

## MarketScope for Monolithic Frame-Based Disk Arrays

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New and upgraded products from Hitachi/Hitachi Data Systems and IBM provide new features that will maintain healthy competition in this market. However, only four products from five vendors remain, and customer choice has been reduced due to Oracle-Sun Microsystems' exit from this market segment.

## WHAT YOU NEED TO KNOW

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The monolithic frame-based disk array market continues to provide advantages in availability, scalability, maturity and host support, compared with modular storage arrays. Although these differences are narrowing between the monolithic and modular storage arrays, revenue for the monolithic frame-based disk array market continued to grow in 2010. The total revenue for the first three quarters of 2010 was \$3.72 billion, an increase of 13% over the same period in 2009. Continued revenue growth is expected as EMC, Fujitsu, Hitachi/Hitachi Data Systems, HP and IBM compete for market share. However, the monolithic market faces competitive pressures from typically lower-cost dual-controller and scale-out modular arrays, unified storage, network-attached storage (NAS), cloud storage and vertically integrated systems that include servers, storage area network (SAN) devices, and storage into a single product, part number or reference design.

High-end customers are risk-averse by nature, and most storage-related downtime is caused by logical corruption problems, not by site or technology failures. Even so, the main reason to purchase monolithic arrays is for their higher availability, due to fewer single points of failure and more built-in redundancy features. Users with storage growth rates that exceed their budgets will sometimes defect to modular or NAS arrays to lower operational costs and dollar-per-gigabyte (GB) pricing, particularly in smaller configurations. Monolithic disk array vendors have reacted to these market realities by making cost a design objective, thereby enabling them to remain competitive and profitable as they shift revenues and margins from hardware to software.

Monolithic storage array vendors charge for these value-added software options. Although each vendor uses a proprietary pricing paradigm, they all use some combination of system capacity, disk types and/or the model to increase software costs as performance/throughput and back-end capacity increase. These pricing models usually elongate the sales cycle, and sometimes push users to select a modular storage solution. This is because of the work involved in quantifying upgrade costs for hardware and software over the planned service life of the array, and the difficulty in understanding the long list of marketing terms describing industry standard options and components, support, and upgrade considerations. Most vendors have moved from a "box shifting" transactional selling approach to a system-oriented consultative sales model, which correctly takes into consideration the customer requirements and long-term IT and business strategy, rather than just selling capacity. However, Gartner recommends that customers treat vendor total cost of ownership (TCO) justification techniques with caution (see "Beware of TCO Storage Tools Bearing Gifts").

Cloud storage has not changed the climate in this market segment, because many hosting and service providers and internal private cloud implementations use monolithic disk arrays, because a large and fully configured monolithic array utilized to its maximum capacity can offer competitive per-GB pricing, compared with other storage solutions. Cloud storage can, therefore, be used as another method to exploit monolithic storage arrays, in the same way that capacity on demand (COD) and utility pricing implement pay-as-you go storage-as-a-service models.

Storage virtualization has also increased in importance for clients who want to virtualize their storage arrays. This enables IT organizations to physically consolidate heterogeneous arrays, simplify management and enable the movement of data between different devices, without a service outage and, therefore, transparently to the application.

Gartner's MarketScopes provide a measure of vendors' current and probable future strengths in the market, which is arrived at using a combination of product and nonproduct evaluation criteria. MarketScopes are not a direct or indirect measure of product attractiveness in a particular user environment.

## MARKETSCOPE

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Innovation has traditionally appeared in the high-end monolithic storage market, then trickled down toward the modular and entry-level systems. During the past two to three years, this trend has reversed, with innovation being offered first in modular arrays, then expanding upward to the monolithic storage arrays, and down toward the entry-level systems. Nonetheless, monolithic storage arrays still have the edge regarding availability, and when customers require diverse or very large numbers of connections and high-capacity systems.

Automated tiering and thin provisioning are examples of functions that became available in the modular array segment first. However, within the past year, these high-value features have become generally available in most monolithic storage arrays. Thin provisioning is extremely useful to improve storage utilization and reduce costs. Automated tiering, which can transparently move data between hard-disk drive (HDD) tiers and solid-state drives (SSDs), is becoming more important in today's storage environments, where the performance requirements of applications change by the minute, and inactive data needs to be moved to the lower-cost disk tiers. All of this needs to be done at the sub-LUN level, without the intervention of an operator or storage administrator who can no longer analyze which data has become inactive, and needs to be moved into low-cost disk pools or respond in time to the constantly changing performance requirements caused by systems such as hosted virtual desktop login storms.

Most monolithic storage vendors have realized that storage array systems must be produced from standardized components to remain cost competitive with the larger modular storage arrays, which are overlapping and successfully competing in scalability and function at the low end of the monolithic storage array market. However, storage buyers should be aware that the value is not in the industry standard components, but in the storage software within the controllers, embedded servers and "heads," which provide the differentiation in function, ease of use and reliability.

Customers requiring niche or legacy system support have no choice other than to purchase monolithic storage arrays. IBM and Unisys mainframe systems, HP OpenVMS, and IBM iSeries and other proprietary systems, which have unique connectivity requirements, can only be provided by this segment. Therefore, customers who do not migrate from these proprietary systems have limited storage array choices and purchasing and negotiation advantages. Customer can, however, mitigate the cost of these legacy requirements by purchasing smaller and lower-cost monolithic storage systems, which have now become available due to the usage of industry standard components. These systems can then be used solely to connect to the aforementioned platforms, if that is the overwhelming requirement.

The full list of evaluation criteria used in positioning vendors in this MarketScope includes:

- Marketing strategy (completeness of vision)
- Sales strategy (completeness of vision)
- Offering (product) strategy (completeness of vision)
- Product/service (ability to execute)
- Sales execution/pricing (ability to execute)
- Market responsiveness and track record (ability to execute)
- Customer experience (ability to execute)

## Market/Market Segment Description

Gartner defines monolithic frame-based disk arrays as external controller-based arrays that utilize redundant array of independent disks (RAID), and that:

- Use a multiple-controller architecture
- Support mainframe and open-system environments
- Support Fibre Connection (FICON), Enterprise Systems Connection (ESCON) or Fibre Channel host connectivity
- Support z/OS and/or other mainframe OSs

## Inclusion and Exclusion Criteria

Vendors are selected for inclusion in the MarketScope for Monolithic Frame-Based Disk Arrays based on a variety of criteria, with final determination made by the authors and input from the global Gartner storage analyst community. Factors that contribute to a provider's inclusion in or exclusion from this MarketScope include:

- Products that meet Gartner's baseline definition for monolithic disk arrays
- Global presence
- Market share and revenue data (a measure of vendor penetration into the market; see Note 1)

Because the HP StorageWorks XP24000/XP20000 and P9500 products are offered through an OEM agreement with Hitachi/Hitachi Data Systems, the definition of product ownership should be clarified. For the purpose of this MarketScope, a product belongs to the technology vendor if it carries the vendor's company logo, is on the vendor's price list and the vendor provides first-level maintenance support.

This MarketScope includes the following providers and arrays (listed in alphabetical order):

- EMC — Symmetrix VMAX and Symmetrix DMX-4 Series
- Fujitsu — Eternus DX8000
- Hitachi/Hitachi Data Systems — Universal Storage Platform V and VM, Virtual Storage Platform (VSP)
- HP — StorageWorks XP24000, XP20000 and P9500
- IBM — System Storage DS8000

The following vendors offer products that fall under Gartner's definition of a monolithic disk array, but were not evaluated in this MarketScope because they do not meet our other criteria for inclusion:

- NEC (iStorage S4900)
- Nippon Unisys (SANArena 6000 Series)

# Rating for Overall Market/Market Segment

## Overall Market Rating: Positive

While monolithic disk array storage is a mature market, we have seen a surge of new array announcements from Hitachi/Hitachi Data Systems and IBM, and revenue growth during the past three quarters for which market statistics are available. These trends, coupled with aggressive price discounting and users embracing consolidation and private storage clouds as tools to hold costs in check, are driving changes in market share and are increasing the importance of high-availability features that make monolithic arrays the storage solution of choice when the cost of downtime is simply too great to risk hosting such workloads on less-available, midrange and modular systems. Monolithic disk arrays are also the only option for organizations deploying a mainframe, or similar proprietary connection requirements.

All the vendors in our evaluation support the technologies that Gartner considers "must have" functionality for the monolithic disk array market, including thin provisioning for open systems, and tiered storage, as well as some key up-and-coming features, such as disk-level encryption and SSDs. All the vendors in our evaluation are financially viable and offer products that scale beyond the requirements of most users.

## Evaluation Criteria

Table 1. Evaluation Criteria

Evaluation Criteria	Comment	Weighting
Marketing Strategy	A clear, differentiated set of messages that are consistently communicated throughout the organization, and externalized through the website, advertising, customer programs and positioning statements.	high
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.	standard
Product/Service	Core goods and services offered by the vendor that compete in/serve the monolithic frame-based disk array market. This includes current product capabilities, quality, and feature sets and skills — whether offered natively or through OEM agreements/partnerships, as defined in the Inclusion and Exclusion Criteria section.	high

Evaluation Criteria	Comment	Weighting
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.	high
Market Responsiveness and Track 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.	high
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 and SLAs.	high
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.	high

Source: Gartner (March 2011)

**Figure 1. MarketScope for Monolithic Frame-Based Enterprise Disk Arrays**

	RATING				
	Strong Negative	Caution	Promising	Positive	Strong Positive
EMC					x
Fujitsu		x			
Hitachi/Hitachi Data Systems					x
HP			x		
IBM					x

As of 15 March 2011

Source: Gartner (March 2011)

## Vendor Product/Service Analysis

### EMC

EMC has again demonstrated its ability to leverage market and technology trends into market share gains. Market statistics show EMC holding a 49% share of the monolithic storage market for the first three quarters of 2010 — more than twice that of its nearest competitor. This is a gain of 6.9% relative to its 1Q09 through 3Q09 share, which is large by any historical measure. This gain reflects EMC's willingness to invest in its vision, which, in 2010, focused heavily on helping users build private cloud infrastructures, as well as its ability to effectively communicate its commitment to cloud and server virtualization-related technologies. Also contributing to EMC's success in the monolithic market is its ability to influence user expectations regarding storage-related wants and needs, through events, product announcements, price adjustments and marketing programs.

EMC's ability to mesh its development efforts with its marketing programs blurs the boundary between existing and future capabilities so that users can take advantage of EMC's considerable investments in new technologies while enabling them to plan for future enhancements, rather than simply hoping for the best. More specifically, Symmetrix VMAX appears to be performing as advertised in terms of availability, performance/throughput and functional enhancements (which are occurring often enough to keep the offering fresh). EMC is always aggressive in its support of server virtualization technologies, such as VMware and Microsoft Hyper-V; green storage technologies, such as thin provisioning and autotiering (aka virtual provisioning and Fully Automated Storage Tiering [FAST]); and new back-end storage devices, such as SSDs and higher-capacity disks that lower costs and environmental footprints.

*Rating: Strong Positive*

### Fujitsu

Compared with the first three quarters of 2009, Fujitsu's monolithic storage revenue increased by 4.7%, and its market share declined by 0.3% in the first three quarters of 2010. Because the Eternus DX8000 is a technically mature, full-featured competitive monolithic storage array, it shows that sales execution outside of Japan is still the greatest challenge for the high-end Fujitsu Eternus storage arrays. Market adoption of the DX8000 has been hindered by Fujitsu's historic sales relationship with EMC, which led the Fujitsu sales force outside of Japan to often sell

monolithic EMC storage, instead of the equivalent Fujitsu products. Therefore, market adoption and sales execution was as much of an internal issue as external customer and market awareness. Fujitsu has recently reiterated its intention to change its focus from selling EMC storage to selling its own intellectual property, such as the DX8000. Past problems can also be partially attributed to the fact that the range of Eternus storage was not generally available or marketed outside of Japan before 2009. However, prospective customers can now obtain the product worldwide, so availability is no longer an inhibitor.

Fujitsu has not exploited the inherent advantages of its large service business, which could sell the value of Fujitsu's storage technology or the large, accessible market of jointly designed Oracle-Sun Microsystems M-Series servers, which have been tuned, tested and supported to work with the DX8000 series. Present Oracle-Sun Microsystems ST9000 series customers are in a product vacuum, because of Oracle's exit from the monolithic storage market, and they are in need of a new established monolithic frame-based storage array supplier. However, to take advantage of these opportunities, Fujitsu must train and reorient its sales force to successfully sell Fujitsu storage to attach to the Oracle-Sun Microsystems M-Series servers.

Automated tiering is accomplished via the RAID migration feature, which has been available for five years. However, to date, it is still a manual process to move data between the storage tiers, such as SSDs, Fibre Channel and Serial Advanced Technology Attachment (SATA) HDDs. Therefore, this feature needs to be automated to compete with EMC's FAST v.2 and Hitachi/Hitachi Data Systems automated tiering products. The DX8000 offers a mature disk encryption feature that was available long before competitive products, and Eco-mode green storage, which is a technology that enables disks that are not being used to be powered down. This feature is generically termed massive array of idle disks (MAID).

*Rating: Caution*

## **Hitachi/Hitachi Data Systems**

Compared with the first three quarters of 2009, Hitachi/Hitachi Data Systems' revenue increased by 14%, and its market share remained constant in the first three quarters of 2010. With a 19% share of the monolithic storage market, Hitachi/Hitachi Data Systems is tied for second place with IBM, and has a reputation for delivering reliable storage systems. With the announcement of its new VSP in September 2010, the vendor responded to competitors' announcements with a competitive offering that aligns well with current user needs. More specifically, the VSP promises high availability and lower storage TCO through high storage efficiency and more ease of use through its array-based replication and enhanced management tools.

Following common industry practice, Hitachi/Hitachi Data Systems cease sales of the Universal Storage Platform (USP) V and USP VM, which ensures that upgrades and maintenance will be available for the near future. While there is a distinct probability that the USP V and VM will be functionally stabilized as Hitachi/Hitachi Data Systems' sales focus shifts to the VSP series, the USP V and VM feature set is competitive. In a market characterized by transient product advantages and no new entrants, the USP V and VSP are the only monolithic storage arrays offering array-based virtualization that works with mainframes and open systems. Array-based virtualization simplifies and accelerates the migration of data from older storage arrays to newer storage arrays virtualized by the VSP. The USP V and VM autotiering feature (aka Tiered Storage Manager) nondisruptively moves data between the storage tiers at the volume level. The VSP takes this a step further and improves this functionality with its Dynamic Tiering feature, which moves data transparently within HDD tiers and between HDDs and SSDs with sub-LUN granularity, thereby removing this workload from the storage administrator. This sub-LUN granularity will not be available on older USP arrays.

The USP management interface represented the complexity and extensive features of the USP system; it was relatively complicated, and required trained and experienced storage administrators. Hitachi/Hitachi Data Systems has simplified this with a much easier-to-use and intuitive management interface for the VSP. However, Gartner still recommends that in the mission-critical environments in which the VSP is used, organizations still need to have experienced storage personnel to avoid any outages due to human error. The VSP continues to offer easy-to-use, nondisruptive microcode update capability.

*Rating: Strong Positive*

## **HP**

HP monolithic storage revenue increased by approximately 0.8% in the first three quarters of 2010, relative to the first three quarters in 2009. However, this increase in revenue did not affect HP's ranking in the monolithic storage market, as overall market share decreased by 0.8% during this period. HP was in fourth place in 2009, and is in fourth place in 2010, with a 6.6% market share. While the sales and marketing challenges confronting HP are somewhat unique, its account control seems to have limited the effects of its belated response to competitors' announcements. Also, HP's launch of the P9500, its version of the VSP, is nearly in lockstep with Hitachi/Hitachi Data Systems' launch of the VSP, which should help HP's competitive position in this market.

Consistent with HP's past practice of differentiating its StorageWorks XP series from other vendors' offerings, HP has chosen to standardize on and only sell the newer 2.5-inch Serial Attached SCSI (SAS 2) disk technology, and will not sell the older high-capacity, but slower-performing 3.5-inch SATA disks. Therefore, until larger-capacity SAS HDDs become available for the HP P9500 in 2Q11, HP may be at a short-term disadvantage, compared with Hitachi/Hitachi Data Systems and other competitors. However, in the long term, this could be an advantage, provided that the high-capacity SAS disks are competitively priced against 3.5-inch SATA disks. Additionally, HP will not have to support, stock and change its part numbers and ordering process when the older 3.5-inch high-capacity SATA disks are no longer produced and sold, toward the end of 2011.

Because HP is a well-established portfolio vendor, it can provide all the hardware components required to run applications and differentiate their storage with additional performance management software, such as with HP StorageWorks Application Performance Extender Software (APEX), which provides quality of service features that enable storage service levels to be controlled and guaranteed. APEX can be used with Microsoft Windows, Red Hat (on a per-server basis) and the HP-UX 11i v3 server on a per-application basis to control storage performance usage. Therefore, it is useful in multitenancy environments, and improves the standard per storage connection/port performance control.

*Rating: Promising*

## **IBM**

IBM reversed the decline in monolithic storage system revenue that it experienced in 2009. Relative to the first three quarters of 2009, monolithic storage array revenue for the equivalent three quarters in 2010 increased by 2.9% to keep IBM in joint second place, with a 19% share of the monolithic storage market. IBM drove the change from negative to positive sales momentum with the launch of the DS8700, together with a number of DS8000 product enhancements that focused on data protection, performance/throughput, storage efficiency and marketing programs. This took advantage of IBM's market coverage, vertical market expertise, and its ability to bundle servers, storage, software and professional services into solutions, as well as IBM's ownership of the z/OS architecture.

The DS8700 was announced on 20 October 2009, and the DS8800 was announced on 7 October 2010. These systems highlight IBM's strategy of leveraging improvements in its microprocessor (Power6 and Power6+) technology into faster, more-usable, functionally rich DS8000 storage systems. Comparatively long microcode update times are continuing to be reduced, even as usability and functionality are enhanced. The DS8700 and DS8800 systems offer an SSD option that supports mainframes and open systems, and Tivoli Storage Productivity Center (TPC) enables users to identify hot spots and recommend target relocations. Buyers should understand that some of the latest features included in the DS8800 announcement will not be available until mid-2011. Examples include Easy Tier, which will allow logical volumes to span different classes of storage because of its support of automated sub-LUN-level tiering, and thin provisioning, which will improve capacity utilization rates.

The DS8800 enhancements extend beyond more performance/throughput to include support of small form factor SAS disks that lower power consumption and cooling requirements, and front-to-back cooling that complements the current practice of laying out hot and cold aisles in computer rooms.

*Rating: Strong Positive*

## **RECOMMENDED READING**

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*Some documents may not be available as part of your current Gartner subscription.*

"Magic Quadrants and MarketScopes: How Gartner Evaluates Vendors Within a Market"

"Quarterly Statistics: Disk Array Storage, All Regions, All Countries, 4Q10 Update"

"IT Market Clock for Storage, 2010"

"Choosing Between Monolithic Versus Modular Storage: Robustness, Scalability and Price Are the Tiebreakers"

"New Storage Architectures Make SSDs More Cost-Effective"

"All Thin Provisioning Is Not Created Equal: What You Need to Know About Thin Provisioning Implementations"

"Emerging Technology Analysis: Advanced Data Protection Schemes Offer More Flexibility and Faster Disk Rebuild Than Traditional RAID"

"Storage Infrastructure Considerations in a Virtual Server Environment"

"3PAR Bidding War Requires Users to Revisit Their Storage Strategy"

"How to Simplify Storage Array Purchasing and Upgrades With Inclusive Data Services"

"Why a Small Minority of Servers Increase Storage Costs"

### **Note 1**

All market statistics quoted herein are based on Gartner market share and quarterly statistics reports.

## Vendors Added or Dropped

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

## Gartner MarketScope Defined

Gartner's MarketScope provides specific guidance for users who are deploying, or have deployed, products or services. A Gartner MarketScope rating does not imply that the vendor meets all, few or none of the evaluation criteria. The Gartner MarketScope evaluation is based on a weighted evaluation of a vendor's products in comparison with the evaluation criteria. Consider Gartner's criteria as they apply to your specific requirements. Contact Gartner to discuss how this evaluation may affect your specific needs.

In the below table, the various ratings are defined:

### MarketScope Rating Framework

#### Strong Positive

Is viewed as a provider of strategic products, services or solutions:

- Customers: Continue with planned investments.
- Potential customers: Consider this vendor a strong choice for strategic investments.

#### Positive

Demonstrates strength in specific areas, but execution in one or more areas may still be developing or inconsistent with other areas of performance:

- Customers: Continue planned investments.
- Potential customers: Consider this vendor a viable choice for strategic or tactical investments, while planning for known limitations.

#### Promising

Shows potential in specific areas; however, execution is inconsistent:

- Customers: Consider the short- and long-term impact of possible changes in status.
- Potential customers: Plan for and be aware of issues and opportunities related to the evolution and maturity of this vendor.

#### Caution

Faces challenges in one or more areas.

- Customers: Understand challenges in relevant areas, and develop contingency plans based on risk tolerance and possible business impact.
- Potential customers: Account for the vendor's challenges as part of due diligence.

#### Strong Negative

Has difficulty responding to problems in multiple areas.

- Customers: Execute risk mitigation plans and contingency options.
- Potential customers: Consider this vendor only for tactical investment with short-term, rapid payback.

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