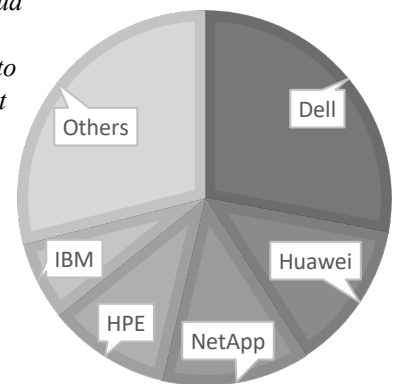# Data Storage Competitive Insights

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Abstract

The market for Data Storage systems is forecast to continue to grow indefinitely, both in cloud storage and on-premise data storage. This growth reflects the continued demand for data as new technologies enable the capture of new data sources and new applications enable data to create value. In 2022, Huawei together with four top competitors in the Data Storage market received about 2/3 of the available revenue. These competitors share some common vision about the direction for Data Storage, but also differ in their approach and investment to capitalize on the growth and changes in the market. This report attempts to explain and predict the behavior of these top four competitors to Huawei (Dell/EMC, HPE, IBM, and NetApp) as well as provide recommendations based on the apparent competitive strategies. The intended audience for this research is executive management.

TOP 5 VENDOR SHARE

1. Dell

Dell has dropped the "EMC" from Dell/EMC in most of its communications. This also reflects an overall change in attitude the company has in regard to product lines outside of its server business. Like Huawei, a major source of revenue for Dell is in consumer devices, and the overall culture of the company is not receptive to establishing long-term value.

Dell's Storage product portfolio reflects a long history of acquisitions. Many of the products are competitive within the portfolio. Few of the products are designed to work together, but Dell is quickly resolving these issues.

As the market leader, Dell is the company to beat. The largest market share gains are made by taking customers from the leader.

1.1 Current Status & Focus

Dell continues to segment Storage into traditional segments, including "Primary" and "Unstructured". These follow the lines of Storage product legacy which continue to shape the thinking of Storage analysts, competitors, and old-school customers.

Dell's current Storage portfolio consists of the following offerings, within their segments:

Primary Storage

PowerStore is the lead product for Dell in the Primary Storage segment. It is an SDS system, created from EMC's Unity XT and provided on Dell server hardware. It has a unified block and file version and a specific version that includes the VMware hypervisor. It has many competitive disadvantages that are part of its development legacy, including not being truly active-active, limited scalability, uses ALUA failover, and does not have synchronous replication without using a VPLEX Metro node. Dell continues to invest in PowerStore, and has removed several competing prodcuts from the sales portfolio, with hopes for furthering its SDS capabilities and Cloud relevance.

PowerMax is essentially the same VMAX from 2013. It is clear from the management, operation, and features that this is largely the same code base from Symmetrix with little change. All of the new features and configurations were possible in VMAX, with the major recent developments being the transition from SAS attached drives to NVMe, reflecting the change in hardware from EMC custom to Dell off-the-shelf, reverting to the former RAID-5 configurations but now calling it "FlexRAID", removing the segmentation of CPU functions, and providing NVMe/TCP and NoF on the front end. Another change that looks significant outside, but was easily accomplished due to the VMAX Guest Host function (which is the sidecar by which VMAX/PowerMax has always provided NAS), was including PowerStore as a guest to create SDNAS. The lack of large innovation in PowerMax makes sense considering the reduction in the number of engineers working on the system as a result of layoffs and those leaving on their own. Dell also has severely cut from other support functions for PowerMax, which is a good indication that PowerMax's days are limited, and Dell is subtely attempting to transition customers from PowerMax onto other platforms which are lower cost for Dell to maintain, such as PowerStore. Dell's interest in PowerMax is driven by its current market and customer tolerance of elevated pricing, and often relies on its stickiness to retain customers in competitive bids.

PowerVault is targeting the SMB Storage market as well as being relevant for HPC, VDI, and Edge. Dell was attempting to move current PowerVault customers to the entry-level SC series through channel-only SPIFs and promotions, but now has reversed that direction and has embraced PowerVault after dropping the entire SC (Compellent) product line. Customers of the former PS (EqualLogic) series who did not shift to SC last year are now being migrated to PowerVault. Dell has had several different products with the PowerVault name over the years which were developed by other companies, including the DL (Symantec), MD (LSI/Engenio), and NX (Microsoft). Rumor has it that PowerVault ME5 is a mix of SC code with some PS, DataDomain, and other "inspiration" [1] in its code. Dell pushes ME5 for the low-end block (DAS/SAN) and NX for NAS, including backup. PowerVault fits well within the Dell mindset, and the leaders hope to grow the SMB on-prem Storage business through ME5 and NX.

Legacy products such as **Unity XT** and **VMAX** are still being sold by Dell on their unique hardware.

Unstructured Data Storage

PowerScale is Dell's lead unstructured product. It is a scale-out achitecture, though rather limited in how large it gets with a maximum of 186 PB in a 252-node cluster. PowerScale is an evolution of EMC's Isilon, which was recently improved by the Infinity effort in removing some of the limitations that the OneFS filesystem inherited from FreeBSD. Apparently, Dell is still struggling with other legacy limitations in the Isilon architecture that hamper scalability beyond 252 nodes. Dell recently added NVMe

capabilities to PowerScale and also was late to the party with many Data Reduction features for their all-flash nodes. OneFS does not support Objects directly, and thus provides a translator capability within PowerScale to map S3 objects into its internal OneFS storage (object-protocol-on-file). This is a fundamental limitation that hampers PowerScale's ability to perform well in high-performance Object Store use cases. Dell is still invested in PowerScale, because it already has a large market share to be maintained, though many key thought-leaders have left the company.

ECS is Dell's other scale-out Object offering. It can provide 11.2PB per rack running on standard off-the-shelf servers, with an advertised "no maximum" for the number of nodes in a cluster. ECS is the merger EMC's Centera and Atmos object storage platforms. Centera was a CAS Object Storage product designed as a regulatory-compliant analytics WORM archive and adopted technology EMC bought from Storigen Systems. Atmos was designed as a software-only COS product originally released in 2008 to solve global Cloud distribution. It seems clear that Dell does not see a future in this product since it did not get rebranded with a "Power" name. ObjectScale is a software-only scale-out Object Store for Containers derived from the ECS codebase. Both ECS and ObjectScale can be downloaded for non-production use from the Dell website.

Streaming Data Platform, or "SDP", is the commercial version of the open source Pravega software that adds persistence to message bus streamed data using Data Storage systems.

HCI Storage

EMC bought ScaleIO and renamed it as part of the VMware portfolio to VxFlex. Dell renamed the product **PowerFlex**. PowerFlex fits Dell's preferences for a Data Storage product. It is software-only and runs on standard Dell server hardware. PowerFlex AWS runs on AWS and can use EBS for persistent storage or the EC2 Instance Store. PowerFlex is one of Dell's favourites and they heavily invest in its development. However, it is worth noting that Dell does not position this as a general-purpose Data Storage offering, but only in the context of HCI.

Dell also provides Nutanix HCI storage as part of their Dell **XC** HCI offering.

Backup

Aside from Data Storage systems being used as backup targets, Dell has **PowerProtect DD**. This rebranding and evolution of DataDomain now includes features for Ransomware protection. It is still receiving significant investment to maintain the product. **PowerProtect Data Manager** is the software to manage the PowerProtect appliances and can be provided as software or on an appliance. The most significant advantage for the PowerProtect line is the management software, which discovers Containers, VMs, databases, filesystems, and other entities and orchestrates their protection. The backup strategy can be drive from applications, by policy, or from a single management pane.

Storage Management

Dell's Storage Management is largely a collection of management tools from a long history of acquisitions. Each Data Storage product line has its own ecosystem and its own management toolset. However, Dell also has some Storage Management products designed to unify the portfolio.

CloudIQ is a cloud-based application to provide AIOps and Systems Management across PowerStore, PowerMax, PowerScale, PowerVault, Unity XT, XtremIO, and the SC series Data Storage systems. It also manages servers; HCI assets including VxBlock, VxRail, and PowerFlex; and networks including PowerSwitch and Connectrix. Its AIOps features include proactive management and health monitoring that includes VxRail clusters, STaaS, anomoly detection, and cybersecurity. CloudIQ manages nearly the full stack, including systems in the data center, at the edge, and cloud assets. It also has reach into the platforms running on the systems, with knowledge of VMs and Containers. **SRM** is still supported be Dell, and is their heterogeneous monitoring, visualization, and reporting platform.

DataIQ manages unstructured data. It monitors storage systems, but for the purposes of providing scanning, indexing and search capabilities across heterogeneous systems. It provides insights into data usage, tagging, user access patterns, and performance. DataIQ is the platform for real data services that go beyond data protection and security, but enables customers to find and extract value from their data.

AppSync provides Copy Data Management and allows users and applications to create and manage thin copies of data. This has become a key application for DevTest as well as analytics workloads.

CloudLink is another important tool in the Dell portfolio. It provides key management and a unified multi-level capability to encrypt data for Bare-metal, Virtualized, and Containerized workloads across Public and Private Clouds.

Dell also still supports **Connectrix, VPLEX,** and **PowerPath**.

1.2 Expected Response & Strategy

Dell can be expected to continue the products in their portfolio as required to substantially retain the revenue they bring. Dell will cut off profitable products and is willing to sacrifice customers for the volume business.

Based on Dell's investments and prior behaviors, it can be expected that PowerMax and ECS will be eliminated as soon as customers will largely accept PowerStore and PowerScale, respectively, for their use cases. A further convergence of PowerStore and PowerVault lines is also very likely since Dell internal management is personally invested in the Compellant acquisition, and will not allow PowerVault to fail or look bad relative to other products.

PowerScale continues to work heavily to remove the limitations of their architecture. Without real scalability and high-performance Object, PowerScale has a limited future. PowerFlex continues to grow and has a lot more design flexibility than PowerScale. While PowerScale continues to win deals and retain customers, it would be very Dell for them to divest themselves of the high expense of the engineering required to keep it going, and opt to retain only PowerFlex.

Dell is highly aware of the market evolution. Their **APEX** offering hits the market with unified Cloud as a Service promises the customer wants to hear. The Data Storage is owned and maintained by Dell directly, as a full STaaS offering. The customer uses the APEX console to provision capacity without any need to know anything about infrastructure. APEX's promise is an ideal fit for VDI, Containerized and VM-deployed applications including any associated databases, as well as AI/ML and HPC. Dell knows APEX is a significant offering for both direct and channel businesses, and will expand this capability into more geographies and industries. We can expect them to expand the automation, Edge support, debug and resiliency intelligence, and data services offerings, as well as provide industry-specific features, packagings, and customer-ready solutions as cloud-managed appliances. APEX must grow to match HPE's GreenLake vision, or EMC will lose significant market share to HPE.

CloudIQ and DataIQ are addressing management costs and cutting across all levels of infrastructure. These tools will also be improved if for no other reason but to improve the APEX offering. Dell is already significantly ahead in these areas and will also be moving to industry trends for automation, self-service and as-a-service, and Cloud-centric operation.

Notice that this Dell strategy does not include goals for high levels of IO performance. Dell is aware that the customers place performance much lower over the long term than other business needs such as cost reduction, primarily through reduction of non-revenue-generating personnel costs; reducing risk, through data protection, security, and increasing application resilience; and increasing agility to respond to changes in business needs and to leverage new technologies. Dell also will look to reduce its own internal costs and fend off HPE's product advances.

2. HPE

HPE has some advantages over competitors. They are very adept at marketing to the business of the customer. They also have a lot of resources in key geographies to stay in front of customers and support pre-sales and post-sales efforts. They have been quick to adapt to new consumption models and Cloud technologies. Although their portfolio contains a collection of products obtained through acquisitions, they have unified the management of this diverse portfolio under GreenLake, which is the lead proposal for every customer interaction.

2.1 Current Status & Focus

HPE divides their Data Storage products into several categories, but all of them are available as part of their as-a-service offering, HPE GreenLake for Storage.

Hyperconverged Infrastructure (HCI) Solutions

Simplivity is the lead product for HCI. It is the HCI offering that defines a standard for what an HCI does. However, it does not scale to support large operations with only 96 nodes in a federation and a total raw capacity of about 4.4PB. It is simple to deploy and use, and tends to be targeted to ROBO and Edge deployment.

Alletra dHCI is a disaggregated HCI that scales much larger and is often higher performance than Simplivity. It uses Nimble for the Data Storage. The advantage of dHCI is that it looks like HCI from a management perspective but can scale Data Storage independently from Compute. Data Storage, even though it is a Nimble system, is managed from the dHCI console, and not as a separate entity. dHCI might be more accurately categorized as a Management solution, for system, infrastructure, and platform, but HPE lists it only under HCI solutions in recognition of its limited hardware and platform software compatibility.

All Flash & Hybrid Storage Solutions

Alletra is mainly a brand and not a system since the products under this label are not compatible with each other. (The Alletra 6000 is a Nimble system, where the Alletra 9000 is a 3PAR system.) The Alletra 9000 system is an upgrade of the **Primera**, although HPE still offers Primera for new customers. The Alletra 9000 architecture still is based on a four-node cluster, which limits its performance to below Huawei, EMC, and NetApp. The Alletra 5000 is the hybrid version of the system and does not support NVMe SSDs, including those used for the SSD-based cache.

Nimble is provided under its own brand as an all-flash offering. It is claimed that Nimble supports SCM and NVMe, but the current configurator only lists SATA SSDs for systems under this label. NVMe configurations are available for Nimble from HPE as an Alletra 6000 system.

XP8 is available as an all-flash or hybrid array. XP8 is a HitachiVSP system sold under an OEM agreement. HPE guarantees 100% availability for XP8, claiming eight 9s of designed availability. The systems can be large, with around 60PB of available storage internal to a single all-flash system and 255PB of external storage. It is targeted to the high-end, mainframe-class customers.

MSA is the entry-level block Data Storage system with roots back to DEC/Compaq StorageWorks. It finds use in Edge, ROBO, and small office installations with up to almost 2.4PB of raw capacity. It has a variety of options for storage media and has a lot of features for an entry-level.

Data Protection Solutions

Zerto is owned by HPE and is featured as their lead data protection solution. Zerto converges management of DR and backup, enables data mobility between Clouds, and enables Ransomware recovery. It uses CDP to provide real-time protection and performs journal-based recovery. It is application aware and captures Containers and VMs with "write-order fidelity". It is policy-driven and can orchestrate data movement via its APIs. It can do some interesting operations, such as backing up AWS workloads onto on-prem Data Storage.

StoreOnce is the on-prem backup appliance. It is also available in software-only form as **StoreOnce VSA**. The VSA is commonly used with Simplivity to provide integrated backup for HCI, especially at the Edge. HPE combines this capability with Zerto to create a unified single-pane backup strategy to include backup targets on-prem and in Public Clouds across multiple Data Centers and Edges.

File Storage and Object Storage

Apollo 4000 is primarily targeting Data Lake use cases where converged data analytics is the driving application. It has GPU support for AI/ML. Apollo is HPE's enterprise-class server storage architecture, which means the hardware is just a server in a chassis with a lot of drive bays. HPE partners with software-only Storage services companies, like Cohesity, Scality, and Qumolo, to create Data Storage systems out of their server offerings.

StoreEasy is way at the bottom of the list for HPE. StorEasy includes their entry-level file storage appliance for SMB and ROBO use cases. This family of systems also includes the StoreEasy 1560 16TB Backup and Recovery Solution. StoreEasy is a very successful product reaching the under $15k channel market with a simple, pre-configured NAS solution that provides significant savings over competitive Public Cloud solutions.

Storage Data Management

HPE GreenLake for Storage is HPE's STaaS solution for Data Storage. GreenLake is the first answer HPE provides for all IT projects, encompassing as-a-service capabilities for all layers of the stack. GreenLake includes HPE's *Data Services Cloud Console* that implements AI-driven "intent-based provisioning" that allows customers to simply assign the type of application, capacity, and SLA for the application, including Data Protection, and HPE deploys, manages, and operates the entire fleet of Data Storage. This single portal works for on-prem, Edge, and Cloud resources without requiring the customer to make decisions of Data placement. It is an application-centric, role-based self-service system intended for use directly by application administrators. It complements other GreenLake capabilities, such as GreenLake for Containers (Ezmeral) and GreenLake for data fabrics.

InfoSight is HPE's autonomous infrastructure management solution that uses AI to automate daily operations (AIOps) and to virtualize data center resources. It is particularly for use with HPE Nimble Storage, but also works with Alletra, Primera, and 3PAR Storage systems. InfoSight is offered where GreenLake is not acceptable.

Scality **RING** and Scality **ARTESCA** are solutions specific to Scality. RING provides file and object storage for hybrid-cloud ready data management, and ARTESCA provides a cloud-native platform for Kubernetes orchestration. HPE does not support these directly but relies entirely on Scality.

CloudPhysics is still used by HPE partners to attract new customers. For HPE direct business, CloudPhysics is integrated into the GreenLake edge-to-cloud platform through the Data Services Cloud Console.

2.2 Expected Response & Strategy

GreenLake is clearly the current and long-term strategy for HPE. HPE Storage is focused on beating EMC and EMC's copycat APEX offering. In conjunction with this, HPE may consolidate some of its internally supported portfolio for cost savings. This consolidation is hinted to by Alletra including both 3PAR and Nimble under this one brand. MSA also is likely to be reimplemented using another in-house technology, bringing the Primary offerings down to a high-, mid-, and low-end set of systems. This consolidation of systems provided for GreenLake's on-prem component will be accelerated as EMC reduces its cost structure with similar consolidations.

However, HPE has a huge gap in unstructured capabilities, and this poses other questions about the corporate strategy. The bulk of Data is unstructured and most current application development is looking to Object for persistent Data Storage, including High-performance Object. HPE has no advantage for Object and relies on third-parties like Scality to bring the answer, which is why HPE does not find itself on the Gartner MQ for Distributed File and Object. Scality RING is an excellent product. HPE has a history of erratic strategy, so it is difficult to predict perfectly how it will solve this unstructured issue. The most likely and profitable future for both Scality's investors and HPE is for HPE to buy Scality for a premium, which HPE has a track record of doing. This direction fits with HPE's culture and will provide HPE with control over its ability to execute on its GreenLake strategy and go head-to-head with EMC.

3. IBM

IBM has also shown itself to be a leader in hardware by quickly integrating new processors, protocols, and storage media. In the field, IBM is extremely cost competitive.

3.1 Current Status & Focus

Primary Storage

FlashSystem (formerly a TMS system) has a wide range of models extending from just over $15k to large enterprise sizes available in all-flash or hybrid, and up to 4.5PBe per enclosure. The highest performance system uses Intel Ice Lake with Gen 4 PCIe. FlashSystem can be managed by Spectrum Virtualize.

IBM Elastic Storage System scales from 36TB to 633YB of capacity in a single cluster, with high performance support for up to 1.8PB/s with a 20 node cluster. The software running on ESS includes the ESS system, Spectrum Scale, and RedHat Linux. The hardware of the latest 3500 model is composed of nodes made their 2U AMD EPYC Rome, 7642, 48 core server platform, plus a management node (EMS) running on their Power9 architecture.

DS8900F is IBM's Mainframe storage system. It can reach 18μs read latency. According to ESG, Mainframes are still a major part of worldwide commerce including banking, airlines, credit card processing, and retail operations. This keeps IBM on the floor and a foot in the door for every major account.

Software-defined Storage

Spectrum Storage includes IBM's software-only storage offerings IBM is attempting to group every Data Storage component under this "Spectrum" brand as the Spectrum Storage Suite.

Spectrum Scale is the code running on ESS that provides Data Storage services. It also runs on customer-supplied virtualized server hardware and in Public Clouds. The licensing for Spectrum Scale allows the customer to move Storage nodes between deployments without a change in license or fees. Spectrum Scale include a high-performance Object Store, which is critical for modern Cloud-native applications. It directly supports Nvidia GPUs, Kubernetes, Cloudera Analytics, and Apache Spark. IBM also has used Scale to support Watson Knowledge Catalog, Watson Studio, and Watson Machine Learning.

Spectrum Fusion is Container-native storage for Red Hat OpenShift. Given the huge popularity of OpenShift, this offering from IBM has a large interest. Fusion includes several enterprise-grade Data Storage and Data Protection services, provides Hybrid Cloud capability, combines Data Storage platform and services into a single application-aware storage architecture, and provides a unified access model for block, file, or object across disparate data sources without requiring data movement for global access. Fusion, OpenShift, and IBM servers are the foundational part of **Spectrum Fusion HCI.**

Cloud Object Storage

IBM **Cloud Object Storage** (COS, originally Cleversafe) has a wide range of storage tiers including Vault, Smart Tier (Cool and Cold), Cold Vault, and Archive to provide customers with several pricing and data access options. It does not have native file or block-based access. It is primarily a solution for Cloud backup and archive, but with the Smart Tier capability adds Hybrid Cloud to Cloud-native and Big Data Analytics applications.

SAN Virtualization

IBM's **SAN Volume Controller** continues to provide a way in which IBM retains market share. SVC continues to be sold and upgraded for SAN deployments, making penetration into IBM block storage accounts more difficult.

Systems and Data Management

IBM calls its family of management products the "**Spectrum Storage Suite**". It is a single license that includes all the systems and software under a single linear capacity-driven price. The Suite is composed of several components: **Spectrum Control** provides monitoring, automation, and analytics, **Spectrum Virtualize** provides block virtualization, **Spectrum Protect** provides Data Protection using hybrid Cloud and **Spectrum Protect Plus** extends that protection to VMs, **Spectrum Archive** manages IBM tape libraries, **Cloud Object Storage** manages object storage, and **Spectrum Discover** manages an AI workflow.

IBM also has **Storage Insights** which is an AI-driven monitoring tool providing data usage and forecast information.

3.2 Expected Response & Strategy

IBM has led the competition to consolidate their engineering and use their SDS code to reshape their offerings. With the exception of the TMS and Mainframe-oriented systems, Spectrum Scale is the single Data Storage offering. This should allow IBM to be very efficient to develop new software-based capabilities and products.

IBM also has take a strategic move to acquire Cleversafe and become a Cloud Service Provider itself. This should lead to more Cloud-based offerings. IBM also has STaaS and IaaS offerings, which appear mature but not highly promoted, where HPE's offerings are a lot more polished and are their lead offerings. IBM is banking on its brand as a staple in the IT world. IBM Expert Care and their partner network have a great reputation. However, IBM's on-prem STaaS

deployments are often all-flash FlashSystems, and not the Spectrum Scale based products, and several customers have given less-than-stellar reviews of their experience on PeerSpot, TrustRadius, and G2. Only Gartner Peer Insights gives IBM's STaaS a very respectable 4.9 out of 5.0 rating.

IBM appears to lag EMC and HPE in the trend toward complete automation and simplification for Data Storage. IBM throughout its history has had cycles of walking off the path and then finding their way again. At this point, they are wandering into the Cloud and away from customer business needs. At some point, they will realize this and come back with leading innovations based on what they learned by making mistakes. When this will be remains to be seen, but in the mean time IBM will continue to fight with competitors with their low costs and unified Spectrum Scale systems, which for now is hard enough but will be become easier and easier for EMC and HPE if these competitors continue on their current paths.

When IBM does get back on track, it will have technologies to completely and invisibly automate all of the Spectrum offering, inherent analytics and data insights, with a family of IT-as-a-service and application-focused options to suit a wide range of customer consumption models.

4. NetApp

NetApp, like IBM, often has lost its formula and had to go back to the drawing board to reinvent the company and its products. They are currently in the middle of the latest rebirth, with a new direction and focus just now being revealed. Unlike Dell, HPE, and IBM, NetApp is a Data Storage company only, and is not able to command and leverage a full stack of its own products in customer data centers. However, like the others, it has a long history in which it has obtained many customers who have built their operations around NetApp's unique capabilities.

4.1 Current Status & Focus

Storage Management

NetApp has recently introduced "Evolved Cloud" in the form of **BlueXP**, a SaaS-delivered control plane to manage a simple hybrid multi-cloud experience for Storage and Data Services across on-prem and Public Cloud. BlueXP provides unified Management for NetApp, AWS, GCP, and Azure Data Storage, including AIOps health and performance monitoring, security and protection control, data governance, and data mobility orchestration. BlueXP integrates several

former individual tools, including **Cloud Insights, Cloud Backup Service, Cloud Sync, and Cloud Tiering.**

Cloud Data Sense appears to not have been obsoleted by BlueXP. CDS provides automated control and reporting of where data is deployed, whether in Public Cloud or on-prem. This might reflect the use of CDS as a sales tool.

Global File Cache and **Cloud Volumes Edge Cache** software products also continue to be available.

BlueXP can directly drive NetApp's **ONTAP** Storage OS software in the cloud or on-prem. ONTAP recently added tamper-proof snapshots, AIOps-driven anti-ransomware protection, and to match Huawei's Interworking capability, technology to allow simultaneous NAS file and S3 object access to the same data.

NetApp also has a management tool named **Astra** to protect, move, and store your Kubernetes workloads across hybrid multi-cloud environments and includes Astra **Trident** as a Kubernetes Container Storage Interface (CSI) driver. Astra supports CVO, CVS for Google Cloud Platform, Google Persistent Disk, ANF, Azure Disk Storage, and ONTAP.

NetApp has several on-prem offerings which it groups as follows:

Performance

AFF is NetApp's All-Flash Array offering, with an A-Series providing high-end workload performance and a C190 version providing an entry-level to all-flash. These are hybrid multicloud systems running NetApp's ONTAP Storage OS.

The **EF-Series** of All-Flash Arrays are the highest performance option from NetApp with 2M IOPS and sub-100μs latency and almost 8PB of raw capacity. The EF series uses NetApp's SANtricity software and not ONTAP, so many capabilities of ONTAP are missing, including all of the Cloud capabilities. NetApp has applications like SANtricity Cloud Connector to provide host-based backup for the E and EF series.

Value

FAS is ONTAP running on less expensive hardware and scaling out to a cluster of 176PB for Tier 2 workloads.

The **E-Series** are hybrid-flash arrays to match their all-flash EF series counterparts with SANtricity software and lacking many features, including Cloud integration.

Object Store

StorageGRID appliances are Object-only scale-out storage system NetApp obtained when it bought Bycast. Each node can be a maximum of about 1PB raw. StorageGRID requires host-based Data Services like backup or BlueXP to be able to gain tiering, backup, recovery, copy, and sync capabilities.

Cloud-based Offerings

NetApp also has NetApp Cloud Volumes Service, Amazon FSx, Azure NetApp Files, and GCP Cloud Volumes Service – all of which help NetApp integrate their on-prem solutions to include the major Public Clouds.

STaaS

NetApp also has a STaaS offering called **Keystone.** Keystone provides pay-as-you-grow management of Data Storage on-prem, as a hybrid Cloud, or on Public Cloud. Once past the starting period, Keystone pricing is based on peak usage, and cost optimization is left to the customer. This reflects NetApp's position as a storage-only player, putting it behind Dell, HPE, and IBM who all have a better story for as-a-service offerings.

4.2 Expected Response & Strategy

BlueXP is just the beginning. NetApp has more transformation to reveal that has already been in the works. Using BlueXP as the Blueprint for what that new strategy is, we can conclude that NetApp can be expected to take the HPE route and lead with the "everything is a Cloud" approach. NetApp has now gotten the message from customers that the biggest challenges in the future are not met with proprietary features, like FlexCache, but manageability challenges that remove humans from the daily operations, increase agility, and reduce risk. BlueXP is a quick answer to these challenges that on one hand simply combines much of what NetApp already had, but on the other hand simplifies and clarifies the human role in a diverse IT environment.

On the negative side, NetApp is not well positioned to solve enough of the problem for it to compete. It is already losing and companies like Pure Storage are making gains with mature Storage and management technologies. While ONTAP has advantages over HPE and Dell, momentum and the investment needed for NetApp to succeed are against it.

NetApp can be expected to neglect their SANtricity-based products and concentrate on ONTAP offerings and StorageGrid, which received the most attention and support

from BlueXP. ONTAP as a virtual software-only solution can help re-orient the company as a Storage Software and STaaS provider, reducing costs and allowing the company to make larger strides toward a Best-in-Class Data Storage solution, which is NetApp's only long-term salvation short of being acquired by someone else.

Summary of Long-term Competitive Direction and End State

Full Stack capability that reorganizes the operation into vertical slices of infrastructure and enforces every aspect of an SLA including performance, availability and resiliency, security, regulatory compliance, data protection, and cost from an end-user viewpoint is a key component to providing a Cloud experience. The leaders have shown that they intend to provide this Cloud-like, self-service experience across infrastructure layers. The long-term end user perspective of IT does not see the divisions between Compute, Network, and Storage, nor does it see geographic differences or capabilities differences among hardware implementations. The long-term goal of vendors is to directly support the end-users in their goals, alleviating the IT shop from the manpower needed for daily operations and maintenance.

The vendors commonly provide application integration support to offload management tasks to applications and automation tools. The applications increasingly drive the SLA requirements, data value, and workload behaviors from within the application itself. The long-term requirement is for Storage to not just recognize applications and predict their behaviors but respond to specific application-level control of the infrastructure.

Vendors are emphasizing the ability to fully utilize Public Cloud and other external resources for resilience, capabilities, and cost reduction. Public and Private Clouds, as well as other on-prem, Edge, and external data producers and consumers are joined as a unified set of resources, and long-term these resources are to be allocated automatically and optimally in every solution determination without human intervention. Multiple Public Clouds will be a part of every Data Center, and on-prem resources at each location exist to enable, accelerate, and improve on capabilities that could easily have existed elsewhere.

Vendors are adding high levels of automation to eliminate human IT involvement in every aspect of application deployment and user support as possible. The use of AI and other technologies should, in the long term, provide zero-touch, lights-out for every IT process. Everything needed to provision, deploy, manage, protect, secure, optimize, and

satisfy the SLAs for a workload will be derived from the selection of the application and attributes selected by the end-user.

True IT-as-a-Service capabilities that substantially reduce customer tasks to matching business strategy to forecasts, development of differentiated services, and creating revenue. Vendors have shown that they understand the needs of customers to outsource maintenance and operation of systems. In the long term, whatever daily needs cannot be accomplished by automation will be expected to be provided by the vendors, either directly or invisibly through partners.

In no case is the major direction to increase IOPS or reduce latency of IOs. Vendors are not looking to create differentiated appliances that require application-specific configuration and management. This follows the customer's direction.

Contrary to customer desires, the top competitors are not creating a vendor agnostic solution. Each of the top competitors is focused on locking customers into vendor-specific on-prem solutions, where their management solution ensures that the parts that it manages are under the vendor's control, using the vendor's Storage, even if software-only. There is no effort for Vendor A's Storage system to exchange information with Vendor B's Storage system and create an optimized solution for the customer. Likewise, APEX, GreenLake, Spectrum, and Keystone are all new vendor silos for the customer. While they are multi-cloud, and work with a variety of ecosystems like Containers, VMware, and Microsoft, they do not work with other Data Storage solutions. When a customer sees this, they are hesitant to adopt any of these offerings, because it is apparent that whoever controls your Storage controls your data. The same problem is presented by solutions from Public Cloud vendors as well – only their Cloud works well with their on-prem solution.

Recommendations

To accomplish these long-term ideals, it will be necessary to develop interim steps toward these goals. However, it is important that the steps be large, since Huawei is already well behind other vendors.

Organizationally, it will be necessary to manage roadmaps and their features and capabilities vertically across product groups. Products must be made to synchronously satisfy unified end-user-driven requirements. This includes platform/Cloud software, servers, network, and Storage. All

the Enterprise must work as a unit, as a system and as an organization.

Huawei (and Futurewei) should take the lead on setting Standards leading to further interoperability at the control plane oriented to full-stack automation. Information exchange between systems to provide federated operation of IT will benefit the customer and will allow vendors to better specialize in infrastructure and platform management challenges relevant to their specific customer base. Full-stack automation and delivery of a Cloud experience directly to IT end-users will soon be expected from all major vendors.

Huawei can be informed by academic thought in this effort, where new ways of automating and constructing Clouds include ideas that fit the customer goals. One such conversation is Composable Disaggregated Infrastructure (CDI). While vendors have adopted this title to apply to their current offerings, the power and innovation of CDI as originally envisioned has not been even partially realized in the market. The ONAP project is another closely-related effort which can be leveraged to provide capabilities even beyond Telco/carrier.

In addition to automation, Huawei needs to address the as-a-service part of the changes in the market. PayU and PayG are not the same as STaaS from other vendors. The missing part of the puzzle is mostly the automation, but every other aspect of intervention on the Storage system must be provided as part of the maintenance and licensing fee in a STaaS offering. Huawei's top six competitors all have STaaS offerings.

Huawei also need to pay close attention to the major global Public Cloud providers and have mobility and bursting solutions for each. The competitors all have multi-cloud solutions and can be expected to increase their Cloud capabilities.

Other smaller differences have been up to now been ignored, but Huawei lags in key system capabilities that competitors are exploiting in the field. For example, many customers want to evolve to NoF by first deploying NVMe/TCP within their existing Ethernet network environment. Huawei Storage does not support this protocol, so the competitor gets to take the floor tiles, which also means that the competitor will be significantly advantaged when the customer is ready for the next refresh. Huawei needs to consider the customers' evolution from technology to technology as a priority over the big innovation by speaking about that end technology while first deploying the steps to that end as the customer is ready to consume them.

Huawei needs to be careful about following competitors. The naming of products and at times the scope of offerings make it easy for competition to align the offerings and show customers why Huawei is not competitive. Huawei needs to avoid using competitor terminology and concentrate on customer terminology, at least in English. Huawei needs to look at role functions and workloads within customer operations to define scope and not competitive products. For example, if a role at a customer is to be automated, the whole role or a complete process or a specific function should be automated away. Otherwise, the customer cost was not dramatically changed. If a solution for a workload is to be created, that whole workload should be included, not a few pieces, because Huawei easily loses when the competitors highlight the missing pieces. We are more disadvantaged by having an "almost right" solution for almost all customer workloads than being "just right" for most. The competitors produce products and services that omit parts that they cannot provide, and if Huawei simply mimics the competitor and omits additional capabilities, it can quickly not fit customer requirements at all. Stay customer-centric and make sure the solutions are fitting customer problems, because the competitors are often missing the mark and copying them does not help Huawei.

Huawei also need to pay attention to the long-term. As we look toward 2028, Object Store, including high-performance Object Store, will be the high demand, and block storage as an external resource will continue to diminish. Analytics requirements will also grow. Huawei's investment in current development needs to be working on steps toward the long term, which might mean cutting back on products that are most profitable today. With Key/Value, Data-defined, and other Storage access methods, data services, and near-data functions emerging, it is important to cut investment in offerings that will be less important in the future and invest in technologies that lead us to the future.

Huawei also needs to consider the competitors' advantages of having a large part of the global market to themselves. Huawei needs to license a supplier in the USA to sell products based on Huawei technology. This can take the form of licensing Huawei code under NDA to allow the vendor to fully support customers, as well as OEM hardware sold to the vendor to use for deploying appliances. Huawei income will come in terms of hardware and licensing. The goal is to take some revenue away from the competitors, increase the voice of the technology in Standards and ecosystem partners, and to slow competitor progress in other markets by the need to increase their fight for domestic business. This is an

improved version of the Lenovo Netapp model and has minimal risk to Huawei.

References

[1] "Inspiration" was a term a former co-worker coined at EMC to mean copying code into the current branch from other product lines within the company, often without permission.

Information for this report was gleaned from the company press releases, customer comments, online reviews, vendor websites, public conferences, and other information publicly available.

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