

Magic Quadrant for General-Purpose Disk Arrays

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Summary

Storage vendor consolidation, competition from SDS vendors and cloud providers, and new sales and support models are continuing to change the storage market. I&O leaders who understand the opportunities and risks created by these changes will make better infrastructure refresh decisions.

Market Definition/Description

General-purpose storage arrays are designed to satisfy the storage needs of applications running on physical or virtual servers. Block and file protocols (such as FC, iSCSI, NFS and SMB) continue to dominate this market. Gartner segments this market into the general-purpose disk array market, which includes all disk and hybrid arrays, and the solid-state array (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 Magic Quadrant and/or Critical Capabilities research.

Magic Quadrant

Figure 1. Magic Quadrant for General-Purpose Disk Arrays



Vendor Strengths and Cautions

DDN

DDN is a privately held company that focuses on delivering storage solutions for high-performance computing (HPC), media and analytics use cases. DDN's strength in these market segments is highlighted by its OEM agreements with Hewlett Packard Enterprise (HPE), Dell, Fujitsu, Atos, Cray, IBM and Lenovo, and are a reflection of the management team's deep engineering roots. DDN's hybrid storage product portfolio mainly consists of the SFA14K and the smaller SFA7K series. NAS and object storage functionality is provided by configuring the SFA7K and SFA12K systems as the back-end storage, namely the GRIDScaler and EXAScaler platforms. EXAScaler is built on the Lustre file system and positioned for HPC use cases, while GRIDScaler leverages IBM

Spectrum Scale (based on GPFS) and is positioned for big data use cases. DDN also offers vertical-specific solutions, namely BIOScaler and MEDIAScaler for life sciences and media content production workflows, respectively. The Storage Fusion Xceleration (SFX) flash cache accelerates file system performance and supports multiple configurations depending on the pattern of reads and writes. DDN has its support and professional services teams present in all major geographies that help the vendor to respond to specific customer requirements adequately.

STRENGTHS

- 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 within its target verticals.
- The SFA series provides deep integration with VMware and Microsoft Hyper-V storage APIs.

CAUTIONS

- Data services such as compression, deduplication and writeable snapshots are available only when configured as enterprise fusion architecture (EFA).
- The SFA series does not support file protocols natively, thus cannot position itself as unified storage for general-purpose use cases.
- DDN's lack of mind share in the general-purpose storage market makes standardizing on its technology more difficult for storage architects seeking simplification.

Dell EMC

Dell's acquisition of EMC is now more than a year old. While organization and personnel adjustments are still occurring, the new organization's strategy for product rationalization is now in much clearer focus and can best be summarized as, "Do no harm while repositioning the company and its product portfolio." This has translated into maintaining investments in Unity, VMAX, Isilon and SC (aka Compellent) series storage arrays, minimizing interseries competition and creating "better together" integrated infrastructure solutions that leverage heritage Dell-owned technologies without putting partner relationships at risk. Omitted from this list is the PS series, which is on the road to end of life.

Dell EMC is taking advantage of its status as a privately held company by prioritizing the creation of lease agreements that publicly traded companies have difficulty in countering, the development of indirect channel-centric marketing and sales programs, and maintaining an image of technology leadership over other key performance indicators, such as individual transaction profitability and R&D to revenue ratios. Much of Dell EMC's sales success in the EMC installed base is attributable to its success in upgrading its installed base with Unity, VMAX and Isilon arrays configured with solid-state drives (SSDs), and product enhancements that improve staff productivity and business continuity. Dell Storage Center Operating System 7 (SCOS 7), the latest version of the SC microcode, is providing similar functional enhancements to the Dell Compellent installed base; of particular note is SCOS 7's support of Live Volume and compression and deduplication across SSD and hard-disk drive (HDD) tiers of storage.

STRENGTHS

- Innovative rental and lease offerings, multiyear enterprise license agreements, and the SC series' perpetual right to use software license agreements that waive one-time charges when doing array refreshes keep Dell EMC on many end-user shortlists.

- A broad portfolio of storage arrays that are competitive within their respective market segments enables customers to choose storage solutions that optimally align with application needs without complicating vendor management.
- Dell EMC's faster-than-forecast paydown of its debt and its broad product portfolio are keeping it a "safe choice" in a chaotic market.

CAUTIONS

- Dell EMC's changes in senior management, loss of experienced sales and support personnel, and increased emphasis on hyperconverged integrated systems (HCISs), cloud and the Internet of Things (IoT) are disrupting customer relationships and plans and creating opportunities for competitors.
- Managing a disparate collection of Dell EMC storage systems complicates vendor and asset management and adversely affects operational efficiency.
- Dell EMC's strategy of "better together," a slowdown in the cadence of significant product enhancements, and limited product rationalization may be precursors to declines in array competitiveness.

Fujitsu

Fujitsu's high-level direction is to provide a solution and service business, rather than specific point products. Nevertheless, Fujitsu also resells the NetApp FAS and AFF series arrays, in situations when a customer requires a large file-storage-oriented solution. Due to this, the Fujitsu marketing and sales emphasis is not solely on products, but also on the wider IT solution, and therefore customers are not as aware of Fujitsu storage array marketing programs as they are with product-oriented competitors. Taking this into account, Fujitsu offers the Eternus DX S3 series of storage arrays, which consists of the midrange DX500 and DX600, and the high-end DX8700 and DX8900 models. The DX500 S3 and DX600 S3 have not been upgraded since November 2013. Fujitsu recently made available the highly competitive AF250 and AF650 SSAs in November 2016, which use the same administration GUI and can be used to cluster and replicate data from and to disk arrays. While Fujitsu's long-term direction is toward SSAs, the vendor also enables the integration of the Eternus DX into OpenStack environments by providing the OpenStack integration Cinder driver/software for Eternus DX storage. Fujitsu has provided customers with transparency for the performance and pricing of its storage arrays, and continues to do so with a published SPC-2 benchmark that became available in May 2016.

STRENGTHS

- All DX series arrays share the same microcode, administration GUI, replication and clustering for high availability.
- Fujitsu has deep and broad R&D and engineering resources that enable it to develop highly scalable multipetabyte DX8900 arrays and a family of hybrid arrays and SSAs, which all interoperate with each other.
- Data compression and deduplication are available and included in the purchase price of the DX500 and DX600 arrays.

CAUTIONS

- The high-end DX8900 arrays do not offer data compression or deduplication.

- Fujitsu made available new DX60, DX100 and DX200 S4 entry-level arrays in May 2017, which can now scale to similar capacities and performance levels as the midrange S3 arrays.
- Fujitsu does not offer a cloud gateway or connector or interface specifically for Amazon S3 or Azure with its storage arrays.

Hitachi Vantara

Hitachi Vantara (formerly known as Hitachi Data Systems [HDS]) is a company in transition. Changes in senior management and business strategies, reductions in workforce, and Hitachi's decision to focus Hitachi Vantara on IoT opportunities within its installed base suggest that storage marketing and sales resources will continue to be constrained for the foreseeable future. Hence, we expect Hitachi to continue to rely on its reputation for building reliable high-performance storage arrays, its customer base and its partners to support its storage business. While this is suboptimal from a storage growth perspective, this strategy does have the advantage of using the vendor's large global customer base and its well-respected worldwide support organization to maximum effect.

Hitachi has kept its Virtual Storage Platform (VSP) and Hitachi Network Attached Storage (HNAS) gateway offerings competitive by most measures of product attractiveness, particularly those that are important to business and mission-critical workloads. Sharing a common architecture and management tools from the smallest VSP G200 to the flagship VSP G1500 preserves customer investments in and policies and procedures, and leverages ecosystem-related investments. Hitachi-engineered Flash Modules (FMDs) are now available within all VSP G series systems. FMDs provide wire speed in-line data compression without consuming controller resources by offloading data compression overhead into a custom application-specific integrated circuit (ASIC). Data deduplication is restricted to Flash (FMD and SSD) layer with block workloads and across all tiers of storage with file workloads using the integrated NAS modules or HNAS gateways. Other product enhancements have focused on improving ease of use, developing tighter integration with VMware, developing a hybrid cloud solution and increasing the distance of the Global-Active Device (GAD) offering to 500 km.

STRENGTHS

- A worldwide presence, a reputation for building reliable storage arrays, an effective support organization and being part of a large conglomerate have maintained Hitachi Vantara's persona of being a "safe" storage vendor.
- The VSP's common architecture, administrative tools, interoperability, ecosystem and scalability simplify the sales cycle and align well with channel capabilities.
- GAD, Hitachi Automation Director, Hitachi Infrastructure Analytics Advisor, and tiering to Amazon Web Services (AWS), Microsoft Azure and Hitachi Content Platform (HCP) are improving usable availability and staff productivity, and keeping the VSP on user shortlists.

CAUTIONS

- Hitachi's change in company direction and focus on its installed base leaves it generally unable to influence the GPDA storage market and puts its ability to execute its new strategy at risk.
- The vendor's lack of HDD-level compression and deduplication, coupled with a reluctance to compete on price, limits its appeal in price-sensitive customer environments.

- Despite Hitachi Storage Advisor improvements, administrative and operational GUIs, and intuitiveness relative to Hitachi Command Suite, management complexity remains a problem within the VSP and, by inference, HNAS installed bases.

HPE

The Hewlett Packard Enterprise (HPE) storage array portfolio consists of the XP7, 3PAR StoreServ, StoreVirtual and HPE Nimble Storage CS-Series arrays. The CS-Series of midrange arrays was added to the HPE portfolio with its acquisition of Nimble Storage in April 2017. Nimble Storage sales, marketing and operations have been fully merged into centralized HPE corporate functions. Nimble R&D and support operate as a group and report to a Nimble team within the storage business. The Nimble CS-Series is clearly positioned to complement, not replace, the HPE 3PAR StoreServ series. Nimble's InfoSight will also enhance HPE's service and support effectiveness by improving remote support, analysis and predictive monitoring. Differentiation in arrays is primarily in architecture, scale, ease of use, and breadth of protocol and server support. Therefore, for the most common and standard use cases, such as server virtualization, all of the arrays in the HPE storage portfolio can be successfully implemented. The HPE 3PAR StoreServ series of arrays was recently enhanced with the 20000 R2 series, which became available in June 2017. The HPE XP7, which is sourced from Hitachi Ltd., Japan, is sold into very specific point solutions where niche protocol connects are required and, therefore, HPE rarely leads with the HPE XP7. Instead, it leads with the 3PAR StoreServ and Nimble CS-Series arrays for the majority of customer requirements.

STRENGTHS

- Existing HPE 3PAR customers will be able to benefit from HPE InfoSight's fault monitoring and predictive preventative maintenance analysis.
- HPE Nimble Storage provides competitively priced storage arrays due to an array design that uses 100% industry-standard commodity components.
- CS3000 and CS5000 arrays' support of HDD-level compression and deduplication improves CS-Series economics across a broad range of workloads.

CAUTIONS

- 3PAR and Nimble arrays are not compatible; they use different GUIs and cannot replicate between each other.
- A lack of 3PAR HDD-level compression and deduplication makes comparing 3PAR versus CS-Series ownership costs difficult because such costs become a variable that is influenced by workloads.
- Rapidly integrating Nimble Storage into HPE will almost assuredly adversely impact existing sales and support relationships.

Huawei

Huawei is a large and growing provider of a broad range of hardware and software technology products. With a global reach, Huawei is leveraging its strong standing as a network equipment provider to the telecommunications industry to sell its enterprise IT products, servers and storage. With a late start, the vendor has emerged as a disruptive provider of general-purpose storage arrays, gaining share from the entrenched legacy vendors. Featuring a scale-out architecture, its OceanStor 5000 V3, 6000 V3 and 18000 V3 platforms cover a broad range of use cases in the midrange and high-end general-purpose storage array and NAS market. The OceanStor offerings have the performance and capacity scale, along with a strong set of controller-based data

services, to meet most users' requirements. Since early 2016, Huawei has been strengthening its OceanStor controller-based software support for OpenStack, the public cloud and deployments requiring robust high availability. Huawei strategically engages with a broad range of value-added resellers, distributors, system integrators and cloud service providers to reach the end-user market.

STRENGTHS

- Huawei's OceanStor operating system underpins its entire general-purpose storage array portfolio, unifying and simplifying management from entry-level to high-end platforms.
- The OceanStor controller-based HyperMetro Active-Active architecture provides a cost-effective disaster recovery platform, enhancing high availability.
- Huawei's supply chain, along with its efficient manufacturing processes, enable it to present cost-effective general-purpose storage arrays to the user community.

CAUTIONS

- Huawei employs a software value-added pricing model that complicates contract administration and makes total cost of ownership projections more difficult to determine.
- The vendor's postsales customer support is more reactive than proactive, as it only recently introduced a cloud-connected predictive-analytics-driven support system outside of China.
- The geopolitical attitudes of leaders in some western countries may preclude organizations located in those countries from considering Huawei as a viable supplier of general-purpose storage arrays.

IBM

IBM's general-purpose storage portfolio mainly consists of the Storwize family, DS8000 series and the XIV series. While IBM continues to make incremental investments in the Storwize and DS8000 series, and positions these products aggressively, the cadence of XIV series product enhancements has slowed in the past year. IBM released the V7000 Gen 2+ and all flash variants, namely V5030F and V7000F, in August 2016. The V7000 Gen 2+ was released with Intel 10-core Broadwell processors and increased memory, and 16GB FC interfaces. The V7000 Gen 2+ can coexist with earlier versions of the V7000 in a single cluster. IBM also continues to release new versions of its SDS product, Spectrum Virtualize, at a regular cadence to minimize potential microcode interoperability problems. Enhancements to the DS8000 series include support for space reclamation and tiering to cloud-based object storage platforms. Tiering to cloud does not require an additional gateway device and can be used to archive aging datasets.

All three platforms — Storwize, DS8000 series and XIV Storage System — can be used as building blocks in VersaStack, IBM's integrated systems product.

STRENGTHS

- The V7000 offloads compression to the compression accelerator card and thus has negligible performance overhead, as well as a compression guarantee of 2:1.
- The Storwize family and DS8000 series support a broad range of hypervisors and data protection software.
- The XIV supports secure multitenancy and integration with VMware, OpenStack and Microsoft Azure Site Recovery; all of this makes it suitable for private cloud and hybrid cloud deployments.

CAUTIONS

- The DS8000 series' lack of native virtualization, compression and deduplication requires customers to deploy it behind a SAN volume controller (SVC) for these functions, with its accompanying cost and complexity.
- The Storwize V7000/V5000 and XIV Storage System still do not have data deduplication, which is a common data service offered by most enterprise hybrid storage vendors.
- Although the V7000 is a scale-out system, the lack of secure multitenancy makes it less attractive for private cloud deployments.

Infinidat

Infinidat, founded in 2011, is a privately held company reporting positive cash flow and profitability of InfiniBox series sales into the high end of the storage array market. InfiniBox differentiation centers on high availability, consistent high performance, autonomic operation, multiprotocol support, and much lower acquisition and ownership costs than competitors' high-end arrays. InfiniBox v.3 microcode, released in September 2016, includes in-line data compression, iSCSI and NAS protocol support, and improved performance analytics. Its optional data compression has a minimal impact on performance because data is only compressed when it is destaged from second-level cache (i.e., SSDs) to back-end HDDs.

InfiniBox has an intuitive web GUI and an architecture that takes ownership of data placement and reduces the skills needed to own and make effective use of InfiniBox F2000, F4000 and F6000 series storage arrays. InfiniBox's automation capabilities are further enhanced by the availability of software development kits (SDKs) and support of nonblocking RESTful APIs. InfiniBox's use of three active controllers per system provides lots of compute power to reduce the impact of microcode updates and controller failures, and enables the ongoing development of new functionality that consumes CPU resources. 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 has achieved profitability with revenue growth balanced across North America, EMEA and the Asia/Pacific region, with new and repeat business.
- The InfiniBox is a high-end, simple-to-use, multiprotocol, low-cost general-purpose storage array that is feature- and performance-competitive with more expensive high-end arrays.
- Infinidat's investments in direct sales and technical specialist teams help it and its channel partners to deliver valuable pre- and postsales services to large global enterprise accounts.

CAUTIONS

- Infinidat's focus on high-end storage leaves it more vulnerable to established vendors with large product portfolios that can use their financial resources to create nonproduct barriers to entry into large accounts.
- InfiniBox does not yet offer data deduplication, synchronous replication, metro or stretch-cluster, or three-site replication.
- InfiniBox's lack of 16 Gbps and 32 Gbps FC and 25 GbE support and a 24-port maximum may result in increased connectivity costs and limit usable scalability in input/output (I/O)-intensive environments.

Infotrend

Infotrend is a small, but established provider of a broad range of general-purpose storage arrays. With attention to detail and a steady cadence of R&D innovation, Infotrend has been developing and shipping entry-level to midrange general-purpose storage arrays for over two decades. Noted for being an early adopter of latest-generation HDDs and SSDs, as well as the latest Intel CPU sets, Infotrend's products generally deliver above average price/performance. Infotrend's midsize general-purpose storage systems have evolved over time from platforms that supported only block-access protocols to platforms that support multiple protocols, including block-, file- and object-access services. The EonStor GSe Series and GS Series include an integrated Cloud Gateway Engine that supports backup and archiving functions to Amazon S3, Microsoft Azure, Google Cloud Platform and Alibaba Aliyun. With market success in the Asia/Pacific region, Japan and EMEA markets, Infotrend exclusively reaches the end-user market via its channel partners.

STRENGTHS

- Infotrend uses independent SPC-2 test results to validate EonStor price/performance standing among midrange general-purpose storage arrays.
- Infotrend's longevity, over two decades, as an independent technology provider of general-purpose storage arrays illustrates that it is providing value to the user community.
- 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

- Quality of service (QoS), multitenancy and vCenter plug-ins are missing EonStor features.
- Limited penetration in the Americas may unfavorably impact responsive service and support.
- Infotrend's client care infrastructure does not include phone home or cloud-connected analytics support.

Inspur

Inspur is a China-based information and communication technology (ICT) vendor that is well-known for its leadership in the server market, primarily targeted at cloud service providers. With a strong presence in the hyperscale market, Inspur has expanded into the global market and made inroads in the service provider segment. However, it also has a comprehensive portfolio of entry-level, midrange and high-end storage, as well as SDS products. Inspur positions the AS5000G2 series as the midrange storage product, and targets the AS18000 at the high-end market. The AS18000 supports both iSCSI and FC block protocols, but does not support file protocols. Data services, namely 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 a majority of its products directly, and has very few channel partners outside the Asia/Pacific region and Japan.

STRENGTHS

- The Inspur AS18000 series supports a broad range of hypervisors and backup vendors.
- The AS18000 series also supports local mirroring and snapshots, as well as remote replication in both synchronous and asynchronous modes, thus providing multiple levels and types of data protection.

- The autotiering feature supports four different tiers of storage, as well as the ability to archive data to the cloud via an embedded cloud gateway.

CAUTIONS

- Inspur lacks significant presence and overall brand awareness outside of Greater China.
- The AS5000G2 supports in-line compression, but does not support data deduplication. The AS18000 lacks data reduction technologies, such as compression and deduplication.
- A lack of secure multitenancy may be impediments when customers evaluate Inspur as a solution to deliver infrastructure as a service.

Lenovo

Rather than applying R&D resources to acquire or develop an enterprise storage stack, Lenovo has opted to partner with other technology providers to establish a presence in the enterprise storage array market and to complement its server offerings. Lenovo offers two Lenovo branded product families that span the entry-level to midrange enterprise storage array market — the DS Series and the V Series. Lenovo sources the DS Series from a third party under an OEM arrangement, selling it under the new ThinkSystem DS Series brand. The ThinkSystem is an umbrella brand covering Lenovo servers, storage and networking products. It sources the V Series from IBM under an OEM arrangement, selling it under the established Lenovo Storage V Series brand. Emphasizing leading-edge price/performance attributes, the DS6200 offers a basic set of data service features and limited scalability. The more full-featured V5030 offers more than twice the scalability of the DS Series, as well as a richer set of data service software.

STRENGTHS

- Lenovo has a global service and support organization that makes it more appealing to international corporations.
- Both the DS Series and V Series storage arrays are proven technology with an established record of incremental enhancements.
- Utilizing IBM's Spectrum Virtualize software at its core, the Lenovo Storage V Series storage array facilitates data migration from other enterprise storage arrays.

CAUTIONS

- Lenovo's reliance on OEM relationships limits its control over product roadmaps and the ability to create differentiated storage offerings.
- Lenovo does not offer a cloud-connected client support infrastructure for the ThinkSystem DS Series and Lenovo Storage V Series.
- Selling architecturally dissimilar arrays that lack interoperability or common management tools complicates infrastructure management and sales cycles.

NEC

NEC is an established Japan-based technology and service provider. In the last two years, NEC has made efforts to increase its brand awareness in the U.S., and is working with channel partners to expand its reach in this market. Over the past year, NEC has made several updates to its flagship storage product line, the Mx10 Series. NEC entered the SSA market with the release of the Mx10-F Series. It has established key technology partnerships with Commvault, Veritas Technologies' NetBackup and Veeam for backup, and Milestone Systems for video surveillance solutions. From security and compliance standpoints, it supports audit trails, role-based access

control (RBAC) capabilities and integration with third-party antivirus scanning engines such as Trend Micro ServerProtect for Microsoft Windows, McAfee VirusScan Enterprise and Symantec Protection Engine. NEC is an active contributor to OpenStack and has regularly released OpenStack Cinder drivers for FC and iSCSI in the last year. It also provides verifiable and independent performance benchmarks by publishing SPC-1 benchmarks. Software licensing for the Mx10 Series is controller-based and does not depend on the capacity of the storage procured.

STRENGTHS

- NEC offers deep integration with VMware environments and supports VMware Virtual Volumes (VVOLs), VMware Storage Replication Adapters and vCenter plug-ins.
- The NEC Mx10 Series uses MAID technology, which reduces power consumption by automatically turning off HDDs when they are in idle state.
- The Mx10 Series integrates with NEC's disk-based backup and archive deduplication appliance, HYDRAsstor, via DirectDataShadow software, thus streamlining the backup and archive process.

CAUTIONS

- Compression and deduplication are supported via a third-party appliance, SANblox from Permabit, which was recently acquired by Red Hat, resulting in deployment complexity and increased risk of early product obsolescence.
- The lack of a significant presence outside of Japan means those customers must carry out a more comprehensive due diligence of NEC's local postsales support capabilities.
- The Mx10 Series requires procuring an additional NAS gateway to enable file protocols.

NetApp

NetApp is leading its array value proposition with the Data Fabric architecture, which is designed to improve agility and enable customers to exploit the hybrid cloud. To enable this from a storage array perspective, NetApp has positioned its FAS series as general-purpose storage and its E-series as storage building blocks for use with single-application workloads such as video surveillance, technical computing, and backup and recovery, and 100Gb NVMe-over-InfiniBand for HPC workloads. The FAS8200 and FAS9000, which were made available in October 2016 and November 2016, respectively, and the E5760 and E5724, featuring the new SANtricity 11.40 OS, were released in September 2017. NetApp made the Ontap 9.2 version of array software available for the FAS arrays to provide additional data fabric features and capabilities that integrate with cloud services and provide common data management across storage arrays, cloud storage, SDS and hyperconverged solutions. While the value proposition of data management rather than storage management resonates well with customers, it is very complex to implement and support in a heterogeneous storage vendor environment; therefore, most customers' successes will be in a homogeneous NetApp infrastructure. Ontap software is now available as stand-alone SDS software that customers can implement on servers in the cloud (AWS and Microsoft Azure) and on industry-standard servers for remote offices and converged systems.

STRENGTHS

- NetApp's realigning its storage array series to clearly identified use cases and focusing on all-flash FAS has improved customer confidence in the vendor's future direction.
- The Data Fabric architecture integrates NetApp products with the cloud and is an intelligible, easy-to-understand strategy.

- Ontap 9.2 software provides agility and data management features for application developers in a transparent manner, which makes the underlying storage array hardware transparent.

CAUTIONS

- The E-Series provides commodity-level functionality, competes on price and is often considered a tactical, rather than strategic, product choice.
- NetApp now sells more SSAs than disk-based general-purpose arrays.
- NetApp is not using an all-inclusive software pricing model with its FAS arrays, but a set of base and advanced bundles that somewhat simplify acquisition cycles and deployment decisions.

Oracle

The Oracle ZFS Storage Appliance is a technologically mature, general-purpose enterprise storage array platform. The ZFS Storage Appliance's underlying in-memory architecture produces high input/output operations per second (IOPS) performance and low latency, and comes with a rich set of data services. The ZFS Storage Appliance Analytics software, DTrace, provides users with fine-grained visibility into the elements of a ZFS infrastructure, as well as into Oracle Database 12c pluggable databases and virtual machines (VMs) in server virtualization environments, helping to optimize performance and capacity, and troubleshoot issues affecting business applications. Building on the ZFS Storage Appliance core architecture and data service platform, Oracle has implemented specific features to enhance integration, ease of use and performance with Oracle applications and databases. To further support its cloud initiative, the vendor has added a built-in cloud gateway to the ZFS Storage Appliance, enabling users to seamlessly place and retrieve data on the Oracle Public Cloud platform.

STRENGTHS

- Oracle offers multiple host interface protocols, enabling support for SANs and NAS infrastructures.
- Independent SPC-2 test results provide transparency regarding ZFS Storage Appliance performance.
- Hybrid Columnar Compression (HCC) and Oracle Intelligent Storage Protocol (OISP) maximize the capacity utilization and performance associated with Oracle Database 12c.

CAUTIONS

- The ZFS Storage Appliance does not support a native interface to AWS or Microsoft Azure.
- Multitenancy support is a missing feature in the ZFS Storage Appliance platform.
- Adoption of the specific features associated with Oracle applications and databases raises concerns about vendor lock-in.

Promise Technology

Promise Technology has a portfolio of storage arrays and solutions primarily positioned to address opportunities in media and entertainment, rich media, video streaming, file sync and share, postproduction, video surveillance, and backup and archiving. However, only the Promise VTrak E5000, VTrak Ex30 RAID and VTrak A-Class Shared SAN storage appliance offerings qualify as general-purpose storage arrays. With design emphasis on performance associated with large blocks and ease of use, the VTrak E5000 and VTrak Ex30 RAID platforms are basic storage

arrays that support a SAN or direct-attached storage (DAS) infrastructure. Conforming to a scale-out architecture, the VTrak A-Class platform incorporates a high-bandwidth and low-latency file system, VTrakFS, to support file sharing applications. With a global presence, Promise has advanced research centers, sales, marketing and service/support personnel located in the U.S., China and its home country, Taiwan. Promise reaches the end-user community via a wide array of reseller and OEM partners.

STRENGTHS

- As a provider of general-purpose storage arrays, Promise has exhibited staying power in a highly competitive market by focusing on the requirements associated with media and entertainment, postproduction, and video surveillance deployments.
- Promise provides timely certification for the latest versions of the macOS operating system versions, as well as support for asymmetric logical unit access (ALUA) to enhance availability and load balancing in a SAN infrastructure.
- The VTrak A-Class Shared SAN storage appliance supports up to eight VTrak E5000 or VTrak Ex30 RAID nodes, enabling capacity to scale to 7 PBs.

CAUTIONS

- Autotiering, thin provisioning, QoS, multitenancy and data reduction are missing features in the VTrak E5000 and VTrak Ex30 RAID platforms.
- Promise's client support infrastructure is a reactive model that is unable to predict potential issues concerning performance and capacity, or perform online root cause analysis.
- Promise relies on a rather shortlist of Tier 1 channel partners and system integrators for its financial well-being.

Quantum

Quantum's storage portfolio consists of the QXS hybrid storage system, namely QXS-3 series, QXS-4 series and QXS-6 series products that are targeted at general-purpose workloads as well as vertical-specific use cases. The QXS system also supports data services such as tiering, snapshots, local mirroring and replication capabilities, but lacks data reduction technologies such as compression and deduplication. The QXS Q-Tools provide storage management capabilities such as caching and thin provisioning. QXS supports a broad range of hypervisors and integrates with open-source software platforms such as OpenStack.

Quantum sells all of its storage systems via channel partnerships. Postsales support is addressed by support staff stationed in multiple geographies that mostly address Level 1 and Level 2 cases, while Level 3 issues are addressed by dedicated engineering teams located in Quantum's headquarters. In 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 QXS series offers responsive and granular tiering features.
- QXS offers highly resilient array controllers and enclosures from a heat, dust and vibration perspective, which meet both NEBS and MIL-SPEC criteria.
- Quantum has a unique focus on verticals such as media content production and video surveillance, with well-established partnerships with vendors in these verticals.

CAUTIONS

- The lack of support for file protocols decreases QXS appeal in the midsize enterprise segment, which increasingly prefers unified storage solutions.
- Additional licenses are required for snapshots, replication and tiering.
- Performance and capacity does not scale linearly as the QXS series does not support a scale-out architecture or a distributed file system.

Synology

Taiwan-based storage vendor Synology primarily sells NAS solutions to the midmarket segment. Although the Synology XS+/XS series is mainly deployed for file storage, the same platform can also be used to host the vendor's proprietary email server, sync and share server, backup server, and a video surveillance system, each of which can be enabled by downloading separate software plug-ins. The platform also supports iSCSI, thereby providing small or midsize businesses with a low-cost optimized option for traditional SAN storage. Synology offers its customers the flexibility to choose the hard drive type and capacity for each of its storage products and does not bundle its HDDs with the storage array models. Its products are certified with a wide variety of virtualization and cloud platforms, such as VMware, Microsoft, Docker and OpenStack, as well all major public cloud vendors. 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. Synology has a rich ecosystem of channel partners to address all major markets, and technical support staff cover all major geographies.

STRENGTHS

- Synology DiskStation Manager (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 use cases such 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 can perform a multitude of server and storage roles, thus creating potential confusion during the buying cycle.
- Synology storage arrays lack scale-out capabilities.

Tegile

Tegile is a vendor that often leads in the ability to implement and offer new storage technologies, purchase methods, guarantees and features. In August 2017, Western Digital announced that it would acquire Tegile, which would lead to more financial, technology and go-to-market resources; however, organizational integration plans are not available and, therefore, the success of this acquisition and completion of this acquisition cannot yet be determined. Tegile is now working on 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, Tegile offers unified storage arrays with most protocols and storage media, and can transition to new technologies quickly. Support is provided globally in the Asia/Pacific region, EMEA and the U.S. Tegile'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. Tegile continues to grow and gain new customers within the hybrid storage array market, but sales of its SSAs are overtaking the HDD-based hybrid arrays. However, since Tegile uses the same storage software in hybrid arrays and SSAs, the hybrid arrays and SSAs have the same administrative GUI and can replicate to each other, and customer migrations from and to SSAs and hybrid arrays are simple.

STRENGTHS

- Tegile has demonstrated an ability to adapt quickly and implement new features, purchase methods (such as all-inclusive storage software features) and monthly storage subscription charges.
- Tegile now has large 1 PB, high-availability scale-out arrays that have proven real-world 1,000,000 IOPS capabilities.
- Tegile's arrays are modern designs that have all the features that incumbent arrays have 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 Tegile's customer base without negatively impacting customer satisfaction.
- Synchronous replication is still not available with the Tegile hybrid arrays.

Tintri

After growing its installed base to over 1,400 customers and 4,300 systems, Tintri became a publicly traded company in June 2017. The money raised by this IPO will be invested in marketing, sales and R&D. The Tintri T800 Series of fully autonomous hybrid storage arrays is targeted at customers that do not want to manage or administer their storage arrays or are considering HCIS solutions. Tintri's decision to provision only VMs, rather than physical and VMs, has enabled it to deliver ease of use that is very competitive with HCIS solutions, and more prescriptive in tailoring performance to individual VM needs. The arrays only require monitoring, not storage provisioning or configuration. All Tintri arrays provide in-line compression and deduplication across all tiers of storage. This is especially valuable in VDI and dev/test environments.

Tintri Global Center (TGC) Standard is a no-charge management tool that can manage up to 64 systems from a single management console. Features such as VM-based policy management, QoS automation, and systemwide real-time storage and server analytics provide the ability to manage and meet service levels, even as systemwide server and storage performance change. TGC Advanced with VM Scale-out software is an extra chargeable item that creates a federated pool of storage that can scale up to 40 PBs and 480,000 VMs with accelerated storage live migration through array offloading. Analytics and modeling provide recommendations to storage administrators that minimize the cost of meeting service-level objectives. Tintri Cloud Connector allows workloads to be protected in Amazon S3 or IBM Cloud Object Storage, in addition to Tintri replication and snapshots.

STRENGTHS

- Tintri's status as a publicly traded storage company differentiates it from privately held storage companies and will give it more credibility in many competitive situations.

- TGC and VM Scale-out software improves T800 Series' attractiveness in small, midsize and large opportunities by simplifying provisioning and optimizing costs.
- Tintri has a diversified hybrid and SSA product portfolio running the same OS and management platform, with superb ease of use and competitive compression and deduplication features.

CAUTIONS

- Tintri's IPO generated less cash than anticipated, which could adversely affect its growth plans and ability to reach profitability.
- Tintri's decision to only support VMs via NFS or SMB3 file protocol access, and the limited scalability of its T800 Series arrays, forces customers that have not fully virtualized their infrastructure and/or large-capacity demands to pursue a dual vendor storage strategy.
- The inclusion of more storage features in hypervisors and hyperconverged systems competes directly with Tintri's value proposition.

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

- Lenovo
- Synology

Dropped

- Dell Technologies (now integrated into Dell EMC)
- Nimble Storage (acquired by HPE)
- X-IO Technologies

Inclusion and Exclusion Criteria

The criteria enumerated below apply to both established and emerging vendors alike selling midrange and high-end general-purpose storage systems that support block, file, or both block and file protocols. Commonly supported protocols include FC, iSCSI, SMB (aka CIFS) and NFS. Less commonly used, but still qualifying, protocols include 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

Notes:

- 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 (October 2017)

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

Source: Gartner (October 2017)

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, and they have 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

A vendor in the Challengers quadrant participates in the broad general-purpose disk array market and executes 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, but they lack the size and influence of vendors in the Leaders quadrant.

Visionaries

A vendor in the Visionaries quadrant delivers innovative products that address operationally or financially important end-user problems on a broad scale, but has 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 market 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 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-autonomic operation becoming ubiquitous general-purpose disk arrays. 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 HCIS, 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 self-encrypting disks (SEDs) generally available.

Market Overview

The general-purpose disk array market is declining on a revenue and unit basis, even as capacity shipped continues to grow. This has made vendors ever 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 less than 6% unsatisfied with their general-purpose disk array, per reference checks conducted for this research. Visionary vendors such as Infinidat, Tegile (now part of Western Digital), Tintri and Nimble Storage (now part of HPE) improve the customer experience and maintain pressure on the incumbent vendors with their new offerings, extensive features, and easy-to-use/purchase and support storage arrays. Not surprisingly, storage connection protocol usage remains essentially unchanged, with the top three used by customers being FC (47%), iSCSI (15%) and NAS (23%), with 15% using other protocols, such as FCoE, InfiniBand, etc. The virtualization of more than 80% of user applications and improvements in technology have 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 disaster recovery capabilities, has led many users to allow them to compete against each other — even in business-critical environments.

Emerging storage vendors — particularly those in the Visionaries quadrant — are indirectly influencing the market by using their innovation to influence large established storage vendors. Many large established storage and portfolio vendors are using these emerging storage companies as their primary source of product innovation.

Gartner expects that the advantages of traditional high-end enterprise storage arrays will continue to disappear over the next three to five years as scale-out storage arrays, integrated platforms and infrastructure SDS gain maturity, and market 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.

