Gartner rates the emerging Internet Small Computer System Interface storage area network market as improved enough to move from our 2006 rating of “Promising” to “Positive” overall, and rates the vendors that have been in this market for at least one year.

WHAT YOU NEED TO KNOW
The lure of the Internet Small Computer System Interface (iSCSI), based on 1 Gbps Ethernet technology, is the promise of a lower-cost alternative to Fibre Channel (FC) for building storage area networks (SANs). Further promises include similar performance, use of established IP networks, simpler management and similar scale. Scale and management software for iSCSI are more limited than for FC; however, for the smaller configurations being deployed in the market, iSCSI largely delivers on these promises. Moreover, iSCSI SAN solutions are available from a sizable number of vendors, and they are viable – provided requirements and expectations are properly matched to solutions and vendors.

STRATEGIC PLANNING ASSUMPTION(S)
By 2011, disk arrays with iSCSI native host interface will represent 20% of the open systems SAN (FC and iSCSI) market by revenue.

MARKETSCOPE
The iSCSI specification was ratified in February 2003 by the Internet Engineering Task Force. By the end of 2007, all but a few storage vendors had introduced products supporting iSCSI. Most iSCSI products in the market are focused on entry-level to midlevel SANs, with initial success mostly focused on replacing direct-attached storage (DAS) with fabric-attached storage, especially for Microsoft Exchange/SQL Server, accelerating the adoption of SANs by organizations that fall in the midsize category of the small or midsize business (SMB) market sector, as previously predicted by Gartner. Despite users’ focus on lowering cost, most iSCSI arrays support snapshots and remote replication, opening the door to disaster recovery and improvements in recovery time objectives and recovery point objectives, a high-end capability previously unavailable in the low end.

There also is considerable play by some vendors into larger organizations that still have many low-end servers with DAS that could be attached to SANs, thereby consolidating storage, reducing costs and simplifying management. NetApp, in particular, has exploited this end of the market by allowing side-by-side deployment of low-cost servers over iSCSI with network-attached storage (NAS)- and FC-connected applications. The result for end users has been the affordability of more servers connected to SANs, and the result for NetApp has been significantly increased sales of snapshot, replication and other management software.
licenses. Several vendors have followed NetApp’s lead by introducing simultaneous FC and iSCSI support in their arrays. Other vendors selling to larger organizations are installing pure-play iSCSI SANs that are modest in scale compared with FC SANs. Users with VMware deployments, which largely have been connected to FC, often consider iSCSI for its cost savings, and VMware deployments are likely to be a driver for future iSCSI market expansion.

Most, if not all, savings associated with iSCSI over FC are in connectivity – host connections and switch ports. If the user considers the total solution cost (including host connections, switch ports, storage arrays, management software and installation services) and compares similarly configured alternatives, then the iSCSI savings are far less than the 50% to 75% connectivity savings. If a user is looking at a solution involving a low-end array using a Serial Advanced Technology Attachment (SATA) disk, connected to servers using iSCSI and network interface cards (NICs), and compares that with an installed midrange or high-end array using high-performance disks connected to servers using high-performance host bus adapters (HBAs) and FC directors, then the cost difference could be from two to 10 times. However, these are not “similarly configured” alternatives, and a comparison using a low-end FC array using a SATA disk connected to servers using low-cost FC switches and HBAs brings the comparison back to more-modest savings.

Market/Market Segment Description

iSCSI lowers the cost of building storage SANs by using Ethernet NICs and switches instead of more-expensive FC HBAs, switches and directors. The iSCSI SAN market – a subset of the overall SAN market – encompasses delivery of storage network solutions, including disk arrays, switches, HBAs (or standard NICs with free software initiators), and management software and services. Although users typically buy integrated solutions, some vendors sell only the software, depending on the reseller or OEM to integrate the hardware parts of the solution.

Disk arrays that support the iSCSI protocol may be segmented into “unified” disk arrays, dual-mode (iSCSI and FC) arrays, or pure-play iSCSI disk array categories. Unified disk arrays support file-level access (commonly referred to as NAS) and iSCSI block-level access within the same platform. The NetApp FAS and NearStore product families represent the leading examples of unified disk arrays. In some cases, the unified platform simultaneously supports file-level access and iSCSI block-level access. Dual-mode and pure-play iSCSI disk arrays are based on platforms that support the iSCSI block-level access protocol. Dell EqualLogic’s PS Series, EMC’s CLARiON AX4i, HP’s MSA1500i, IBM’s System Storage DS3000 and LeftHand Networks’ SAN/iQ configurations represent five product families that fall within the pure-play iSCSI disk array category. The more-visible dual-mode storage system families are 3PAR’s InServ, Compellent’s Storage Center, EMC’s CX3 and Hitachi Data Systems’ AMS systems. Gartner estimates that the pure-play iSCSI disk array market generated $892 million in vendor revenue in 2007; this represents 8% of the external controller-based disk storage systems that were attached to an open SAN (FC and iSCSI) infrastructure.

The iSCSI market has been almost entirely a Windows market, with Linux a distant second. During 2007, we started to see some activity around Solaris as a result of Sun Microsystems’ efforts to support iSCSI.

Inclusion and Exclusion Criteria

To be included in this MarketScope, companies must have been in the market for at least 12 months, have designed and/or made a significant portion of the solution, have a minimum of 200 installations, and have a minimum of five references.

Rating for Overall Market/Market Segment

Overall Market Rating: Positive

The iSCSI SAN market has increased by almost 50% since the last version of this MarketScope, with most major storage vendors and several smaller companies offering products that deliver reasonable satisfaction to users. However, compared with incumbent FC SANs, the scalability, manageability and solution maturity of iSCSI limits its use mostly to smaller deployments. Cost savings exist, but they come with trade-offs, especially for high-performance environments.

Vendor Product/Service Analysis

3PAR

When configured to support the iSCSI protocol as a host interface, all the InServ Storage Server’s distinguishing features (including thin provisioning, thin-provisioning-aware replication, dynamic optimization, and reservationless snapshots and clones) are fully available to the user. However, 3PAR addresses storage markets that mostly are served by FC, and that, at best, are in the upper ranges of the iSCSI market. Nevertheless, more than 30% of InServ Storage Servers are implemented in a multiprotocol environment, simultaneously supporting FC and iSCSI, with only a small percentage deployed in pure iSCSI storage infrastructures.

In its present stage of development, 3PAR’s dynamic optimization feature only migrates entire volumes between high-performance and high-capacity disks, rather than moving data at a subvolume level. Redundant array of independent disks (RAID) 6, an increasingly popular technology that protects users from a two-drive disk failure, also is a missing feature. Targeted at the mid to
### Evaluation Criteria

#### Table 1. Evaluation Criteria

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<tr>
<th>Evaluation Criteria</th>
<th>Comment</th>
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<tr>
<td>Market Responsiveness and Track Record</td>
<td>The vendor’s 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.</td>
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<td>Sales Execution/Pricing</td>
<td>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.</td>
<td>standard</td>
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<tr>
<td>Market Understanding</td>
<td>The vendor’s ability to understand buyers’ wants and needs, and to translate those into products and services. Vendors that show the highest degree of vision listen and understand buyers’ wants and needs, and can shape or enhance those wants and needs with their added vision.</td>
<td>standard</td>
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<td>Overall Viability (Business Unit, Financial, Strategy, Organization)</td>
<td>Viability includes an assessment of the organization’s overall financial health, the financial and practical success of the business unit, and the likelihood of the individual business unit to continue investing in the product, to continue offering the product and to advance the state of the art in the organization’s portfolio of products.</td>
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<td>Product/Service</td>
<td>Core goods and services offered by the vendor that compete in/serve the defined market. These include 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.</td>
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Source: Gartner

### Figure 1. MarketScope for iSCSI SAN Integrated Solutions

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Source: Gartner (June 2008)
high end of the modular disk array market, the InServ Storage Server may be out of reach for some IT budgets, particularly as 3PAR always tries to price to value, resulting in higher raw dollars per gigabyte prices than for midrange disk arrays from the larger vendors.

**Rating: Promising**

**Compellent**

Compellent’s Storage Center offers a function-rich system with simultaneous iSCSI and FC support; thin provisioning; automated storage tiering with a fine-grained migration policy in a system; and advanced snapshots and replication. Besides having a robust product for the iSCSI market, Compellent has grown its revenue rapidly by establishing dedicated channel relationships. Compellent completed its IPO in October 2007 and reported strong revenue growth in 3Q07 and 4Q07.

From a technology perspective, support for RAID 6 represents an important missing feature in the Compellent Storage Center system. As lower-cost and larger-capacity disk drives increasingly are deployed, RAID 6 support is becoming a necessary comfort factor for end-user customers. With the resources of a new and relatively small public company, Compellent is not able to attack the iSCSI market on as many fronts as larger competitors, and must focus on a narrower set of software and hardware variables that may be certified for interoperability.

**Rating: Positive**

**Dell**

Dell is taking a leadership role in positioning disk array storage based on the iSCSI protocol as an appropriate FC alternative to support server virtualization infrastructures. Its acquisition of EqualLogic, combined with its other iSCSI-based disk array offerings, is likely to make Dell the leading provider of disk array storage systems based on the iSCSI protocol. Leveraging its iSCSI storage product offering with its server and networking product portfolio, Dell is able to offer a complete server, storage and networking infrastructure solution with a single point of contact for assistance and service. Gartner surveys support the observation that Dell storage systems provide general user satisfaction with regard to value.

Dell’s iSCSI disk array product portfolio is composed of point products that lack seamless interoperability from the entry-level offerings (PowerVault NX1950 and PowerVault MD3000i) to the midrange enterprise-level offering (Dell/EMC CX series). The acquisition of EqualLogic further exacerbates this situation, while at the same time strengthening the overall product line. Moreover, the acquisition of EqualLogic is a challenge for Dell as it manages new channel partnerships and its current relationship with EMC and LSI Logic.

**Rating: Positive**

**Dell EqualLogic**

In terms of vendor revenue, Dell EqualLogic was the pure-play iSCSI market leader in 2006. Estimated revenue growth in 2007 exceeded 50%. The PS series is based on a scale-out architecture that enables capacity and performance to nondisruptively scale linearly. As additional nodes are added to the PS series configuration, the workload is automatically reconfigured and load-balanced across the components comprising the revised system. Dell EqualLogic’s library of provisioning and data services software, which is bundled with the PS series system price, includes support for classic (fat) provisioning, thin provisioning, auton snapshot manager, space-efficient volume snapshots, volume cloning, autoreplication (asynchronous and synchronous), and multipath input/output (I/O). The bundle hardware/software pricing model means the user is not faced with separate licensing fees for unforeseen additional optional software features or software license increases as capacity grows. Dell’s acquisition removes company viability issues, enhances supply chain efficiency, broadens global visibility, improves larger-enterprise penetration opportunities, and potentially strengthens R&D capabilities.

The PS series supports iSCSI-only host interfaces, which narrows its deployment flexibility in enterprises with diverse storage infrastructure requirements. The PS series lacks support for RAID 6, subvolume quality of service and requires space to be prereserved to support its snapshot functionality. Managing conflict between Dell’s direct go-to-market model and EqualLogic’s channel go-to-market model presents an important challenge to maintain Dell EqualLogic’s revenue growth momentum.

**Rating: Positive**

**Dot Hill**

Dot Hill has steadily brought to market new disk array products based on its internally developed R/Evolution Architecture. The R/Evolution 2330 disk array, which supports the iSCSI protocol, features an innovative mirrored cache implementation that reduces time to write data to cache by 90%, a cost-efficient, battery-free power loss backup design that extends protection from hours to years. In addition, the R/Evolution 2330 disk array features high-performance RAID 6, which Dot Hill claims has only a 3% to 5% performance impact over RAID 5 on write I/O per second. SAS and SATA disk drives may be mixed in the same disk enclosure, providing a cost-effective tiered storage solution.

In their present incarnations, products based on the Dot Hill R/Evolution Architecture lack thin provisioning, subvolume quality of service, remote replication, and the ability to support iSCSI and FC block-access host interfaces on a common platform (controllers can be swapped to change the interconnect). The omission of these features may increase acquisition, operational and management costs relative to competing solutions supporting these capabilities. With R&D expenditures scaled to revenue generation, Dot Hill must prioritize product development and qualification investments in functionality that provides early revenue accretion.

**Rating: Promising**

**EMC**

EMC is most notable as the only vendor with iSCSI storage offerings across the full market range – from the $5,000 AX to the DMX line, as well as the unified Celerra. Its largest sales volumes are with the lower models in the CLARiiON CX3 line, as a result of healthy channels to the midrange developed during the past few years. Since the introduction of the NS20 and NS40 in 3Q07, Celerra sales have accelerated, and EMC also enjoys some traction with Symmetrix DMX and the rest of the CLARiiON line. Of these offerings, only Celerra and DMX have thin provisioning; EMC has promised CX3 thin provisioning for delivery later in 2008, but until it is priced and market validated, it should not influence current storage decisions. In addition to its usual advantages as a successful storage vendor, EMC is one of a few vendors with
storage resource management (SRM) and SAN management software that recognizes iSCSI, as well as VMware, increasingly coupled with iSCSI deployments. In 2007, EMC greatly reduced the complexity of its configuration tools. It also provides good snapshot integration with common applications.

Dell’s purchase of EqualLogic will affect EMC’s overall volumes. EMC’s most popular iSCSI offering, CX3, lacks thin provisioning, and offers more-limited snapshot and replication capabilities than do several of the other vendors’ products in similar price ranges, causing EMC to just miss a Strong Positive rating.

**Rating: Positive**

**FalconStor Software**

FalconStor is best known for sales through OEMs (especially virtual tape), but it still achieves more than half its revenue through value-added reseller/reseller channels. The FalconStor Network Storage Server is controller software typically installed on an Intel server or servers to create a controller or controllers, and is integrated with disk drives (often from Nexxan) to make an iSCSI and/or FC array. Another FalconStor offering is an iSCSI target, which, when added to a Windows server, enables the direct-attached disk to be served to the iSCSI network. Users can mix internal and external disks with other FalconStor features, such as continuous data protection, replication and backup. Some resellers rebrand the product, but others sell NSS (built on the IPStor platform) using the FalconStor brand, making the company visible to users.

Because of the nature of FalconStor relationships, it is difficult to determine the vendor’s exact customer base; however, we believe it has grown its iSCSI revenue more slowly than most other vendors.

**Rating: Promising**

**Hitachi Data Systems**

Hitachi Data Systems has enjoyed some success with the iSCSI version of midrange AMS/WMS products, and also supports iSCSI on its high-end USP and BlueArc NAS offerings. It has partnered with QLogic and Microsoft to offer simple plug-and-play iSCSI SANs, and it supports VMware. Recently, the company has been working to create a better channel into the iSCSI market. All these products provide support for snapshots, remote replication, and extensive volume management. The USP product supports thin provisioning, and allows “virtualization” of external storage arrays to provide migration and disk alternatives for iSCSI and FC.

Hitachi Data Systems’ products mostly are above the “sweet spot” for iSCSI in the market, and success as a high-end storage vendor has not provided the channel access required to be a bigger iSCSI player.

**Rating: Promising**

**HP**

Since its introduction late in 4Q05, thousands of HP’s MSA1510i arrays have been sold, superseded in February 2008 by the MSA2000, which brings controller-based snapshots and the promise of additional features over time. These sales have been almost entirely to its Proliant/Windows server base, which could easily be described as centered squarely on the iSCSI market for storage. Pricing is the MSA line’s most compelling feature, and HP’s reseller channels are accustomed to selling that line. HP also has enjoyed success with the All-In-One (AiO) storage servers in the SMB market; AiO servers offer an iSCSI virtual tape product and support Proliant servers running Windows Storage Server as iSCSI targets.

HP supports iSCSI options on the Enterprise Virtual Array (EVA) products via a gateway, but integration of the gateway into the EVA tools makes it easier to use than other gateways. The February 2008 introduction of the lower-priced EVA 4400, coupled with this management tool integration, will better-align the EVA products with the iSCSI market. HP’s SRM and SAN product, Storage Essentials, does not support iSCSI. Despite the MSA line’s attractive pricing and new snapshots, HP still faces a more complete set of features found in competitor’s lower-end iSCSI arrays.

**Rating: Positive**

**IBM Storage**

IBM’s primary iSCSI solutions are based on an OEM agreement to resell the entire NetApp line, rebranding it as the N series and giving it a strong, unified offering. This gives IBM the benefits of thin provisioning, extensive snapshots, deduplication, tiered storage and other modern features across a broad range of scale and cost. It complements this with professional services, and has worked to provide better alignment between IBM and NetApp resources in the field. The DS2200 supports host SAS only, and the DS3400 supports FC only. As always, IBM uses integration of blade and other servers with storage solutions to give customers a complete solution.

IBM’s SRM and SAN management software, TPC, does not support iSCSI. Some customers note that not all information that is available directly to NetApp customers is available to IBM’s N series customers.

**Rating: Positive**

**Intransa**

Supporting 1 Gbps and 10 Gbps Ethernet, Intransa’s StorStac N-Way clustered architecture and internal IP topology scales performance and capacity independently and nondisruptively to meet changing needs, while preserving initial investment. Version 4 of Intransa’s StorOS software and scalable StorManager software have evolved in features, functions and maturity since they first shipped in 2003. The Intransa StorStac storage systems are designed specifically to support network-based applications requiring extreme performance and scalability. These storage systems are certified with Microsoft for a 10 Gbps Ethernet IP SAN solution, supporting 11,000 Exchange 2007 users. Video storage, particularly video surveillance, represents Intransa’s fastest-growing market.

Since its 2001 launch as a 3Com spin-off, Intransa has gone through many changes in leadership and strategies, hampering its success in the market. In 4Q06, another new management leadership team, with extensive backgrounds in storage and networking, was put in place. Supported by an additional $10 million in venture capital funding, this seasoned leadership team is attempting to leverage Intransa’s innovative architecture into a successful storage business. Although the Intransa architecture is scalable in performance and capacity, the host interface and disk drive interface technologies are limited to iSCSI and SATA technologies, respectively.

**Rating: Caution**
LeftHand Networks
Although its software business model results in less revenue, LeftHand Networks claims customer counts for SAN/iQ in the same range as Dell EqualLogic. A key element of the company’s success has been “meet in the channel” relationships, which enable resellers of servers, especially from HP, IBM and Dell, to provide an integrated iSCSI solution to end users. SAN/iQ pools multiple industry standard hardware platforms into a cluster to create an iSCSI SAN. Its rich feature set includes nondisruptive capacity, performance and redundancy expansion, virtual volumes, synchronous replication, unlimited snap copy, and thin provisioning. This vendor also sells a branded version of SANiQ that is integrated on an x86 platform. Perhaps the most intriguing recent enhancement is the ability to load SANiQ onto virtual machine partitions, allowing internal disks in ESX servers to be served out as an iSCSI SAN with all SANiQ features enabled.

LeftHand Networks supports RAID 0, 10, 5 and 6 – if it is configured as part of the server hardware – and it enhances data protection by using multiple copies of all data.

Rating: Positive

NetApp
With more than 12,000 production deployments, NetApp continues to be one of the most successful iSCSI vendors, especially in the upper midrange and high end, as a result of its use of iSCSI across its product line and as a companion/alternative to FC and file protocols. This vendor also has been successful across the midrange, and with configurations that are often larger in size than the market average. NetApp’s broad feature set, especially thin provisioning, extensive snapshots, deduplication, tiered storage and other modern features, are supported on models covering a broad range of scale and cost. The company also has provided extensive snapshot integration for most common applications. Most importantly, NetApp is pushing the boundaries of iSCSI scale in its testing labs, where it enables customers to set up proof-of-concept tests prior to purchase.

NetApp has attempted to develop a channel into the lower parts of the SMB market, but has met with only modest success, limiting its access to some of the highest-volume portions of the iSCSI market. In addition, pricing, particularly of software, is sometimes a challenge against the pure-play providers.

Rating: Strong Positive

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.

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.