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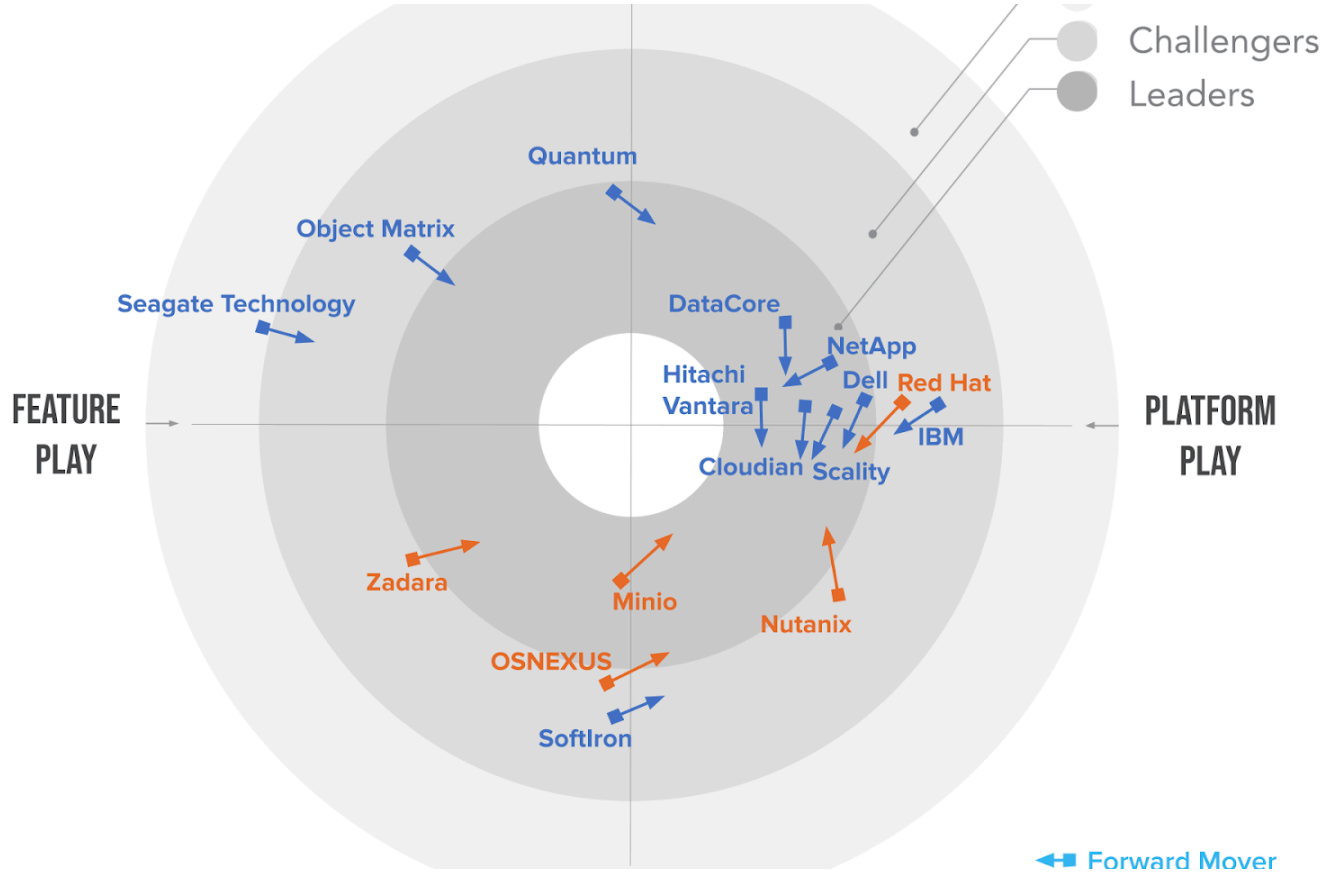

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GigaOm Radar for Enterprise Object Storage v2.0

Vendor Assessment for Technology Decision Makers

GigaOm Radar for Enterprise Object Storage

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1. Summary

The market landscape for object storage has been changing quickly and radically. The S3 protocol is now a standard for many applications, and developers are adopting it for a growing number of use cases. Object stores evolved from cheap deep storage repositories to solutions that can support multiple workloads and applications concurrently. Even though object storage performance cannot be compared to that of file and block storage, the latest iterations of the technology demonstrated that it can indeed be used for high-performance applications. (Note that a separate Radar report on high-performance object storage is available as well.)

The most critical evaluation metrics remain $/GB and scalability but, as a result of changing user needs, efficiency and flexibility are becoming equally important. In fact, the market saw an increase in use cases and user needs, including multitenancy and performance, that directly impacted these.

Users started to take advantage of object storage directly as a primary target for most applications that require storing large amounts of data. For example, many backup products are now able to use object storage as the primary repository and make the most of its object immutability characteristics for enhanced security. The same goes for data analytics products, which can now use object stores to access active data. Furthermore, it is clear that part of the growth in enterprise object storage in the last year, both public and private, is attributable to the many digital transformation initiatives that enterprises started because of the COVID-19 pandemic. In such cases, object storage is the best choice because of its accessibility characteristics compared to other solutions.

It is also important to note that object stores are becoming a common data service deployed on top of or alongside Kubernetes. This is another sign of the changed role that object storage is taking on in many IT infrastructures.

These new directions brought about several challenges in product development. Vendors now need to offer optimizations for small files, advanced analytics, better ease of use, and a lower entry point for their solutions, while keeping the system balanced for traditional, less interactive workloads. In fact, with the need to efficiently manage large numbers of small files, hybrid and all-flash clusters became more common, though many vendors are not yet ready to provide the necessary optimizations to take advantage of this media or, in some cases, to provide enough flexibility for data movement across tiers in relatively small systems. To adequately respond to these new challenges, several vendors are currently navigating a transition phase, with the goal of rearchitecting their solutions to become more Kubernetes-friendly and better optimized for next-generation workloads and needs.

HOW TO READ THIS REPORT

This GigaOm report is one of a series of documents that helps IT organizations assess competing solutions in the context of well-defined features and criteria. For a fuller understanding consider reviewing the following reports:

Key Criteria report: A detailed market sector analysis that assesses the impact that key product features and criteria have on top-line solution characteristics—such as scalability, performance, and TCO—that drive purchase decisions.

GigaOm Radar report: A forward-looking analysis that plots the relative value and progression of vendor solutions along multiple axes based on strategy and execution. The Radar report includes a breakdown of each vendor's offering in the sector.

Vendor Profile: An in-depth vendor analysis that builds on the framework developed in the Key Criteria and Radar reports to assess a company's engagement within a technology sector. This analysis includes forward-looking guidance around both strategy and product.

2. Market Categories and Deployment Types

For a better understanding of the market and vendor positioning (**Table 1**), we assess how well solutions for enterprise object storage are positioned to serve specific market segments.

- **Small-to-medium enterprises:** In this category we assess solutions on their ability to meet the needs of mid-market organizations ranging from small businesses to medium-sized companies. Also assessed are departmental use cases in large enterprises, where ease of use and deployment are more important than extensive management functionality, data mobility, and feature set. Characteristics like ease of use, simple deployment options like preconfigured appliances, and low entry point for minimal configurations are among the most important here.
- **Large enterprises:** Here, offerings are assessed on their ability to support large and business-critical environments. Optimal solutions in this category will have a strong focus on flexibility, scalability, ecosystem, multitenancy, and features to improve security.
- **xSPs:** Optimal solutions will be designed for multitenancy, integration with third-party solutions, ease of management at scale, and monitoring and chargeback capabilities. In this segment, flexibility in the deployment and licensing models is also important because the business needs of the local MSP or CSP should be taken into account.

In addition, we recognize two deployment models for solutions in this report: cloud-only or hybrid and multi-cloud.

- **Appliance:** In this category we include solutions that are sold as fully integrated hardware and software stacks, with a simplified deployment process and support.
- **Software:** This refers to a software solution installed on top of third-party hardware and OS. In this category we include solutions with hardware compatibility matrices and pre-certified stacks sold by resellers or directly by hardware vendors.
- **Containers:** This category has been added to reflect the latest industry trend in which object storage is installed on top of a Kubernetes cluster. This type of solution is usually favored by developers and other organizations that need extreme flexibility to address next-generation workloads and use cases.

Table 1. Vendor Positioning

	MARKET SEGMENT			DEPLOYMENT MODELS		
	Enterprise	Mid-Market	xSP	Appliance	Software	Container
Cloudian	+++	+++	+++	+++	++	++
DataCore	++	+++	++	+++	+++	-
Dell	+++	++	++	+++	-	++
Hitachi Vantara	+++	+	++	+++	++	++
IBM	+++	++	+	+++	++	-
MinIO	+++	+++	++	-	+++	+++
NetApp	+++	++	+++	+++	++	-
Nutanix	+++	+++	++	+++	++	+
Object Matrix	++	++	++	+++	+	-
OSNEXUS	+++	++	+++	++	+++	-
Quantum	+++	+	++	+++	+	-
Red Hat	+++	++	++	-	+++	+
Scality	+++	+	++	-	+++	++
Seagate	++	+	+++	-	+++	-
SoftIron	++	+++	+	+++	+++	-
Zadara	+++	++	+++	+++	-	-

+++: strong focus and perfect fit of the solution
++: The solution is good in this area, but there is still room for improvement
+: The solution has limitations and a narrow set of use cases
-: Not applicable or absent.

Source: GigaOm 2021

3. Key Criteria Comparison

Building on the findings from the GigaOm report, "Key Criteria for Evaluating Object Storage," **Table 2** summarizes how each vendor included in this research performs in the areas that we consider differentiating and critical in this sector. The objective is to give the reader a snapshot of the technical capabilities of different solutions and define the perimeter of the market landscape.

For this specific Radar report about enterprise object storage, we tend to give a more balanced view of the solutions, while in the companion Radar dedicated to high-performance object storage, performance and other features that support demanding workloads are seen as more relevant for the user, and are given more weight.

Table 2. Key Criteria Comparison

	KEY CRITERIA						
	Multitenancy	Security	Performance & Consistancy	Serverless	Cloud Integration	Analytics	Kubernetes Support
Cloudian	+++	+++	+	++	+++	+++	++
DataCore	+++	++	++	++	++	+++	-
Dell	+++	+++	++	++	++	++	++
Hitachi Vantara	++	+++	++	+++	+++	+++	++
IBM	+	+++	+	++	+	++	-
MinIO	++	+++	+++	+++	+++	++	+++
NetApp	+++	+++	++	++	+++	+++	-
Nutanix	+++	+++	+++	++	++	+++	++
Object Matrix	++	++	++	+++	++	+++	-
OSNEXUS	++	+++	++	-	-	+++	-
Quantum	+	++	++	+	+	++	-
Red Hat	++	+++	++	+++	+++	++	+++
Scality	++	+++	++	+++	+++	++	+++
Seagate	+	++	+	+	+	++	-
SoftIron	++	+++	++	-	+	++	-
Zadara	+++	+++	++	+	++	++	+

+++: strong focus and perfect fit of the solution
++: The solution is good in this area, but there is still room for improvement
+: The solution has limitations and a narrow set of use cases
-: Not applicable or absent.

Source: GigaOm 2021

Table 3 compares each vendor in terms of the evaluation metrics considered in this report.

Table 3. Evaluation Metrics Comparison

	EVALUATION METRICS					
	$/GB	Efficiency	Flexibility	Manageability	Ecosystem	TCO
Cloudian	+++	++	++	+++	+++	+++
DataCore	+++	+++	+++	+++	++	+++
Dell	+++	++	++	+++	+++	+++
Hitachi Vantara	++	+++	++	+++	+++	+++
IBM	+++	++	++	+++	+++	++
MinIO	++	+++	+++	++	+++	+++
NetApp	++	+++	++	+++	+++	+++
Nutanix	++	+++	+++	+++	+++	+++
Object Matrix	++	++	++	+++	+++	+++
OSNEXUS	+++	+++	+++	+++	+	+++
Quantum	+++	+++	++	+++	++	+++
Red Hat	+++	++	++	+++	+++	+++
Scality	+++	++	+++	++	+++	+++
Seagate	+++	++	++	++	++	++
SoftIron	+++	+++	++	+++	+	+++
Zadara	++	++	+++	+++	++	+++

+++: strong focus and perfect fit of the solution
++: The solution is good in this area, but there is still room for improvement
+: The solution has limitations and a narrow set of use cases
-: Not applicable or absent.

Source: GigaOm 2021

By combining the information provided in the tables above, the reader can develop a clear understanding of the technical solutions available in the market. The quantity of high scores across the board expresses the maturity of the market, with very few exceptions due to the introduction of new products. There is a general alignment to provide better and more user-friendly management tools lately, along with a strong commitment from all vendors to provide a good overall TCO. The latter, in association with $/GB, became particularly important in the last couple of years after many enterprises started to adopt hybrid cloud strategies when looking for options to repatriate data in order to reduce costs.

4. GigaOm Radar

This report synthesizes the analysis of key criteria and their impact on evaluation metrics to inform the GigaOm Radar graphic in **Figure 1**. The resulting chart is a forward-looking perspective on all the vendors in this report, based on their products' technical capabilities and feature sets.

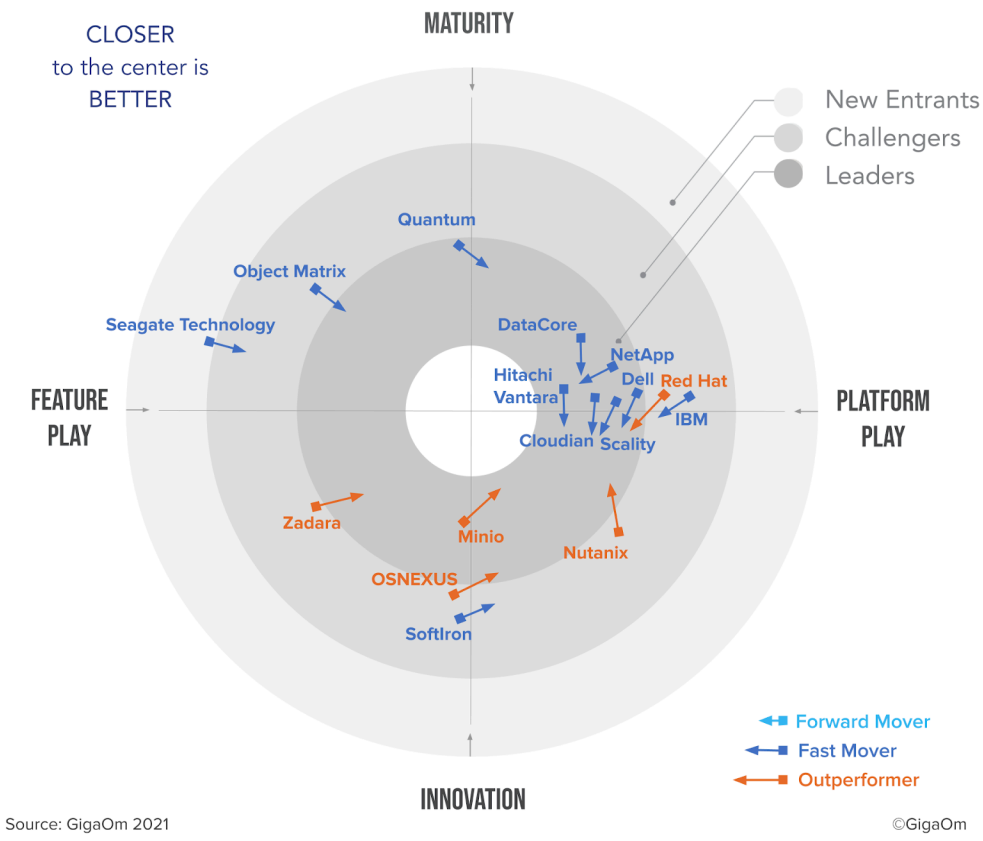

Figure 1. GigaOm Radar for Object Storage

The GigaOm Radar plots vendor solutions across a series of concentric rings, with those set closer to center judged to be of higher overall value. The chart characterizes each vendor on two axes—Maturity versus Innovation, and Feature Play versus Platform Play—while providing an arrow that projects each solution's evolution over the coming 12 to 18 months.

As you can see in the Radar chart in **Figure 1**, there are many vendors moving quickly toward the innovation area; most of the traditional players are in a transitional phase, reacting to emerging user needs and redesigning their products to respond to new use cases. In the meantime, companies like MinIO and Red Hat have been showing tremendous acceleration during the last year in terms of targeting their platforms at a growing number of next-generation use cases. Two other Outperformers worth mentioning are Nutanix, for the impressive usability and maturity of its relatively new product, and OSNEXUS, for its innovative approach to infrastructure composability and its top-notch system management that hides most of the complexity endemic to Ceph.

INSIDE THE GIGAOM RADAR

The GigaOm Radar weighs each vendor's execution, roadmap, and ability to innovate to plot solutions along two axes, each set as opposing pairs. On the Y axis, **Maturity** recognizes solution stability, strength of ecosystem, and a conservative stance, while **Innovation** highlights technical innovation and a more aggressive approach. On the X axis, **Feature Play** connotes a narrow focus on niche or cutting-edge functionality, while **Platform Play** displays a broader platform focus and commitment to a comprehensive feature set.

The closer to center a solution sits, the better its execution and value, with top performers occupying the inner Leaders circle. The centermost circle is almost always empty, reserved for highly mature and consolidated markets that lack space for further innovation.
The GigaOm Radar offers a forward-looking assessment, plotting the current and projected position of each solution over a 12- to 18-month window. Arrows indicate travel based on strategy and pace of innovation, with vendors designated as Forward Movers, Fast Movers, or Outperformers based on their rate of progression.

Note that the Radar excludes vendor market share as a metric. The focus is on forward-looking analysis that emphasizes the value of innovation and differentiation over incumbent market position.

5. Vendor Insights

Cloudian

Cloudian built a strong reputation for its object store over the years, thanks to its commitment to the S3 API. Now that this is no longer a major differentiator, the company evolved its core product, HyperStore, along with its add-ons, to offer a mature platform that is capable of addressing a growing number of workloads and can be deployed on top of Kubernetes as well (including VMware Tanzu).

The product is available both as software-only, with options to run on bare metal or virtual servers, and as a preconfigured appliance, with the latter usually chosen by enterprises for simplified deployment and support. In addition, an all-flash appliance recently joined the list of configurations available to customers. Cloudian offers several purchasing options, including traditional and subscription-based models.

The usability of the product has always been one of HyperStore's major advantages. The UI is among the most complete on the market, offering a very user-friendly experience that includes strong multitenancy support, granular management of system resources, advanced security controls, role-based access control (RBAC), chargeback functionality, and more. Moreover, the addition last year of HyperIQ, an advanced analytics tool, improved system monitoring and observability with better visibility on user and application access patterns, performance, and capacity consumption trends.

Cloudian HyperStore offers a long list of security certifications and its architecture provides end-to-end encryption. Object lock API is supported as well. The partner ecosystem is one of the most complete in the market and users report high satisfaction rates with global support.

Strengths: Solid, mature platform with a large partner ecosystem of certified solutions. Easy to deploy and use with a number of features designed to simplify system management and reduce system TCO.

Challenges: Despite the release of an all-flash appliance, Cloudian's architecture is still not optimized for high-performance workloads.

DataCore

DataCore acquired Caringo at the beginning of 2021, completing its product line with an object store and reorganizing its companion products accordingly. DataCore Swarm is now available through DataCore's extensive reseller network to grow its presence in Europe and other regions. Swarm was always easy to use, efficient, and generally solid for every type of installation, ranging from very small one-node deployments at the edge up to multi-petabytes in all market segments, including media and entertainment and HPC.

The latest version of the product also introduced important new features like active-active replication

and strong consistency for the most demanding workloads. In the last couple of years, Swarm was enhanced to address specific use cases in the M&E industry without losing its focus on general-purpose use cases. The software is supported on major hardware platforms and all-flash configurations are available even if they are not fully optimized for that media yet. That said, Swarm can handle small objects better than most object stores on the market and its performance numbers are always good, thanks to the efficiency of its internal architecture and its data placement algorithms.

Users generally report very high satisfaction with support and cluster lifecycle management, including node decommissioning and cluster expansion, due to the efficient internal load balancing mechanism. Prometheus and Grafana are supported for analytics, and system alerting enhances management. This solution also offers native WORM functionality with a good set of security features and plans to extend its features with S3 object locking later this year. Several licensing options are available.

Strengths: Swarm has always been an efficient and balanced product. Thanks to its acquisition by Datacore, it can now benefit from a broader ecosystem and a larger partner network. Datacore and Caringo are both quite nimble and it is easy to see the advantages of the integration between them.

Challenges: Serverless and Kubernetes support is still limited compared to others and the roadmap in this regard is still vague. DataCore will probably focus on this issue fairly soon, given its investments and partnerships in this area.

Dell Technologies

As with other players in the market, Dell Technologies is in an important transition phase, moving from its mature and solid ECS object store to its next-generation product, ObjectScale. The two products will maintain the same core functionality and a smooth migration path between the two is expected. Dell will continue to support the ECS installed base for traditional use cases, while ObjectScale is focused on enabling next-generation workloads. In fact, ObjectScale is available for select customers on VMware Cloud Foundation, deployed on top of Tanzu.

ObjectScale will inherit most ECS capabilities around security, scalability, and manageability, but it will also be getting some new capabilities such as cross-region replication and will be more flexible and portable across different environments because it is deployed on top of Kubernetes. At the same time, Dell ECS is still receiving major upgrades, including all-flash NVMe-optimized appliances to address demanding workloads like AI and big data analytics. Currently, the solution is available as a preconfigured appliance, with multiple options to address both capacity-driven and performance-focused use cases.

From a technical standpoint, Dell EMC ECS has a balanced design and offers all the features typically required in enterprise environments, including multitenancy, end-to-end encryption, WORM capabilities, an easy-to-use GUI, and comprehensive API and CLI interfaces. Performance, especially with small files, is not the strongest aspect of ECS, and neither is flexibility. ObjectScale is expected to address these concerns in future releases.

The Dell ecosystem is one of the most extensive on the market and includes integrations with other Dell products and third-party applications, which lets users take full advantage of the offerings to consolidate more data and applications on a single system.

Strengths: Exciting roadmap with a potentially seamless migration path. Large solution ecosystem and global product support with a local presence everywhere.

Challenges: ObjectScale is a next-generation product but it does not offer an appliance based solution and migration will be offered later. Dell customers will have to decide whether they should start with ECS and migrate later, or begin with ObjectScale on a software-defined Kubernetes platform instead of an appliance.

Hitachi Vantara

Hitachi Content Platform (HCP) is still a market leader in terms of functionality and ecosystem, and even though the product has a traditional design, Hitachi Vantara is already providing an upgrade path to its customer base, thanks to the new HCP for cloud scale. This is next-generation object storage, fully ready with Kubernetes, that retains most of the DNA of its predecessor.

HCP is well integrated with the rest of the product family, and can be used as a backend to offload cold data from primary storage, such as VSP and HNAS systems. A series of add-ons, including HCP Anywhere for sync and share, a NAS gateway, and the new Hitachi Content Software to support DFS workloads (HPC/AI/ML), completes the HCP platform. Even better, the company has built a strong partner ecosystem over the years with a long list of solutions that address the majority of use cases, including integration with the Hitachi Lumada platform and other data analytics frameworks that can take advantage of the S3 interface.

HCP also provides strong ILM capabilities and compatibility with major public cloud storage APIs to offload data to remote locations or for disaster recovery purposes. The product includes complete end-to-end encryption and certifications for the most demanding environments.

HCP's metadata management is also worth mentioning. In fact, its integration with Hitachi Content Intelligence enables users to analyze data during ingestion, augment metadata and make it searchable, and more, creating a powerful backend that can be leveraged for a number of next-generation applications.

HCP is available via a software-only license or as a fully integrated appliance with both CapEx and OpEx purchasing options.

Strengths: Solid, mature product with a large user base, strong ecosystem, and solid data-management capabilities. HCP Anywhere and Gateway enable users to build end-to-end modern file services for distributed enterprises.

Challenges: Although Hitachi Vantara has a compelling roadmap for object storage and data management, the migration from the old generation of the product to the new one could raise some concerns among users, despite Hitachi's very good track record in similar cases.

IBM

IBM Cloud Object Storage (COS) is part of its comprehensive unstructured data storage product portfolio, which also includes some innovative data management solutions like IBM Spectrum Discover. Spectrum Discover is an important addition to COS in terms of metadata augmentation, index and search, and more, enabling COS to support a broader range of next generation applications.

Unlike some of its competitors, IBM remains focused on traditional workloads and scalability with COS, delegating high-performance workloads to other products like Spectrum Scale. That said, IBM COS can show very high sustained bandwidth for highly parallelized access and sequential workloads. At the same time, the good integration between the two products enables users to ingest and access data concurrently via file and object interfaces.

IBM COS core architecture is based on an efficient, distributed erasure coding mechanism that can be leveraged to build large-scale, geo-distributed object stores. Security is excellent and includes WORM, RBAC, and end-to-end encryption, with several certifications for highly regulated environments. Integrations with several other IBM storage products, as well as an extensive ecosystem of third-party solutions simplifies data consolidation and the introduction of additional types of workloads.

Kubernetes support for COS is not a priority at the moment and the product is not designed to support small files or strong consistency, limiting its direct usage for interactive AI and analytics workloads.

IBM COS is available as a software-only solution or as a preconfigured appliance with OpEx- and CapEx-oriented purchasing models. Minimal configuration starts under 100TB of usable capacity, and $/GB can be very competitive in large configurations thanks to distributed EC and the use of the latest SMR high-capacity drives.

Strengths: Part of a large product line, and integrated with several other IBM products, which can contribute to a quick ROI and to an overall improvement of infrastructure TCO. Solution ecosystem is extensive. Attractive $/GB and throughput in large configurations.

Challenges: IBM COS is focused strongly on capacity and traditional object storage workloads, missing the features necessary to properly support Kubernetes and the highly interactive workloads that are gaining traction among users.

MinIO

MinIO's versatile object storage solution can target a broad range of use cases. The company's friendly open source strategy is attracting a huge community of developers, technology partners, and users who can take advantage of the product's lightweight design to start testing with a minimal infrastructure or by using a container, and building from there. At the same time, enterprises can count on innovative and DevOps-friendly support services and the breadth of features in the large ecosystem that surrounds this solution.

MinIO has a strong commitment to Kubernetes and next-generation workloads, including edge use cases. In the past year, the company enhanced its core product in a number of ways, including: a new GUI, improved multitenancy, an integrated load balancer, an encryption key management system, active-active remote replication, and ILM functionality that enables users to build hybrid-cloud infrastructures. The MinIO object store is very efficient and can be configured to serve high-performance workloads, assuring strong consistency for the most demanding applications, including common data analytics and AI frameworks. For monitoring, MinIO is well integrated with Prometheus and Grafana, and the product also supports advanced capabilities such as object locking, bucket notifications, lambda functions, and S3 Select.

The product is free to download and install on x86 and ARM systems. MinIO does not offer an end-to-end integrated appliance, but certified hardware solutions are available from primary server vendors.

Strengths: Innovative solution, very lean and lightweight design, showing the most advanced integration with Kubernetes on the market. Impressive acceleration in the past year with regard to new features and attention to enterprise needs.

Challenges: Some features, like multitenancy, are designed to be operated in a Kubernetes cluster. The new UI helps in this case, but this aspect could remain a challenge for some organizations.

NetApp

NetApp StorageGRID is a solid product that fits very well with the company's overall data and cloud strategy. In the past, the solution was typically adopted for traditional backup and archiving or as a second tier for primary storage. Lately, however, analytics and other demanding workloads are becoming more prevalent. In this regard, NetApp FabricPool, a mechanism for offloading data from primary to secondary storage, has played an important role and simplified adoption of the solution for many NetApp customers.

In general, the product shows a strong commitment to simplified operations and includes all the components necessary for an end-to-end stack, including an integrated load balancer that also provides QoS functionalities. StorageGRID's granular ILM capabilities let users tune their object storage infrastructure for different workloads and improve data placement for compliance and other demanding requirements. ILM also can be used to offload data to the public cloud. StorageGRID's

multitenancy capabilities make this product appealing to large enterprise users, as well as to regional and local service providers. StorageGRID can be configured to support strong consistency for interactive workloads.

The UI is well designed, with monitoring and analytics providing a consistent experience across the board. Integration with external tools like Prometheus confers additional flexibility upon these features.

The large solution ecosystem, including integration with the rest of NetApp's product line, allows users to take advantage of the object store in a variety of scenarios, which helps to improve ROI quickly.

Preconfigured appliances are the most common option chosen by NetApp customers, but a software-only solution is available as well. Several purchasing models are offered, including subscription options.

Strengths: Balanced and solid product that delivers its best when deployed with its integrated load balancer for added multitenancy and QoS features. Easy to use, with granular ILM policies.

Challenges: Stronger Kubernetes integration is not imminent. Even though performance is aligned with other object storage vendors, the product needs additional optimizations for all-flash configurations.

Nutanix

Nutanix Objects is part of an expanding ecosystem of storage solutions available for the Nutanix Cloud Platform. Based on the same core technology that powers data storage for hyperconverged infrastructure solutions, Nutanix Objects impresses with its ease of use and good overall performance and flexibility. Nutanix Objects can be deployed as part of an existing cluster, as a standalone product, or in a hybrid fashion with storage resources coming from other clusters.

The product's architecture is very lean and includes an integrated load balancer for simplified operation and better performance. Its multitenancy capabilities are good, and it is based on a strong consistency model that allows the product to be used for interactive workloads. Objects does not aim at deep archiving or the lowest $/GB, but virtually every workload from backups up to big data analytics can be a good fit. It combines good management of small files with deduplication and compression to further expand the range of potential use cases.

Nutanix is investing heavily in the public cloud and in Kubernetes, and Objects works well with cloud-native workloads and hybrid cloud scenarios. In particular, thanks to Karbon, Nutanix's Kubernetes management solution, users can build integrated edge-to-cloud stacks leveraging the same technology stack. Unfortunately, support for bucket notifications and event-triggered functions is still limited, but the product does support S3 Select. Security is good, WORM functionality is available, and

the S3 object lock API has been recently certified.

Users report high satisfaction with both the product and its support. A 2TB license is included with every AOS Cluster, and can be aggregated across multiple clusters for evaluation purposes. The product is usually licensed on a subscription basis.

Strengths: A relatively recent product with an innovative interpretation of object storage that goes beyond traditional cold storage workloads. Flexible with very good performance. Operations and cluster lifecycle management are as easy as you would expect from Nutanix.

Challenges: Replication between sites is available but geo-replication is not supported yet. Though the product is not aimed at the lowest $/GB, a cheaper capacity option would expand the number of use cases.

Object Matrix

Object Matrix MatrixStore is an S3-compatible object store highly specialized for the media and entertainment industry and, in general, for any organization that needs to manage video assets or other rich media files. In fact, along with optimizations to manage large objects and integrations with third-party software solutions for media management, Object Matrix offers its own media asset management tool (Vision).

Object Matrix is usually deployed with preconfigured hardened appliances that start with a minimum of three nodes and range up to multi-petabyte configurations. Initial configuration is very simple and the UI is easy to use as well. In addition, a new analytics tool (Sense), based on Grafana, provides plenty of dashboards to control all aspects of the system. The solution is usually sold with a traditional licensing and support model, but the company also offers an OpEx-friendly subscription.

Data can be protected and remotely replicated with different mechanisms, including multiple copies, dual parity, and erasure coding. Indexing and search capabilities are integrated within the product. WORM and auditing capabilities make the product more appealing to regulated environments, but Object Matrix lacks any specific certification in this regard. S3-compatible object stores can be used to offload data to the public cloud.

Object Matrix is also expanding the MatrixStore ecosystem with additional hybrid and cloud services, though with limited global availability at the moment.

Strengths: Specialized object store with a strong orientation toward media management. A cost-effective solution with a good TCO for organizations of all sizes, especially when used in conjunction with Vision or other integrated solutions.

Challenges: Limited capabilities for workloads other than media management. Global access to Object Matrix cloud is limited, though the company has expansion plans for additional regions.

OSNEXUS

OSNEXUS QuantaStor is a software-defined storage solution based on the open source Ceph project. Its biggest differentiator stems from its system management tools, which hide Ceph's complexity behind the scenes while offering advanced control on the supported hardware. Even better, thanks to a tight collaboration with Western Digital, OSNEXUS is now able to provide the same level of sophistication with an NVMe-oF backend based on WD OpenFlex technology. The granular control over infrastructure resources and flexibility of this solution improves infrastructure utilization and offers enterprises and service providers a composable infrastructure without the need for custom hardware or infrastructure the size of a hyperscaler. And though ease of deployment and management are the main selling points of this product, its flexibility and efficiency can impact TCO strongly as well. Furthermore, QuantaStor's performance is good when compared to other Ceph-based solutions.

Other additions made by OSNEXUS to Ceph include multi-cluster management, strong multitenancy capabilities, and remote replication. Security has been improved also and the product is certified to operate in compliance with several demanding regulations.

QuantaStor benefits from the large Ceph ecosystem for integration with Elastic and other tools for searching and event notifications, but the company itself doesn't offer an integrated solution in this regard. The Ceph community is very active regarding the containerization of the entire solution and it is expected that QuantaStor will take advantage of this community support. At the moment, a CSI plug-in for Kubernetes is available.

The product has a good analytics platform, the UI is easy to use with several standard dashboards already available, and the engine in the backend can be customized quickly to create an additional dashboard with Grafana.

OSNEXUS has a friendly licensing mechanism based on capacity, and the solution supports mixed configurations with hardware from different vendors able to coexist in the same cluster.

Strengths: Extremely easy to deploy and manage. Innovative and efficient use of NVMe-oF in the backend while still supporting traditional hardware configurations as well as mixed vendor deployments.

Challenges: Some areas of interest for next-generation applications, including Kubernetes, serverless notifications, and advanced indexing and searching are available only via third-party solutions.

Quantum

Quantum is moving quickly toward executing its vision and its new product line reflects this. ActiveScale has become more and more a key component of Quantum's solution ecosystem, contributing to the building of end-to-end solutions for data storage and management. This strategy is

also helping the company to expand its reach to new markets.

Quantum ActiveScale is sold as an appliance, though the company is planning to offer a software-only version of the product in the immediate future. The advantages of this product are more visible in large-scale deployments, where the benefits of its internal design become apparent with distributed erasure coding and a series of algorithms for dynamic data placement (DDP) and data repair (DDR). Overall system throughput is good, showing good internal parallelism and efficient use of resources, and the system has optimizations to manage relatively small files and interactive workloads. Quantum does not provide all-flash configurations at the moment.

The system is easy to deploy and manage at scale with an intuitive UI and analytics dashboards that display plenty of information about the system, workloads, and user activity. In addition, ActiveScale provides end-to-end encryption capabilities, fully hardened backend, and object lock (WORM), and it offers features to facilitate bucket synchronization to the cloud.

Strengths: Efficient system architecture and good overall TCO. Quantum's vision is solid and the ecosystem is quickly growing to meet users' expectations about large-scale storage solutions with integrated data management features.

Challenges: Limited focus on cloud-native applications at the moment, including Kubernetes. Cloud integration needs to be enhanced.

Red Hat

Red Hat Ceph is an open source object store with integrated file and block interfaces. The company is showing impressive progress with its core product and its ecosystem, which is also the foundation for Red Hat Container Storage. In fact, Ceph is well integrated with OpenShift and is a key component of the company's strategy around Kubernetes.

The acceleration is evident in all aspects of the product, including its usability and performance. Additionally, the acquisition of NooBaa for better cloud integration provides greater flexibility for hybrid cloud scenarios. Red Hat Ceph supports several open source and commercial products for metadata search and augmentation, and for S3 SQL queries with Trino, with S3 Select coming in a future release. In addition, Ceph's integration with OpenShift enables users to create automated serverless ingest pipelines and simplifies the development of complex cloud-native applications.

Red Hat Ceph clusters can be configured with end-to-end encryption, and they support external key management systems (with KMIP support in upcoming product releases), RBAC, and IAM roles. On the performance side, RedHat recently published several benchmarks that combine performance and large-capacity scenarios with high infrastructure utilization rates. All-flash configurations are now supported and new reference architectures for running high-performance workloads are available as well.

Red Hat Ceph is available as a software-only solution with capacity-based and pay-as-you-go licensing for end users and service providers. Red Hat partners offer the solution with certified hardware to simplify the sizing and deployment process.

Strengths: Continuous improvements to the core product and a strong roadmap for Kubernetes. Easier to install and use than in the past.

Challenges: Object lock API support is available in the upstream version of Ceph, and will be available later this year in the downstream release. The containerized version of the product is available only for OpenStack deployments at the moment.

Scality

Scality has been particularly active in the last few years enhancing the feature set of its object store, RING, and companion products. The solution is solid and mature with plenty of multi-petabyte installations and a growing number of workloads supported, with customers in all major market segments. Some of the most advanced products, like Zenko multi-cloud data controller, are now fully integrated into RING, making the product even more appealing. Kubernetes support has been improved as well, with more components now fully containerized and an interesting roadmap that will soon bring additional flexibility to RING and new products. Moreover, the scale-out file system can be used in the cloud now with Microsoft Azure or Google Cloud, further simplifying the creation of hybrid cloud infrastructures to manage unstructured data.

Scality has a strong solutions ecosystem. HPE, which is also an investor in Scality, offers many pre-configured systems and a global presence for sales and support, with other primary hardware vendors providing certified systems and, lately, becoming resellers as well. All-flash configurations are also available. On the software side, Scality's partner network is extensive, with plenty of certified solutions.

A Prometheus exporter is available and RING now has a better user interface and better usability than in the past. Scality is active in the open source community, and some of its technology is free to download on GitHub. RING's metadata search, realized via an integration with MongoDB, is also worth a mention.

Strengths: Global presence and mature product with a strong ecosystem. RING is evolving, also leveraging the established engagement in the open source community and expertise in Kubernetes, from a traditional design to a next-generation object store able to target a broader range of workloads at scale.

Challenges: Migrating from traditional object storage implementation to the next iteration of the technology is a major challenge. Given this scenario, Scality RING customers can count on long-term support and a viable roadmap before making the transition.

Seagate Technology

A few months ago, Seagate introduced CORTX™, a new software-defined object storage solution that is completely open source and is optimized to support the company's latest HDD technology. The open source project is hosted on GitHub and a VM is also available for testing purposes. Among the core principles underpinning the project are the ability to run it on any CPU and support for both hard drive and flash memory technology, along with modern design concepts that improve performance and efficiency.

Lyve™ Rack is the commercial offering powered by 100% open source CORTX. The current Lyve Rack version is the entry level solution for edge use cases with about 1PB of usable capacity. A multi-PB scale-out version is under development.

Seagate's strategy is to attract large enterprise users and services providers via the tight integration of hardware and software for better efficiency, which yields better $/GB. Seagate plans to offer CORTX through certified hardware partners as well.

The product is designed to offer the best possible reliability and an advantageous TCO while maintaining performance and overall system efficiency. To do so, CORTX has been implemented with a modern design for distributed metadata management and erasure coding techniques. Strong consistency helps to extend the number of potential use cases for this product.

The UI is simple to use and includes basic analytics tools to monitor the state of the system and its activity. Other features—including index and search, geographic cluster distribution and replication, strong multitenancy capabilities, and support for some of the latest S3 API—are still under development.

Strengths: A promising open source project that offers a compelling $/GB and business model for organizations that need to store massive amounts of data efficiently. Qualifying the latest hard drive technologies means that Seagate can deliver access to cost-efficient storage.

Challenges: The project and the commercial solution are still in their infancy and need additional features to compete with other vendors. The roadmap is promising, though.

SoftIron

SoftIron HyperDrive is an end-to-end solution based on Ceph. The main advantages of HyperDrive are the hardware, which has been designed and manufactured specifically for this solution, and the UI, which tremendously improves the user experience thanks to a friendly GUI that hides all the complexity of Ceph. That said, SoftIron also offers a software-only version of its product for users that want to reuse existing hardware. This solution is finding increasing success with mid-sized companies and other organizations that want an open solution but don't have the skills or resources to manage an open source storage cluster.

The efficiency of HyperDrive is assured due to the tight control SoftIron maintains over hardware, including the use of ARM CPUs for better power consumption. This leads to an overall power consumption that can be up to 80% less than other Ceph solutions. Moreover, SoftIron customers receive hardware whose provenance is certified, limiting the security risks that come from installation of malware in the firmware or even malicious chips.

The product benefits from the large Ceph ecosystem, and customers can take advantage of compatibility with the open source version for a smooth migration. In addition, the combination of the latest versions of Ceph with HyperDrive hardware provides good overall performance while keeping $/GB low, especially considering the better TCO due to better power consumption and ease of use of the solution.

SoftIron is actively working to expand its solution ecosystem, which already includes major backup vendors, data management tools like iRODS, and several other commercial and open source solutions.

Strengths: An appealing solution for users who want an open source core but also need a fully featured, easy-to-use solution. Very efficient, thanks to the end-to-end, task-specific design of hardware.

Challenges: The product strongly depends on the development of Ceph, over which SoftIron has limited control.

Zadara

Zadara Virtual Private Storage Array (VPSA), part of Zadara's zStorage Cloud Service, offers a software-defined storage solution preinstalled in racks that can be consumed on-premises and in the cloud, with an STaaS consumption model that combines the benefits of both worlds. The solution is extremely easy to use and configure, offering several options, from all-flash and hybrid configurations down to low $/GB cost-conscious solutions. Zadara's 100% OpEx-based model is very attractive for midsize companies that need flexibility and multi-cloud support, as well as local and regional hosting service providers.

The Zadara software stack is designed around security and it is certified for many industry standards and regulations. It includes end-to-end encryption, strong multitenancy features, WORM and object lock API support, RBAC, and a complete set of monitoring and auditing tools. Zadara is also efficient, with support for multiple erasure coding schemes, object replicas, and deduplication options that are selectable depending on workload and protection needs. The VPSA can replicate objects to a remote location, and the integrated load balancer helps to simplify system management. Additional features that are particularly appealing to service providers include chargeback and a complete REST API for integrating VPSA with other products and simplifying system management at scale.

Zadara does not offer index and search capabilities, nor does it provide serverless functions, but its zCompute Cloud Services includes a complete AWS EC2-compatible service that can be activated

within the same cluster that provides the storage services. The user interface is well designed and offers basic analytics dashboards, but advanced analytics are not yet available.

Strengths: The Zadara object storage solution provides good flexibility and the 100% OpEx-based consumption model lets users expand quickly when necessary as well as shrink in capacity or performance according to business needs. The partner network is quite extensive.

Challenges: TCO is very good, but compared to other on-premises object stores, Zadara VPSA may not always offer the lowest $/GB.

6. Analyst's Take

Strong demand for object storage for new use cases is quickly changing the market landscape. Market leaders with traditional solutions are redesigning or updating their products to become more flexible and able to support cloud-native applications, IoT, big data analytics, AI, and demanding interactive workloads. In many scenarios, S3 is replacing scale-out file systems, not only because of its global accessibility and ability to share data more freely but also for its rich metadata capabilities.

Users and software vendors alike want to leverage object storage for its good $/GB compared with other storage solutions, as well as for the better TCO this architecture promises when deployed in multi-petabyte scenarios. On the other hand, most object storage vendors are responding with compelling roadmaps, and those that are already in the position to offer support for next-generation workloads are adding features to replace traditional object storage workloads and operational models. The vendors who provide the desired features first will be rewarded with the biggest success.

In the next 12 to 18 months, users will be even more interested in object storage because of unceasing data growth and accessibility needs. Many users also want to consolidate object storage to take advantage of its cost and scalability benefits. This consolidation will generate additional needs for data management that go beyond single applications, and the first signs of this trend are already visible. Vendors who are able to increase the value of data (for example, through metadata augmentation during ingestion) and analyze or reuse it efficiently, perhaps in the case of compliance checks, will further improve their lead in the market.

Moreover, object storage is becoming available at the edge. With other components of the stack heading to the edge, object stores will become more common for storing data there, even if only temporarily, via S3 APIs in remote locations. Mechanisms to synchronize data from the edge to the core or the cloud will then be necessary. And, at the moment, only a few vendors have completed the transition to containers that will provide this kind of flexibility in the near future.

7. About Enrico Signoretti

Enrico has 25+ years of industry experience in technical product strategy and management roles. He has advised mid-market and large enterprises across numerous industries and software companies ranging from small ISVs to large providers.

Enrico is an internationally renowned visionary author, blogger, and speaker on the topic of data storage. He has tracked the changes in the storage industry as a Gigaom Research Analyst, Independent Analyst and contributor to the Register.

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