region (CALA) the figure was only 22%.

Globally, 83% said they had funded data center new-build and improvement projects. In EMEA, the figure is 91% and in CALA 66%.

The projects underway included server consolidation (cited by 37% of respondents), implementing virtualization (39%), improving data security (37%) ensuring business continuity (41%) and enhancing backup and recovery (37%).

Virtualization is especially popular in EMEA where 53% of respondents say they are investing in this. In CALA, the figure is 27%. In the North America Region (NAR), 38% of respondents have virtualization projects and in Asia Pacific (AP) the figure is 39%.

Question:
What types of infrastructure projects are being funded in today's business and economic environment?



Globally, nearly two thirds of respondents (65%) said they had to cost justify projects with a specific ROI, IRR or payback period to get funding approved.

Higher Density – Higher Performance Infrastructure

Investment in consolidation and virtualization indicates a move to increased density delivering more services without expanding the physical size of the data center. High density was cited by 26% of respondents worldwide as a top five issue in implementation and management of the data center. There was little variation between regions on this.

Among respondents worldwide, 85% indicated their reasons for higher density deployments. Reasons given for the move to higher density included space, cost and energy savings.

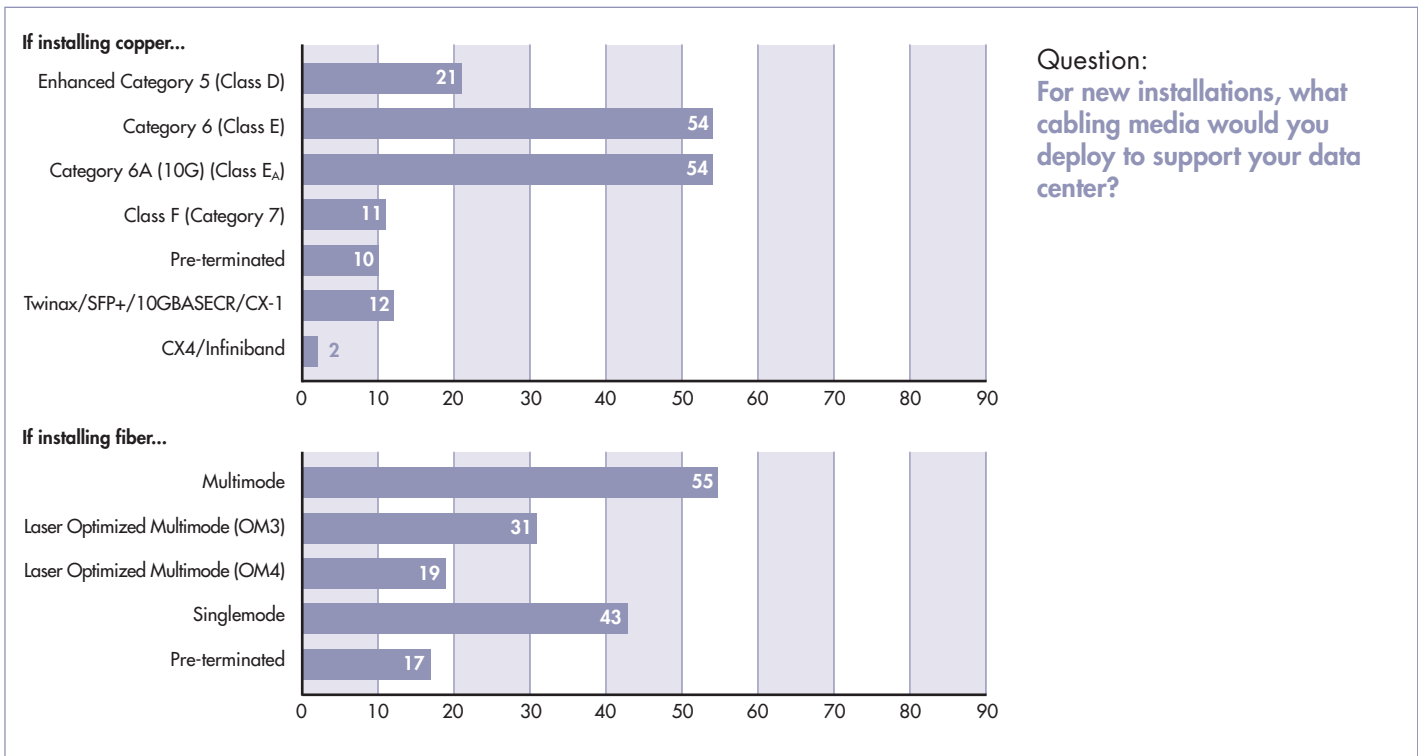
Question:
If high density deployments are required in your data center, what are the primary reasons driving these deployments?

	Global	NAR	AP	EMEA	CALA
Save rack space	50%	44%	49%	52%	54%
Save floor space	39%	41%	39%	44%	32%
Cable management	38%	29%	34%	38%	50%
Lower costs	47%	43%	48%	42%	51%
Lower energy consumption	45%	40%	42%	45%	57%
High density deployments are not required	15%	16%	16%	17%	12%

To connect higher density deployments, enabled by blade servers, consolidation and virtualization, data centers are installing high performance infrastructure.

For new copper cabling installations, more than half of all respondents (54%) said they would use 10Gb/s Category 6A/Class E_A cabling. In CALA, this figure rose to 78%. Airports with 86% and Healthcare with 71% lead the industry verticals in the deployment of Category 6A. Meanwhile Entertainment/Leisure with 17% and Finance/Insurance with 16% lead the industries in the deployment of pre-terminated copper solutions.

For new fiber installations, 50% said they would use laser-optimized multimode fiber conforming to the OM3 or OM4 standards. The figure for CALA was 61%. The Pharmaceutical sector leads the field in the deployment of OM4 fiber, with 50% of respondents in that industry selecting it.



To take advantage of the high performance cabling, data centers are adopting 10GBASE-T (10 Gigabit Ethernet over twisted pair). Globally, 30% have already done so for backbone connections, and a further 46% said they would do so within three years. The highest figures were in CALA, 86% in this region said they had adopted 10GBASE-T in the backbone or would do so within three years.

	Global	NAR	AP	EMEA	CALA
Have done so already	30%	35%	27%	32%	31%
Within 1 year	24%	22%	20%	24%	33%
Within 3 years	22%	17%	24%	22%	22%
Within 5 years	8%	11%	10%	5%	4%
Will not deploy	17%	14%	20%	17%	11%

Question:
What are your deployment plans for 10GBASE-T (10 Gigabit Ethernet over twisted pair) in your data center backbone?

In horizontal connections, 21% were already running 10GBASE-T and an additional 48% intend to do so within three years. Again, the highest figures were in the CALA region.

Question:

What are your deployment plans for 10GBASE-T (10 Gigabit Ethernet over twisted pair) in your data center horizontal?

	Global	NAR	AP	EMEA	CALA
Have done so already	21%	22%	20%	21%	22%
Within 1 year	24%	22%	20%	26%	29%
Within 3 years	24%	24%	24%	24%	25%
Within 5 years	13%	14%	14%	12%	12%
Will not deploy	18%	17%	22%	17%	12%

The Quality Reliability and Performance Factors

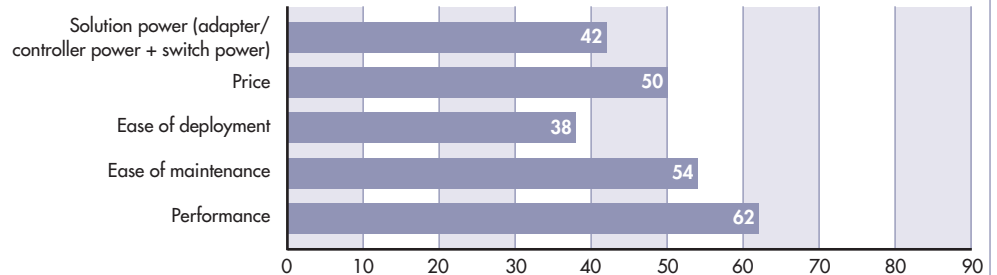
Responses to questions on a selection of network topologies and equipment reflect the importance attached to infrastructure quality, reliability and performance. When questioned, 62% of respondents put performance among their top two priorities.

Price sensitivity was highest in NAR with 57% putting it in their top two priorities and lowest in EMEA with 46%. However, 70% of NAR respondents put performance among their top two priorities compared with 64% in EMEA.

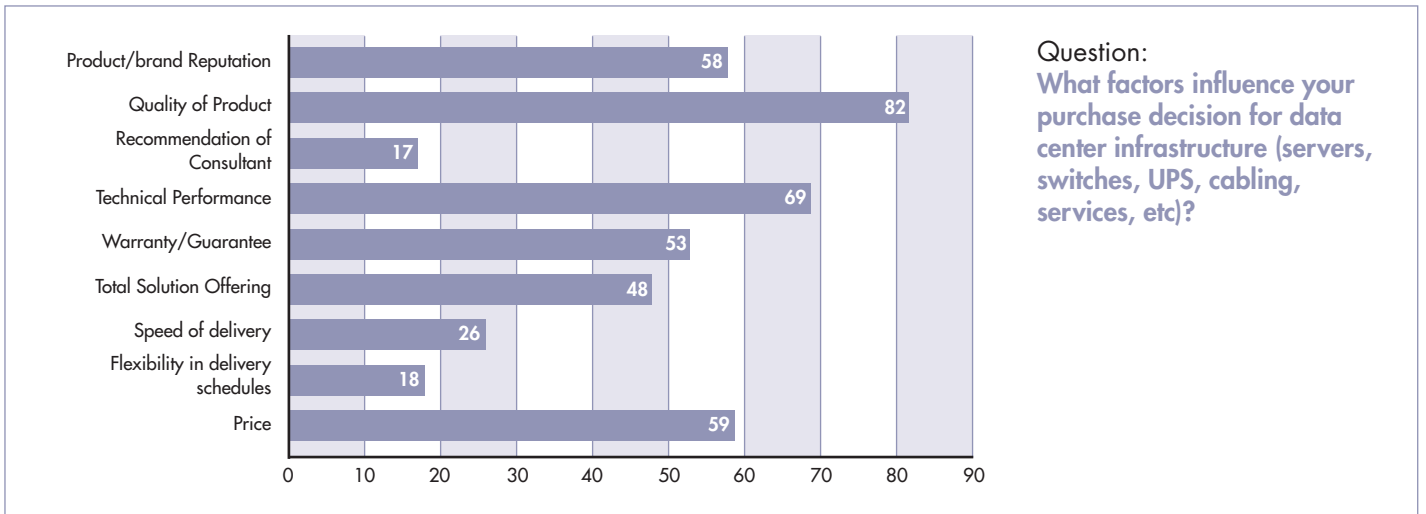
Globally, ease of maintenance was also prioritized above price. Of those who responded, 54% put it in the top two priorities; in AP the figure was 63%.

Question:

What are the two most important considerations in selecting switching/cabling medias and topologies?



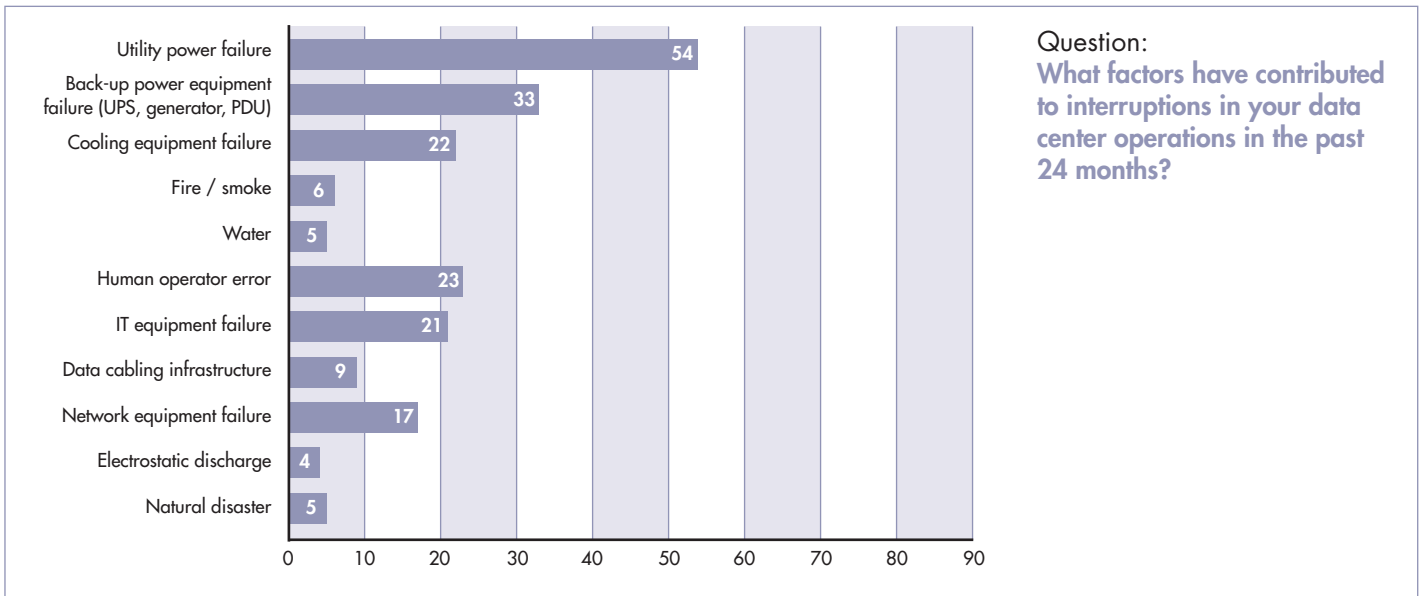
The higher priority given to performance factors over price was confirmed by a question on factors influencing choice of data center infrastructure equipment. Quality of product was cited by 82% of all respondents as a factor, and performance by 69%. The responses across the regions were quite consistent except for CALA where 90% cited product quality as a factor and 59% cited technical performance.



Question:
 What factors influence your purchase decision for data center infrastructure (servers, switches, UPS, cabling, services, etc)?

The two biggest concerns expressed about existing IP LAN infrastructure were reliability, cited by 26% of respondents, and performance, cited by 20%.

A question on factors contributing to interruptions in data center operations showed that utility power failures (cited by 54%) and failure of back-up power (cited by 33%) are the most frequent cause of problems. Human error comes in third place with 23% reporting interruptions due to data center personnel. Intelligent infrastructure can help lower the negative effects of human error. Network and IT equipment failure are twice as likely to cause an interruption as problems with the cabling infrastructure.



Question:
 What factors have contributed to interruptions in your data center operations in the past 24 months?

Architecture Choices

Most data centers (83%) deploy full cross connects for some or all copper connections between server and switch ports. Forty six percent use a cross connect on more than half of switch-to-server connections over copper.

For fiber connections, 83% said they used full cross connects on some connections and 41% use them on more than half of connections

The survey revealed that network architecture choices depend on data center size. The 17% of data centers that did not use any full cross connect server ports and switch ports typically have a smaller number of server cabinets, with the majority having less than 50 server cabinets.

Globally, 72% of respondents said they had less than half their servers connected to a Fiber Channel SAN. In the AP region, the figure was 80%.

Ten percent of respondents reported their data centers had no Fiber Channel SAN; and notably the figures for NAR were 16% and EMEA 5%.

When questioned on the location of switches supporting IP network traffic within their data center, 46% of all respondents said these were centralized. In EMEA and CALA the figure was 41%. In NAR and AP the figure was 50%.

Of all respondents, 33% said their IP switch locations were zoned. AP and EMEA have a slightly higher percentage than NAR and CALA.

Question:

Where are your switches located that support IP network traffic within the data center?

	Global	NAR	AP	EMEA	CALA
Top of rack	29%	27%	24%	36%	31%
End of row	15%	11%	18%	12%	12%
Middle of row	24%	14%	26%	24%	23%
Centralized (all access switches in one location)	46%	52%	50%	41%	41%
Zoned (group of switches service number of server rows)	33%	27%	36%	35%	29%

For switches supporting SAN traffic, overall 42% of respondents said these were centralized and 27% zoned. The figures for top-of-rack switches were 29% for IP networks and 25% for SAN traffic.

Question:

Where are your switches located that support Storage Area Network (SAN) traffic within the data center?

	Global	NAR	AP	EMEA	CALA
Top of rack	25%	17%	24%	21%	33%
End of row	13%	5%	16%	11%	11%
Middle of row	22%	16%	24%	26%	17%
Centralized (all access switches in one location)	42%	43%	46%	39%	35%
Zoned (group of switches service number of server rows)	27%	29%	28%	30%	21%

On the subject of Fiber Channel over Ethernet (FcoE), 20% of respondents said they had already evaluated or installed this technology and another 43% said they intended to evaluate it or install it within two years.

Responses on the uptake of FCoE was quite consistent across NAR, EMEA and AP regions with an average of 60% saying they had evaluated or adopted it or would do so within 24 months. In CALA 70% said they had evaluated or adopted FCoE, or intended to, within two years.

Nearly 80% of respondents said they preferred deployment locations for FCoE technology other than at the top of rack.

Given a choice, 32% of all respondents said they would deploy FCoE technology centrally, 27% said zoned and 21% top of rack. The centralized location was more preferred in AP where it was chosen by 36% of respondents compared to 25% in NAR and 30% in both EMEA and CALA.

The top of rack location was more favored in NAR where 32% said this was their preferred location compared with 18% in both AP and EMEA. Choice of the zoned approach was quite consistent across all regions.

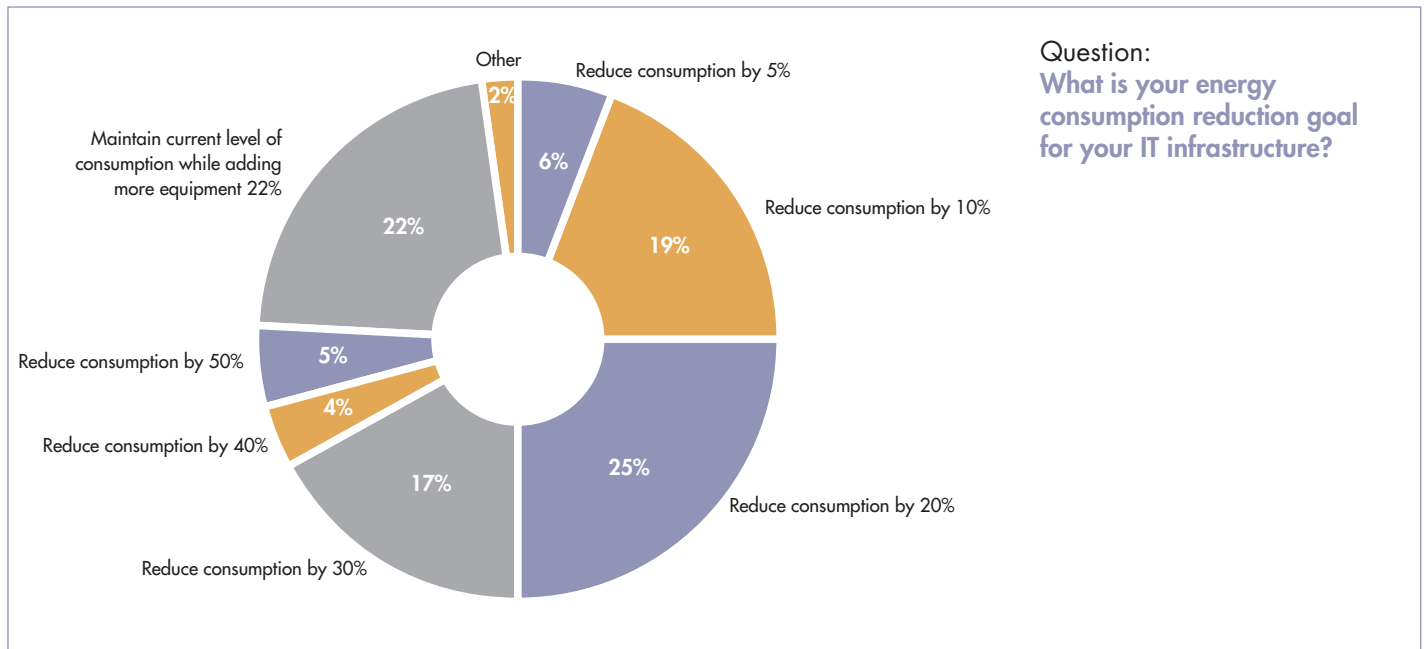
End of row and middle of row locations were each chosen by less than 10% of respondents.

Data Centers and the Environment

When questioned on environmental impact, 78% of respondents cited reduction of data center power and cooling costs as an area of most concern.

Globally 51% of respondents said they aimed to reduce power consumption by 20% or more. The figures were surprisingly consistent across all the regions.

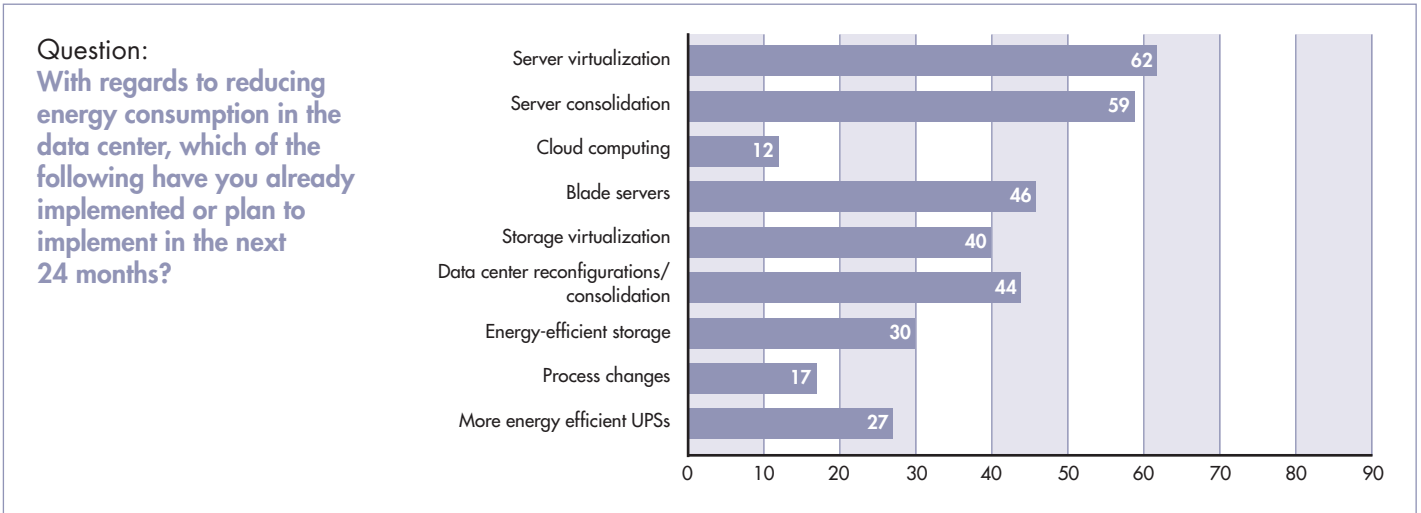
While 22% of respondents planned to maintain their current level of consumption while adding more equipment, 25% will use 20% less energy in their data center operations. Pharmaceutical companies have the most aggressive goals with 25% seeking a 50% reduction in energy consumption.



Worldwide 64% said they wanted to implement their energy consumption reduction strategy within 24 months. This figure was also consistent across all regions.

Higher density is seen as an energy reduction strategy. Virtualization (adopted by 62% of respondents) and server consolidation (adopted by 59% of respondents), were the most often implemented means of cutting energy consumption.

A wide variety of approaches to energy saving had already been tried. In addition to server consolidation and virtualization, methods used by respondents included blade servers (46%), storage virtualization (40%), energy efficient storage (30%), and energy efficient UPS (27%).



In total, 73% of respondents will purchase a more energy efficient UPS even if it costs more now because of the higher energy savings later.

COMMENTARY ON FINDINGS

The survey shows that organizations across all sectors and regions are still willing to fund improvement of their data center infrastructure. The key role of data centers in driving business performance is clearly recognized and this is overcoming constraints imposed by current global economic conditions.

Energy saving and reducing the data center's carbon footprint are clear priorities among organizations of all types in every region. Higher equipment density, achieved through virtualization and server consolidation, is seen as a means to meet these environmental demands, as well as performance and economic needs.

Increasing server efficiency through virtualization brings a requirement for higher network bandwidth. This is reflected in the number of companies intending to specify high performance copper and fiber cabling infrastructure for new projects

A higher density of equipment also requires careful purchasing and planning of network infrastructure to avoid excessive cabling volume. In general, more cable volume means less space for the flow of vital cooling air.

Early adoption of 10Gb/s Category 6A copper cabling and OM4 fiber is another important means to limit increases in cable volumes. The high performance of these solutions reduces the need to add additional cables as bandwidth continues to grow. Data centers planning to support parallel transmission migration paths can install pre-terminated OM3 or OM4 backbone fiber when the data center is built to avoid major upgrade costs while preserving the cabling infrastructure.

Over half of data centers were planning to reduce their energy consumption by 20% or more. However, power consumption is only part of the data center's environmental impact. The equipment installed has to be manufactured and disposed of when it is obsolete - both processes that consume energy and resources.

Lengthening equipment replacement cycles has potential to make data centers greener and save money at the same time. With active equipment a short replacement cycle may, however, be justified by new levels of performance and energy efficiency achieved by the latest products.

When selecting passive components such as cabling, there is no excuse for under specifying that results in premature replacement. Ripping out cabling that is only a few years old will not only damage an organization's budget, it can seriously harm its green credentials.

Among data centers' other concerns about existing installations and priorities for new ones, reliability and ease of maintenance are high on the list. In addition, nearly a quarter of them had seen an interruption of their operations due to human error. All these issues can be addressed by the use of intelligent network infrastructure.

Greater knowledge and control of the network physical layer allows cabling to be managed more effectively. Data traffic channels are easily identified and managers are immediately alerted to any unplanned connectivity changes.

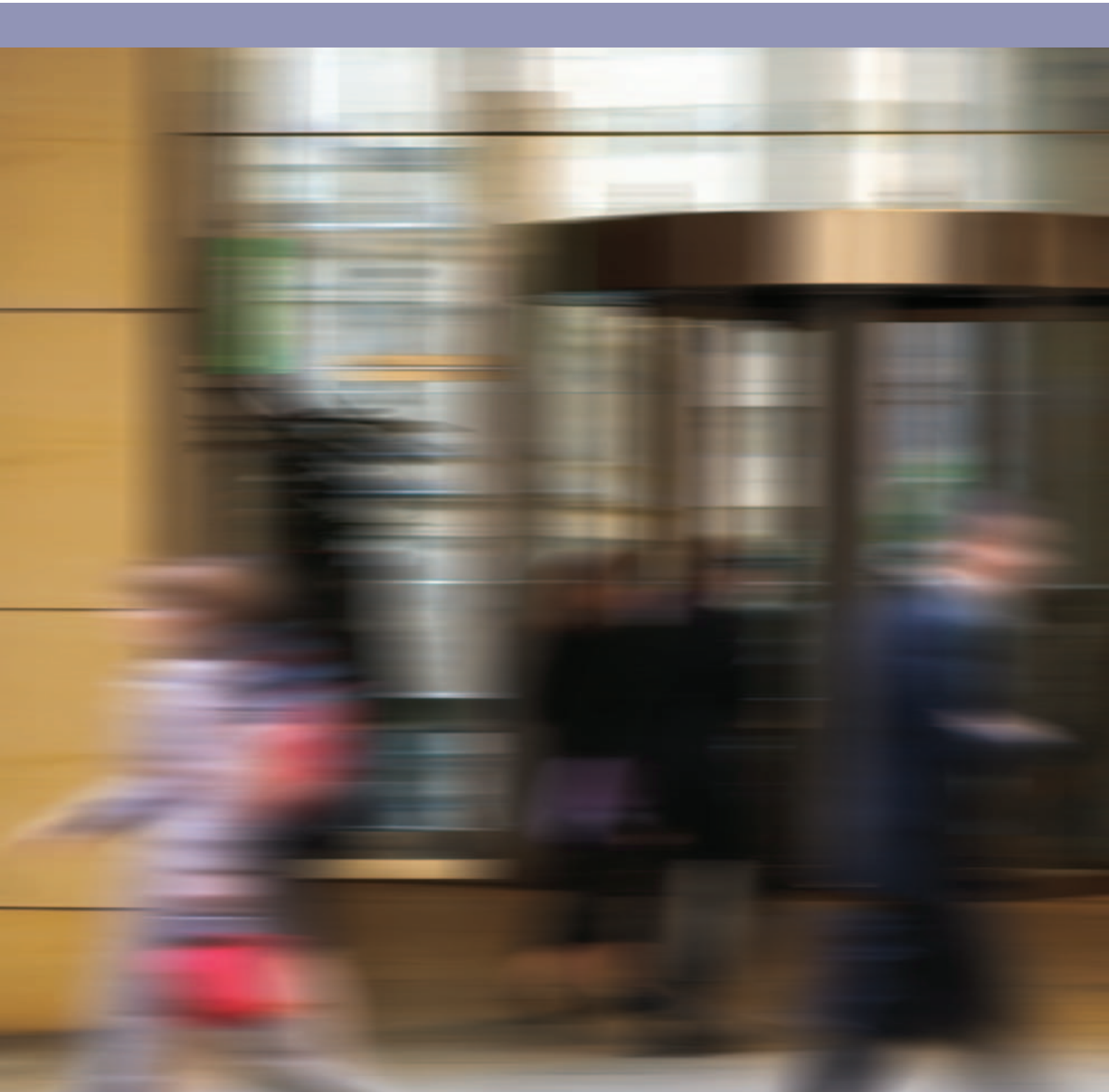
The benefits of better control of resources through intelligent infrastructure include greater efficiency and less waste on many levels. Optimizing the passive system can play a big part in meeting the business and environmental challenges highlighted by this Data Center Survey.

APPENDIX A

List of Countries respondents are located in

Angola
Argentina
Australia
Austria
Bangladesh
Barbados
Belgium
Bhutan
Bolivia
Brazil
Canada
Chile
China
Colombia
Costa Rica
Estonia
Finland
France
Germany
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Korea
Kuwait
Latvia
Lithuania
Malaysia
Mexico
Netherlands, The
Nigeria
New Zealand
Oman
Panama
Paraguay
Peru
Philippines
Qatar
Saudi Arabia
Singapore
South Africa
Spain
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Switzerland
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Thailand
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United Arab Emirates
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