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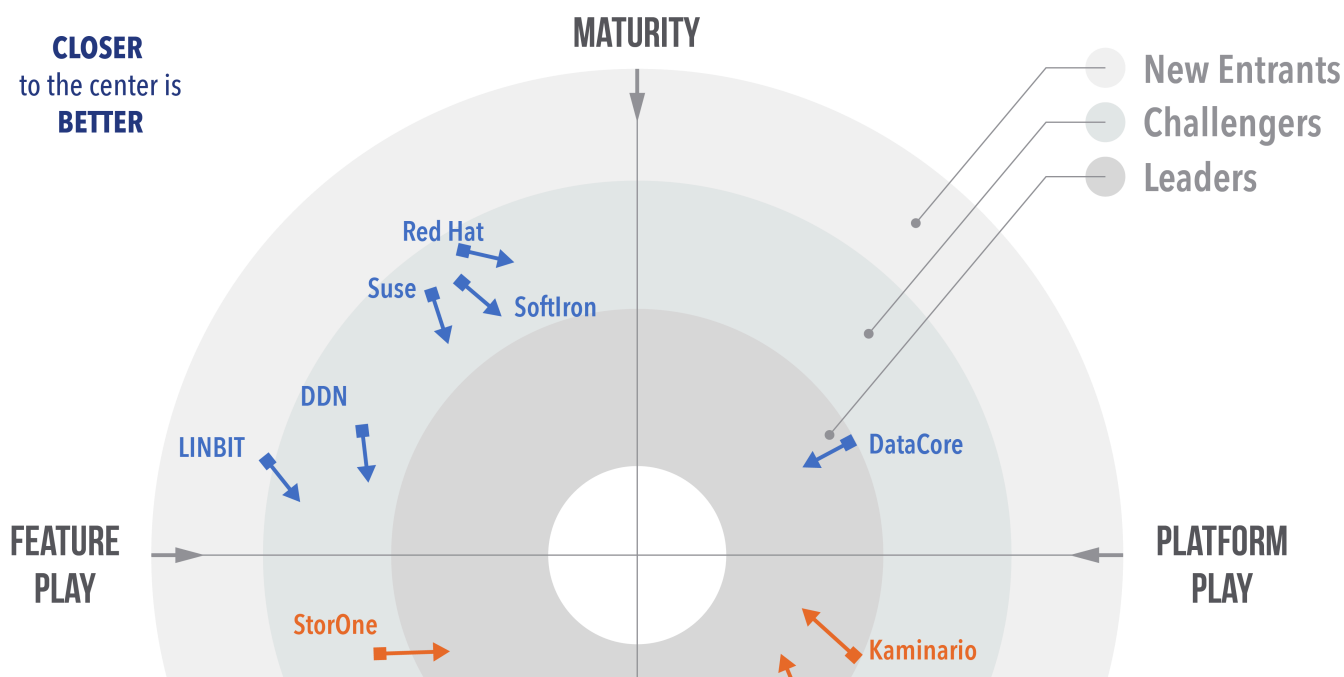
GigaOm Radar for Software-Defined Storage `v1.0`

Block Storage - Software-Defined Storage Systems

ENRICO SIGNORETTI

TOPICS: `BLOCK STORAGE` `DATA STORAGE`

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GigaOm Radar for Software-Defined Storage

Block Storage - Software-Defined Storage Systems

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1. Summary

In recent years, the storage industry has moved from systems based on proprietary hardware to systems that take advantage of commodity x86 servers. The latter is more flexible: depending on the product architecture, increased freedom of infrastructure design comes with the separation between the control plane (where all the intelligence resides) and the data plane (where data is stored persistently). Moreover, hardware and software can be purchased separately during the acquisition process.

Software-defined storage (SDS) comes with some trade-offs, not the least of which is that installing, configuring, and tuning software requires more skill than simply installing an appliance does. It also imposes management overhead. This is why there are three different types of solutions in the market that claim to be software-defined:

- **Software only:** The software can be installed on any x86 hardware that complies within a compatibility matrix.

- **Pre-installed and configured bundles:** This solution is usually delivered by reseller partners or directly from large hardware vendors.

- **Pre-configured appliances:** In this case, the notion of software-defined is stretched as the solution looks much like any other appliance, even if based on commodity hardware.

Software-defined storage is a great opportunity for innovation and enables vendors to implement new technology more quickly than with a traditional approach. This is beneficial for users, and is the reason why most startups in the data storage space work on software-defined solutions instead of developing their own hardware. Using commodity components helps an organization to take advantage of standard operating systems and robust hardware platforms, with plenty of resources available for the most demanding tasks. This approach allows small storage vendors to concentrate their development efforts on new, innovative features instead of reinventing the wheel.

Even though SDS continues to grow mindshare, its benefits are most visible in highly demanding environments or when the organization's available skills can cope with the additional management tasks and complexities that come with it. On the other hand, for most enterprise users, the difference between traditional storage arrays and software-defined solutions in Day-2 operations is minimal and doesn't really impact infrastructure TCO.

2. About the GigaOm Radar

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.

3. Market Categories and Deployment Types

To better understand the market and vendor positioning (**Table 1**), we categorized enterprise block storage systems by the target market segment. We recognize three segments in this report: small-medium business, large enterprise, and specialized:

- **Small-medium enterprise:** In this category, we find solutions that appeal to customers that value ease of use and deployment. These organizations can range from very small startups to businesses with medium-sized infrastructures. They can also be solutions adopted by large enterprises for departmental use cases, often without a very rich feature set and with limited data mobility and management capabilities.

- **Large enterprise:** Usually adopted for larger and business-critical projects. Solutions in this category have a strong focus on flexibility, performance, data services, and features for improving security and data protection. Scalability is another big differentiator, as is the ability of hybrid solutions to store data across on-premises and public cloud.

- **Specialized:** Designed for specific workloads and use cases, such as storage optimized for virtual infrastructures, big data, and high-performance computing (HPC), for example.

In addition, we recognize two deployment models for solutions in this report, on-premises and hybrid cloud:

- **On-premises solutions:** Available only for on-premises deployments. A traditional and simpler approach to block storage for those users who don't plan to move data seamlessly, and across different environments, through the storage infrastructure.

- **Hybrid and multi-cloud solutions:** These solutions are meant to be installed both on-premises and in the cloud, allowing customers to build hybrid or multi-cloud storage infrastructures. Solutions can be based on physical and virtual appliances or cloud managed services. This approach is more flexible, and the user usually has greater control over data mobility and the entire infrastructure stack.

Table 1: Vendor Positioning

	MARKET SEGMENT			DEPLOYMENT MODEL	
	Small/Medium Enterprise	Large Enterprise	Specialized	On-Premises	Hybrid Cloud
Commvault	++	+++	++	+++	++
DataCore	+++	+++	++	+++	+
Datera	++	+++	+	+++	+
DDN	+	+++	++	+++	+
Excelero	+	+++	+++	+++	+
Kaminario	++	+++	+	+++	++
LINBIT	+++	+	++	+++	+
Red Hat	++	+++	++	+++	+
SoftIron	+++	++	++	+++	-
StorOne	++	++	+	+++	-
StorPool	+	+++	+++	+++	-
Suse		+++	++	+++	+

+++ 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 2020

4. Key Criteria Comparison

Following the general indications introduced with the "Key Criteria for Evaluating Enterprise Block Storage," **Table 2** summarizes how each vendor included in this research performs in the areas that we consider differentiating and critical for modern data protection. The objective is to give the reader a snapshot of the technical capabilities of different solutions and define the perimeter of the market landscape.

Table 2: Key Criteria and Evaluation Metrics Comparison

	KEY CRITERIA						EVALUATION METRICS					
	AI-Based Analytics	New Media Types	NVMe-oF	Cloud Integration	API and Automation	Kubernetes Integration	System Lifespan	Flexibility	Ease of Use	$/IOPS	$/GB	TCO
Commvault	-	++	-	+++	+++	+++	+++	+++	+++	++	+++	+++
DataCore	+	+++	-	++	+++	++	+++	+++	+++	+++	+++	+++
Datera	+++	+++	+	+	+++	++	+++	++	++	+++	++	+++
DDN	+	++	-	-	+++	+++	++	++	++	++	++	+
Excelero	-	+++	+++	-	+++	+	++	++	++	+++	+	++
LINBIT	-	+	+++	+	+++	++	++	++	+	+++	++	++
Kaminario	+++	+++	+	+++	+++	++	+++	+++	+++	+++	++	+++
Red Hat	-	+	-	+	+++	++	++	++	++	++	++	++
SoftIron	++	-	-	-	+++	++	++	++	+++	++	++	++
StorOne	-	+++	+++	-	+++	+	+++	++	+++	+++	+++	+++
StorPool	-	+++	-	-	+++	++	+++	++	++	+++	++	+++
Suse	-	++	+	+	+++	++	++	++	+++	++	++	++

+++ 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 2020

Looking at the table, it is important to note that software-defined storage solutions still lack the maturity level of some key criteria (AI-based analytics, cloud integration, and NVMe-oF) compared to high-end and general purpose storage systems.

By combining the information provided in **Table 1** and **Table 2**, the reader should be able to get a clear idea of the market and the available technical solutions.

5. GigaOm Radar

This report synthesizes the analysis of key criteria and their impact on critical 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.
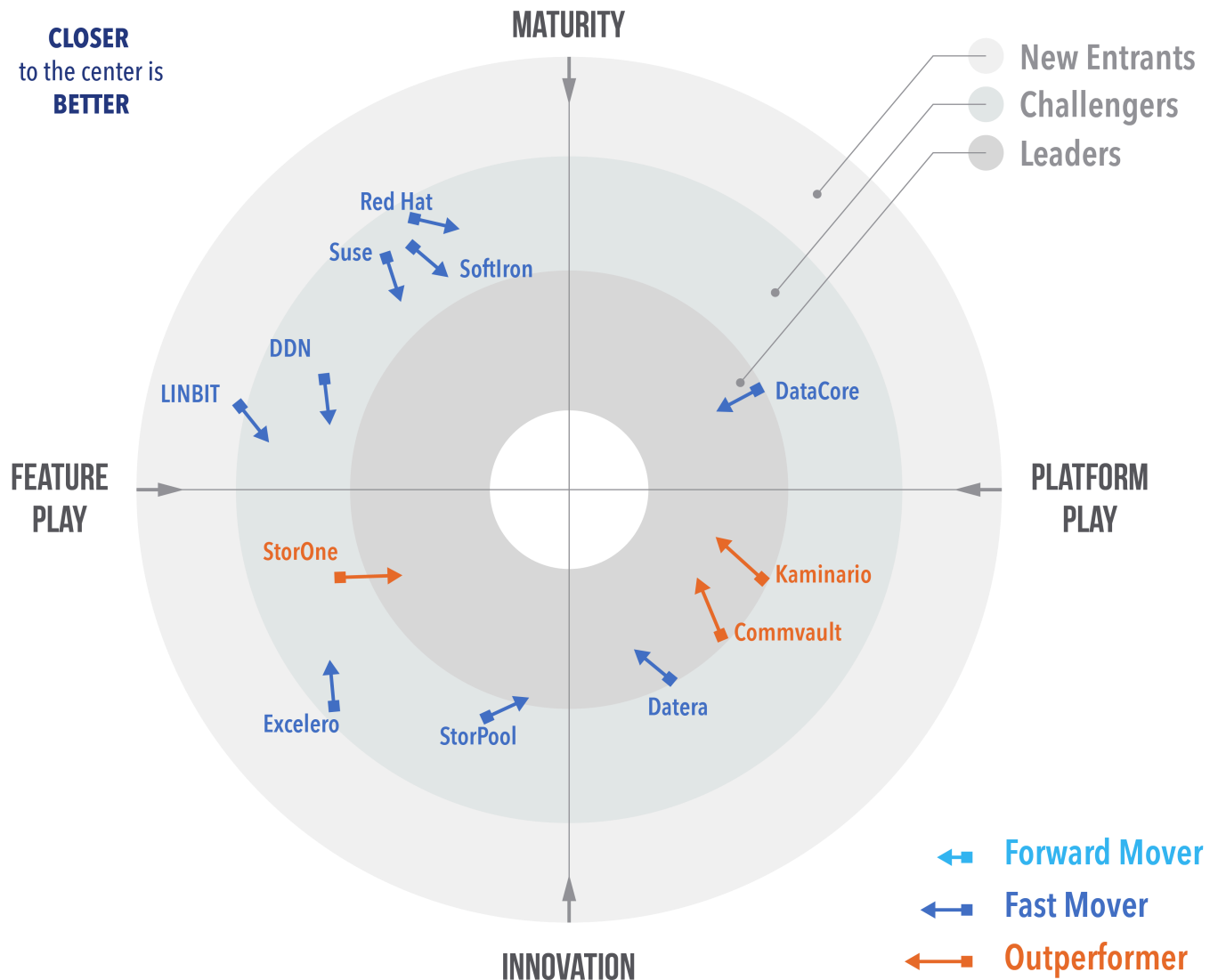
Figure 1: GigaOm Radar for Software-Defined Block Storage

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**, we show only "Outperformers" and "Fast Movers" in this Radar graphic. The SDS market is very active and most of the vendors constantly improve their products to reflect changing user needs.

The leader group counts DataCore, Kaminario, and Commvault (Hedvig) among its ranks. Datacore is mature, with a large installed base of satisfied customers, while Commvault and its Hedvig acquisition project a very strong vision and roadmap ahead.

In the group of challengers, StorOne and StorPool are showing great potential in their respective market segments—the kind of laser-focused, feet-on-the-ground solutions that can provide quick ROI and good TCO for the core use cases, while preserving the flexibility to make quick changes when necessary.

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.

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6. Vendor Insights

Commvault

Hedvig is a scale-out, software-defined storage solution recently acquired by Commvault to enable an end-to-end stack for data protection and expand the product line with a primary storage solution. In this regard, the Hedvig architecture is very flexible and allows configuration of the system for both capacity and performance, enabling users to target several types of workloads and data consolidation. Advanced caching mechanisms and data footprint optimization further improve system efficiency.

Hedvig is integrated with major operating systems, as well as with virtualization and orchestration platforms such as VMware and Kubernetes. It is certified with all primary hardware vendors, and can be deployed on-premises or in major public clouds.

Strengths: Scalable and modern architecture, easy to use with a comprehensive set of API, CLI, and webUI interfaces. Extensive partner network across the globe.

Challenges: NVMe is supported in the backend, but NVMe-oF is not available yet. AI-Based analytics features will be available early in the second half of 2020. Hedvig can be deployed in the cloud, but a managed service is not available.

DataCore

DataCore SANsymphony products are mature and rock solid. Starting with block storage virtualization of diverse SAN controllers many years ago, they now support local storage installed in clustered HCI nodes. The solution has been adopted by thousands of customers around the world, ranging from small organizations to large enterprises and cloud service providers.

The licensing model is simple, and the solution is flexible and feature-rich. HCI nodes can be mixed with storage-only nodes to maximize infrastructure utilization, and each node can be configured with different types of media. DataCore also built a strong reseller and technology partner network, enabling the vendor to provide both support services worldwide and certified hardware stacks.

Strengths: SANsymphony SDS scales effectively from small configurations to large installations, and is very flexible in terms of deployment and integration with other components of its ecosystem. Boasts extensive support for OSes and virtualization platforms.

Challenges: DataCore is working to improve its native data footprint optimization (compression and deduplication), while full NVMe-oF support is expected later this year (NVMe is already supported).

Datera

Datera employs a scale-out architecture that can combine several types of devices in the same data volume with an auto-tiering mechanism, based on user-defined policies, for correct data placement and quality of service (QoS). The solution is scalable and provides responsive, low-latency block storage to support consolidation of multiple types of workloads, including Tier 1 performance, in a single system.

Datera is designed for enterprise organizations that want to bridge the gap between traditional storage and next-generation applications, with good Kubernetes integration and policy- and API-based automation. The product has the ability to adapt quickly and continuously to user-declared requirements. The product also includes cloud-based analytics systems to simplify day-to-day operations.

Strengths: Innovative approach and a good combination of features. High-performance, low-latency block storage and good integration with legacy and emerging virtualization and orchestration platforms. Boasts a large technology partner ecosystem and a good hardware compatibility list.

Challenges: Lack of FC and NVMe-oF support for legacy infrastructures and high performance (tier-0) needs. Integration with VMware can be improved.

DDN

DDN NexentaStor, based on Open-ZFS, is a scale-up solution that provides both block (Fiber Channel and iSCSI) and file protocols. The solution is well known for OpenStack deployments in telco companies but can be deployed for a large number of use cases. It can be installed on bare metal, virtual appliances, and public clouds. The solution offers a good combination of performance and scalability with a centralized management console (Nexenta Fusion) that includes a complete set of analytics tools.

The compatibility matrix includes several pre-certified configurations from major server vendors, as well as a list of components from which to build customized systems for performance-driven and capacity-focused configurations. NexentaStor still is based on Illumos (previously Open Solaris), an OS that has been abandoned by most users and is being served by a rapidly shrinking developer community.

Strengths: A mature solution that offers a good combination of features and deployment options. It is integrated with major virtualization platforms and Kubernetes. Open-ZFS is very flexible, allowing configuration of the system for several types of workloads.

Challenges: No NVMe-oF support. The Open-ZFS community is very small, with limited contributions and few active users.

Excelero

Excelero provides an elastic NVMe solution that is designed for high-performance workloads such as AI training and analytics at any scale, and supports both disaggregated and hyper-converged configurations. Its innovative and efficient scale-out architecture focuses on workloads that require low latency and high performance, such as GPU storage. The solution takes full advantage of the NVMe and NVMe-oF protocols and requires minimal CPU resources, while providing distributed data mirroring and dual parity RAID across the cluster for resiliency.

Excelero provides an API-first approach to system management, with CLI and web-based user interfaces designed to offer a complete overview of the system. Detailed analytics tools serve to further simplify troubleshooting. Support is provided for both Linux and Kubernetes environments.

Strengths: Very scalable, with up to 256 nodes per zone and support for unlimited zones. Excelero supports NVMe-oF on both Ethernet and Infiniband. Fast and easy to automate resource allocation and deallocation.

Challenges: Limited support for legacy protocols, interfaces, and other data services usually requested by traditional enterprises. No integration with virtualization platforms such as VMware vSphere and limited OS support.

Kaminario

Kaminario has evolved from an all-flash array to a data storage platform aimed at serving hybrid cloud data requirements. It employs a simplified deployment process for major cloud providers. The Kaminario Cloud Data Platform enables organizations to accelerate the move to the public cloud, reducing the risk involved in running mission-critical applications in cloud-agnostic environments, while delivering agility, cost efficiency, and performance SLAs.

The Kaminario platform combines an AI engine with an orchestration layer to automate the task of scaling underlying resources and moving workloads within a hybrid cloud environment, based on business requirements. For on-premises deployments, Kaminario offers several connectivity options, including most of the modern ones (NVMe-oF and NVMe/TCP) alongside FC and iSCSI for legacy environments.

Strengths: Modern and compelling vision with a complete solution spanning hybrid cloud to multi-cloud deployments with consistent user experience. Flexible licensing and subscriptions, with software-only and pre-configured appliance options.

Challenges: Even though Kaminario has distribution agreements in the U.S. and E.U., its partner network is not as extensive as those of other vendors in the market.

LINBIT

LINBIT LINSTOR is a robust and intriguing software-defined storage solution that is able to provide block storage resources to Kubernetes and other platforms such as OpenStack, OpenNebula, and Red Hat OpenShift. The solution contains LINBIT's Distributed Replicated Block Device (DRBD) technology—its open-source, data replication platform for Linux systems.

LINSTOR supports iSCSI and NVMe-oF protocols and can be configured in a scale-out fashion while providing stretched cluster functionality. The solution can be deployed on all-flash and hybrid servers, and provides an automated tiering mechanism to move data across tiers. Linux-based snapshots and remote replication are available as well.

The product can also be deployed in a VM and share storage volumes via iSCSI to create cost-conscious, hyper-converged infrastructures compatible with VMware ESXi servers. A simple user interface is available to manage day-to-day tasks. LINSTOR LINBIT is available free of charge with support subscriptions offered to enterprise users.

Strengths: Deployable as a standalone storage system, either within the Kubernetes cluster or in a VM for hyperconvergence. Strong focus on Linux-based cloud and orchestration platforms. Provides advanced volume placement and QoS functionality, as well as an available Kubernetes scheduler for optimized placement of PODs with existing persistent volumes and fast failover.

Challenges: User interface is less appealing than those provided by other solutions. Advanced analytics tools are absent, though integration with Prometheus is coming. LINSTOR architecture relies on LVM or ZFS for some functionality and offers no native data footprint optimization.

Red Hat

Red Hat Ceph has been working through a constant progression, both in terms of performance and manageability, over the last few years—a product of the investments Red Hat has made in the platform over that span. The improvements address installation and configuration challenges, as well as Day-2 operations and performance.

Ceph is well integrated into the OpenShift ecosystem, and is very scalable, with support for block, file, and object protocols. Integration with both Kubernetes and Red Hat virtualization platforms is good, but there is limited support for leading virtualization platforms like VMware vSphere or Microsoft Hyper-V, or other operating systems like Microsoft Windows. System analytics is limited.

Strengths: Well integrated into the Red Hat ecosystem, especially OpenShift. Very scalable and integrated file and object storage services. The simplified installation process is welcome.

Challenges: Entry-level configuration remains overprovisioned for small organizations. Integration with other virtualization platforms is limited, and performance still needs improvement.

SoftIron

SoftIron recently joined the group of Ceph-based products dedicated to enterprise use cases, with an end-to-end solution that includes specialized appliances, software, and a comprehensive user interface to simplify operations. Easy to both deploy and manage, the SoftIron solution offers a welcome combination of flexibility, efficiency, and usability, thanks to a series of appliances dedicated to different types of workloads, gateway functions and management roles. While the solution is scalable, it lacks support for NVMe and NVMe-oF protocols and is not well suited to low-latency workloads.

It's worth noting that SoftIron operates its own manufacturing facility, speeding the design process for hardware and certifying the provenance of all the components in its stack. Overall system optimization has proven quite effective in reducing data center footprint and improving power efficiency.

Strengths: Easy to deploy and manage, with a design that overcomes most of the limits usually associated with Ceph-based deployments. The solution is both scalable and efficient, thanks to hardware designed specifically for Ceph.

Challenges: Lack of advanced analytics tools. Support for NVMe and NVMe-oF is not available yet. Like all other Ceph solutions, SoftIron is not particularly well suited for latency-sensitive workloads.

StorOne

StorOne S1 has a very lightweight and optimized architecture design that enables users to deploy systems with high performance at reasonable prices on commodity x86 hardware. Usually deployed in a traditional two-node cluster with a wide range of options for the backend (including NVMe-based storage-class memory and flash memory devices), StorOne S1 can address several types of use cases ranging from archiving to latency-sensitive HPC workloads. Hybrid configurations support multiple storage tiers in the same system and an automatic tiering mechanism that can move data efficiently between them. The system supports file and object protocols, snapshots, and synchronous and asynchronous replication.

StorOne S1 offers advanced data protection and data services, including automated tiering. Simple, easy-to-use UI, CLI, and APIs complete the picture. A very transparent sales model allows users to build and configure new systems quickly and with clear pricing. The business model is all indirect, with partners in a position to configure the entire system and provide the end user a complete end-to-end solution.

Strengths: Efficient, flexible, cost-effective, feet-on-the-ground type solution. Friendly licensing model.

Challenges: StorOne doesn't provide any integration with the cloud, but tiering to the cloud will be soon available, and a virtual appliance is offered as well.

StorPool

StorPool is a scale-out, high-performance storage solution that combines simplicity and reliability with good multi-tenancy and a strong API-driven approach. Usually adopted by service providers, StorPool is becoming more popular among enterprises and solution providers because of its flexibility. For example, the software can be installed on storage-only nodes or in a hyperconverged fashion, enabling users to optimize infrastructure density and performance.

StorPool provides integration and plug-ins for most common virtualization platforms and orchestrators, simplifying deployments in several scenarios. StorPool demonstrated more than once the very impressive performance it achieved by taking advantage of NVMe flash-memory and memory-class storage in relatively inexpensive configurations. Licensing options are flexible too, and the vendor offers the solution as a managed service as well.

Strengths: StorPool is cost-effective, very high-performance and it efficiently supports NVMe-based configurations. It offers multiple deployment options, multi-tenant capabilities, and the ability to integrate with several platforms in use among service providers and enterprises.

Challenges: Even though the product is growing in enterprise deployments, it is still primarily focused on the service provider market.

Suse

Suse Enterprise Storage is based on the Ceph open source project and provides several access protocols, including iSCSI. Simpler to install and manage than many other Ceph-based solutions in the market, Suse also offers simple subscription-based support plans. The solution is not optimized for intensive IO operations, but can combine scalability and throughput for several tier-2 types of workloads and, like other Ceph solutions, file and object protocols are supported as well.

Suse Enterprise Storage can count on several technical partnerships for pre-certified hardware solutions and a good reseller network across the globe. It is also important to note that Suse is one of the few Ceph solution providers that support ARM-based configurations for those customers that require the best power efficiency. No integration with the cloud in the backend is available at the moment, and advanced analytics tools are not available yet.

Strengths: Highly scalable and easier to use than other Ceph-based products. Suse Enterprise Storage is also available for ARM CPUs, making it a better option for installations with high power efficiency requirements.

Challenges: Even though Suse worked hard on performance optimization, Ceph is not designed for latency-sensitive workloads and support for NVMe-based protocols is still missing.

7. Analyst's Take

Software-defined storage is a growing market segment, which started with object and file storage and now extends to block storage. Solutions are more mature and robust, providing better performance figures thanks to the commoditization of fast flash-memory devices. This improved performance enables users to address mission-critical workloads better than in the past.

More enterprises are looking at the flexibility of this type of system for their infrastructures, with the goal of optimizing investments while accelerating the pace of innovation that comes from a simplified product development process. This doesn't mean that enterprises love the DIY (do it yourself) approach. In fact, they prefer pre-certified and pre-configured appliances in most cases.

If we look again at the Radar chart, we see that a growing number of solutions are based on open source technologies such as Ceph, especially those placed in the Platform Play area. These solutions are focused also on use cases that feature the Linux operating system as a preeminent part of the infrastructure. Linux users are known for being open to adopting new technology and alternative software-defined approaches to traditional IT infrastructure challenges.

In general, the market is moving quickly as enterprises ask for flexibility and cloud-readiness for storage. Solutions that separate hardware from software allow organizations to build flexible, hybrid and multi-cloud infrastructures more easily and with greater flexibility than traditional approaches do.

8. 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.

9. About GigaOm

GigaOm provides technical, operational, and business advice for IT's strategic digital enterprise and business initiatives. Enterprise business leaders, CIOs, and technology organizations partner with GigaOm for practical, actionable, strategic, and visionary advice for modernizing and transforming their business. GigaOm's advice empowers enterprises to successfully compete in an increasingly complicated business atmosphere that requires a solid understanding of constantly changing customer demands.

GigaOm works directly with enterprises both inside and outside of the IT organization to apply proven research and methodologies designed to avoid pitfalls and roadblocks while balancing risk and innovation. Research methodologies include but are not limited to adoption and benchmarking surveys, use cases, interviews, ROI/TCO, market landscapes, strategic trends, and technical benchmarks. Our analysts possess 20+ years of experience advising a spectrum of clients from early adopters to mainstream enterprises.

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