

COMPARISON: FIBRE CHANNEL SAN, FCoE SAN, iSCSI SAN AND NAS

Fibre Channel SAN, FCoE SAN, iSCSI SAN and NAS are four techniques with which storage networks can be realised. Figure 4.15 compares the I/O paths of the four techniques and Table 4.2 summarises the most important differences.

In contrast to NAS, in Fibre Channel, FCoE and iSCSI the data exchange between servers and storage devices takes place in a block-based fashion. Storage networks are more difficult to configure. On the other hand, Fibre Channel at least supplies optimal performance for the data exchange between server and storage device.

NAS servers, on the other hand, are turnkey file servers. They can only be used as file servers, but they do this very well. NAS servers have only limited suitability as data storage for databases due to lack of performance. Storage networks can be realised with NAS servers by installing an additional LAN between NAS server and the application servers (Figure 4.16). In contrast to Fibre Channel, FCoE and iSCSI this storage network transfers files or file fragments.

One supposed advantage of NAS is that NAS servers at first glance have a higher pre-fetch hit rate than disk subsystems connected via Fibre Channel, FCoE or iSCSI (or just SCSI). However, it should be borne in mind that NAS servers work at file system level and disk subsystems only at block level. A file server can move the blocks of an opened file from the hard disk into the main memory and thus operate subsequent file accesses more quickly from the main memory.

Disk subsystems, on the other hand, have a pre-fetch hit rate of around 40% because they only know blocks; they do not know how the data (for example, a file system or database) is organised in the blocks. A self-configured file server or a NAS server that uses hard disks in the storage network can naturally implement its own pre-fetch strategy in addition to the pre-fetch strategy of the disk subsystem and, just like a NAS server, achieve a pre-fetch hit rate of 100%. Today (2009) Fibre Channel, iSCSI and NAS have been successfully implemented in production environments. It is expected the FCoE will enter the market in 2009. Fibre Channel satisfies the highest performance requirements – it is currently (2009) the only transmission technique for storage networks that is suitable for I/O intensive databases.

Since 2002, iSCSI has slowly been moving into production environments. It is said that iSCSI is initially being used for applications with low or medium performance requirements.

It remains to be seen in practice whether iSCSI also satisfies high performance requirements (Section 3.5.2) or whether FCoE establishes as *the* technology for storage networks based on Ethernet. NAS is excellently suited to web servers and for the file sharing of work groups. With RDMA-enabled NFS and CIFS, NAS could also establish itself as a more convenient data store for databases.

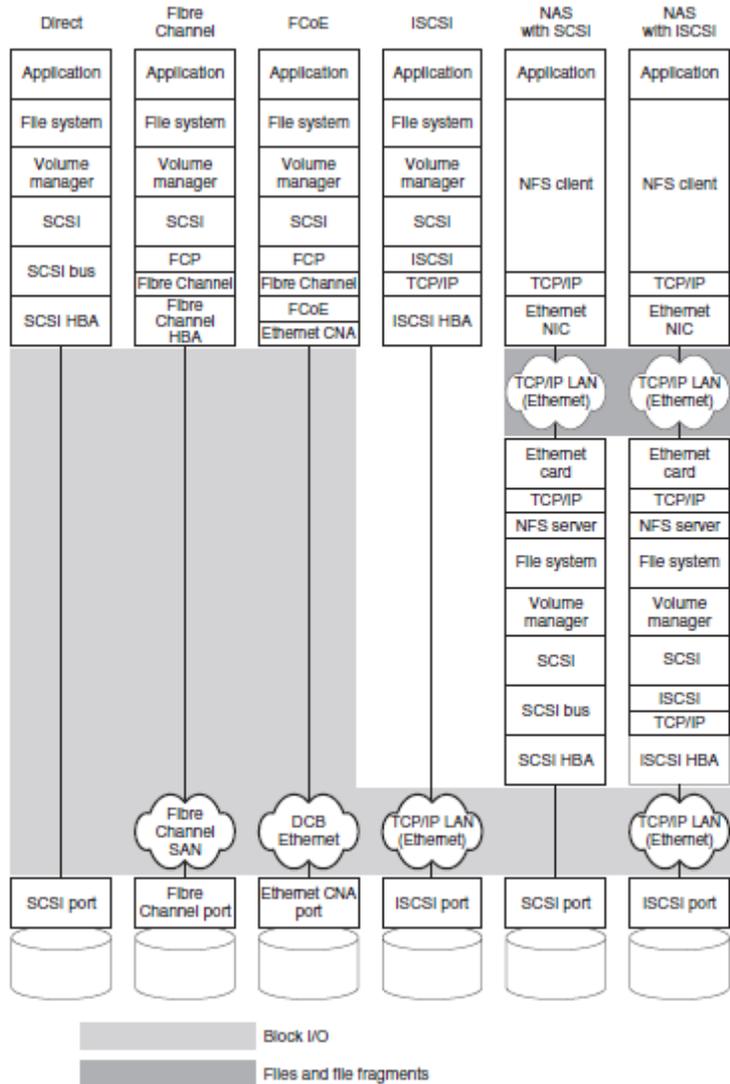


Figure 5.15 Comparison of the different I/O paths of SCSI, iSCSI, Fibre Channel, FCoE and NAS.

Table 4.2 Comparison of Fibre Channel, iSCSI and NAS.

	Fibre channel	FCoE	iSCSI	NAS
Protocol	FCP (SCSI)	FCP (SCSI)	iSCSI (SCSI)	NFS, CIFS, HTTP
Network	Fibre Channel	DCB Ethernet	TCP/IP	TCP/IP
Source/target	Server/storage device	Server/storage device	Server/storage device	Client/NAS server, application server/NAS server
Transfer objects	Device blocks	Device blocks	Device blocks	Files, file fragments
Access via the storage device	Directly via Fibre Channel	Directly via Fibre Channel	Directly via iSCSI	Indirectly via the NAS-internal computer
Embedded file system	No	No	No	Yes
Pre-fetch hit rate	40%	40%	40%	100%
Configuration	By end user (flexible)	By end user (flexible)	By end user (flexible)	Preconfigured by NAS manufacturers (Plug&Play)
Suitability for databases	Yes	Yes	To a limited degree (2009)	To a limited degree
Production-readiness	Yes	Market entry in 2009	Yes	Yes

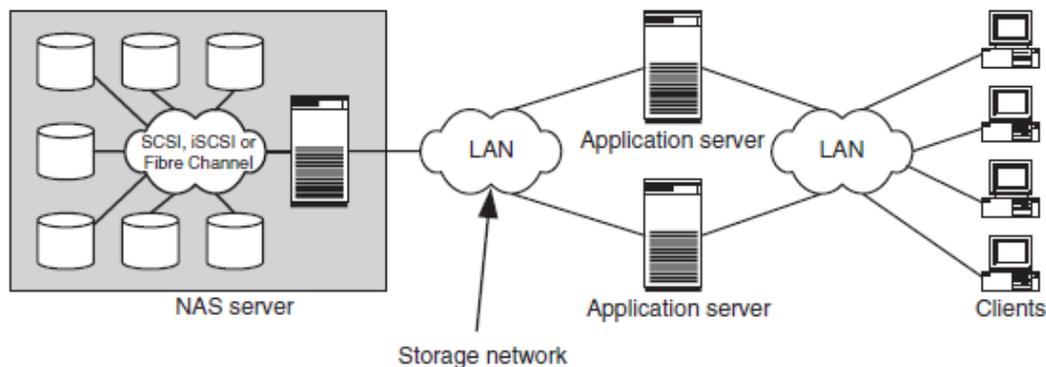


Figure 5.16 For performance reasons a separate LAN, which serves as a storage network, is installed here between the NAS server and the application servers.

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