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The State of Software-Defined Storage, Hyperconverged and Cloud Storage

SEVENTH ANNUAL MARKET SURVEY

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Introduction

For the seventh consecutive year, DataCore Software explored the impact of software-defined storage (SDS) on organizations across the globe.

According to IDC, "the enterprise storage market started 2018 with significant momentum, underscoring clients' appetite for transformative storage solutions, both in on-premise and cloud environments."[1]

In its seventh consecutive market survey, DataCore Software sought to find out more about what is driving that momentum. DataCore's survey questioned organizations across a variety of markets to distill the expectations and experiences of 400 IT professionals who are currently using or evaluating software-defined storage (SDS), hyperconverged and cloud storage to solve critical data storage challenges. The results yield surprising insights from a cross-section of industries over a range of workloads.

Please refer to the section on Survey Demographics for details on the size of companies, geographies, and vertical markets represented.

Summary of Findings

- High availability/disaster recovery are still top issues. The biggest concern for storage infrastructure of any type is to minimize disruptions; providing business continuity and disaster recovery are the top cited examples by respondents. Interestingly, business continuity is an overarching key concern when it comes to storage, whether on-premise or in the cloud.

- The biggest surprise reported is that there is still too much vendor lock-in within storage, with 42% of respondents noting this as their top concern. Software-defined storage is being used to solve this (management of heterogeneous environments) as well as for automation (lowering costs, fewer migrations and less work provisioning). Therefore, it should not be a surprise that the results also show adoption of software-defined storage is about double that of hyperconverged (37% vs. 21%), with 56% of respondents strongly considering or planning to consider software-defined storage in the next 12 months.

- The reality of hyperconverged deployments was also revealed. While it continues to make inroads, in addition to above, respondents also said they are ruling out hyper-converged because it does not integrate with existing systems (creates silos), can't scale compute and storage independently, and is too expensive. Hybrid-converged technology is a good option for IT to consider in these cases.

- Interestingly, while simplifying management, higher performance, and reduced costs are reported as top reasons for deploying software-defined storage, those who have reported the top reasons to rule out software-defined storage were a need for separate management, lack of performance and too expensive to implement. However, not all software-defined storage solutions are equal. For example, DataCore reports a 95% renewal rate and similar customer satisfaction scores.

- Many enterprises are exploring containers, although actual adoption is slow due to: 1) lack of data management and storage tools; 2) application performance slowdowns—especially for databases and other tier-1 applications; and 3) lack of ways to deal with applications such as databases that need persistent storage.

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- While all-flash arrays are viewed as the simplest way to add performance, more than 17% of survey respondents found that adding flash failed to deliver on the performance promise, most likely because it does not solve the I/O bottlenecks pervasive in most enterprises. Technologies such as Parallel I/O provide an effective solution for this.

- NVMe is still struggling to become mainstream. About half of respondents have not adopted NVMe at all. Thirty percent report that 10% or more of their storage is NVMe and more than 7% report that more than half of their storage is NVMe. However, while adoption is still slow, enthusiasm for the technology does appear strong. Technologies such as software-defined storage with Gen6 HBA support and dynamic auto-tiering with NVMe on a DAS can help simplify and accelerate adoption.

- In looking at cloud storage adoption and maturity, while cost savings is a driver, many report[2] that it is also a major obstacle, along with security and regulatory concerns. 36% percent realized the cloud is not less expensive, and 42% are not considering public cloud storage. Furthermore, another top response for surprises reported is that using the cloud failed to reduce storage costs.

- Overall, respondents view requirements, use cases and decision drivers very differently based on where they stand relative to how much and how long they currently are using storage—on-premise or in the cloud.

- For example, databases, consolidation and VDI are the top three use cases reported for on-premise software-defined storage and hyperconverged infrastructure deployments whereas backup, archival and disaster recovery, as in past surveys, continue to be the top three use cases for public and hybrid cloud deployments.

- Reducing new hardware costs and adding performance were the main decision drivers in past surveys (prior to 2017) across all types of deployments. There has been a significant shift this year as well as last year, making automation, simplification and extending the life of existing assets top of mind.

The Current State of Software-Defined, Hyperconverged and Cloud Storage

In its recent Hype Cycle for Storage Technologies 2018, analyst firm Gartner "advises enterprises that have not yet leveraged technologies that improve efficiency and modernize data protection to include them in the next technology refresh. Organizations should then shift their focus to innovation areas such as software-defined storage, NVMe and NVMe-oF, public cloud storage, container-native storage and hybrid cloud storage as these technologies mature."[3]
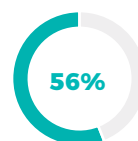
We asked respondents, **what are the business drivers for implementing software-defined storage; hyperconverged storage; public cloud storage; and hybrid cloud storage?** Below is a breakdown of the responses by technology category.

60%

Automate frequent or complex storage operations

56%

Simplify management of different types of storage

56%

Extend the life of existing storage assets

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For software-defined storage, the top responses were:
These were all selected by more than half of respondents. In the prior survey, conducted in 2017, DataCore asked respondents a similar question regarding software-defined storage business drivers. The top results in that study included: simplify management of different models of storage (55%); future-proof your infrastructure (53%); and extend the life of existing storage assets (47%). For the second time, these survey results portray the market's recognition of the economic advantages of software-defined storage and its power to maximize IT infrastructure performance, availability, and utilization.
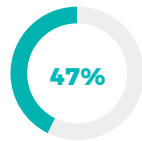
Gartner's Hype Cycle for Storage Technologies 2018 also <u>stated</u> that "I&O leaders should look at infrastructure SDS not as another storage product but as an investment in improving storage economics and providing data mobility including hybrid cloud storage integration." Additionally, the report echoed some of this research as in its list of the top reasons for interest in software-defined storage, which included:
- Improving the management and agility of the overall storage infrastructure through better programmability, interoperability, automation and orchestration
- Opex reductions via reducing the demands of administrators
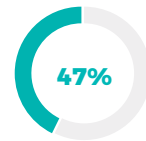- Capital expenditure (capex) reductions via more efficient utilization of existing storage systems[4]

This year's DataCore survey found that the top three business drivers for hyperconverged include:

54%	47%	47%
Deliver **higher performance** storage	**Simplify management** of different types of storage	**Automate** frequent or complex storage operations

It is not surprising that higher performance has risen to the top since that was a main complaint in past surveys. Likewise, previous surveys highlighted that hyperconverged systems were more constrained, offered less choice in types of storage and that it was a vendor-specific technology, and therefore limited to managing only vendor-supplied storage offerings. This made systems difficult to integrate with existing storage investments and more applicable to 'green field' or departmental use cases. Clearly, the trend continues from past surveys that automation and simplification of storage operations are key decision criteria for hyperconverged deployments.

Interestingly, when asked the same question regarding public cloud and hybrid cloud storage, many respondents are still not considering cloud technologies (54 % and 47% respectively), citing security and regulatory concerns as the top obstacles. Paradoxically, while cost savings is a common driver, many report that it is also a major obstacle. Other surveys, including those from <u>451 Research</u>[5], note cloud storage cost post migration as becoming the number one pain point.

Of those that are deploying public cloud, the top three business drivers identified for doing so include: business continuity (46%); aid in digital transformation efforts (39%); and lowering their hardware costs by shopping among several vendors (37%). Of those that are deploying hybrid cloud, the top three business drivers identified for doing so include: business continuity (41%); future-proof your infrastructure (37%); and aid in digital transformation efforts (37%).

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What are the business drivers for implementing the following storage technologies?

- Software-defined Storage
- Hyperconverged
- Public Cloud Storage
- Hybrid Cloud Storage
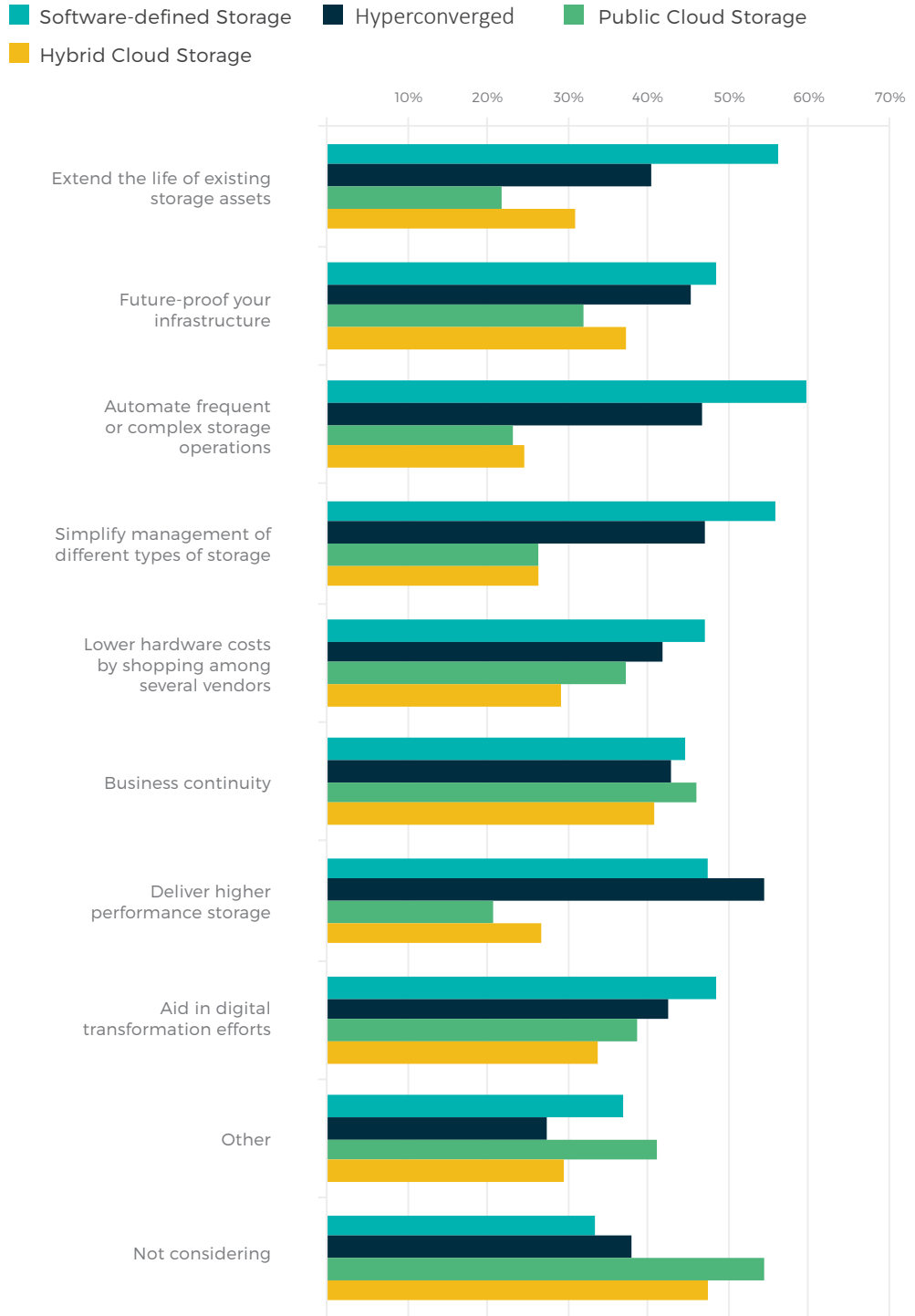
We also asked our respondents **"what are the primary capabilities that you would like from your storage infrastructure?"** The top capabilities identified were: business continuity/high availability (metro clustering, synchronous data mirroring) at 74%; disaster recovery (from remote site or public cloud) at 73%; and enabling storage capacity expansion

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without disruption at 72%. In our previous survey, we asked respondents a similar question, "what are the primary capabilities that you would like from your storage infrastructure when virtualizing storage?" The majority of respondents (83%) similarly identified business continuity from high availability (metro clustering, synchronous mirroring) as number one. Enabling storage capacity expansion without disruption received nearly an identical response as well, with 73% of respondents previously identifying that, and disaster recovery also ranked high at 60% in the past survey.

Eliminating Application Downtime and Business Disruption Are Top Priorities

In general, to answer "what primary capability is most needed from a storage infrastructure," the best solution is "minimize disruptions and provide continuous availability to run the business." Fundamentally, business continuity, disaster recovery and adding capacity for growth without impacting application downtime represent variations of that answer and were the top three most mentioned examples.

Business Continuity and Data Protection are Top of Mind for Users

Of note in the first two questions is that business continuity is top of mind for respondents across all technologies, irrespective of how and where storage is deployed. It's first on the list at 74% for the primary capability that respondents would like from their storage infrastructure and was also number one in the previous DataCore market survey. Additionally, business continuity is the top business driver for those deploying public and hybrid cloud storage (46% and 41%), and similarly ranks high in the complete results for software defined and hyper-converged storage business drivers, coming in at 45% and 43% respectively (see accompanying visual for question 1).

How to Protect your Data

Unfortunately, it is likely that equipment will fail at some point in time. Even highly reliable hardware isn't enough to ensure that systems will stay operational. The ideal way to protect against the myriad equipment, environmental and human factors that contribute to downtime is to mirror data, transparently, automatically, in real time.

Establishing physically separate nodes, each in a different fault zone, provides a level of availability that highly reliable hardware can't match. If one of the nodes is impacted, the other node(s) continue to provide data access to applications, ensuring uptime. Synchronous mirroring ensures zero downtime, without the need for a witness to ensure proper handoffs so the failover is completely automated. Asynchronous replication ensures that when disaster strikes a region and a data center becomes inoperative, data has been replicated to a disaster recovery site, either another physical location or the cloud. This enables operations to resume as soon as possible.

Furthermore, malware, viruses, and ransomware can also corrupt data or prevent users from accessing data. Additional defenses such as continuous data protection provide users with the ability to time-stamp every change to data, and the ability to go back to any point in time to the last known healthy state. Continuous data protection keeps track of all writes and changes to data for a specified time period (e.g., two weeks). As a result, any data can be restored to the immediate point before corruption. From an RTO perspective, continuous data protection makes it easy to create another volume that rollbacks to the good state and mapped to a different file server so the process takes just minutes. This provides insurance against malware, ransomware and other threat vectors that alter data.

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Storage Technology Deployment and Adoption

We also wanted to explore where the market was in regards to overall deployment of storage technologies. The bar chart below summarizes the participants who answered "standardized on it" in response to the question, **where are you in your deployments of the following technologies?** The leading response for "standardized on it" falls in the software-defined storage category. IDC stated that software-defined storage is gaining traction because it meets the demands of the next-generation datacenter better than legacy storage infrastructure. As a result, IDC forecasts that the worldwide SDS market will see a compound annual growth rate (CAGR) of 13.5% over the 2017-2021 forecast period, with revenues of nearly $16.2 billion in 2021.[6]

STANDARDIZED ON IT
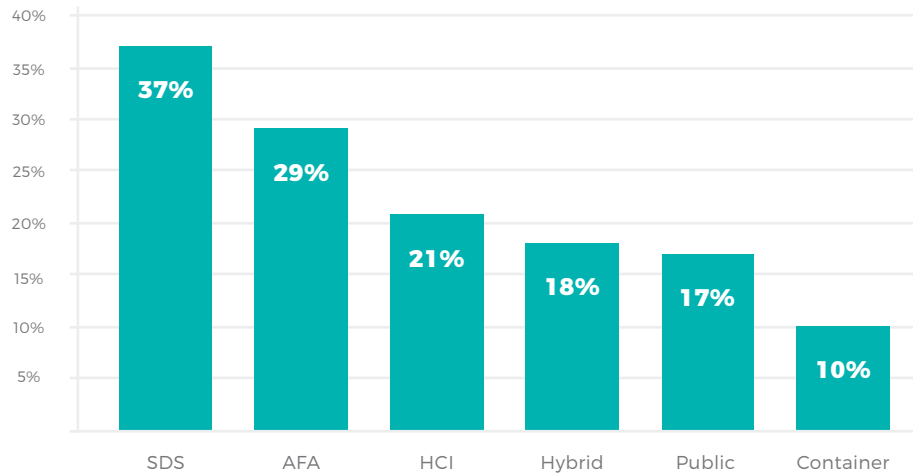
It is also interesting to see what technologies people are not considering now but may be considering in the future. The top three being strongly considered are all-flash arrays, hyperconverged infrastructure and software-defined storage. Forty-two percent are not currently considering public cloud or containers.

FUTURE TECHNOLOGIES BEING CONSIDERED

	SDS	HCI	Public	Hybrid	Container	AFA
Strongly Considering but Haven't Deployed Yet	31%	32%	24%	23%	19%	33%
We Plan to Consider in the Next 6-12 Months	25%	28%	28%	30%	18%	19%
Not Considering	30%	30%	42%	32%	42%	23%

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What use cases/applications are you using the following storage technologies for?

Software-Defined Storage

The top three use cases for software-defined storage include: databases (48%); consolidated primary storage/ SAN (46%); and VDI (45%). Databases and consolidated primary storage where SANs are used to share storage resources were the top use cases reported in past surveys. However, VDI emerged this year as the third most reported use case, surprisingly.

Hyperconverged Infrastructure

While hyperconverged has gained in popularity, nearly half of respondents (49%) surveyed are not currently using it. It is interesting to see the results to a different question on why customers would rule out using hyperconverged solutions. The top three reasons to rule out hyperconverged solutions remain consistent with past surveys: 1) creates vendor lock-in; 2) does not integrate well with existing infrastructure; and 3) does not provide flexibility to easily scale compute and storage separately.

The remaining top use cases identified for hyperconverged include: data center consolidation (44%); databases (44%); and VDI (42%). The increased use of hyperconverged for database use cases was the most interesting change from previous surveys, which tended to highlight VDI and ROBO as the top use cases. It is believed that the increased use of flash and NVMe storage within hyperconverged has helped drive this shift.

Cloud Technologies

Once again in response to this question, participants noted they are largely not using public cloud and hybrid cloud storage, with "not currently using" being the top answer in both of these categories at 56% and 44 % respectively. Of those who are using public cloud storage, the top use cases are other cloud-based applications (e.g. Salesforce), or those focused on secondary storage or less actively accessed data such as back up to public cloud and long-term archival. When respondents of the last DataCore market survey were asked: "Which types of uses are you considering for public cloud for storage?" not surprisingly, the top answer received was also "not currently evaluating or using the cloud for storage" at 40%. The top three use cases identified by those willing to use the public cloud for storage were similar: long-term archive (35%); back up to cloud and restore on premise (33%); and disaster recovery in cloud (33%).

Of those that are using hybrid cloud storage, the top three use cases include: other (36%); disaster recovery (33%); and back up to public cloud (30%).

Reasons to Deploy: Evaluation Criteria
To follow up, we wanted to understand why users are deploying certain technologies. Respondents were asked, **if applicable, what is the number one reason you are evaluating or currently deploying the following storage technologies?**
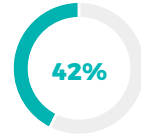
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For software-defined storage, the top reasons identified were:

47%

42%

42%

Simplify Management
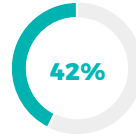
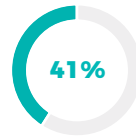**Speed Up Performance** for
Specific Applications

Reduce Hardware Costs

For hyperconverged storage, the top reasons included:

43%

41%

38%

Consolidation

Speed Up Performance for
Specific Applications

Simplify Management

Respondents yet again stated that they are not adopting public cloud and hybrid cloud storage, with "not currently evaluating or deploying" being the top answer in both of these categories at 58% and 41% respectively. Of those evaluating or currently deploying public cloud storage, the top three reasons include: reduce hardware costs (34%); easy to scale out (32%); and improve availability (24%). Of those that are evaluating or currently deploying hybrid cloud storage, the top three reasons include: improve availability (31%); easy to scale out (27%); and consolidation (26%).

Reasons NOT to Deploy: Evaluation Criteria

Software-Defined Storage
We similarly wanted to explore why people are not using certain technologies. We asked: what is the number one reason you are ruling out the following storage technologies? The top reasons for ruling out software-defined storage were: separate management (32%); lack of performance (32%); and too expensive (30%). Paradoxically, these mirror the same top reasons users select software-defined storage.

Hyperconverged
Top reasons for hyperconverged include: vendor lock in (40%); doesn't integrate with rest of infrastructure (another data silo) (38%); and can't scale compute, storage and networking independently (38%). The top reasons identified in the previous survey when respondents were asked this question specifically about hyperconverged storage also included vendor lock-in (24%) and can't scale compute, storage and networking independently (19%).

Cloud Technologies
This survey has highlighted lower adoption rates for public and hybrid cloud storage so it's useful to see the reasons identified why users are ruling these technologies out in this question. The top two reasons for public cloud storage include: security (61%) and regulatory requirements (59%) and lack of performance (44%), which have been long-standing concerns for many users. Top reasons for hybrid cloud storage also naturally include: regulatory requirements (30%); security (29%); and doesn't integrate with rest of infrastructure (another data silo) (24%).

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Surprises, False Starts and Technology Disappointments

Containers promise to revolutionize software development inside and outside of the cloud. Developers have been early to incorporate containers into application development and deployment, but generally, enterprises have been somewhat hesitant to pursue widespread adoption. Industry figures, however, point to strong growth rates in the market. 451 Research has reported that containers are beginning to replace virtual machines. The research firm expects the market will double and grow from $1.5 billion to nearly $3 billion in 2020.[7]

Container Adoption

We asked respondents, "which of the following surprises/unforeseen actions did you encounter after implementing containers?" More than a third of respondents have not implemented containers yet (34%). Of those that have, the top surprises include: lack of sufficient storage tools or data management services (19%); application response time slowdowns (18%); and lack of persistent storage for key applications (18%).

Which of the following surprises/unforeseen actions did you encounter after implementing containers?
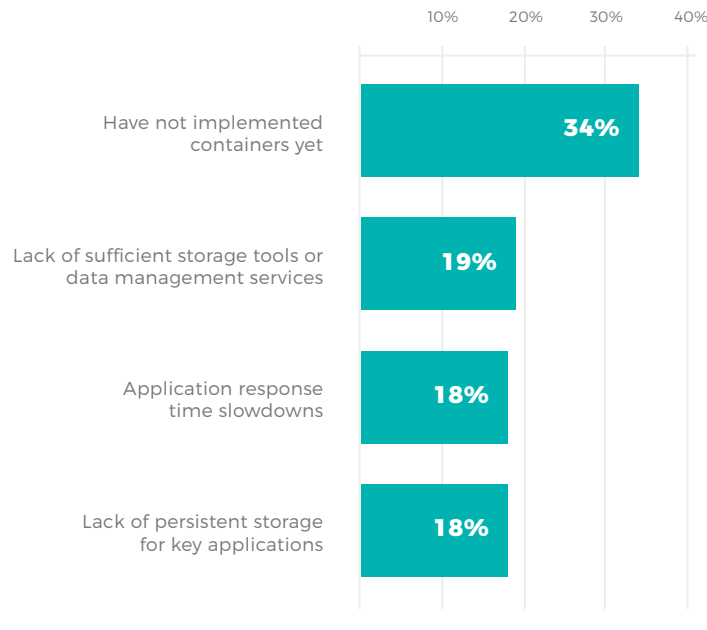
Storage Infrastructure

We also explored what technology disappointments or false starts respondents have encountered in their storage infrastructure. The top response was that they are locked into a specific storage vendor at 42%, followed by cloud storage failed to reduce costs (37%). Thirty percent stated that managing object storage is difficult, and finally 18% felt that flash failed to accelerate applications.

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What technology disappointments or false starts have you encountered in your storage infrastructure?

Locked into a specific storage vendor	**42%**
Cloud storage failed to reduce costs	**37%**
Managing object storage is difficult	**30%**
Flash failed to accelerate applications	**18%**
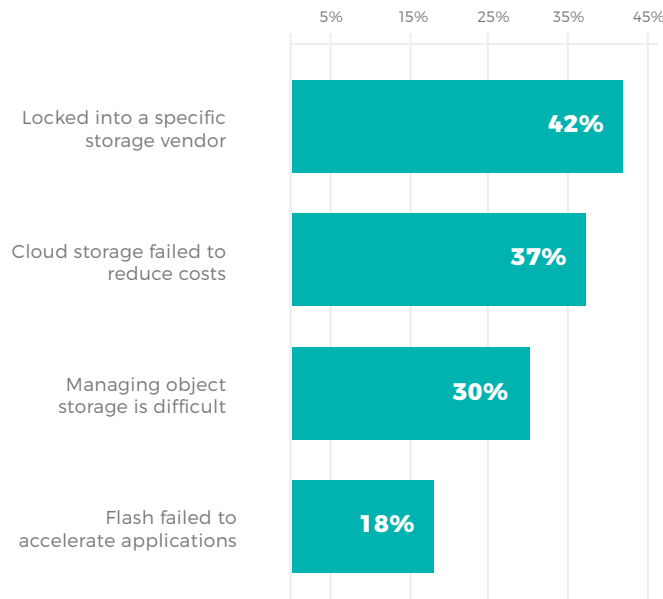
The findings in the previous survey likewise included that cloud storage failed to reduce costs (31%); managing object storage is difficult (29%); and flash failed to accelerate applications (16%). It is interesting to note that the DataCore 2015 State of the Industry Survey had an identical finding—16% of participants of that survey also felt that flash had failed to accelerate applications.

The State of NVMe

NVMe (Non-Volatile Memory Express) is one of the hottest industry topics right now. As a protocol for accessing high-speed storage, it promises to provide many advantages over legacy protocols such as SAS and SATA. In today's world, which is driven by the need for always-on, real-time data, this becomes a particularly attractive value proposition.

We wanted to take the industry's pulse on where it is with actual deployments of NVMe, so we polled respondents by asking, "NVMe storage will account for roughly what percentage of your storage capacity in 2018?" Almost half (48%) are still not using NVMe, but adoption is clearly on the rise with 22% reporting they are using some NVMe, but less than 10%; 23% are using 10-50%. The rest of respondents are using more than half NVMe while 2% of that subset are almost using all NVMe (90-100%).

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NVMe storage will account for roughly what percentage of your storage capacity in 2018?

48% – Not using NVMe

22% – Using some NVMe, but less than 10%

23% – Using 10-50% NVMe

7% – More than half NVMe
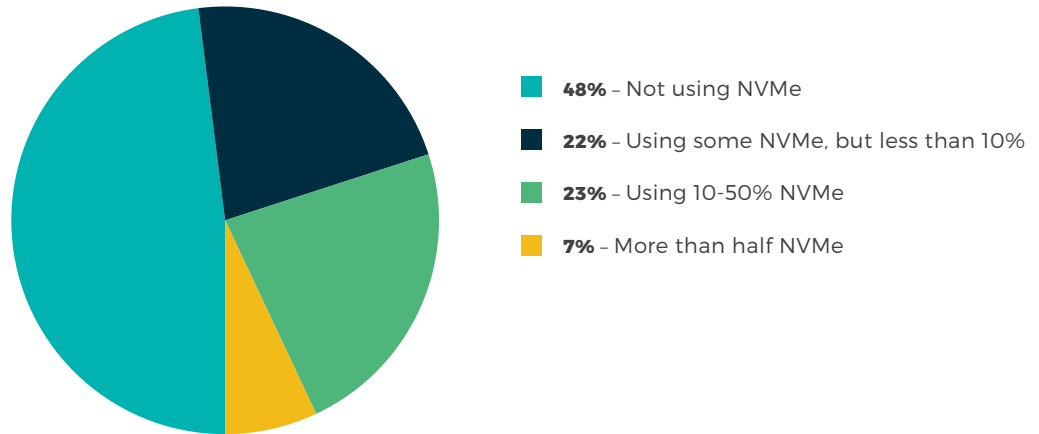
Part of the issue is that while NVMe, and NVMe over Fabric (NVMe-oF), promise new levels of performance for flash-based storage systems, for large, distributed systems, the problem remains of deploying, managing, and migrating data and applications. Adoption has been particularly slow due to a lack of software and data services to provide a simple path for businesses to transition without suffering the costs and disruptions required to benefit from the technology. Customers are usually forced by their storage vendors into a 'rip-and-replace' abandonment of current investments.

NVMe and NVMe-oF need proven software to accelerate customer adoption. For example, software-defined storage can act as a bridge that unifies and abstracts legacy and new storage, allowing users to seamlessly integrate new technologies such as NVMe-oF and gain the benefits without having to sacrifice past investments.

Software-defined storage can provide a basis for managing all types of storage at the speed required to realize the benefits of NVMe. Effective software-defined storage can eliminate changes to hosts, provide quality of services, automate data migration, support NVMe with the existing fabric network, and provide a wide range of enterprise-class data services such as continuous data protection, load-balancing, HA mirroring, auto-tiering, and data migration. Software-defined storage allows for the adoption of varied implementations of NVMe, including local SSDs and NVMe-oF using standard HBAs, and end-to-end NVMe for workloads demanding minimum latency.

Performance, simplicity of deployment, and the ability to leverage existing storage are all critical factors in easing the adoption of NVMe. As we move toward the next evolution of performance and lowering latency with NVMe/NVMe-oF, software-defined storage can help dramatically improve performance and utilization, reduce down-time, and minimize cost and management complexity.

The future for NVMe certainly looks bright. IDC expects that by 2021, NVMe-based arrays using NVMe over Fabric host connections will be driving more than 50% of all external primary storage revenue.[8]

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What percentage of your storage budget in 2018 is allotted to each of the technologies listed?

Flash technology leads in the more than 25% category at 23%, with SDS right behind at 22%. In the previous survey, software-defined storage topped the charts in planned spending with 16% reporting that software-defined storage represented 11-25% of their budget, and 13% representing that it made up more than 25% of their allocated budget for storage. This was followed by flash technology, with 14% of survey participants putting flash in the 11-25% of total budget category and 11% responding that the technology made up more than 25% of their allocated budget for storage.

Both technologies continue to show strong adoption and growth; it appears that users increased their spending on each in 2018.

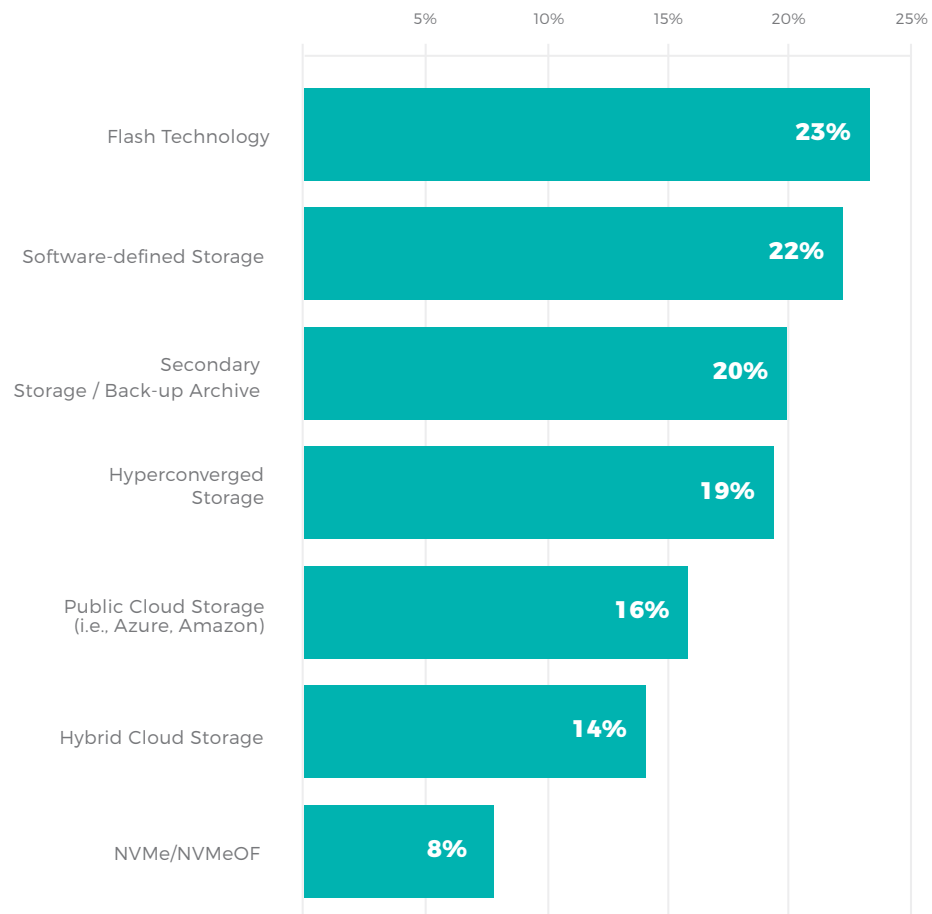**What percentage of your 2018 storage budget is allotted to each of the technologies listed? Response = more than 25%**

Technology	Percentage
Flash Technology	23%
Software-defined Storage	22%
Secondary Storage / Back-up Archive	20%
Hyperconverged Storage	19%
Public Cloud Storage (i.e., Azure, Amazon)	16%
Hybrid Cloud Storage	14%
NVMe/NVMeOF	8%

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Secondary Storage / Back-up

Also, the numbers for secondary storage/back-up are interesting in that they show that it is still costly for enterprises and consumes a significant part of the enterprise IT budget. This survey has respondents claiming it at 20% in the more than 25% of the 2018 budget category. It is estimated that approximately 80% of enterprise storage capacity is currently allotted to secondary storage—"mass storage" for use cases such as cold data; data with long retention requirements that is still needed online; online archiving/backups; filer storage; offsite storage (e.g. for disaster recovery); and more. These all typically hold very large volumes of data that do not need the level of performance that business-critical production applications need. However, it is still very important that all of this data is accessible when needed.

Leveraging existing storage investments or using comparably cheap storage hardware for secondary storage has resulted in a variety of different technologies for this application. On one hand, that has created a fragmented storage infrastructure, often paired with different storage service levels, making the overall management difficult. On the other hand, to harmonize such a diverse storage landscape would require tremendous new investments.

To address these problems, modern IT departments are leveraging software-defined storage technology. Just like virtualization helped solve similar problems in the compute layer, software-defined storage is solving challenges in the storage space. Software-defined storage helps lower costs for the high storage volumes required in secondary storage while providing central and uniform management of the entire storage architecture. Among the benefits of software-defined storage technology are the ability to future-proof the environment, easy extensibility, simple data migration and uniform storage management. With this solution, users are able to leverage high-end storage features for any disk with a clear separation between high-performance primary storage and cost-effective secondary storage—offering cloud-like economics to the market.

Gartner estimates that by the end of 2022, more than 35% of large global enterprise IT organizations will build their secondary storage systems with infrastructure software-defined storage based on a commodity hardware approach, up from 10% in 2018.[9]
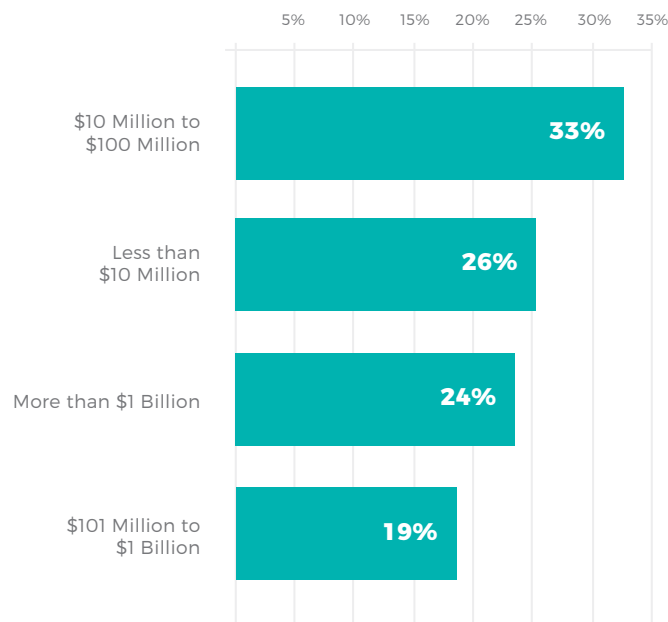
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Survey Demographics

400 IT professionals responded to this year's survey. Respondents came from a diverse set of organizations, both in size and industry, providing statistically significant insights into the similarity of needs for software-driven storage over a wide range of IT environments. A range of vertical market segments were represented, including financial services, healthcare, government, manufacturing, education, IT services and other related industries. Respondents were from a mix of organizations, including those with fewer than 500 employees, between 500 and 5,000 employees, and more than 5,000 employees.

Participants were primarily located in North America, with some additional respondents located in Europe and a minor amount from the regions of South America, Asia, Africa, the Middle East, Australia and New Zealand.
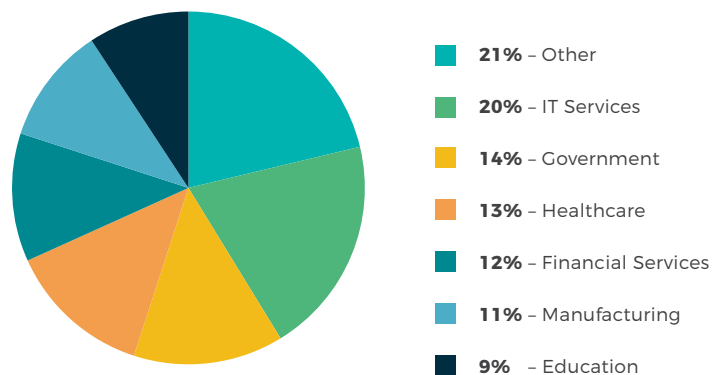
Size of Your company (by revenue):

Revenue	Percentage
$10 Million to $100 Million	33%
Less than $10 Million	26%
More than $1 Billion	24%
$101 Million to $1 Billion	19%

By Industry:

- **21%** – Other
- **20%** – IT Services
- **14%** – Government
- **13%** – Healthcare
- **12%** – Financial Services
- **11%** – Manufacturing
- **9%** – Education

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By Geographic Region:

- **83.25%** – North America
- **.25%** – Australia and New Zealand
- **.75%** – Middle-East and Asia
- **.25%** – Africa
- **15%** – Europe
- **.5%** – South America

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About DataCore

DataCore is the authority on real-time data. The company pioneered software-defined storage and has now expanded its technology leadership to hyperconverged infrastructures. DataCore empowers IT organizations to achieve always-available, high-performance and highly efficient data. Its patented technology eliminates storage bottlenecks with adaptive parallel I/O optimization, enables zero-downtime synchronous mirroring, and provides a true hardware-agnostic architecture – resulting in flexibility, resource efficiencies, and
cost savings.

DataCore Software is the cornerstone of the next-generation, software-defined data center. DataCore's value has been proven in more than 10,000 customer deployments across traditional, hyper-converged, cloud, and hybrid environments.

Visit www.datacore.com or call (877) 780-5111 for more information.

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3. Gartner, **Hype Cycle for Storage Technologies**, 2018, John McArthur, July 13, 2018

4. Gartner, **Hype Cycle for Storage Technologies**, 2018, John McArthur, July 13, 2018

5. 451 Research, **The Cloud Transformation Journey: Great Expectations Lead to a Brave New World**, Owen Rogers, William Fellows, Jean Atelsek, March 5, 2018

6. IDC, **Worldwide Software-Defined Storage Forecast, 2017–2021: SDS Market Growth Significantly Outpaces Enterprise Storage Growth, Led by HCI**, Eric Burgener, Ritu Jyoti Amita Potnis, Eric Sheppard, Natalya Yezhkova, September 2017

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