

OVERCOMING THE CLOUD STORAGE CHALLENGE

Building and Operating Real Hybrid Clouds Today with NetApp

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Cloud adoption seems inevitable almost by definition – organizations ever in search of better IT economics and increasingly competitive services are naturally seeking out the elastic, self-provisioning, and dynamically optimizing capabilities that comprise cloud solutions. Transforming traditional IT with cloud approaches empowers business users while enabling IT to focus on adding value instead of being seen only as a necessary cost.

With maturing technologies that can bridge and span across the many types of possible cloud deployments, it's becoming fluidly possible to implement and seamlessly integrate clouds with existing infrastructure and data centers. But there are still significant challenges to getting a “hybrid” cloud right. The real trick to cloud success today is twofold – first, understanding that there is a range of cloud approaches and that the likely optimal architecture for existing organizations will be a “hybrid” approach, and second being able to successfully manage across such a mixed “model” of on-premise, private, and public services.

At the heart of the rationale driving the hybrid approach is data. While cloud computing is a resource that is quick to spin up and down as needed, bursting elastically and with little risk, cloud storage is another matter. Data requires protection, permanence, and performance characteristics that are problematic in pure public cloud scenarios, while pure private clouds can't fully recognize the potential of cloud economics. A hybrid approach bridges these two worlds, and if successful can help organizations with their data requirements and still gain cloud advantages.

The key to successfully implementing a hybrid cloud approach lies in having the right IT infrastructure and management solutions that are capable and consistent across multiple types of likely hybrid cloud architectures. In fact, in this new hybrid world, the success of all of IT will likely boil down to how well IT can stay on top of and manage across the underlying integrated web of on-premise and cloud-based storage. NetApp's unique approach here is two-fold – deploy Data ONTAP as a consistent storage platform across the hybrid cloud, and then leverage the proven OnCommand portfolio to manage it.

In this report we'll first examine the types of hybrid cloud architectures that are most likely to arise, and the management challenges they present. We'll then summarize the key storage management factors required in the new hybrid cloud world, and show how a mature suite of management capabilities as found in NetApp OnCommand working together with the related NetApp storage portfolio solutions (e.g. Data ONTAP, Cloud ONTAP, etc.) line up to help IT organizations succeed in extending their datacenter forward through a cloud adoption journey in a familiar, effective and efficient manner.

IT'S A CLOUDY WORLD

Beyond new Web 2.0 type companies built entirely on public cloud hosting, rarely will an existing organization's cloud adoption be fully hosted on just one place/type of cloud. While it's going to be a cloudier world due to relentless business pressures seeking greater service and less cost, we predict

that most IT over time will transform into a “hybrid” of on-premise infrastructure, public services, virtual private resources, and so on. Always accountable, IT will have the enviable task of managing an increasingly complex, geo-distributed and network-separated infrastructure that they don’t fully control, while also being given the opportunity to dynamically optimize their architecture and services for greatest efficiency and best service (at lowest cost).

The big challenge to wholesale cloud migration, moving everything into a public cloud and relying on the service provider’s IT completely, is corporate data. Metaphorically, data has “friction”, “inertia” and “gravity” that can make it difficult or expensive to move, store, and retrieve it quickly on demand across unspecified and unknown cloud hosting, limiting the promised benefits of cloud economics. Much corporate data requires specific protection (e.g. security, BC/DR), permanence (e.g. compliance and regulation policies), and performance (e.g. access, availability, latency, throughput/bandwidth) service levels that are simply hard to guarantee in public cloud hosting.

On the other hand, pure “private” clouds aren’t by definition multi-tenant shared resources. Although when actively managed by IT as a Service Provider they can appear to be self-provisioning and elastic to end users, the underlying infrastructure still requires committed CAPEX and dedicated OPEX.

A hybrid approach bridges these two worlds to provide infrastructure and services that both protects data as necessary and takes advantage of cloud economics where possible. In this hybrid world, we’ve seen some creative approaches to data storage. Different workloads and data sets can be hosted in several ways that match the elastic profile of required computing with the sensitivity and weight of associated storage. To take best advantage of the hybrid opportunity, the first step is figure out where the data should be landed and managed.

For example, one of the most intriguing and practical hybrid solutions we’ve seen is NetApp Private Storage (NPS), in which an IT organization places their own NetApp arrays in NetApp arranged co-locations intimately near well-known hyperscale public cloud provider datacenters. This privately owned, controlled, and managed NetApp storage then has low latency and a big pipe that supports large-scale public cloud computing. This is great for workloads with specific data management requirements that now can take advantage of cloud bursting, elasticity, and access.

There are many other possible hybrid scenarios, like test/dev workloads bursting in the public cloud and requiring only “sample” datasets to be copied in quickly and temporarily. Other examples include mission critical workloads that need to run on-premise but access far-flung data sets, big data and BI analytics that might have data workflows going in many directions, and virtualized environments where workloads (and their data) should be migrated dynamically where it’s most efficient and economical to currently run. And no doubt more useful permutations will emerge over time.

These hybrid examples might make experienced IT administrators shudder a bit. After all, it’s taken decades to mature on-premise data center management. How can existing IT – people, processes, and technology investments – extend to take advantage of these new hybrid opportunities?

In fact, extension is probably the key word to keep in mind. The best route to success involves leveraging proven solutions (with existing staff experience and investment previously made in them), and extending them out from the traditional datacenter where possible. This is where we see NetApp providing some serious advantages to the intrepid hybrid cloud builder.

This is based on two main elements – the NetApp OnCommand suite for management, and NetApp enabled hybrid cloud scenarios that entail leveraging versions of Data ONTAP as a common platform appearing in various hybrid cloud locations. It’s worth pointing out however, that the OnCommand portfolio is capable of multi-vendor management, so while a consistent Data ONTAP deployment has great benefit (as we will see later), mixed storage scenarios are not an impediment and in fact would be expected in any large and diverse organization.

NETAPP ON THE CLOUD ADOPTION JOURNEY

While the so-called “journey to the cloud” can be told many ways, NetApp has some particular advantages in that it’s been a storage leader in all the practical main steps an enterprise might take to the cloud. Unlike other storage vendors that are attempting to badger their customers into their own cloud hosting, or make them painfully transition wholesale to “elastic cloud” storage arrays built, designed and operated differently than their existing enterprise storage, NetApp is seeking to do what’s best for their customers. This involves providing choices, preserving investments, and enabling hybrid solutions – all leading up to where a customer can optimize all along their chosen cloud journey.

PRIVATE CLOUD

As a company evolves in IT maturity, and starts to transform its internal virtualization hosting into more of a private cloud service model, it will necessarily need to further consolidate resources, transition into an internal service provider, and of course stand up and manage scalable cloud infrastructure.

NetApp has recognized that an organization heavily invested in their successful virtualization storage solutions will want to make full use of them as they go forward with cloud adoption. We can see the first part of NetApp’s cloud strategy is to extend and leverage Data ONTAP as a universal data storage platform across the full range of private cloud scenarios, whether storage is hosted on-premise or at tier 2/3 cloud providers that offer varying levels of cloud-hosted private storage infrastructure. In fact, NetApp claims that it’s reported to be the largest provider of storage solutions to these service providers.

At the heart of what makes a private cloud a cloud, NetApp provides cloud builders effective cloud-friendly storage management solutions. The benefit is that these “new” cloud solutions are actually the well-proven NetApp data center capabilities that extend and remain consistent in applicability across the cloud journey – physical, virtual, and now at this step private cloud. The primary solutions include OnCommand System Manager, Unified Manager, Workflow Automation (WFA), and Insight storage resource management that can manage, automate, integrate and orchestrate storage activities whether traditional, virtual, or private cloud (including custom, OpenStack, and/or prebuilt VMware or MS private cloud solutions).

PUBLIC CLOUD

As a result of working with their large install base, NetApp has come to appreciate that focusing only on private clouds severely constrains making good use of public cloud services. When working with a public cloud however, by definition native public cloud storage service infrastructure tends to be completely opaque and therefore “off-radar” when it comes to IT oversight, making manageability and risk mitigation all the more important. In this regard, NetApp has come up with two brilliant approaches to enable practical and efficient public cloud adoption.

First, hyperscale cloud providers (e.g. Amazon Web Services) present great opportunities to take advantage of elastic compute capabilities and economics, but with difficult data management problems, especially for sensitive corporate data. In addition to lack of sufficient data management, much less any storage infrastructure level insight or management capabilities, a heavy reliance on public cloud storage over time can also become a relatively expensive proposition.

As we noted earlier, here is where NetApp’s NPS solution proves eminently practical, straightforward, and easy to adopt. By enabling public cloud adoption, key benefits are obvious – the consistent use of NetApp storage array capabilities and the direct storage management coverage by solutions like the NetApp OnCommand portfolio of products. This enables an enterprise to make interesting and economically advantageous use of hyperscale cloud computing without sacrificing data control or hemorrhaging money.

Second, NetApp is also packaging up a Data ONTAP version called Cloud ONTAP that will run on a cloud machine instance (layered over whatever block storage is available in the cloud). Although Cloud ONTAP is currently targeted at first release for Amazon Web Services for dev/test scenarios (as a primary workload expected suitable for public cloud-side data hosting), all instances of Cloud ONTAP can be fully managed as first-class storage arrays directly from a customer's internal NetApp management solutions. Given the enterprise features of Data ONTAP, it's possible that over time Cloud ONTAP could be validated for certain BC/DR and other production application scenarios.

HYBRID CLOUDS

We expect that most enterprise cloud journeys will ultimately end up in a hybrid state, combining on-premise, hosted private cloud, and public cloud computing in some ever-evolving, dynamically balanced architecture. As we've been examining, getting control of data and its storage down solid is an absolute pre-requisite. Without aligned and well-managed storage it will be impossible to recognize the promised cost, agility and risk benefits from adopting a hybrid cloud architecture.

NetApp has a long history in the data center, and as a result has worked out practical paths to cloud adoption (and working closely with many customers doing it). NetApp has arranged their portfolios and solutions so that optimal hybrid use cases can be approached as extensions to the data centers of today. Because of heterogeneous cross-environment issues that include security and firewalls, widely distributed large-scale operations, remote data collection issues, and the need for timely consolidated views and reports, hybrid cloud management isn't easily accomplished with most traditional storage and data management tools. We think NetApp is competitively unique with their practical and efficient (and cost-effective) hybrid-enabling storage management.

Management is Key to Hybrid Clouds

The storage management challenges with hybrid clouds derive from the distributed and disparate hosting that must all be viewed as one end-to-end system. While the hybrid cloud presents a business optimized blend of agility, economics, reliability, and competitiveness, to get there they must have efficient IT supported mechanisms for self-service provisioning at desired service levels, and on the backside to guarantee contracted service delivery at minimal cost. This comes from cohesive IT management that must span the hybrid cloud architecture.

This leads back to our definition of brokering, the process of managing and optimizing data storage and flow in, amongst and between the various possible hybrid architecture locations. Effective brokering requires capabilities to baseline, monitor, react, plan, migrate, and report on data no matter where it lives or is being used. As an IT shop starts to think about adoption paths, and requirements for hybrid cloud, transitioning from IT Builder to Service Broker, they should ensure they have coverage in these following areas:

- **Self-Service** – This includes capabilities for establishing and evolving a catalog of appropriate and

Clustered (and Cloud) ONTAP for the Hybrid Cloud

Along with OnCommand management, NetApp's Data ONTAP software itself contributes greatly to NetApp's hybrid cloud approach.

- Data ONTAP provides fundamental cloud-building capabilities including seamless scalability, efficiency, and "non-disruptive operations".

- Using Data ONTAP in all hybrid locations ensures an interoperable set of storage features (i.e. replication, snapshots), enabling efficient data transport/migration, and consistent service quality. Data ONTAP is deployable on-premise, in SP's, in cloud co-locations, and even in public cloud.

- Data ONTAP is also a versatile platform that can be applied to many use cases designed to take advantage of hybrid clouds – available in FAS products, through FlexPod solutions, and now also as a cloud instance (Cloud ONTAP).

relevant services, as well as the provisioning automation necessary for agile, elastic operations.

- **Service Analytics** – This includes being able to baseline, monitor and report on delivered QoS, end user utilization, efficiencies and remaining capacities. This supports the optimal performance, capacity planning, and high availability requirements that large shared infrastructures demand.
- **Cloud Economics** – This includes managing service costs with the desired service qualities (performance, protection, availability, bandwidth/access, et.al.), both on internal and external platforms. Hybrid cloud owners need comprehensive facilities for cost management and to execute the subsequent data migrations required to optimize spending over time.
- **Automation** – Many, if not most, of the tasks performed in traditional silo storage management must be automated so that they can be implemented across all the various data storage opportunities in the hybrid scenario. This is critical to achieve scale, control costs, and manage risk as data spreads out of the traditional data center silo.

COMMANDING CLOUDS WITH NETAPP ONCOMMAND SUITE

We’ve reviewed the NetApp management portfolio and have determined that fundamentally, NetApp has evolved their proven solutions to provide robust capabilities in the areas above that together

OnCommand	Product Description
System Manager	Provides device level management of NetApp storage systems
Unified Manager	Discovers, monitors and alerts on the health of your NetApp storage environment
Performance Manager	Provides performance monitoring and root-cause analysis of clustered Data ONTAP; integrated with Unified Manager
Workflow Automation	Automates repeatable storage tasks and integrates with IT and orchestration systems to enforce standards and reduce storage management complexity
Insight	Facilitates configuration and performance management, capacity planning, and advanced reporting for heterogeneous environments to optimize storage management and capacity utilization
Cloud Manager	Provides management for Data ONTAP hybrid clouds, including NetApp Cloud ONTAP and NPS, easing configuration, provisioning, and monitoring across all virtual and hardware cloud storage nodes

Table 1 - The OnCommand portfolio provides robust capabilities for storage management in a hybrid cloud

overcome the inherent (and distributed) challenges to successful hybrid cloud management. Central components to their hybrid cloud solution specifically are multi-vendor storage management, workflow automation, and cloud operations management.

OnCommand Insight – At a high level, OnCommand Insight is designed to assure service levels through monitoring performance, managing capacity, identifying reclamation opportunities, and managing IT cost awareness. This intelligence can be served back to the entire IT organization through dashboards and reports.

Together, these features enable the optimization of hybrid cloud storage through:

- **Efficient Storage Operations** – The management interface is accessible from a range of end-user computing devices enabling quick and comprehensive storage tasks, operations, analysis, and remediation.
- **Ensuring Service Quality** – Insight can be used to baseline and profile performance, manage configurations and changes, and trend and forecast capacity for the optimal balancing and alignment of data to storage. Insight makes visible the whole path of data workloads to storage leading to better performance, increased availability, and lower operating costs.
- **Optimizing Cost Management** – Insight tracks comprehensive utilization and service metrics, supporting an end-to-end BI level analysis and reporting of consumption for chargeback/showback. Storage allocations and their subsequent costs can then be optimized across the hybrid cloud.

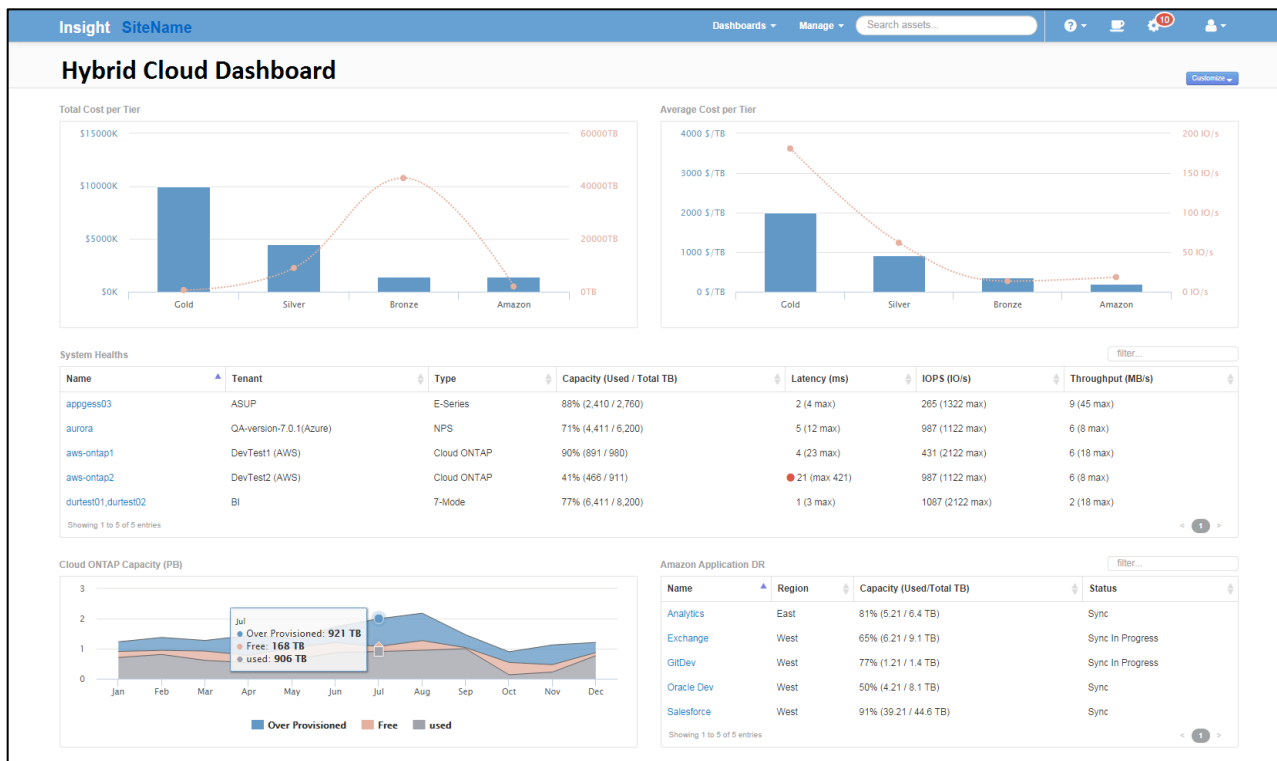


Figure 1 - OnCommand Insight Hybrid Cloud Dashboard

Insight has efficient remote collection and is thoroughly heterogeneous supporting all NetApp platforms and 3rd party storage including EMC, HP, HDS, and IBM as well as switches, NPV/access gateways, and virtualization vendors.

Workflow Automation (WFA) – Automation is key to complex cloud management. Even though Data ONTAP is highly featured (see sidebar), it’s the integrated automation of tasks that makes the cloud successful. WFA is key to the distributed and reliable operations, and forms the basis for establishing consistent storage services (i.e. gold/silver/copper storage).

WFA today is included with NetApp storage and Data ONTAP. It provides an environment for easily creating automated “runbooks” of storage processes, and comes with an existing catalog of automation services and a library of workflow building blocks that greatly simplify storage management in complex environments. One of the unique features of WFA is that a storage domain expert can use it to delegate to and enable downstream non-storage admins (e.g., virtual admins, devops, DBA’s) with the ability to execute powerful storage tasks that are aligned with pre-defined service level objectives (but not modify them or otherwise go “off script”). This automation effectively enables building any kind and scale of hybrid storage architecture while encapsulating custom operations safely within a self-service operator portal.

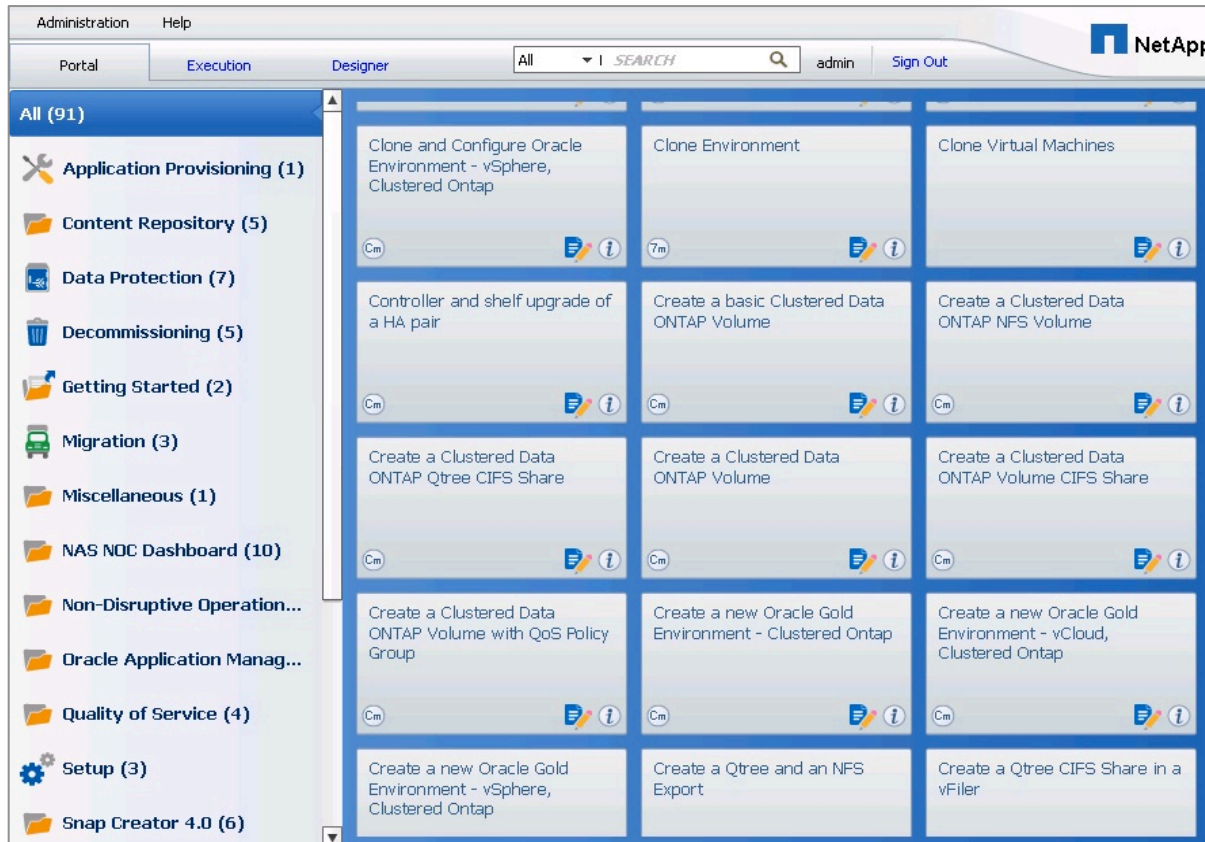


Figure 2 Automate and standardize manual processes with more than 50 workflows out of the box.

WFA is created around an open framework to allow for the design of custom cloud services and integration with third party orchestration solutions supporting end-to-end service delivery.

Cloud Manager - OnCommand Cloud Manager provides management for Data ONTAP-based hybrid cloud storage architectures, including Cloud ONTAP and NPS. Cloud Manager eases the day-to-day operations for Cloud ONTAP and NPS environments, including configuring, provisioning and monitoring of active virtual and hardware cloud storage nodes. It’s used to rapidly deploy Cloud ONTAP instances and can even automatically select and assign cloud resources. For example, when deploying to Amazon Web Services (AWS), it can use your AWS credentials to automatically select the right EC2 virtual machine and EBS storage.

TANEJA GROUP OPINION

Hybrid cloud is not just an opportunity, but might soon become a competitive mandate – get to the cloud or get left behind. NetApp appears on the surface to have taken an indirect approach to cloud, with many of its competitors out directly trying to sell their own commodity cloud storage services,

or position disparate cloud storage solutions that are quite distinct from their existing enterprise products for cloud building. To some degree, when we were fully briefed on NetApp's currently understated cloud strategy here at Taneja Group, we were struck with both its subtlety and eminently practical approach.

As outlined in this report, there are several parts to the NetApp hybrid cloud story, but they all hang tightly together, and the cloud adoption paths that NetApp clients can easily take will likely give them competitive advantage over those facing more difficult transitions. We expect that those that can first take best advantage of cloud benefits will come to dominate their competition. By offering a seamless, low risk, and frankly boring route (one not full of challenges or danger) to hybrid cloud, we think current NetApp customers will find themselves soon operating hybrid clouds without much thought or effort.

As we've seen, more than a single platform, key to this is a consistent, extensible storage management that enables hybrid storage operations, a service management orientation, and an ability to minimize costs. In other words, effective cloud brokering. While some elements of the NetApp management portfolio like WFA are not yet heterogeneous (it is on the roadmap), we see the OnCommand Insight already providing the key brokering functionality heterogeneously across mixed storage environments.

Furthermore, NetApp is continuing to innovate, and has its targets locked on this hybrid future with impending releases of Cloud Manager to help actively broker/migrate across competing public cloud providers, Cloud ONTAP virtual storage arrays, expanding NPS hyper-scale providers, and broadening heterogeneous management. NetApp of all the big storage vendors is maintaining a clear focus on solving storage challenges, which for clouds and hybrid clouds especially is really the single-most big transformational issue that IT faces today.

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