

## iSCSI software initiators vs. iSCSI host bus adapters

*For some applications, software initiators will suffice, but more-demanding applications will require iSCSI and TCP/IP hardware accelerators on host bus adapters*

### **By Saqib Jang**

The promise of iSCSI for early adopters is affordable storage consolidation solutions for server environments where simplicity, flexibility, and price/performance are critical IT decision factors. While a range of storage applications may benefit from iSCSI, initial deployments are focused on departmental and workgroup e-mail and database applications, including Microsoft applications such as Exchange and SQL Server, as well as other applications that run on Windows such as Lotus Notes.

"While iSCSI is initially being deployed for e-mail and database applications," says Glenn Clowney, director of iSCSI product marketing at Adaptec, "we're also seeing medium-sized companies looking to iSCSI for many of their applications." Most e-mail and database servers require block-level I/O and are not well suited to file-type data structures such as network-attached storage (NAS).

For example, until iSCSI, users setting up a Microsoft Exchange system could either use direct-attached storage (DAS) or if they needed better connectivity, availability, and manageability, they had to invest in a Fibre Channel storage area network (SAN).

"As a block protocol, iSCSI is a fit for Microsoft Exchange storage, whereas NAS is currently not supported with Exchange," says Zane Adam, director of product management and marketing in Microsoft's Enterprise Storage Division.

"Replication for distributed file sharing is also an ideal iSCSI application, because it takes advantage of existing IP infrastructure," says Adam. Microsoft's iSCSI driver for Windows client and server is now available, and more than 60 vendors have announced plans to develop Windows-based applications and hardware products based on Microsoft's iSCSI architecture.

"The issue with a Fibre Channel SAN for departmental e-mail and database applications is that the customer has to invest in expensive management, personnel, and SAN connections [and hardware]," says John Howarth, director of product marketing at Intransa, a developer of iSCSI storage systems. He estimates that the cost for a \$2,500 Windows server in a Fibre Channel SAN is approximately \$2,000 (\$1,000 for the switch port and \$1,000 for the HBA). "iSCSI allows customers to bring the advantages of a SAN to applications like Exchange that have needed the functionality for availability and backup, but have not been able to justify the cost with existing technologies."

## **Equipping servers with iSCSI**

Windows application servers have four options for supporting iSCSI clients (or initiators in SCSI terminology):

- A software-only initiator, such as the Microsoft iSCSI software driver, with a standard network interface card (NIC), preferably Gigabit Ethernet;
- A Microsoft iSCSI software initiator combined with an accelerated NIC (often referred to as a TCP/IP Offload Engine, or TOE, card);
- An iSCSI host bus adapter (HBA); and
- A multi-function device that combines both storage and networking traffic using acceleration.

In all cases, the Microsoft iSCSI initiator service would be used to aggregate the management from any hardware or software initiators used in a Windows system. iSCSI HBAs are available from a number of vendors, including Adaptec, Intel, and, later this year, QLogic, all of which use ASICs for fully offloading both TCP/IP and iSCSI protocols from the application server. iSCSI TOE adapters are available from vendors such as Alacritech and provide a means for speeding up TCP applications over Gigabit Ethernet networks.

While both types of adapters speed up iSCSI processing on the server, Microsoft Windows treats TOE adapters very differently than iSCSI HBAs.

"An iSCSI HBA appears to Windows as a storage device, while an iSCSI TOE card appears as a very smart NIC," says Microsoft's Adam. "iSCSI HBAs allow booting from an iSCSI target and can take advantage of Windows storage services."

Microsoft has initiated an iSCSI Designed for Windows logo program to qualify iSCSI HBA compatibility with Windows.

The tradeoffs between software-only iSCSI initiators and iSCSI HBAs span cost, CPU overhead, and support for mission-critical functionality such as cryptographic security, fail-over, and booting from an iSCSI target. Not surprisingly, there are cost implications of going with either approach. "iSCSI software initiators allow customers to attach to block-based storage for only about \$200 [\$100 for a NIC and \$100 for a GigE switch port] per port," says

Intransa's Howarth, whereas iSCSI HBAs typically cost about \$600 each.

There is also a major difference in the CPU overhead between each approach. The software-only initiator may consume up to 500MHz of CPU for 1 Gigabit Ethernet line rate. In contrast, with a hardware-assisted iSCSI initiator HBA, the TCP/IP and iSCSI processing is offloaded to the HBA, resulting in less than 10% CPU overhead for a 1GHz CPU, which is comparable to that of a Fibre Channel HBA. The two approaches also differ in enabling advanced security, availability, and administration capabilities for iSCSI servers.

"Beyond server CPU utilization, iSCSI HBA initiators permit highly scalable iSCSI deployments, iSCSI capabilities such as gigabit-level cryptographic acceleration for end-to-end storage security, diskless server booting, and dynamic fail-over," says Adaptec's Clowney.

What does all this mean for end users evaluating iSCSI for departmental or distributed e-mail and database applications? The first variable users have to evaluate is the loading level of the application servers. If the servers are lightly loaded, even iSCSI overhead with a software initiator would not noticeably affect application performance. Most existing servers, however, are moderately to highly loaded and will need to be equipped with iSCSI HBAs.

### **Where to spend the money**

In the case where users have the option of purchasing new servers, they will be faced with a question of where to spend the money: Should users purchase servers with 3GHz CPUs and an iSCSI HBA, or a 4GHz server with an iSCSI software initiator? Even if the software approach is used for small deployments, users may still choose to deploy iSCSI hardware adapters in their production configurations to keep a maximum of CPU cycles available for application services and to address emerging performance needs such as disk-to-disk backups.

Microsoft considers the two approaches complementary and believes that both may be required for iSCSI implementations. "For many deployments, a software initiator will work fine in conjunction with an existing NIC card. For customers with higher-performance needs, an iSCSI HBA may be more appropriate," says Microsoft's Adam. In addition, Adam's view is that as iSCSI adoption broadens, vendors will learn more about the different customer scenarios and needs that dictate the best way to deploy software and hardware iSCSI initiators.

While performance will initially be the important factor in deciding which option to pursue, a more important issue as iSCSI deployments grow will be the opportunity to reduce management costs and minimize resources required to scale IT infrastructure through using iSCSI HBAs.

As with Fibre Channel HBAs, iSCSI HBAs are emerging to permit high levels of security, monitoring, fault isolation, and performance management—capabilities that will translate to significant IT personnel cost savings. This means that iSCSI HBAs promise to be a standard server infrastructure component for business-critical iSCSI deployments.

***Saqib Jang** (saqibj@margallacomm.com) is a principal at Margalla Communications, a Woodside, CA-based strategic and technical marketing consulting firm focused on storage networking.*