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Multicloud and Hybrid Cloud

The Path Forward for Storage Infrastructure

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JULY 2020

About this paper

A Pathfinder paper navigates decision-makers through the issues surrounding a specific technology or business case, explores the business value of adoption, and recommends the range of considerations and concrete next steps in the decision-making process.

ABOUT THE AUTHOR

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Henry Baltazar is a Research Vice President for the Storage Channel at 451 Research. Henry returned to 451 Research after spending nearly three years at Forrester Research as a senior analyst serving Infrastructure & Operations Professionals and advising Forrester clients on datacenter infrastructure technologies. Henry has evaluated and tested storage hardware and software offerings for more than 15 years as an industry analyst and as a journalist.

Executive Summary

Multicloud and hybrid cloud environments are the path forward for infrastructure. However, the fusion of on-premises storage arrays and cloud storage services will not be a trivial transition for most organizations given the differences these storage resources have in terms of reliability, performance and storage efficiency. Organizations could potentially leverage advanced cloud storage services that have the ability to integrate with their existing on-premises arrays to narrow the gap – to unlock the full potential of hybrid, multicloud environments while providing consistency.

Key Findings

- Organizations are increasing their usage of cloud storage and desire interoperability between their on-premises and cloud environments.
- Cloud storage has disadvantages relative to on-premises storage arrays.
- Data migration to/from cloud is a key requirement since it happens often, and enterprises have low tolerance for downtime.

The Rise of Cloud Storage

The adoption of cloud storage has been steadily increasing for some time now, and in our Voice of The Enterprise (VotE): Storage Organizational Dynamics 2019 survey, 55% of respondents said they were already using cloud storage services in their environment, while only 18% did not have cloud storage in their two-year plans. Over half (59%) of organizations that are trimming their on-premises storage budgets are shifting their spending to public cloud, according to our VotE: Storage, Budgets and Outlook 2020 survey. Even if organizations are planning on keeping most storage resources on-premises, the need for consistent and resilient cloud storage services will continue to increase.

The rising importance of cloud storage is being driven by a wide range of factors:

Management is mandating it. In our recent Voice of The Enterprise: Storage, Data Management and Disaster Recovery 2020 survey (see Figure 1), 35% of respondents said that the primary driver was an upper management directive to use cloud storage services. In conversations with end users, we found that part of the rationale for shifting spending to cloud storage was driven by management's desire to lower capex costs, and in the survey, 30% of respondents selected that as a reason. The need for geographic expansion is another key reason that organizations are turning to cloud, especially with many looking to get away from building and running new datacenters.

Data protection and recovery modernization. Cloud storage has had a major impact on the data protection space, where these services are taking up more of the backup and disaster recovery burden. In the Data Management and Disaster Recovery survey, 61% of organizations said they are already using cloud for data protection. Having remote copies in different availability

zones is a best practice that is being driven by compliance regulations. Just over a third (34%) of respondents claimed they were using cloud as a replacement for tape for long-term backup storage, which is being driven by cost advantages and accelerated data access compared to off-site storage.
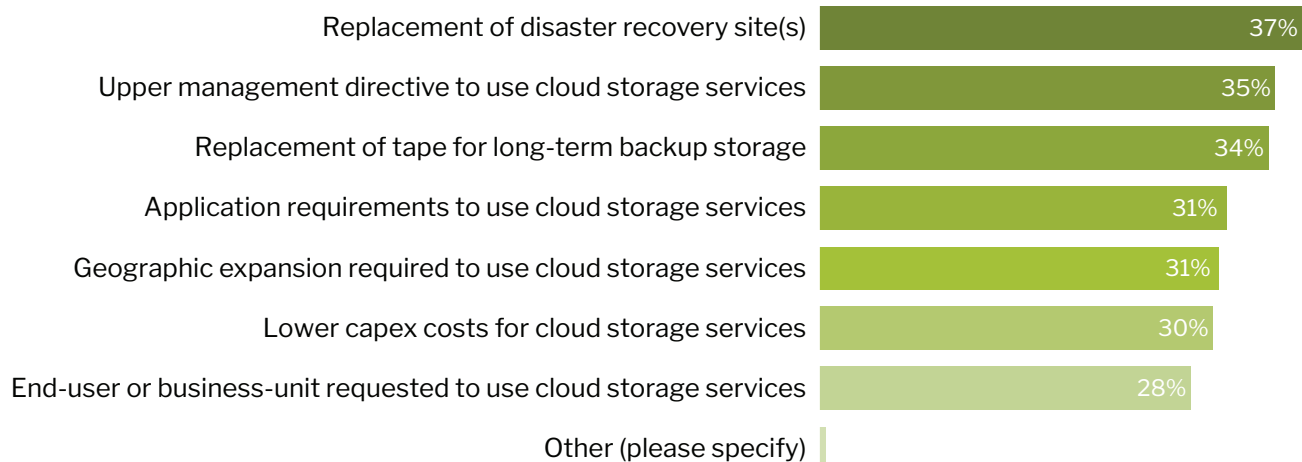
Business stakeholders and next-gen applications require cloud. Hyperscalers are introducing to the market a wide variety of innovative microservices and algorithms, which many next-generation application developers are looking to leverage. The advent of containers has also given organizations a reason to use cloud services to quickly deploy environments and accelerate development efforts. Nearly one-third (31%) of respondents said they are using cloud to meet application requirements, while another 28% claimed their primary driver for cloud was end-user or business-unit requests for these services.

Figure 1: Drivers for cloud storage adoption
Source: 451 Research's Voice of the Enterprise: Storage, Data Management & Disaster Recovery 2020
Q: What is the primary driver for your organization's use of public loud storage services? (Please select all that apply.)
Base: Respondents who have data being archived on public cloud infrastructure (n=186)

Replacement of disaster recovery site(s)	37%
Upper management directive to use cloud storage services	35%
Replacement of tape for long-term backup storage	34%
Application requirements to use cloud storage services	31%
Geographic expansion required to use cloud storage services	31%
Lower capex costs for cloud storage services	30%
End-user or business-unit requested to use cloud storage services	28%
Other (please specify)	

Technological Discussion/Challenges

Gaps for Cloud Storage

Despite the benefits and momentum behind cloud storage services, respondents to our surveys indicated a few key areas where they found cloud storage services lacking compared with on-premises storage systems (see Figure 2):

Performance was the top disadvantage. In a recent VotE Storage survey, 30% of respondents chose performance as a shortcoming for cloud storage services, and this was more prominent with larger organizations with over 1,000 employees (38% of respondents). As organizations seek to leverage cloud resources to act as a failover site in the event of a disaster, they need to provide production-level performance and consistency to match production standards.

Cost efficiency is an area for improvement. Although important efficiency-boosting technologies such as inline deduplication and compression have been the norm for modern all-flash array system in on-premises environments for years, this is not the case with most cloud storage services. Deduplication and compression can increase the effective capacity of storage, essentially giving customers more storage capacity by eliminating redundant content, and it can potentially provide cost savings. Another key benefit of these technologies is that they shrink the payload size of workloads, which makes it easier to move data from site to site for data protection or operational reasons, such as leveraging a new execution venue.

Security is still a concern. This continues to come up as a concern in conversations with end users who are hesitant about moving workloads from on-premises to cloud environments. Beyond leveraging key technologies such as encryption of data both at rest and in-flight, the process of maintaining security needs to be easier.

In a recent end-user interview, a large retail organization held back its migration of primary data to cloud since its teams were not able to put the necessary security in place. On-premises staff that are now tasked with managing cloud storage services will need to be prepared for a substantial learning curve as they gain a better understanding about how to secure, provision and monitor cloud resources using the APIs and management tools provided by cloud providers.

"Pretty much all primary stuff is all in between datacenters [not in cloud]…. It's not that they are against it. They really don't have the security in place, and they have just so much on their plate."

– IT ENGINEERING, CONSUMER RETAIL, $2.5-4.9BN REVENUE, 10,000-49,999 HEADCOUNT
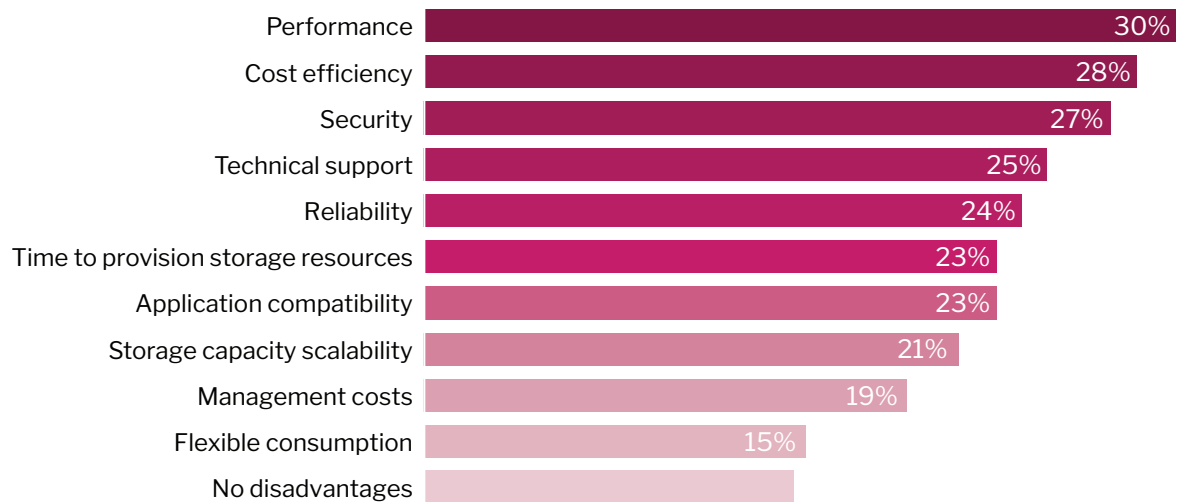
Technical support is perceived as a gap. A quarter of respondents claimed that the technical support of their cloud storage service provider was a key disadvantage in comparison to support they get for their on-premises storage systems. Support continues to be a key element in the customer experience for storage customers and could have an impact on a customer's ability to avoid or fix technical problems related to cloud storage services.

Figure 2: Disadvantages of cloud storage
Source: 451 Research's Voice of the Enterprise: Storage, Data Management & Disaster Recovery, 2020
Q: What are the key disadvantages – if any – of cloud storage services compared to on-premises storage systems? (Please select all that apply.)
Base: All respondents (n=194)

Performance	30%
Cost efficiency	28%
Security	27%
Technical support	25%
Reliability	24%
Time to provision storage resources	23%
Application compatibility	23%
Storage capacity scalability	21%
Management costs	19%
Flexible consumption	15%
No disadvantages	

Migration Matters

Closed and siloed environments are gradually becoming a thing of the past, with organizations demanding the ability to leverage resources and new technologies as quickly as possible. This in turn has increased the value of data migration capabilities to bridge the on-premises and cloud worlds.

Hybrid IT architectures, which leverage both on-premises and off-premises cloud/hosted services, are becoming more common. According to our VotE: Cloud, Hosting & Managed Services, Workloads & Key Projects 2020 survey, 42% of respondents have a hybrid IT architecture in place, and an additional 29% are either in the process of implementing a hybrid architecture or have plans to do so. Multicloud is another approach that has become common, and in the survey, 72% of the respondents that where using public cloud IaaS indicated they were using more than one vendor; this figure rose to 79% of respondents among large enterprises (10,000+ employees). In addition to the rise of hybrid IT and multicloud, there are several factors that make data migration technologies and processes important, including:
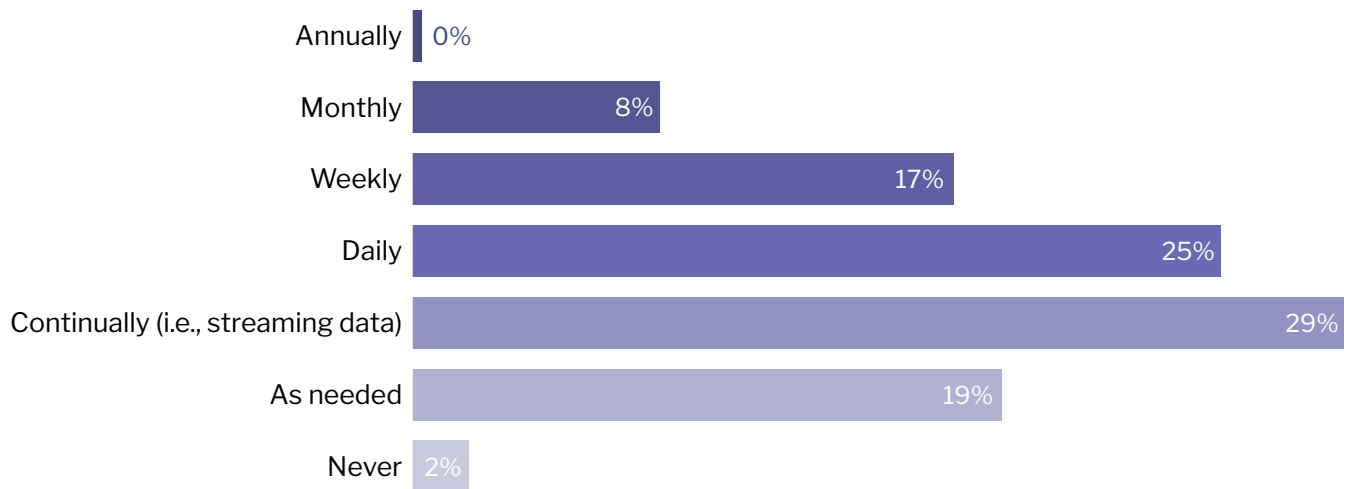
Data migration happens frequently for many organizations. While storage professionals typically think of data migrations as episodic events that happen with a system refresh or datacenter move, in the hybrid cloud world, data migrations – which include bidirectional data movement to and from cloud environments – are common. In the VotE: Storage, Data Management and Disaster Recovery survey, 25% of respondents claimed they were migrating data to/from cloud and on-premises environments on a daily basis (see Figure 3). Furthermore, an additional 29% said the migration of data was happening continually in their environments to support use cases such as streaming data. In some cases, limited network bandwidth is forcing organizations to do continual migrations because they cannot move an entire payload in a migration session. Egress charges that hyperscalers impose when customers retrieve data from public clouds to on-premises environments are another complication for organizations.

Figure 3: Data migration happens frequently
Source: 451 Research's Voice of the Enterprise: Storage, Data Management & Disaster Recovery 2020
Q: How often does your organization transfer on-premises data to/from public cloud environments?
Base: Respondents who have migrated workloads/applications (n=335)

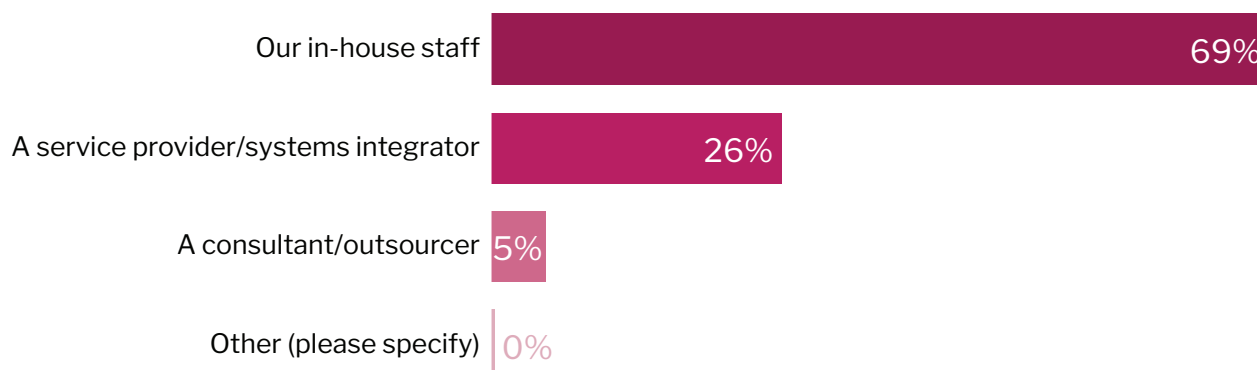| Category	Percentage
Annually	0%
Monthly	8%
Weekly	17%
Daily	25%
Continually (i.e., streaming data)	29%
As needed	19%
Never	2%

In-house staff run most migrations. In the survey, 69% of respondents claimed that in-house staff were responsible for managing the migration process for their organizations (see Figure 4). In contrast, 26% said they rely on a systems integrator or service provider to handle this task, while 5% use consultants or outsourcers. To help in-house staff, data migration tools and processes need to become easier to set up and manage to ensure migrations happen in a timely fashion and do not prevent the organization from tapping into the resources of a fully functioning hybrid cloud architecture. Automation is another key area for improvement, which organizations should consider when creating their data migration plans.

Figure 4: In-house staff run most migrations

Source: 451 Research's Voice of the Enterprise: Storage, Data Management & Disaster Recovery 2020
Q: In your organization, who manages the process of transferring on-premises data to/from public cloud environments?
*Base: Respondents who have migrated workloads/applications (n=335)*

Our in-house staff	69%
A service provider/systems integrator	26%
A consultant/outsourcer	5%
Other (please specify)	0%

Downtime tolerance is low for migrations. In the survey, 19% respondents claimed they could not afford to have any downtime during their data transfer operations, while another 35% said that only downtime on the scale of minutes was acceptable. Ultimately, migrating data either via network links or by physical transports can take a considerable amount of time – days, weeks or even months for organizations dealing with large datasets on the scale of hundreds of terabytes or petabytes. As a result, organizations need to invest in intelligent data migration capabilities that can replicate data to a new site while keeping the active dataset available during the process. Enterprise-class storage systems and specialized software packages are typically used for these large-scale migrations since they limit downtime to the cutover point when the data has already moved to the new site.

Figure 5: Lengthy downtime is not acceptable for most migrations

Source: 451 Research's Voice of the Enterprise: Storage, Data Management & Disaster Recovery 2020
Q: What is acceptable downtime allowed for a data transfer operation?
Base: Respondents who migrate workloads/applications to/from public cloud environments (n=329)

No downtime	19%
Minutes	35%
Hours	35%
Days	8%
Weeks	2%
Months	1%
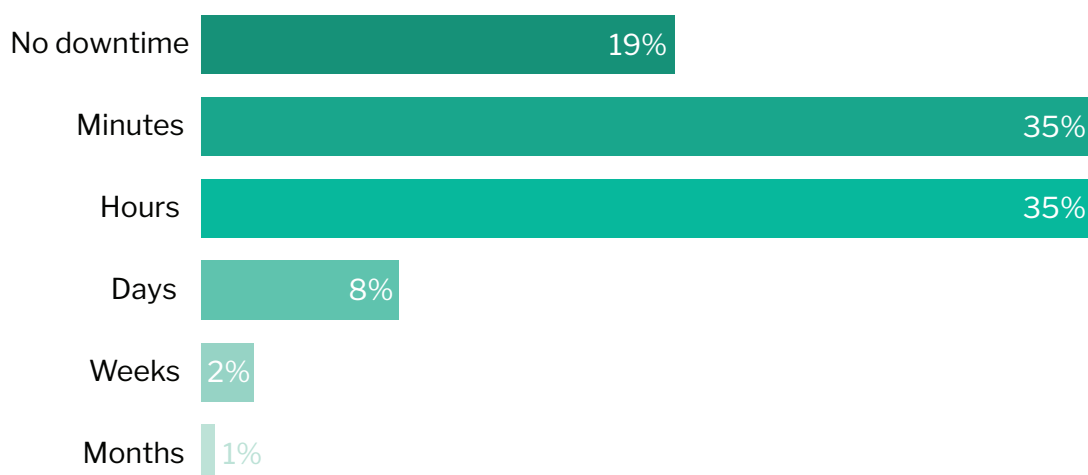
Data Transports

In the Data Management and Disaster Recovery survey, we found that 48% of organizations are using network transports to migrate data from on-premises datacenters to cloud service providers (see Figure 6), in contrast to physical transports (8% of respondents) and provider-enabled transports (18% of respondents).
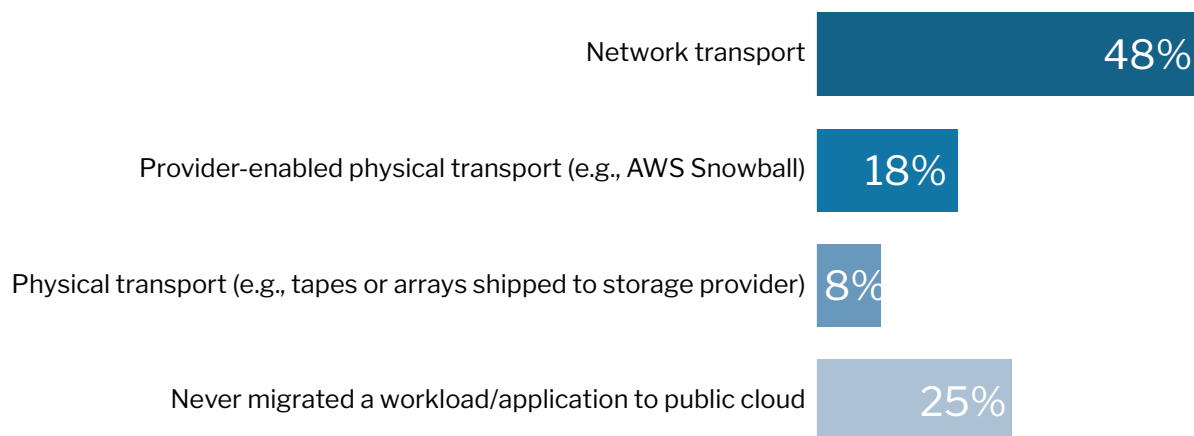
Organizations that plan to move data over networks should leverage intelligent data management tools to understand which data can be moved easily and which data is frequently accessed and cannot be moved without planning. Network consumption is another concern since disruption of production applications and workloads could occur if wide area networks use up too much of their capacity on migration jobs. This is often a concern when migrating data from remote sites or in countries where WAN bandwidth is expensive or limited. The use of storage efficiency boosting technologies such as deduplication and compression should be considered as well since they can potentially move a dataset many times faster than a basic copy operation. A final consideration for network transfers is security, and organizations are often looking to use data-at-rest and in-flight encryption to protect data throughout the entire migration process.

Figure 6: Network is the main migration transport method
Source: 451 Research's Voice of the Enterprise: Storage, Data Management & Disaster Recovery 2020
Q: Thinking of your organization's last workload/application migration from a company-owned datacenter to a cloud service provider, how did the migration occur?
Base: All respondents (n=458

Category	Percentage
Network transport	48%
Provider-enabled physical transport (e.g., AWS Snowball)	18%
Physical transport (e.g., tapes or arrays shipped to storage provider)	8%
Never migrated a workload/application to public cloud	25%

Recommendations

With the rise of hybrid cloud and multicloud environments, organizations should select cloud storage services that are on par with the on-premises storage systems they already rely on. As we discussed previously, reliability, performance and cost efficiency are potential gaps in current cloud storage services. These are areas where a premium cloud service with advanced capabilities such as deduplication, space-saving snapshots and proactive management tools can provide a boost over standard storage services.

Modern organizations will need integration with virtualization and container orchestration tools to reach the level of agility required to rapidly create environments for test/dev and production use cases. The use of cloud resources as a replacement for disaster recovery sites is already recognized as a top driver for cloud consumption. The on-demand nature of cloud is a cost-saving benefit for organizations, and we also note that by leveraging multiple availability zones, customers can enhance their resiliency in the case of a large-scale disaster.

Pure Cloud Block Store

Pure Cloud Block Store is a cloud storage solution that abstracts applications and data from their underlying hardware, enabling data mobility between on-premises and cloud environments. Pure Cloud Block Store delivers high availability and resiliency within an availability zone (AZ) or between multiple AZs in different regions while maintaining a consistent user experience. Keep data replicas in sync with master data sets and maintain data integrity with always-on encryption. Pure Storage, a member of TSANet (Technical Support Alliances Network), works collaboratively to address our cloud joint customers' diverse and ever changing needs. Pure Storage products integrate, are managed and supported on today's leading cloud platforms, creating a consistent data layer to facilitate simplified and consistent user experiences and data and workload mobility for today's most critical business applications.

Learn more at: *purestorage.com/cloud-block-store*.

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