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Magic Quadrant for Solid-State Arrays

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Summary

Solid-state arrays have matured beyond performance-oriented workloads, and the benefits are now compelling for all primary storage plus old and new unexpected workloads. This Magic Quadrant will help IT leaders better understand SSA vendors' positioning in the market.

Strategic Planning Assumptions

By 2021, 50% of data centers will use SSAs for high-performance computing and big data workloads, up from less than 1% today.

By 2020, 50% of data centers will use only SSAs for primary data, instead of hybrid arrays, up from less than 1% today.

Market Definition/Description

This document was revised on 25 August 2016. The document you are viewing is the corrected version. For more information, see the Corrections (http://www.gartner.com/technology/about/policies/current_corrections.jsp) page on gartner.com.

Considering the disruptive nature of solid-state arrays (SSAs) and their impact on the general-purpose external controller-based (ECB) disk storage market, Gartner has elected to report only on vendors that qualify as an SSA vendor. We do not consider solid-state drive (SSD)-only general-purpose disk array configurations in this research. To meet these inclusion criteria, SSA vendors must have a dedicated model and name, generally available by 29 February 2016, and the product cannot be configured with hard-disk drives (HDDs) at any time. These systems typically (but not always) include an OS and data management software optimized for solid-state technology.

Magic Quadrant

Figure 1. Magic Quadrant for Solid-State Arrays

Source: Gartner (August 2016)

A vendor's position on the Magic Quadrant should not be equated with its product's attractiveness or suitability for every client's requirements. If a particular solution better fits your needs, has the appropriate support capabilities and is attractively priced, then it is perfectly acceptable to acquire solutions from vendors that are not in the Leaders quadrant.

Vendor Strengths and Cautions

EMC

EMC offers many SSA and ancillary SSD-based products on the market: XtremIO, VMAX All Flash, DSSD and most recently Unity. EMC has understood customer demand and recognized the movement to solid-state storage by transitioning and implementing changes throughout its product portfolio to reflect the rapidly growing demand for SSAs. However, more Dell-EMC branded arrays will become available when Dell's acquisition of EMC is completed, causing customer confusion due to competitive pressure from competing block storage SSAs. In discussions with customers, EMC now often leads with solid-state arrays rather than traditional or hybrid disk arrays. Overall, EMC has been able to successfully sell and market XtremIO due to its large sales force, channel bandwidth and sales execution. The array has a relatively large rack, power and cooling requirements compared to competitor products, especially in sub-100TB configurations. Prospective customers should request details of future improvements and have these contractually agreed as nondisruptive and nonchargeable upgrades.

STRENGTHS

EMC has provided value-based sales via SSA sizing and data reduction assessment tools to help customers moving between HDD arrays and SSAs.

EMC provides existing customers with higher discounts than its competitors, and advantageous XtremIO purchase terms and ownership costs for warranty and maintenance.

EMC has an extremely capable global support and service organization that is very responsive when customers have to perform upgrades and cluster expansions.

CAUTIONS

Customers will soon have more SSA product choices from Dell-EMC, and this will lead to confusion as the different products do not interoperate with each other.

XtremIO is relatively inflexible in regard to adding extra capacity, and extra products such as RecoverPoint and VPLEX often need to be purchased to provide high availability and replication, adding cost and administration complexity.

XtremIO provides global deduplication, but it does not have detailed data reduction reporting by logical unit number (LUN) or volume. Data reduction reporting is only available at the X-Brick or cluster level.

Fujitsu

Fujitsu customers are extremely satisfied with the reliability and performance of the

Eternus DX200F, as well as Fujitsu customer support. The Eternus DX200F is not a niche product, but is accepted and used as a standard SSA for primary applications that do not require data reduction. In December 2015, the Eternus DX200F controller software was updated, providing performance improvements and making all features available in the wider DX storage array family available on the Eternus DX200F as well. Fujitsu offers a partial inclusive software licensing method, where quality of service (QoS), clustering and mirroring are separately licensed. Nevertheless, the packaging makes it quicker and simpler for customers to purchase all features and to expand the array with fewer hidden option and upgrade costs. The product offers proven synchronous and asynchronous replication features based on the DX array software. The capacity of the SSDs was increased from 1.6TB to 2TB in June 2016, which will increase raw system capacity by 7TB, to 46TB in total.

STRENGTHS

Fujitsu customers can use a Fujitsu product configurator, which shows list and discount price transparency when buying the Eternus DX200F.

There is easy-to-use, common administration and configuration software between all disk and solid-state arrays.

High-availability clustering provides quick failover and synchronization between systems.

CAUTIONS

When expanding capacity, new maintenance contracts are required for each individual SSD, which complicates contract management.

The product has no data reduction features, such as deduplication and compression.

Fujitsu has limited sales, support coverage, marketing and, therefore, customer awareness in the Americas.

Hitachi Data Systems

Hitachi Data Systems launched a dedicated Hitachi Virtual Storage Platform (VSP) F Series, available on 10 November 2015, and followed up with its Hitachi Flash Storage (HFS) A Series, available on 18 January 2016.

Hitachi's solid-state portfolio provides a dual path to addressing workloads that demand performance and data management services. The VSP F Series has purpose-built flash modules enabling strong performance and availability, while the HFS A Series leverages commodity hardware, complete data reduction abilities and a smaller operational footprint attractive for virtualized environments. Hitachi's heritage of reliability and performance is

evident in the VSP F Series with its availability guarantee, while the HFS A series offers simplicity and an all-inclusive pricing model. Nevertheless, the VSP F Series, which reuses the hybrid array controller design, has relatively large rack space, power and cooling requirements compared to competitors in sub-50TB configurations. Hitachi's reputation for high-quality storage arrays, its global presence, and its sales and channel bandwidth will enable it to gain traction as new features and ecosystem support mature across both products.

STRENGTHS

Hitachi's storage offering heritage is built upon reliability, performance and familiarity across platforms, supported by a 100% high-availability SSA guarantee.

The vendor's deep engineering expertise is highlighted in its custom flash module approach that has the ability to scale with flash advances and includes tighter integration throughout the data management software layers.

Hitachi has created an SSA portfolio that addresses multiple price points and workloads.

CAUTIONS

Data deduplication is postprocess for file-based protocols and is not available for block protocols on the VSP F array.

The data administration GUI needs refinement to be more intuitive in order to simply and proactively meet customer demands.

Optional software licensing still exists for products such as Hitachi Tuning Manager and Hitachi Automation Director, and for remote replication.

HPE

Hewlett Packard Enterprise enhanced its solid-state array portfolio on 10 September 2015 with the general availability of its 3PAR StoreServ 8000 series and 20000 series, complete with All Flash Starter Kits for each family. The 3PAR hardware architecture and management platform fully exploit the latest SSD technology, providing an aggressive cost structure that is paired with a nearly full complement of data management services. However, the 3PAR StoreServ products still lack the critical compression feature, but HPE is able to offset this impact through aggressive pricing and key abilities such as thin provisioning and deduplication. HPE leads the industry in scalability with its scale-up/scale-out architecture, which benefits from robust resiliency and manageability services. With HPE's separation from HP Inc., it has demonstrated its ability to aggressively pursue the storage market, and particularly the SSA category, by attracting

more channel partners and penetrating further into key verticals and geographies.

STRENGTHS

HPE offers a vast product portfolio that delivers attractive low-cost, low-capacity entry points, which can also scale up and out to nearly 4PB of raw capacity.

Fast validation and efficient use of advanced, enterprise SSD technology allow the company to drive a very aggressive pricing strategy combined with compelling operating expenditure (opex) benefits.

HPE 3PAR StoreServ provides proven enterprise services and familiarity across the platform that appeals to its existing customers and channel partners.

CAUTIONS

Compression is currently unavailable, and customers should plan for and expect optimizations as the feature matures.

HPE's software license model can be confusing when it comes to paying for optional software licenses, which are based on the number of SSDs.

HPE lags deep predictive cloud-based analytic capabilities when compared to leading offerings.

Huawei

Currently, Huawei's product line consists of the OceanStor Dorado2100 G2 and Dorado5100 series, which are second-generation systems. Huawei builds its own custom SSD controllers and drives, and is highly focused on delivering low price per input/output operations per second (IOPS) to stimulate market demand for its products. Huawei's vision is to improve on the present-generation array with a much enhanced third-generation array that is expected to be available within the next 12 months.

Huawei has been expanding its support presence across the globe with more than 10 regional and in-country technical assistance centers (TACs) and more than one hundred spare part depots across the globe. Compared to its competitors, Huawei has the ability to provide large numbers of on-site staff to implement its products, and to perform service and maintenance functions. While Huawei generates a majority of its revenue in Asia/Pacific, where it is headquartered, the EMEA business has been growing rapidly, rivaling its APAC business in terms of number of solid-state array customers. Huawei's market presence in the U.S. continues to be limited, due to the political and brand perception challenges that Chinese technology companies face.

STRENGTHS

Huawei is deeply invested in its storage portfolio with more than 3,000 R&D engineers overall for storage, and more than 200 support personnel specifically supporting its Dorado product line.

Huawei's product is focused on delivering high IOPS and low latency through a vertically integrated design that is validated with third-party benchmarks such as the SPC-1.

Huawei's competitive pricing, flexible capital expenditure (capex)- and opex-based pricing models, and its ability to bundle professional services make it easier for customers to pilot and deploy its products without significant capital or workforce outlay.

CAUTIONS

Huawei has been slow to innovate on software features, business model simplicity and cloud-enabled support, areas that I&O leaders care deeply about.

While Huawei's list prices are competitive, the lack of data reduction features and the need to buy data protection features separately (snapshots and replication) make the overall ownership costs high and complicate purchasing decisions.

When Huawei introduces data reduction capabilities in its product line, customers need to prepare and plan for a disruptive upgrade or migration project.

IBM

While IBM's overall storage portfolio execution has been disparate, the IBM FlashSystem has maintained solid performance and leads the industry in capacity shipments. IBM has performed well with its FlashSystem V9000, which combines the IBM FlashSystem 900 all-flash hardware with IBM Spectrum Virtualize software that provides heterogeneous data services and virtualization capabilities. The IBM FlashSystem 900 is built upon IBM's own developed flash module technology, which further optimizes the flash component performance and reliability. IBM's transition to more cost-effective consumer-grade flash technology was supported by guarantees that covered not just flash endurance and performance, but also guarantees around compression and customer friendly extended support and maintenance programs.

IBM also announced the FlashSystem A9000 on 27 April 2016, which leverages the IBM XIV storage technology. The IBM FlashSystem A9000 and rack version A9000R provide performance and enterprise services, which include the missing deduplication feature from the IBM FlashSystem V9000. IBM also announced its VersaStack product, which combines the IBM FlashSystem V9000 with Cisco Unified Computing System (UCS) infrastructure as an integrated system. These new offerings will complement IBM's SSA portfolio

STRENGTHS

IBM continues to deliver high-performance SSA products supported by performance and reliability guarantees.

IBM maintains an efficient cost structure and an aggressive pricing strategy predicated on its flash-level optimizations and supply relationships.

IBM's channel presence and experience has improved customer awareness in key geographies such as China, as well as in key verticals such as healthcare.

CAUTIONS

When compared to FlashSystem 900, leveraging IBM Spectrum Virtualize and IBM Spectrum Accelerate software that sit in the data path introduces additional latency and potential high-availability challenges, as well as more elements to service.

Customers should demand written deduplication guarantees, as the efficiency of the new deduplication feature with the IBM FlashSystem A9000 series should be thoroughly tested.

Compared to competitive offerings in sub-50TB configurations, the IBM FlashSystem V9000 and A9000 series require more rack space, power and cooling, which could be concerns in restricted environments.

Kaminario

The Kaminario K2 architecture is in its fifth generation. The array's flexibility is evident in that it offers a very good administration GUI and both a scale-up and scale-out approach, with comprehensive capacity upgrade options. It has versatile selectable data reduction options at the LUN level, which are punctuated with a 3.5-to-1 data reduction ratio guarantee. The Kaminario array design allowed it to be one of the first vendors to offer customers the advanced, high-capacity 3D NAND-based SSDs and to sustain its aggressive pricing strategy. The company has improved ease of use, made evolutionary improvements to its platform by adding asynchronous replication and analytics, and broadened its ecosystem support. With a relatively mature platform, Kaminario's focus is to increase market recognition, which has steadily improved since 2015 but still lags in mind share compared to its competitors. Kaminario purposefully stays away from the long customer sales cycles required to take out incumbent storage array vendors in the top-tier accounts. Notwithstanding these sales choices, Kaminario has a solid value proposition for potential SSA customers.

STRENGTHS

Kaminario has a scale-up/scale-out architecture with rich features that has field

validation over its past five product generations.

Consistent and predictable performance, and low latency have been foundational attributes.

Kaminario utilizes flexible storage efficiency and resiliency technologies to maximize cost structure that allow it to enhance its guarantee program to an average of \$1 per GB usable capacity.

CAUTIONS

Customers who buy from the major traditional incumbent brands and storage vendors have limited awareness of Kaminario and its products.

Sales and support are still focused on the U.S. and Europe, so buyers outside these geographies should understand support ramifications and Kaminario's ability to scale support.

Kaminario is privately held, therefore financial transparency, funding timelines and profitability goals are not publicized.

NetApp

NetApp has three SSA products, the All Flash FAS (AFF), EF-Series and SolidFire, which leverage flash to address a gamut of use cases and price points. The recent acquisition of SolidFire and end of life of the aborted FlashRay product herald a strategic shift in NetApp's flash strategy, which has undergone tumultuous changes in the past two years. The FlashRay intellectual property is being integrated into the AFF product line, putting an end to an ill-fated product that NetApp set out to develop. The acquisition of SolidFire gives NetApp a strong foundation to address next-generation distributed applications, and to target the cloud service provider and enterprise private cloud market segments.

NetApp's EF-Series is targeted at workloads that demand raw performance at low cost without data reduction. The All Flash FAS is targeted at Mode 1 enterprise workloads that demand multiprotocol access and robust data service. The SF Series from SolidFire is focused on Mode 2 cloud and big data workloads, but also is used in many traditional cloud and hosting environments. Taking into account market positioning wishes, customers successfully can and do use the products in all three situations and workloads. In the past years, there have been several executive changes within NetApp, both high-profile exits and an infusion of new personnel, as it seeks to gain prominence in the competitive solid-state array market segment, as well as stem the overall revenue decline.

STRENGTHS

SolidFire's scale-out architecture, QoS capabilities and hardware compatibility guarantee

(which allows customers to mix and match nodes and eliminates forklift upgrades) continue to differentiate it against competitors.

All Flash FAS is a mature product that delivers a high degree of flexibility to customers by supporting storage area network (SAN)/network-attached storage (NAS) protocols and scale-out clustering; by being available in a FlexPod configuration with integrated system packaging and support; and by enabling a wide range of recovery time objectives (RTOs)/recovery point objectives (RPOs).

In the past 12 months, NetApp has shown a willingness to be more competitive with products and pricing. It has reduced its pricing for AFF and EF-Series, introduced less-than-\$25,000 entry-level offerings and created a flash software bundle for AFF that packages its data services in a simpler manner.

CAUTIONS

There is continued overlap in NetApp's solid-state array product portfolio with three different products, which complicates R&D allocation, routes to market and overall product selection for I&O leaders.

NetApp needs to maintain the SolidFire engineering, marketing, management talent and product features, given the distinctive legacy and culture of both these companies.

The EF-Series product suffers from low mind share and lack of attention both within and outside NetApp, which may potentially impact the pace of innovation and long-term viability of that product line.

Pure Storage

Pure Storage continues to execute well on its vision of software-led solid-state arrays that leverage off-the-shelf cost-effective hardware components, providing cost-effective SSAs that are simple to upgrade and maintain compared to traditional storage array forklift upgrade paths. Through creative marketing programs and targeted competitive campaigns, Pure Storage continues to achieve high customer awareness and to challenge the large storage behemoths by making it easy for customers to buy and own its products. The redesigned hardware in the FlashArray//m series replaced the older FA-400 series, with a new low-capacity and lower-cost FlashArray//m10 finally replacing the smallest FA-405 model in June 2016. Pure has increased customer satisfaction levels as it has scaled the business. Many competitors still cannot offer quick and seamless capacity and controller upgrades between models. Pure Storage's culture and innovation has been able to attract high-quality personnel as it continues to expand across geographies. A new Pure Storage FlashBlade array is scheduled for availability at the end of 2016 for use with object and file applications, which, if delivered, maintains Pure Storage's cadence of vision and

thought leadership in the SSA market.

STRENGTHS

Pure Storage demonstrates that it understands customer pain points through successful pricing and guarantee programs for controller upgrades, SSD warranties and maintenance pricing.

Pure has shown that it can develop new products and has maintained its cadence of gaining mind share in the market by expanding solid-state array use cases.

The vendor has gained customer trust by demonstrating it is reliable, stable and easy to work with, and thus enjoys high levels of customer satisfaction.

CAUTIONS

Competitors now offer similar effective price capacity guarantees and proactive support programs.

Because Pure Storage has become a significant threat to the incumbent vendors, customers replacing their incumbent vendors' storage arrays with a Pure Storage array often have their purchase cycles stalled by competitor fear, uncertainty and doubt.

Pure Storage does not have user-configurable QoS features at the application, host or volume level, but it performs its own internal performance balancing within the back end of the array.

Tegile

Tegile has successfully grown its SSA customer base and product portfolio with new entry-level T3500 and high-capacity IntelliFlash HD SSAs. The administration GUI was also considerably improved. It offers four T3000 series models ranging from the 6TB T3500 to the 336TB T3800, and a high-capacity 512TB IntelliFlash HD. Customers should exploit Tegile's IntelliCare guarantees around price, 99.999% availability, five-year SSD reliability and upgrades. Tegile SSAs and hybrid storage arrays use the same software, therefore all have the same administration and configuration graphical user interfaces, plus replication can be implemented between different models. The reuse of the same proven software used in the hybrid arrays, and a ZFS-based architecture that has been optimized and rewritten, enable Tegile to offer a mature platform. It also provides a competitive R&D and sales positioning advantage as there is only one product line to manage, market, support and sell. Tegile provides list price and discount percentage transparency on its purchase offers. Complementing this openness, it also includes all software features in the base price of the product; therefore, customers do not have to purchase extra licenses as they expand the array. Tegile sells its products via the channel rather than direct, and customer

satisfaction is extremely high.

STRENGTHS

Tegile SSAs are very simple to implement and administer, with customers able to expand capacity while an array is active and put Tegile products into production themselves.

A highly compact array with low rack, power and cooling requirements with extensive block and file protocol support makes Tegile one of the few unified SSA offerings.

The vendor offers selectable data reduction; detailed instrumentation, quotas, volume to controller and network port affinity; and data reduction reporting on a storage pool and LUN level.

CAUTIONS

Tegile has limited customer awareness, market traction and presence outside North America and Western Europe.

The Tegile SSAs do not have IOPS-level QoS, nor synchronous replication.

The T10000 IntelliFlash HD does not have self-encrypting drives (SEDs), and, therefore, does not provide media-level security.

Tintri

Tintri is a venture-backed company that has been shipping hybrid arrays since 2011. Nevertheless, Tintri launched its VMstore T5000 series of solid-state arrays in September 2015. Its solid-state array portfolio consists of the VMstore T5040, T5060 and T5080 product lines that span raw capacities from 6TB to 92TB. Tintri derives its differentiation from its VM centricity, which can potentially save administration costs by reducing storage complexity and enabling even VM administrators to manage storage arrays. Tintri has close integration with hypervisor APIs and management tools. While the majority of its customers use it for vSphere workloads, Tintri has now extended support beyond VMware to include Hyper-V, Red Hat Enterprise Virtualization and XenServer hypervisors, as well as including integration with Microsoft's ODX API and OpenStack Cinder. While Tintri supports key VMware APIs, such as VAAI, VASA, SRM and VVols, it has been providing a VVols style of VM-level storage abstraction and management for a long time, even preceding the concept of virtual volumes.

Tintri's presence outside the U.S. has been growing, particularly in Western Europe and Japan with dedicated field support and Level 3 engineers in these regions. Tintri's market focus is centered on three key use cases in the enterprise – virtual desktop infrastructure (VDI), virtual server infrastructure (VSI) and private cloud deployments.

STRENGTHS

Tintri provides inherent administration simplicity and ease of use in its product due to its VM-level management for tasks such as cloning, snapshots and replication.

The vendor introduced VM-level QoS capabilities in 2015 that can help administrators guarantee application performance.

Tintri offers a simple vCenter plug-in and a dedicated administration platform – Tintri Global Center – to meet the management requirements of small- to large-scale businesses.

CAUTIONS

Tintri currently does not offer all-inclusive pricing, and customers need to pay for copy data management, replication and encryption separately, or they can choose the recently introduced Tintri Software Suite that combines these with Tintri's Global Center management platform.

Tintri neither supports block protocols (FC, FCoE, iSCSI), nor can it provision storage to physical hosts, limiting its appeal to environments that are fully virtualized.

There is no simple way to add capacity to Tintri's arrays other than buying a new array, which makes the cost of adding capacity and workload consolidation a complex exercise.

Violin Memory

Violin Memory continues to navigate under difficult financial conditions. While, in 2015, Violin has transitioned its product line fully to its Flash Storage Platform, which is predicated on its tenured component hardware approach and revitalized data management software, customer reception has been tepid thus far.

Violin's Flash Storage Platform 7000 series is a significant improvement on the previous 6000 series. This latest product delivers a full suite of data management services as well as selectable data reduction that can be managed on a LUN basis, which provides flexibility to customers with mixed workload environments. This technology complements Violin's hardware heritage, which, through its partnership and investment by NAND flash maker Toshiba, delivers high-performance purpose-built hardware from the chip level. As with nearly all SSA vendors that introduce new software, Violin Memory initially suffered from implementation challenges and some compromise to simplicity, which is essential for SSA products. These delays and setbacks undermined Violin Memory's success in 2015 and continue into 2016. Violin Memory has had to streamline its workforce and focus more heavily on the channel, and is doing so with a new entry point to court new

customers as well as channel partners. This will be an increasingly difficult endeavor until product revenue growth returns and company viability has stabilized.

STRENGTHS

Violin Memory's purpose-built hardware on the most advanced flash technology delivers a very dense and compact array with compelling performance and latency at competitive price points.

Violin Memory has new, low entry prices and capacities that allow incremental expansion as workload needs evolve.

The vendor has an extensive patent portfolio with more than 80 U.S. and more than 100 foreign patents granted or pending.

CAUTIONS

Violin Memory's long-term viability is uncertain, and given it has missed financial and profitability targets should be considered as a potential acquisition target.

During the last two quarters, Violin Memory is generating more revenue through services than products, with customer concentration remaining a major concern.

Staff reductions, employee churn and limited investment in research and development may impede its ability to deliver next-generation products and services with global support and services.

X-IO Technologies

X-IO entered the SSA market late, in March 2015, with the ISE 800 SSA. Nevertheless, X-IO has adapted to the transition to solid-state storage by increasing its focus on its ISE 800 product adoption, which has grown quickly with 30% of X-IO's sales being SSAs. X-IO has an innovative "fast when full" guarantee, which offers sustained performance when the array is using 100% of its capacity. Data reduction features are expected in late 2016, and existing or prospective customers should request free upgrades and any required array transitions to move to the new SSA software, which supports data reduction. X-IO has a 100% indirect sales model, and customers will have to buy X-IO products from channel partners rather than direct from X-IO. X-IO's most recent direction is the newly launched Axellio product, which, depending on the configuration, can be used as an integrated system or, when configured with fewer controllers, it can be used as an SSA. This is a new direction for X-IO as Axellio is an adaptable storage platform suitable for many use cases. X-IO has also recently reorganized its business units and financial structure to improve its ability to execute, and the next 12 months will be crucial in improving the vendor's success.

STRENGTHS

Low and consistent latency and response times are a primary value proposition for X-IO.

X-IO offers the ability to consolidate multiple applications and to manage via QoS policies.

X-IO has a new management team, which may improve the company's financial performance.

CAUTIONS

The ISE 800 array does not have compression or deduplication.

The maximum raw array capacity is relatively small at 74TB.

X-IO is focused on a niche segment of very low-latency high-performance workloads.

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

Hitachi Data Systems, Tintri, X-IO Technologies.

Dropped

Cisco, Nimbus Data Systems, SolidFire (acquired by NetApp).

Inclusion and Exclusion Criteria

To be included in the Magic Quadrant for SSAs, a vendor must:

Offer a self-contained, solid-state-only system that has a dedicated model name and model number (see Note 1).

Have a solid-state-only system. It must be initially sold with 100% solid-state technology and cannot be reconfigured, expanded or upgraded at any point with any form of HDD within expansion trays via any vendor's special upgrade, specific customer customization or vendor product exclusion process into a hybrid or general-purpose SSD and HDD storage array.

Sell its product as a stand-alone product, without the requirement to bundle it with other vendors' storage products in order to be implemented in production.

Have a product and a service capability that is available in at least two of the following markets – Asia/Pacific, EMEA, North America and South America – via direct or channel sales. Availability does not include hybrid (SSD, HDD) storage arrays.

Provide at least five references that Gartner can interview. There must be at least one client reference from Asia/Pacific, EMEA, North America and South America, or the two geographies within which the vendor has a presence.

Provide an enterprise-class support and maintenance service, offering 24/7 customer support (including phone support). This can be provided via other service organizations or channel partners.

Have established notable market presence as demonstrated by the amount of PBs sold, number of clients or significant revenue.

The SSAs evaluated in this research include scale-up, scale-out and unified storage architectures. These arrays have different availability characteristics, performance profiles, scalability, ecosystem support, pricing and warranties. The SSAs enable users to tailor solutions against operational needs, planned new application deployments, and forecast growth rates and asset management strategies.

While the SSA Magic Quadrant represents vendors whose dedicated systems meet our inclusion criteria, ultimately, it is the application workload that governs which solutions you should consider, regardless of any criteria.

Other vendors and products were considered for the Magic Quadrant but did not meet the inclusion criteria. These vendors and/or specific products may warrant investigation based on your application workload:

American Megatrends (AMI) StorTrends 3600i

DDN Storage *SFA7700XI SDA12KX* , IME240, IME14K,

Dell SC Series

EMC VMAX All Flash, *VNX-F* , *DSSD*

Hitachi Unified Storage VM (HUS VM)

IBM FlashSystem A series

Nimble Storage

Oracle All Flash FS1

Pivot3

SanDisk InfiniFlash

Note: Italics represent products that did not meet inclusion requirements. Remaining company/products may be considered in the future if sufficient market presence materializes.

Evaluation Criteria

Ability to Execute

We analyze the vendor's capabilities across broad business functions. Vendors that have expanded their products across a wider range of use cases and applications, improved their service and support capabilities, and focused on improving mission-critical applications will be more highly rated in the Magic Quadrant analysis. Ability to Execute reflects the market conditions and, to a large degree, it is our analysis and interpretation of what we hear from the market. Our focus is assessing how a vendor participates in the day-to-day activities of the market.

Product or Service evaluates the capabilities of the products or solutions offered to the market. Key items to be considered for the SSA market are how well the products and/or services address enterprise use-case needs, the critical capabilities of the product (see "Critical Capabilities for Solid-State Arrays") and the breadth of product and/or solutions.

Overall Viability includes an assessment of the organization's financial health, the financial and practical success of the business unit, and the likelihood that the individual business unit will continue to invest in the product, offer the product and advance the state of the art in the organization's product portfolio.

Sales Execution/Pricing looks at 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 focuses on the vendor's capability 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 provider's history of responsiveness.

Marketing Execution reflects unaided awareness (that is, Gartner end users mentioned the vendor without being prompted) and a vendor's ability to be considered by the marketplace. Vendor references, Gartner inquiries and end-user client search analytics results are factored in as a demonstration of vendor awareness and interest.

Customer Experience looks at a vendor's capability to deal with postsales issues. Because of the specialized nature of the cloud storage market and the mission-critical nature of many of the storage environments, vendors are expected to escalate and respond to issues in a timely fashion with dedicated and specialized resources, and to have relevant detailed expertise. Another consideration is a vendor's ability to deal with increasing global demands. Additional support tools and programs are indications of a maturing approach to the market.

Operations considers 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.

Table 1. Ability to Execute Evaluation Criteria

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

Source: Gartner (June 2016)

Completeness of Vision

Completeness of Vision distills a vendor's view of the future, and of the direction of the market and its role in shaping that market. We expect the vendor's vision to be compatible with our view of the market's evolution. A vendor's vision of the evolution of the data center and of the expanding role of SSAs is an important criterion. In contrast with how we

measure Ability to Execute criteria, the rating for Completeness of Vision is based on direct vendor interactions, and on our analysis of the vendor's view of the future.

Market Understanding looks at the technology provider's capability to understand buyers' needs, and to translate those needs into an evolving roadmap of products and services. Vendors must show the highest degree of vision, listen to and understand buyers' wants and needs, and be able to shape or enhance those wants and needs with their added vision.

Marketing Strategy relates to what vendor solution message is described, how that message is communicated, what vehicles are used to effectively deliver it, and how well the buying public resonates with and remembers the message. In a market where many vendors and/or products can sound the same, or sometimes not even be known, message differentiation and overall awareness are vital.

Sales Strategy considers 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 looks at a vendor's product roadmap and architecture, which we map against our view of enterprise requirements. We expect product direction to focus on catering to emerging enterprise use cases for solid-state arrays.

Business Model assesses a vendor's approach to the market. Does the vendor have an approach that enables it to scale the elements of its business (for example, development, sales/distribution and manufacturing) cost-effectively, from startup to maturity? Does the vendor understand how to leverage key assets to grow profitably? Can it gain additional revenue by charging separately for optional, high-value features? Other key attributes in this market are reflected in how the vendor uses partnerships to increase sales. The ability to build strong partnerships with a broad range of technology partners and associated system integrators demonstrates leadership.

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

Innovation measures a vendor's ability to move the market into new solution areas, and to define and deliver new technologies. In the SSA market, innovation is key to meeting rapidly expanding requirements and to keeping ahead of new (and often more-agile) competitors.

Geographic Strategy measures the vendor's ability 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.

Table 2. Completeness of Vision Evaluation Criteria

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

Source: Gartner

Quadrant Descriptions

Leaders

Vendors in the Leaders quadrant have the highest 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 all four major geographical regions, consistent financial performance and broad platform support.

Challengers

Vendors in the Challengers quadrant participate in the SSA market and execute well enough to be a serious threat to vendors in the Leaders quadrant. They have strong products, as well as sufficient 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 at a broad scale, but has not 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 risks associated with installing their systems.

Niche Players

Vendors in the Niche Players quadrant often excel by focusing on specific market or vertical segments that are generally underpenetrated by the larger SSA vendors. This quadrant may also include vendors that are ramping up their SSA efforts, or larger vendors having difficulty in developing and executing upon their vision.

Context

This Magic Quadrant represents vendors that sell into the enterprise end-user market with specific branded SSAs. An insatiable demand for storage also demands a more capable high-performance tier that can deliver low-latency storage more reliably in order to create tangible benefits. As high-performance storage demand explodes, it will require even more storage administration and deeper analytics, emphasizing the perpetual need for storage efficiency, resiliency and manageability to counter this trend.

Market Overview

Solid-state arrays have moved the external controller-based storage array market from a relatively stagnant incrementally improving market with slow-changing dynamics to a progressive neoclassical market. By 2020, SSA purchases by revenue will be approximately 50% of the external controller-based storage array market. We also expect that by 2020 the SSA market will reach \$9.67 billion, up from a market size of \$2.7 billion in 2015. While the overall SSA market is growing, it is very dynamic and we continue to expect some vendor churn; so that, by 2018, the total number of SSA vendors will increase

by 50%, but 20% of the current SSA vendors will exit the market.

Improvements in the dynamics of many factors – such as reduced storage administration, power, cooling, rack space, increased performance and density – have changed the accepted assumptions of the previous SAN storage array market. More vendors design and develop their own custom solid-state solutions, such as Hitachi Data Systems, Huawei, IBM and Violin Memory. In 2016, this was shown with the DSSD offering from EMC and FlashBlade from Pure Storage. Consequently, more vendors are offering alternate solid-state media form factors with denser and faster systems when they create their own NAND flash storage packaging. From a whole system perspective, the largest SSAs now scale to 3.9PB, and next-generation SSD technology (such as Intel 3D XPoint) and interconnects (such as nonvolatile memory express [NVMe] PCIe SSD) will again redefine performance capabilities, creating demand for faster storage networks (see "The Future of Storage Protocols").

Neither the solid-state array, nor the storage array administrator is the bottleneck anymore; but network latency has become the challenge. This has extended the requirement and life span for 16 Gbps and 32 Gbps Fibre Channel SANs, as Ethernet-based networks and related storage protocols struggle to keep up. Many new vendors have entered the market, such as Pivot3 who provide comprehensive service management via QoS and Nimble Storage with the highly scalable AF Series, and along with many traditional storage vendors, they continue to transition their portfolios from HDD-based arrays to all solid-state arrays.

Consolidation is also taking place, with Dell acquiring EMC, Pivot3 acquiring Nexgen and NetApp acquiring SolidFire, as well as Cisco officially discontinuing its SSA offering inherited from its Whiptail acquisition. Companies are also resizing, for example, HP splitting its consumer and enterprise businesses and X-IO realigning its business units. The market is growing with fierce price competition as incumbent storage vendors offer existing accounts very favorable terms when moving to SSAs. Solid-state arrays have reduced in price, with effective storage guarantees from some vendors reaching the \$1 per GB level, over a three year period. Upgrades, as well as effective capacity upgrades, are common offers and promises; however, many guarantee programs cannot keep the same trays and controllers, and require forklift upgrades, which negate the value of the promised upgrade guarantee programs. Customers therefore need to check for disruptive forklift upgrades. Because many hybrid and HDD general-purpose arrays have low capacity utilization, SSAs – which are not performance-bound – can be used at higher utilization rates. Therefore, an SSA that is two to three times more expensive to purchase becomes a cost-effective replacement for a hybrid or general-purpose array at increased utilization rates. With regard to performance, one SSD can typically replace multiple HDDs, combined

with data reduction features and increased storage administrator productivity the price point at which SSA investment decisions are made is dropping rapidly. Redundant array of independent disks (RAID) rebuild times for high-capacity SSDs are also faster than for high-capacity HDDs. Therefore, as HDD storage capacities increase, so do HDD recovery times, and SSAs reduce the risk exposure during any media failure and recovery window. Use cases for SSAs are moving into analytics, file and object workloads, and some customers even use SSAs as backup targets to reduce backup and restore windows.

Price and ownership programs translate into very competitive purchase prices for buyers, but vendors are faced with challenges to becoming profitable as incumbent vendors discount to avoid losing market share and new vendors discount to attract new customers. Because the SSA market has expanded rapidly with SSD reliability being equal to or better than HDD arrays, and feature parity also equalizing, the competitive battle to differentiate has moved to ease of ownership, and remote and pre-emptive support capabilities.

Evidence

- More than 2,000 Gartner client inquiries in 2015 and 1H16

- Vendor interviews and product demonstrations in 2015 and 1H16

- Surveys of included vendors

- Customer reference surveys in 1H16

- Gartner's dedicated SSA market share forecasts and research in 2013, 2014 and 2015

- Public information, such as U.S. Securities and Exchange Commission filings, press releases, vendor websites and community support forums

Note 1

Product Feature Qualification

Product features considered for inclusion must have been in general availability by 31 March 2016 to be considered in the vendors' product rating. New products lack sufficient market validation and references.

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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