

Magic Quadrant for General-Purpose Disk Arrays

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The GPDA storage market is being reshaped by solid-state arrays, competition from the cloud, hyperconverged infrastructures, secondary storage vendors and vendor consolidation. I&O leaders who understand the benefits and risks created by such changes make smarter infrastructure refresh decisions.

Market Definition/Description

This document was revised on 14 November 2018. For more information, see the [Corrections page](#) (http://www.gartner.com/technology/about/policies/current_corrections.jsp).

General-purpose disk arrays (GPDAs) satisfy the storage needs of applications and middleware, such as databases, backup/restore systems and archiving solutions running on physical or virtual servers. Block-and-file protocols — e.g., Fibre Channel (FC), Internet Small Computer System Interface (iSCSI), Network File System (NFS), Serial Attached SCSI (SAS) and SMB — dominate this market. NVMe-oF, an emerging protocol designed to enhance the performance of solid-state arrays (SSAs), will not be supported by hybrid disk arrays or all hard-disk drive (HDD) arrays, perhaps other than those with flash-centric architectures delivering submillisecond response times.

Gartner segments the external, controller-based storage market into the GPDA space, which includes all disk and hybrid arrays, and the SSA market. This Magic Quadrant excludes SSA, object and distributed file system storage, as well as software-defined storage (SDS), because they have their own respective Magic Quadrant, Critical Capabilities and/or Competitive Landscape research.

Magic Quadrant

Figure 1. Magic Quadrant for General-Purpose Disk Arrays



Source: Gartner (November 2018)

The absence of vendors in the Visionary quadrant is a reflection of a vendor and venture capitalist (VC) focus on SSAs, cloud integration, hyperconverged infrastructure (HCI) and artificial intelligence (AI)/machine learning. These investments provide more autonomic storage management in high-growth market segments with value propositions that align with infrastructure and operations (I&O) leaders' priorities.

Vendor Strengths and Cautions

DDN

DataDirect Networks (DDN) storage arrays consist mainly of SFA14K and SFA7700K platforms, which collectively address a broad range of high-performance use cases. DDN's EXAScaler leverages these platforms, in combination with a custom Lustre file system, to address high-performance computing (HPC), archiving and machine learning use cases. Similarly, DDN GRIDScaler uses these hardware platforms to deploy IBM Spectrum Scale to address traditional HPC use cases. DDN's SFA OS can be viewed as a base OS that supports

these file services. Unlike most other competitor platforms, the SFA is not a variant of UNIX, but is a real-time OS that has been developed from ground up.

Complementing the SFA OS is the Storage Fusion Xcelerator, a licensed feature that uses the solid-state drive (SSD) tier as a cache for predictive application and file system performance. DDN understands the complex nature of its customer deployments. Therefore, it leverages highly technical channel partners that have experience with open-source and HPC deployments. It also has numerous Tier-1 independent software vendor (ISV) partners that resell its products to complete their own product portfolios.

The SFA7990, which was announced in June 2018, is a replacement for the SFA7700K; however, it's not covered here, because it did not meet our cutoff date for new product announcements. In September 2018, DDN completed the acquisition of Tintri, thus expanding its product portfolio to include general-purpose storage. This acquisition gives DDN access to Tintri's legacy customer base and an opportunity to expand and compete effectively in the enterprise storage market with a comprehensive portfolio of products. It also led to the withdrawal from marketing of the Enterprise Fusion Architecture (EFA) offering, which would have overlapped with Tintri arrays.

Strengths

- DDN is a large, profitable, self-funded storage vendor that is still run by its founders. It has demonstrated the ability to respond rapidly to its customers' needs and to new market opportunities.
- DDN has significant deployments and "mind share" in the HPC market, where its arrays offer high-performance storage, as well as archiving capabilities.
- DDN has vertical market solution specialists in life sciences, manufacturing, media, oil and gas, and finance, giving it expertise in its target verticals.

Cautions

- Supporting existing Tintri customers and continuing R&D efforts for its newly acquired product line may reduce focus and investment in its core business.
- SFA arrays do not support compression, deduplication and writeable snapshots.
- The SFA series does not support file protocols natively; thus, it cannot position itself as unified storage for general-purpose use cases.

Dell EMC

Five years after becoming a privately held company, and a privately controlled public company in September 2016, Dell is now in the process of taking itself public again. Dell's re-emergence as a publicly traded company is expected to occur before year-end 2018. After the initial public offering (IPO), VMware will once again become a wholly owned business unit, and Michael Dell will retain enough control to continue repositioning and restructuring the company to coexist profitably with hyperscale public cloud providers. This strategy provides Dell with the resources to potentially dominate the on-premises IT infrastructure market, acquire capabilities and technologies needed to prosper in a digital world, cope with competitive threats, and minimize channel conflicts that could arise from alternative strategies.

Dell's "leave no customer behind" product strategy and reorganizations have delayed the rationalization of its midrange and high-end storage portfolio. This has forced it to continue investing R&D resources in its Unity, VMAX, Isilon and SC Series storage arrays, and to support complex go-to-market strategies.

Dell's "Flash First" strategy and emphasis on new product development have generally limited GDPA R&D investments to keeping GPDA competitive and maintaining large ecosystems, rather than delivering new capabilities. The different lineages of these arrays have resulted in Unity, SC (i.e., Dell Compellent), VMAX and Isilon customers having different support experiences, and have added cost and delays to Dell's efforts to integrate with public cloud infrastructures.

Strengths

- A large installed base, a broad portfolio of competitive storage arrays and a viable cloud integration/coexistence strategy are providing Dell with the time and cushion needed to become a preferred hybrid cloud infrastructure provider.

- Dell EMC's re-emergence as a publicly traded company that is not privately controlled could provide the financial resources needed to enable it to invest in rapidly growing and/or disruptive technologies and new go-to-market strategies.
- Innovative lease and rental programs, multiyear enterprise license agreements and the SC Series' perpetual, right-to-use software license agreements – which waive one-time charges when doing array refreshes – are keeping Dell EMC on many users' shortlists.

Cautions

- Dell EMC's "better together" strategy, technology-refresh-based product announcements and a slowdown in the cadence of significant functional enhancements suggest a gradual loss of competitive advantage.
- Many clients no longer consider Dell EMC postsales service and support a competitive advantage.
- The lack of interoperability among Dell EMC storage systems adds management complexity and operational inefficiencies when deployed in mixed IT infrastructures.

Fujitsu

The Fujitsu disk array storage portfolio consists of the ETERNUS DX500 S4, DX600 S4, DX8700 S3 and DX8900 S3 systems. The midrange ETERNUS DX500 S4 and DX600 S4 arrays are new models that became available in January 2018. The high-end ETERNUS DX8700 S3 and DX8900 S3 models became available in July 2015. A new DX8900 S4 was announced in October 2018; however, this is not included in this analysis, because it's too early to rate this product. Fujitsu has a good understanding of the direction of the market in terms of storage manageability and technology directions. This can be seen in the ability of all DX hybrid arrays and AF SSAs to be managed by the same administration software – the ETERNUS SF. This provides storage infrastructures, with one standardized replication and administration system for several entries: midrange, high-end hybrid and SSAs.

Similarly, Fujitsu is leading in the area of transparency for performance with newly published, publicly available SPC results; the availability of 32Gbs FC connectivity; and a larger SSD tier in the midrange hybrid arrays. All of these factors improve performance and reduce rack space, power, cooling, networking costs and complexity.

Customer satisfaction and reliability are high; however, Fujitsu lacks support for hybrid cloud and pre-emptive AI and machine-learning-driven autoresolution and data analysis of storage array telemetries. Fujitsu's service provider approach offers a broad variety of capacity on demand and "pay as you go" storage services, called Fujitsu Cloud Services. This enables customers to use the ETERNUS DX storage arrays as a private cloud operational expenditure (opex), rather than making a capital expenditure (capex).

Strengths

- Open and transparent, up-to-date, independently verified performance results.
- High levels of reliability and customer satisfaction.
- One family of storage arrays with a common administration graphical user interface (GUI) and cross-array-compatible replication technology.

Cautions

- Lack of support for hybrid cloud.
- Lack of pre-emptive AI and machine-learning-driven autoresolution and predictive data analysis of storage array telemetries.
- Sales and support coverage in North America is not as comprehensive as in Europe, the Middle East and Africa (EMEA) or the Asia/Pacific (APAC) region.

Hewlett Packard Enterprise (HPE)

The HPE disk array storage portfolio consists of the HPE XP7, the 3PAR Series and the Nimble Series of storage arrays. The HPE XP7 and the HPE 3PAR 20000 series are the high-end arrays, whereas the HPE 3PAR 8000 and HPE Nimble HF series are the midrange arrays. HPE has continued to exploit the InfoSight technology that it acquired via the Nimble Storage acquisition. This can be seen by the complete integration of InfoSight predictive support automation with the HPE 3PAR arrays in April 2018. However, Infosight is not

available for the HPE XP7, which is not of great concern to customers, because the HPE XP7 is sold on an exception basis, where niche legacy system support is required.

Overall, Infosight has benefited HPE storage business by providing better levels of support and maintenance. Other nontechnological programs, which enable HPE disk storage arrays to remain competitive, are guarantee programs, such as the “Store More” and “Timeless Storage” offerings. These guarantee data reduction, reliability and inclusive software, as well as provide array controller upgrade programs.

Strengths

- Infosight provides a support and maintenance advantage to HPE 3PAR and HPE Nimble storage arrays.
- The HPE Nimble storage arrays are simple to deploy and administer.
- HPE offers “pay as you go” storage capacity on-demand offerings and HPE GreenLake services, which enable customers to use HPE storage arrays in private clouds at cloud prices and with subscription and service price models.

Cautions

- The HPE 3PAR and HPE Nimble Storage arrays do not support the latest high-bandwidth 32 Gbps FC connections, which reduce cabling and data center complexity.
- The HPE Nimble Storage arrays do not support file-based protocols, which are used by an increasing number of Internet of Things (IoT) and unstructured data applications.
- 3PAR and Nimble Storage product overlaps, differences in features, storage efficiencies and the lack of interoperable remote replication complicate messaging and sales cycles.

Hitachi Vantara

Hitachi Vantara continues to maintain its reputation for building reliable, high-performance storage arrays. New product announcements and enhancements have focused on improving ease of use (i.e., monitoring and management tools) and technical refreshes that carry minimal risks. Hitachi has been able to keep its large global customer base intact, keep customer satisfaction high, and maintain its well-respected service and support organization. This means its plans to become an IoT company may still result in improved performance in the storage market.

Hitachi has kept its Virtual Storage Platform (VSP) and Hitachi Network Attached Storage (HNAS) arrays competitive by most measures of product attractiveness. Sharing a common architecture and management tools, from the smallest VSP G200 to the flagship VSP G1500, provides users with an easy-to-follow upgrade path that leverages their investments in training policy and procedures. It also leverages Hitachi investments in infrastructure monitoring and management tools, as well as ecosystem certifications and plug-ins.

In May 2018, Hitachi refreshed its entry to midrange VSP arrays with the announcement of the G350, G370, G700 and G900. However, these new arrays were announced too late to influence Hitachi’s Magic Quadrant positioning or be considered in Gartner’s “Critical Capabilities for General-Purpose Midrange Storage Arrays.”

Strengths

- A worldwide presence, financial viability, a reputation for building reliable storage arrays and an effective support organization make Hitachi a storage vendor that can meet the needs of multinational corporations.
- The VSP’s common architecture, administrative tools, interoperability, ecosystem and scalability provide operational efficiency, while reducing the risks associated with growth.
- Hitachi is investing in improving its ease of use – specifically, the Storage Management Pack for VMware vRealize Operations, Hitachi Data Instance Director (HDID) and Hitachi Storage Plug-in for Containers (HSPC). They are providing tighter integration with VMware and public cloud providers, automation and copy data management.

Cautions

- Hitachi's reluctance to compete on price and willingness to "no bid" competitive situations limits its usefulness as an alternative to users dissatisfied with their incumbent storage vendors.
- The lack of HDD-level compression and deduplication has the potential to increase storage acquisition, maintenance and facilities costs, relative to competitors that support these features in many environments.
- Despite ongoing improvements, VSP management complexity and staff productivity relative to modern hybrids arrays remain a user concern.

Huawei

Huawei continues to mature as a provider of high-performing, external enterprise storage systems. The Huawei OceanStor series of storage platforms ranges from midrange to high-end. All models in the OceanStor series — 5000V5, 6800V5 and 18000V5 — feature a scale-out architecture and support for multihost, block-and-file protocols. A common OS (OceanStor OS) that implements a strong set of data service features and functions satisfies capacity utilization, replication, performance and security requirements and is shared across the OceanStor series. Huawei continues to release a regular cadence of enhancements strengthening its OceanStor controller-based software support for OpenStack, the public cloud and deployments requiring robust high availability.

Huawei supports its performance claims with published, industry-standard, SPC-1 benchmark results. Designed to meet the needs of specific use-case workloads, the number of controllers, host interfaces, disk drives and memory capacity are the physical attributes that differentiate the three members of the OceanStor series. In addition to the OceanStor family, Huawei has released FusionStorage, an appliance that is based on a new software stack that supports block-and-file protocols, to address on-premises, hyperscale, private cloud use cases. Huawei strategically engages with a broad range of value-added resellers (VARs), distributors, system integrators (SIs) and cloud-serviced providers to reach the end-user market.

Strengths

- In addition to a broad enterprise storage portfolio, Huawei provides a full stack of IT infrastructure solutions, including public cloud services.
- Available on all OceanStor models, the Huawei HyperMetro mirroring feature provides gateway-free, active-active capabilities between two locations supporting high-availability disaster recovery (DR).
- Huawei offers flexible acquisition models, including storage as a service (STaaS) offering that enables tiering and replicates data from on-premises infrastructures into the Huawei public cloud.

Cautions

- The Huawei OceanStor storage systems lack support for a platform-level, proactive-analytics-driven client support system.
- The geopolitical attitude of leaders in some countries may preclude organizations located in those countries from considering Huawei as a viable supplier of general-purpose storage arrays.
- The Huawei OceanStor management software interface does not measure up to best-of-class products in ease of use.

IBM

The IBM hybrid storage array portfolio mainly comprises the Storwize Series and DS 8880 Series. The XIV, which enjoyed moderate success in the marketplace, has been withdrawn from active marketing and has been replaced by the A9000 and A9000R. The Storwize Series is a dual-controller storage platform offered in two variants (the V7000 and V5000), both of which were last refreshed in 2016. Complementing the Storwize hardware is Spectrum Virtualize software, which IBM continues to enhance and improve by releasing regular updates. Block-level deduplication, Docker container support, native cloud tiering and REST API interface support were some of new capabilities introduced with Spectrum Virtualize during the past 12 months.

IBM offers a 2:1 data reduction guarantee on Storwize V5030 and V7000. Licensing is per enclosure, and software licensing can be purchased separately or as a bundle. The DS8000 Series are scale-up storage systems comprising the DS8884 and DS8886 products, positioned for mission-critical workloads. IBM has introduced several new features to the DS8000 series, notably tiering to the cloud and container support. It has also introduced zHyperLink, a mainframe link technology that delivers low-latency z/OS mainframe

input/output (I/O). IBM actively contributes to OpenStack and releases storage drivers at a regular cadence. It also provides strong integration with its ISV partners.

Strengths

- As a result of its strong and loyal partner network, IBM continues to exert strong influence in emerging markets.
- The Storwize platform can externally virtualize most third-party storage arrays, thus simplifying heterogeneous storage management.
- Both Storwize and DS8000 offer native tiering to the public cloud, without the need for a gateway device.

Cautions

- IBM charges for certain extra features in Storage Insights Pro, such as optimized data placement with tiering that others include in their base product; this can add cost and complexity to IBM storage decisions.
- The IBM DS8000 Series does not offer data reduction capabilities and requires deployment of a SAN Volume Controller (SVC) to enable these features.
- Existing XIV customers must plan for migration to alternative platforms, such as A9000R; IBM has announced that the XIV will no longer be actively sold.

INFINIDAT

INFINIDAT is a privately held company that reports positive cash flow, profitability, and continued revenue and installed base growth. In November 2017, it obtained \$95 million in Series C funding to support sales and marketing expansion, as well as increased R&D. These R&D investments have produced InfiniSync, Neutrix Cloud storage service, container support and the new InfiniBox 6212, with as much as 8.3 PBs of capacity.

InfiniSync is a unique alternative to three-site replication that replicates every I/O to a DR site, without the need for a data bunker. It achieves this by storing I/Os that have not yet been acknowledged by the InfiniBox installed at the DR site in a fireproof, shockproof and waterproof safe. These I/Os are then transmitted over a high-speed Wi-Fi or 4G Long Term Evolution (LTE) link, when a networking or array failure is detected. The Neutrix Cloud storage service enables applications to run on Amazon Web Services (AWS), Microsoft Azure or Google infrastructures to access InfiniBox-based STaaS, using a utility-based pricing model from those public cloud compute environments.

INFINIDAT has positioned its InfiniBox hybrid arrays as an attractive alternative to GPDA's and SSAs, by guaranteeing submillisecond response times, providing near-autonomic operation, as well as lower acquisition and ownership costs. Key to these advantages are an intuitive web GUI and an architecture that takes ownership of data placement and reduces the skills needed to competently operate an InfiniBox. InfiniBox's automation capabilities are further enhanced by the availability of software development kits (SDKs) and support of nonblocking RESTful APIs. Overall sales effectiveness is further enhanced by an all-inclusive, capacity-based software pricing model; standard, three-year 24/7 support; and the waiving of installation fees.

Strengths

- INFINIDAT is profitable, and is growing its presence in North America, EMEA and the APAC region.
- High customer satisfaction, an appealing set of InfiniBox value propositions, a demonstrated willingness to compete on price and a capacity on demand (COD) pricing model have created a large target market for INFINIDAT.
- INFINIDAT R&D is delivering a steady cadence of product enhancements that are important to users.

Cautions

- INFINIDAT has expanded into a multiproduct company, with expansion into new geographic areas, and double-digit revenue growth. This will test INFINIDAT's support capabilities and management team.
- InfiniBox's lack of metro or stretch-cluster support can increase the skills and time needed to quickly fail over and fail back.
- The lack of 16 Gbps and 32 Gbps FC and 25 GbE support is a performance and, potentially, a cost handicap. It will become increasingly important to overcome this when SSAs implement end-to-end NVMe-oF.

Infotrend Technology

Infotrend Technology develops and sells competitive entry and midrange scale-up storage platforms under the umbrella EonStor brand. Within this brand, Infotrend has developed three families — GSe Pro, GSc and GS — to address specific use cases. The EonStor GSe Pro is a single-controller solution designed for the small or midsize business (SMB) market; accordingly, the GSe Pro is not considered in this Magic Quadrant. The EonStor GSc family, released in June 2018, is positioned by Infotrend as a hybrid storage appliance to help users embrace the public cloud. It was too late to be considered in this Magic Quadrant. The EonStor GS, the Infotrend product analyzed in this Magic Quadrant, is a general-purpose enterprise storage platform, with multiprotocol block-and-file host support.

Originally architected in the era of HDDs, the Infotrend EonStor GS hybrid model optionally supports SSDs. The EonStor GS feature capacity efficiency, autostorage tiering, snapshot, remote replication, compression and data deduplication functions; however, deduplication is a postprocess implementation. The Infotrend EonOne is a common management platform for all members of the EonStor family. With corporate headquarters in Taipei, Taiwan, Infotrend supports its channel partners and end-user clients with sales and support offices in China, Europe, Japan, Pan-Asia and the U.S.

Strengths

- EonStor GS provides a unified storage platform to integrate with main cloud providers for backup and recovery, including AWS, Microsoft Azure, OpenStack Swift and Alibaba Aliyun, without the requirement for a separate gateway.
- Compression and data deduplication functions may be enabled or disabled by volume.
- Super capacitors, which last for the life of the storage system and require no maintenance, are paired with a flash module to protect against data loss due to power outages.

Cautions

- Infotrend's client support infrastructure heavily relies on its channel partners to resolve client Level 1 and Level 2 issues and has not implemented a deep analytics or AI methodologies system to proactively address client performance, capacity or problem issues.
- API support or snapshot integration with leading backup/recovery ISVs, including Veritas, CommVault and IBM Spectrum Protect, are missing capabilities in the EonStor family.
- The EonStor GS lacks support for quality of service (QoS) or multitenancy capabilities.

Inspur

Inspur, a top-three vendor in the Chinese IT market, is relatively unknown outside China. It is a portfolio vendor with competitive products and demonstrable expertise in servers, storage, cloud infrastructure and AI. Building off its domestic installed base, Inspur has decided to expand into the global market, using its relative independence from the Chinese government, competitive technology and aggressive pricing as key differentiators. Add the appeal of using the same technology for on-premises and public cloud infrastructures, and Inspur has a strong value proposition for organizations with a preference for implementing a hybrid infrastructure using regional cloud providers.

Inspur has a comprehensive portfolio of entry-level, midrange and high-end storage, along with SSA and SDS offerings. Inspur positions the AS5000G2 series arrays as midrange storage, and targets the AS18000 at the high-end market. The AS18000 supports block-and-file protocols, including FC, iSCSI, NFS and CIFS. Data services, including snapshots, cloning, encryption, local mirroring and QoS, are bundled as part of the base license. Additional services, such as remote replication, virtualization and tiering, require separate licenses. Licenses are priced per system for the midrange systems and priced per controller pair for the high-end systems. Inspur sells most of its products directly and has few channel partners outside the APAC region and Japan.

Strengths

- Inspur has the scale, technology and financial resources needed to expand into global markets.
- All AS G Series products, from entry-level to high-end arrays, share a common OS, management tools and ecosystem compatibility matrices.
- Development efforts are aligned with current market and technology trends and include improving management ease of use, replication functionality, storage efficiency, cloud integration and lowering its cost of goods.

Cautions

- Inspur lacks a significant market presence, brand awareness, access to a trained labor pool and demonstrated support capabilities outside China.
- Reliance on partners to sell and provide first-level support outside China will require prospects to do additional due diligence during the acquisitions.
- The lack of secure multitenancy and data deduplication are potential sales impediments for price-sensitive customers building on-premises clouds or delivering infrastructure as a service (IaaS).

Lenovo

The Lenovo DS Series and V Series make up its GPDA portfolio. Co-developed with Seagate Technology, the ThinkSystem branded DS Series is a scale-up storage offering supporting SAS, iSCSI and FC block host protocols. Substantiated by published SPC-1 benchmarks and aggressive pricing, the DS Series is an attractive offering from a price/performance perspective. The DS Series supports a mix of HDDs and SSDs, including self-encrypting hard drives (SEDs). Data service functions include thin provisioning, autotiering, asynchronous replication, snapshots and virtual storage pools; however, the DS Series lacks support for data deduplication or compression. Lenovo's XClarity Administrator is integrated with the DS Series, along with its Rapid Deployment and EZ Start wizard, to provide a standard user interface and to simplify setup and management.

The Lenovo Storage V5030 and V3700 V2 are sourced from IBM under an original equipment manufacturer (OEM) agreement. V5030 and V3700 V2 are scale-up storage platforms that feature support for multihost block-and-file protocols based on 12Gb SAS, 10Gb Ethernet and 16Gb FC technology. Both models support HDDs and SSDs; however, the V5030 can support more than twice the number of drives. The V5030 data service functions are more robust in that encryption, real-time compression and dual-system cluster are not available on the V3700 V2 model.

On 13 September 2018, Lenovo announced a global alliance agreement with NetApp. Under this agreement, Lenovo will source the NetApp SANtricity-based storage platforms, the FAS 2000/8000 series and the AFF A200/A300 All Flash arrays under an OEM arrangement. Lenovo will take these systems to market under the ThinkSystem brand and will be responsible for Level 1 and Level 2 support. The global alliance also includes a joint venture (JV) arrangement, enabling Lenovo and NetApp to develop and sell enterprise storage solutions specifically in the People's Republic of China (PRC).

The new Lenovo global alliance with NetApp is not part of the vendor analysis associated with this Magic Quadrant.

Strengths

- The ThinkSystem DS Series and Lenovo V Series enterprise storage platforms are proven and stable offerings.
- Lenovo has a credible worldwide service and support organization supported by an efficient supply chain.
- With the new NetApp alliance, Lenovo is expected to offer customers a more complete storage offering, from entry storage to unified all-flash arrays.

Cautions

- Ongoing service and support responsiveness for the ThinkSystem DS Series and Lenovo V Series may suffer as Lenovo transitions to the go-forward enterprise storage portfolio based on NetApp intellectual property (IP).
- Lenovo does not offer a cloud-connected client support infrastructure for the ThinkSystem DS Series and Lenovo Storage V Series.
- Lenovo and its ThinkSystem DS Series and Lenovo V Series clients will have to rely on Seagate and IBM to remain good technology partners, as Lenovo transitions away from them.

NEC

NEC is a Japanese IT products and services conglomerate, catering to enterprise and consumer businesses. The NEC hybrid storage array portfolio consists of the Mx10 and Mx20 series that together address entry-level and midrange enterprise storage requirements. Mx20 series functionality has been enhanced with the addition of flash tier data compression support. NEC introduced two new products in 2018 – M120 and M320 – both targeted at the entry-level storage market. In the midrange market, NEC continues to lead

with the M510 and M710 systems to address a broad range of application workloads requirements. Replication is supported in the array, as well as between storage systems in synchronous, semisynchronous and asynchronous modes.

NEC integrates with a broad range of backup, virtualization vendors. It integrates with video management system vendors, such as Milestone, to provide seamless live and archive video storage and contributes to OpenStack by releasing drivers for iSCSI and FC protocols at a regular cadence. It also provides verifiable and independent performance benchmarks by publishing SPC-1 benchmarks. It provides a tool to facilitate migrations between series and systems from multiple generations. Support staff are stationed across all major geographic locations to address escalations in a timely manner.

Strengths

- NEC is considered a leading storage provider in the media production and physical security vertical industries, and it integrates with several ISVs in these industries to deliver unique solutions.
- All essential software licenses are bundled, along with a storage array, thus simplifying the buying experience.
- The Mx10 Series integrates with NEC's disk-based backup and archive deduplication appliance, HYDRAsTOR, via DirectDataShadow software, thus streamlining the backup and archive process.

Cautions

- NEC's reseller agreement with Dell EMC has its business confronting uncertainties in the near term. It can be an opportunity for NEC to sell more of its own products, but it also risks losing a part of its important customer base and further reducing its focus on storage.
- The Mx10 Series does not support native data compression and deduplication, and the Mx20 supports SSD pool only data compression.
- NEC has had limited success in markets outside Japan, despite aggressive marketing campaigns.

NetApp

NetApp's hybrid disk array portfolio consists of the FAS2700, FAS8200, FAS9000 and E-Series of hybrid arrays. The unified FAS9000 is offered for file, block, multiprotocol and hybrid cloud high-end workloads, and the FAS8200 is offered for similar midrange workloads. The E-Series is positioned and offered into specific block storage workloads, where the requirements are oriented toward low-overhead, simple, fast storage that does not require data reduction. NetApp has expanded and diversified its storage array product portfolio to provide offerings for hybrid cloud infrastructures by using array software in integrated systems, software-based storage and cloud offerings. Examples of this include the FAS arrays, which are used to provide storage services by NetApp FlexPod integrated systems and Data Fabric. NetApp has been successful with its Data Fabric value proposition. This offering is for customers that require services that can move applications and their data between any cloud variations, such as among private clouds, among public clouds, and between private and public clouds.

The data mobility conversation that Data Fabric and FabricPool enables (automated tiering to the cloud) has up-leveled NetApp/customer conversations from that of a storage supplier to a supplier of business and developer solutions. Specifically, NetApp now often orients its value proposition to data and application mobility, compared with storage array features. Nevertheless, the result has been an increase in storage array sales. NetApp has partnerships and OEM agreements with many public cloud vendors, such as AWS, Microsoft Azure, and Google Cloud Platform, within which clients can run cloud-native file services or the NetApp storage array software, ONTAP, in the cloud. This enables NetApp storage arrays in private data centers to share, copy, move and transfer data with applications and services in the cloud.

The general-purpose storage arrays, FAS8200 and FAS9000, have not been updated since October 2016 and November 2016, respectively. However, because most functions and features are provided by the ONTAP software, which was updated with Version 9.4 in May 2018 and Version 9.5 in October 2018, customers can obtain all the latest features. Also, because general-purpose arrays are not used for performance-critical applications, the age of the FAS8200 and FAS9000 controllers with respect to performance is less significant. Customers that require performance can purchase solid-state AFF or EF arrays from NetApp.

Strengths

- NetApp offers the FAS Series of highly scalable, unified hybrid storage arrays, with all of the features required by today's hybrid cloud data centers.
- The Data Fabric value proposition resonates well with I&O leaders and opens new opportunities for NetApp.
- Broad cloud support and partnerships, and the ability to run SDS images of NetApp FAS arrays in the cloud with the major hosting vendors.

Cautions

- NetApp E-Series use cases and R&D are focused primarily on the HPC, data analytics and surveillance markets, which do not require unified storage or data reduction.
- Postsales support effectiveness is improving, but remains inconsistent
- Customers that require extra replication features, such as FlexClone, SnapMirror, SnapCenter and SnapManager, are required to purchase the Premium Bundle or other optional software, such as SnapLock and FlexArray Virtualization offerings.

Oracle

The Oracle ZFS storage scale-up, multihost protocol offering is presented in two form factors — as a stand-alone appliance or as a storage system that is preracked and precabled at the factory. The Oracle ZFS Hybrid Storage Pool technology features a combination memory/flash-centric architecture that optimizes performance with either all-HDD, all-flash storage or a combination of both. The mature data service software library reflecting a steady cadence of enhancements, supports a wide variety of capacity efficiency, replication, QoS, system analytics, management and security functions. In addition, Oracle has implemented co-engineered features with the Oracle Database and application development groups to elevate Oracle ZFS performance efficiency and storage management simplicity when deployed to support Oracle Database and application infrastructures.

The ZFS appliance is broadly deployed to support a wide swath of general-purpose and high-performance workloads, and is Oracle's preferred storage platform to support online transaction processing (OLTP) applications based on Oracle Database and Data Warehouse. The optional Oracle Cloud Infrastructure (OCI) SSA enables users to seamlessly migrate backup data to OCI or object storage.

Strengths

- Oracle ZFS Storage Appliances are available under flexible acquisition models, including the traditional capex method, a "right to use" program and a flexible capacity program. In this case, users pay a monthly fee and return the product at the end of the cycle.
- Data encryption is provided at a granular level by the ZFS Storage Appliance Controller, independent of drive media type.
- DTrace Analytics provides fine-grain analysis on the data path, from the ZFS Storage systems to the clients regarding performance, capacity utilization and problem resolution.

Cautions

- Current Oracle ZFS Storage Appliance offerings are not integrated with AWS, Microsoft Azure, Google Cloud Platform or IBM Cloud.
- Oracle does not guarantee performance or capacity utilization for its Oracle ZFS Storage Appliance deployments.
- Multitenancy, synchronous replication and cascading replication remain missing features in the ZFS Storage Appliance platform.

Quantum

Quantum's storage portfolio consists of the QXS hybrid storage systems and its Xcellis Scale-out network-attached storage (NAS). The QXS-3, QXS-4 and QXS-6 Series arrays support tiering, snapshots and asynchronous remote replication, but lack synchronous remote replication, compression and deduplication. This subset of features suggests an array designed for performance and low cost on a raw \$/TB basis. These characteristics align well with the needs of HPC, video and archiving environments, and enable the QXS series to compete in application environments that obtain little benefit from data reduction technologies. Hence, its broad hypervisor support and integration with open-source software (OSS) platforms, such as OpenStack.

With the December 2017 launch of its Xcellis NAS series, Quantum has improved its appeal in the unstructured data market by focusing on price and performance. Xcellis NAS uses Quantum's StorNext File System (SNFS) and can be purchased as an appliance or as SDS. The SNFS is functionally competitive; however, it lacks data compression, deduplication and synchronous remote copy. This subset of functionality maps the Xcellis and QXS series into the same target markets.

Quantum sells all of its storage systems via channel partnerships. Postsales support is addressed by support staff stationed in multiple locations that mostly address Level 1 and Level 2 cases, while Level 3 issues are addressed by dedicated engineering teams located in Quantum's headquarters. During the past few years, Quantum has increasingly focused on delivering vertical-specific solutions. It has established partnerships with video surveillance software providers and media and content production vendors and has delivered solutions that address these specific use cases.

Strengths

- The launch of Xcellis NAS, with an emphasis on scalability, cloud integration and price competitiveness, will align with CIO priorities and should enable Quantum to satisfy more of its customer's block and NAS storage requirements.
- QXS series arrays provide responsive and granular tiering features and meet NEBS and MIL-SPEC criteria.
- Quantum's focus on verticals, such as media content production and video surveillance, with well-established partnerships that have vendors in these verticals, reduces competitive exposures to larger vendors and cloud providers.

Cautions

- The lack of integration with VMware, Hyper-V and Kernel-based Virtual Machine (KVM) limits Quantum's appeal outside its verticals.
- Growth in video surveillance, HPC and AI/machine learning has created a more competitive market in which Quantum is an option.
- Non-Quantum customers considering Xcellis NAS will need to do additional due diligence that includes product capabilities, Xcellis NAS support capabilities and reference checking.

Synology

This Taiwanese company caters to the SMB and midrange storage market. In the midrange enterprise storage market, Synology leads with its FS and XS series storage systems. In the SMB category, it offers multiple product lines: J-series, Value Series and Plus Series, which cater mainly to file storage requirements. All Synology systems are equipped with DiskStation Manager (DSM), a web-based OS that helps users customize the storage system to address specific use cases. DSM can configure the storage system to provide the following services: file sync and share server, cloud gateway, and virtualization platform, as well as a backup/DR target. The DSM also supports iSCSI, which is useful for small enterprises looking for a low-cost SAN solution.

All essential data services, such as compression, snapshots and replication, and file-and-block protocol support, are bundled as part of the base software, which is free of charge. Its products are certified with a wide variety of virtualization and cloud platforms, such as VMware, Microsoft, Docker and OpenStack, as well as all major public cloud vendors. Synology's rich ecosystem of channel partners addresses all major markets, and its technical support staff covers all major geographic locations.

Strengths

- Synology DSM is feature-rich and updated at a regular cadence.
- Synology has a strong presence and mind share in the entry-level and midsize NAS market.
- The Synology arrays integrate with all major public cloud vendors for such use cases as file sync and share and archiving.

Cautions

- Synology has a limited presence and mind share in the enterprise storage market.
- Its storage array platforms perform many server and storage roles, creating potential confusion during the buying cycle.
- Synology storage arrays lack scale-out capabilities.

Western Digital

With its acquisition of Tegile in August 2017, Western Digital can now implement and offer new storage technologies, purchase methods, guarantees and features. It has retained much of IntelliFlash's senior management team and development staff and demonstrated a commitment to making this a successful acquisition. Western is adding a new tier of persistent storage memory in the controller for hybrid storage arrays to improve performance, while maintaining low hybrid storage array purchase costs. Due to the storage software being media-independent, with no proprietary hardware, Western offers unified storage arrays with most protocols and storage media and can transition quickly to new technologies.

Support is provided globally in the U.S., APAC region and EMEA. Western Digital's use of an indirect channel sales model is intended to lower costs, thereby enabling customers to buy on-premises, private data center storage at public cloud cost. IntelliFlash continues to grow and gain new customers in the hybrid storage array market; however, sales of its SSAs are overtaking the HDD-based hybrid arrays. IntelliFlash uses the same storage software in hybrid arrays and SSAs, so the hybrid arrays and SSAs have the same administrative GUI and can replicate to each other. Customer migrations to and from SSAs and hybrid arrays are simple.

Strengths

- Western Digital can adapt quickly and implement new features, purchase methods (such as all-inclusive storage software features) and monthly storage subscription charges.
- Western Digital now has large 1 PB, high-availability scale-out arrays with proven, real-world 1,000,000 input/output operations per second (IOPS) capabilities.
- Western Digital's modern arrays have all the features of incumbent arrays, plus more, such as compression and deduplication for hybrid HDD/SSD arrays.

Cautions

- Most of the vendor's growth is from the solid-state/flash products, not from the HDD or hybrid arrays.
- Western Digital will have to make significant investments in marketing, sales and support capabilities to grow IntelliFlash's customer base without negatively affecting customer satisfaction.
- Synchronous replication is still not available with the Western Digital hybrid arrays.

Vendors Added and Dropped

We review and adjust our inclusion criteria for Magic Quadrants as markets change. As a result of these adjustments, the mix of vendors in any Magic Quadrant may change over time. A vendor's appearance in a Magic Quadrant one year and not the next does not necessarily indicate that we have changed our opinion of that vendor. It may be a reflection of a change in the market and, therefore, changed evaluation criteria, or of a change of focus by that vendor.

Added

None

Dropped

- Tegile was acquired by Western Digital.
- Tintri exited the business due to bankruptcy.
- Promise experienced a change in direction.

Inclusion and Exclusion Criteria

The criteria enumerated below apply to established and emerging vendors alike selling midrange and high-end general-purpose storage systems that support block, file, or block-and-file protocols. Commonly supported protocols include FC, iSCSI, SAS, SMB (aka CIFS) and NFS. Less commonly used, but still qualifying, protocols include FC over Ethernet (FCoE) and InfiniBand. These systems are optionally configured with a mix of HDDs and/or SSDs.

Product Criteria:

- Bundled all the hardware and software needed to store and retrieve data using industry-standard block and/or file host connection protocols into a storage array.
- Implemented architectures with no single points of hardware failure.
- Sold system through indirect or OEM channels, maintained brand awareness with end users, and had an average selling price of more than \$24,999.

Vendor Criteria:

- Annual company revenue of \$50 million or more.
- A multinational presence and 24/7 support capabilities.

The inclusion of dual-controller, scale-out and high-end storage systems in the same Magic Quadrant does not imply that the differences in usable availability, scalability, performance/throughput and functionality in these different architectural approaches are insignificant.

Evaluation Criteria

Ability to Execute

The Ability to Execute axis highlights the change in vendor positioning directly attributable to vendor actions. Criteria that provide relatively high levels of vendor and product differentiation are more highly weighted than those that have relatively little ability to provide differentiation.

Table 1: Ability to Execute Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Product or Service	High
Overall Viability	Medium
Sales Execution/Pricing	High
Market Responsiveness/Record	Medium
Marketing Execution	High
Customer Experience	High
Operations	Medium

Source: Gartner (November 2018)

Completeness of Vision

The Completeness of Vision axis highlights the change in vendor positioning directly attributable to vendor actions. Criteria that provide relatively high levels of vendor and product differentiation are more highly weighted than those that have relatively little ability to provide differentiation.

Table 2: Completeness of Vision Evaluation Criteria

Evaluation Criteria ↓	Weighting ↓
Market Understanding	Low

Evaluation Criteria	Weighting
Marketing Strategy	Medium
Sales Strategy	High
Offering (Product) Strategy	High
Business Model	High
Vertical/Industry Strategy	Medium
Innovation	High
Geographic Strategy	Low

Source: Gartner (November 2018)

Quadrant Descriptions

Leaders

Vendors in the Leaders quadrant have the highest composite scores for their Ability to Execute and Completeness of Vision. A vendor in the Leaders quadrant has the market share, credibility, and marketing and sales capabilities needed to drive the acceptance of new technologies. These vendors demonstrate a clear understanding of market needs. They are innovators and thought leaders with well-articulated plans that customers and prospects can use when designing their storage infrastructures and strategies. In addition, they have a presence in the five major geographical regions, consistent financial performance and broad platform support.

Challengers

Vendors in the Challengers quadrant participate in the broad GPDA market and execute well enough to be a serious threat to vendors in the Leaders quadrant. Challengers have strong products, as well as a sufficiently credible market position and resources to sustain continued growth. Financial viability is not an issue for vendors in the Challengers quadrant; however, they lack the size and influence of vendors in the Leaders quadrant.

Visionaries

Vendors in the Visionaries quadrant deliver innovative products that address operationally or financially important end-user problems on a broad scale, but have not yet demonstrated the ability to capture market share or sustainable profitability. Visionary vendors are frequently privately held companies and acquisition targets for larger, established companies. The likelihood of acquisition often reduces the real versus perceived risks associated with installing their systems.

Niche Players

Vendors in the Niche Players quadrant are often narrowly focused on specific markets or vertical segments, such as data warehousing; HPC; low-cost, disk-based data retention; and other areas that are generally underpenetrated by the larger disk array vendors. This quadrant may also include vendors that are ramping up their disk array offerings, or larger vendors that are having difficulty developing and executing on their vision.

Context

This Magic Quadrant represents vendors that sell into the end-user market with branded general-purpose disk and hybrid arrays. These arrays may be internally developed, or acquired through an acquisition or OEM agreement. Tight budgets and skills shortages have caused vendors and users to focus on technologies and features that lower acquisition and ownership costs, while improving performance and throughput. This has resulted in thin-provisioning, autotiering, hybrid configurations (Flash and HDDs) and near-autonomous operation becoming ubiquitous in GPDA. It is also driving the deployment of SSAs into I/O-intensive environments and creating opportunities for emerging storage companies that can refactor infrastructure designs to obtain incremental improvements in performance, economics and staff productivity.

Examples include hyperconverged integrated systems (HCISs), SDS and cloud gateways that make it practical to implement hybrid on-premises/public clouds. Concerns with security exposures and meeting ever-more-stringent regulatory requirements are now making SEDs generally available.

Market Overview

The GPDA market is declining on a revenue and unit basis, even as capacity shipped continues to grow. This has made vendors more aggressive and innovative as they attempt to grow market share and expand into tangential markets, such as HCIS and hybrid cloud. Customer satisfaction is high, with 77% of customers completely satisfied and fewer than 6% unsatisfied with their GPDA providers, per reference checks conducted for this research. Not surprisingly, storage connection protocol usage remains essentially unchanged. The top three used by customers are FC (47%), iSCSI (15%) and NAS (23%), with 15% using other protocols, such as SAS, FCoE and InfiniBand.

The virtualization of more than 80% of user applications and improvements in technology has led users to treat high-end, midrange and NAS systems as roughly equivalent. This practical parity, coupled with tight budgets, insatiable storage demand and improved DR capabilities, has led many users to allow them to compete against each other – even in business-critical environments.

Emerging storage vendors are indirectly influencing the market by using innovation to influence large, established storage vendors. Some of these storage and portfolio vendors are using these emerging storage companies as their primary source of product innovation.

Gartner expects the advantages of traditional, high-end enterprise storage arrays to continue to disappear during the next three to five years, as scale-out storage arrays, integrated platforms and infrastructure SDS gain maturity, market share and mind share. However, we do not see the midrange and high-end market segments collapsing into a single market, because of prior investments in troubleshooting capabilities and compatibility testing.

Evaluation Criteria Definitions

Ability to Execute

Product/Service: Core goods and services offered by the vendor for the defined market. This includes current product/service capabilities, quality, feature sets, skills and so on, whether offered natively or through OEM agreements/partnerships as defined in the market definition and detailed in the subcriteria.

Overall Viability: Viability includes an assessment of the overall organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue investing in the product, will continue offering the product and will advance the state of the art within the organization's portfolio of products.

Sales Execution/Pricing: The vendor's capabilities in all presales activities and the structure that supports them. This includes deal management, pricing and negotiation, presales support, and the overall effectiveness of the sales channel.

Market Responsiveness/Record: Ability to respond, change direction, be flexible and achieve competitive success as opportunities develop, competitors act, customer needs evolve and market dynamics change. This criterion also considers the vendor's history of responsiveness.

Marketing Execution: The clarity, quality, creativity and efficacy of programs designed to deliver the organization's message to influence the market, promote the brand and business, increase awareness of the products, and establish a positive identification with the product/brand and organization in the minds of buyers. This "mind share" can be driven by a combination of publicity, promotional initiatives, thought leadership, word of mouth and sales activities.

Customer Experience: Relationships, products and services/programs that enable clients to be successful with the products evaluated. Specifically, this includes the ways customers receive technical support or account support. This can also include ancillary tools, customer support programs (and the quality thereof), availability of user groups, service-level agreements and so on.

Operations: The ability of the organization to meet its goals and commitments. Factors include the quality of the organizational structure, including skills, experiences, programs, systems and other vehicles that enable the organization to operate effectively and efficiently on an ongoing basis.

Completeness of Vision

Market Understanding: Ability of the vendor to understand buyers' wants and needs and to translate those into products and services. Vendors that show the highest degree of vision listen to and understand buyers' wants and needs, and can shape or enhance those with their added vision.

Marketing Strategy: A clear, differentiated set of messages consistently communicated throughout the organization and externalized through the website, advertising, customer programs and positioning statements.

Sales Strategy: The strategy for selling products that uses the appropriate network of direct and indirect sales, marketing, service, and communication affiliates that extend the scope and depth of market reach, skills, expertise, technologies, services and the customer base.

Offering (Product) Strategy: The vendor's approach to product development and delivery that emphasizes differentiation, functionality, methodology and feature sets as they map to current and future requirements.

Business Model: The soundness and logic of the vendor's underlying business proposition.

Vertical/Industry Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of individual market segments, including vertical markets.

Innovation: Direct, related, complementary and synergistic layouts of resources, expertise or capital for investment, consolidation, defensive or pre-emptive purposes.

Geographic Strategy: The vendor's strategy to direct resources, skills and offerings to meet the specific needs of geographies outside the "home" or native geography, either directly or through partners, channels and subsidiaries as appropriate for that geography and market.

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