

Storage Technologies

IT403

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Lecture 5



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Storage Network Technologies

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Foreword

- This module introduces the types of storage network and the comparison of the advantages and disadvantages between different types of storage networks.
- This module also introduces the definition of DAS, NAS, and SAN.
- This module also describes in detail on the architecture of DAS, NAS and SAN storage network, and its advantages and disadvantages.

Objectives

Upon completion of this module, you will be able to:

- Describe the characteristics of DAS, NAS and SAN storage network technologies.
- Differentiate between the advantages and disadvantages of DAS, NAS, and SAN storage network technologies.

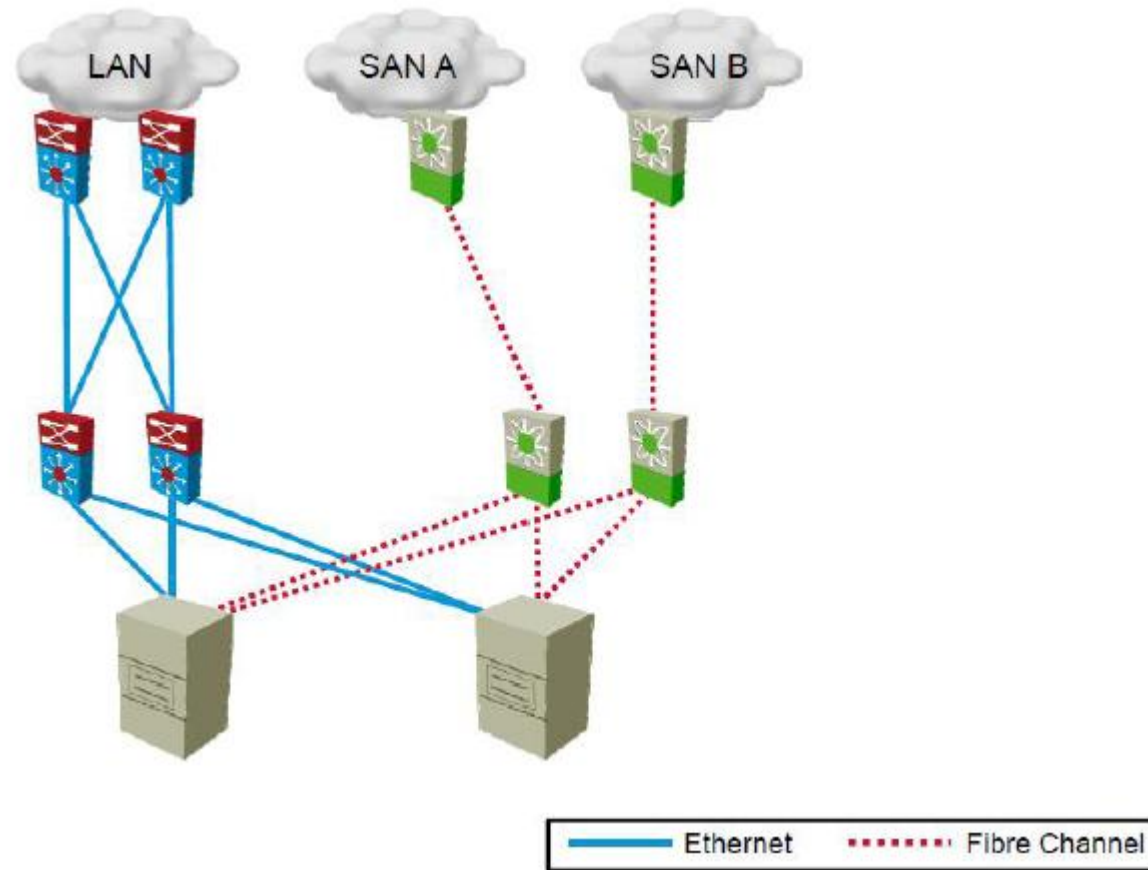
Outlines

- Classification of Network Storages
- DAS - Traditional Storage Technology
 - Challenges Faced By DAS Storage
- SAN - Storage Area Network
 - SAN Storage Application
- NAS - Network Attached Storage.
 - Benefits of NAS
- Comparison of DAS, NAS and SAN

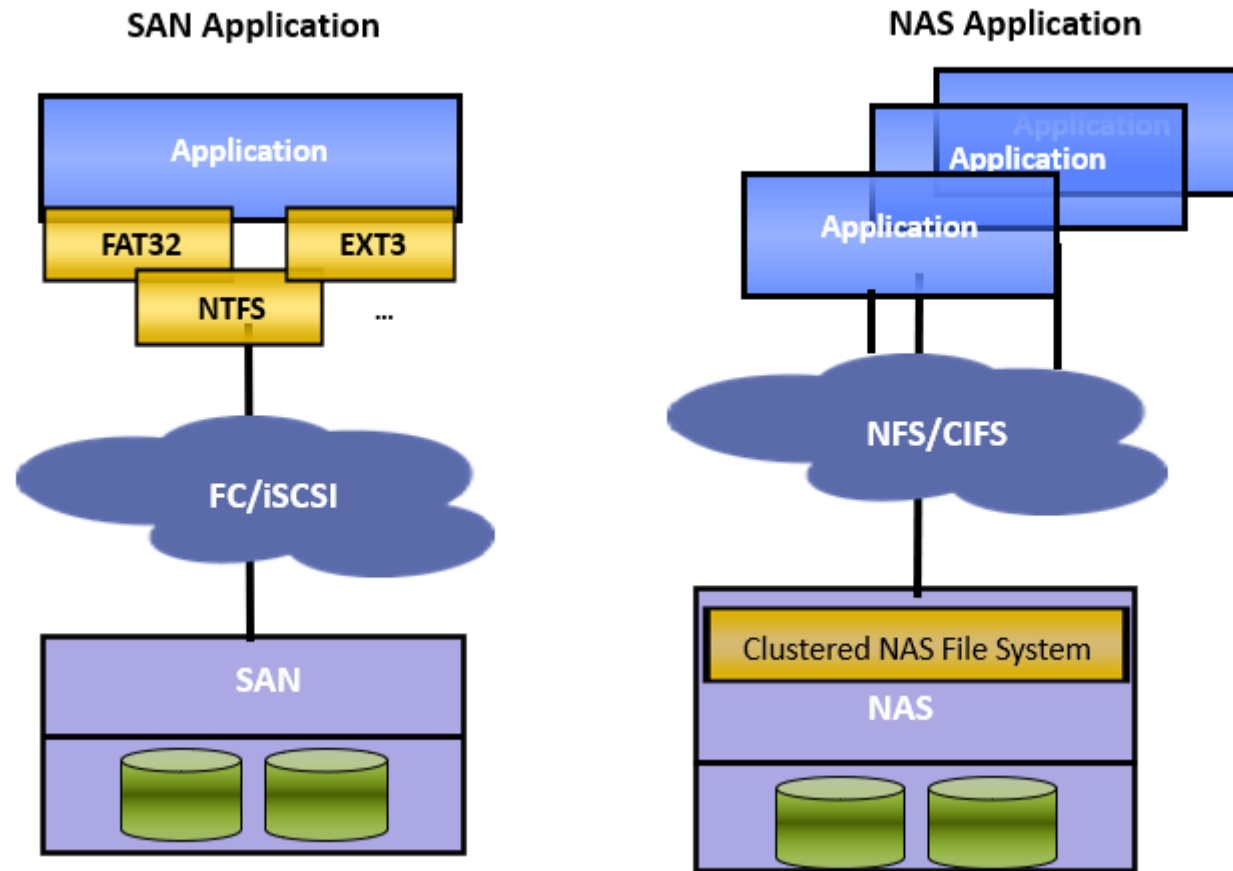
Classification of Network Storages



Data Center Storage Network



SAN VS NAS



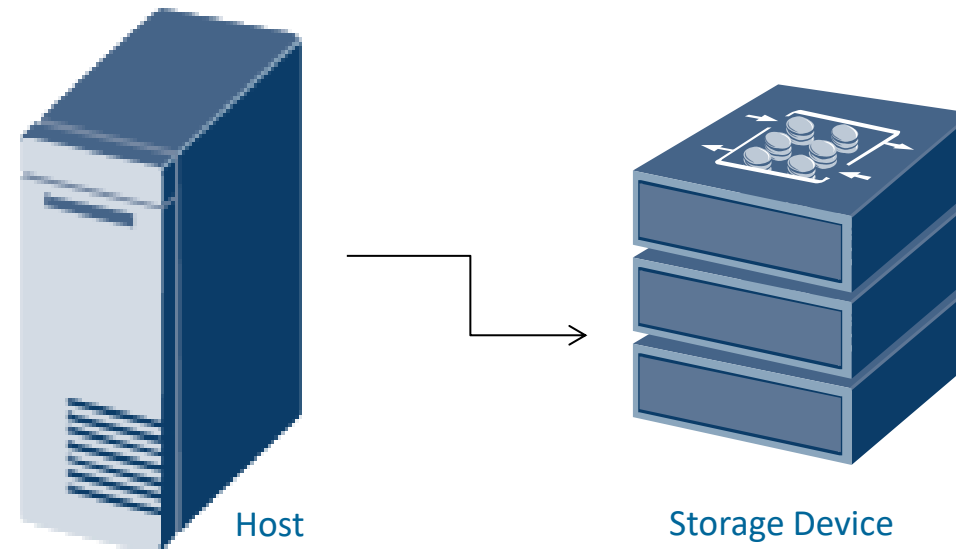
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DAS - Traditional Storage Technology

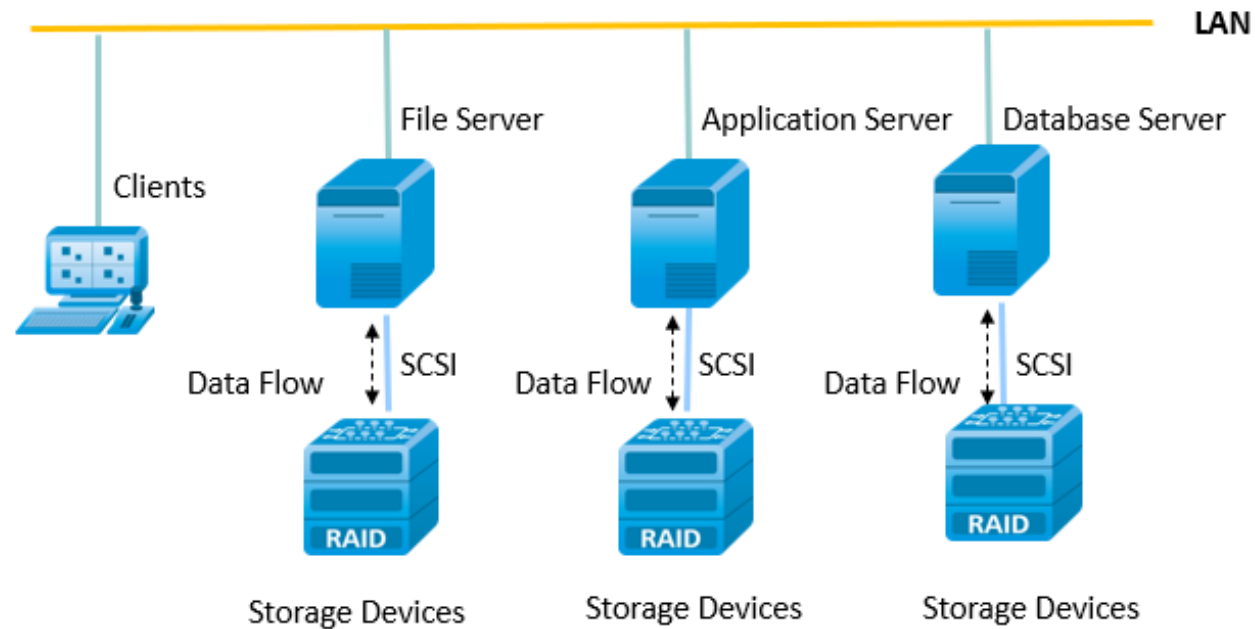


Definition of DAS

- **Definition of DAS:** DAS refers to 1 or more storage devices that are directly connected to the servers which provides block storage services to the servers.
- **Classification** of DAS: Based on the location of those storage devices relative to the servers, DAS is divided into Internal DAS and External DAS.

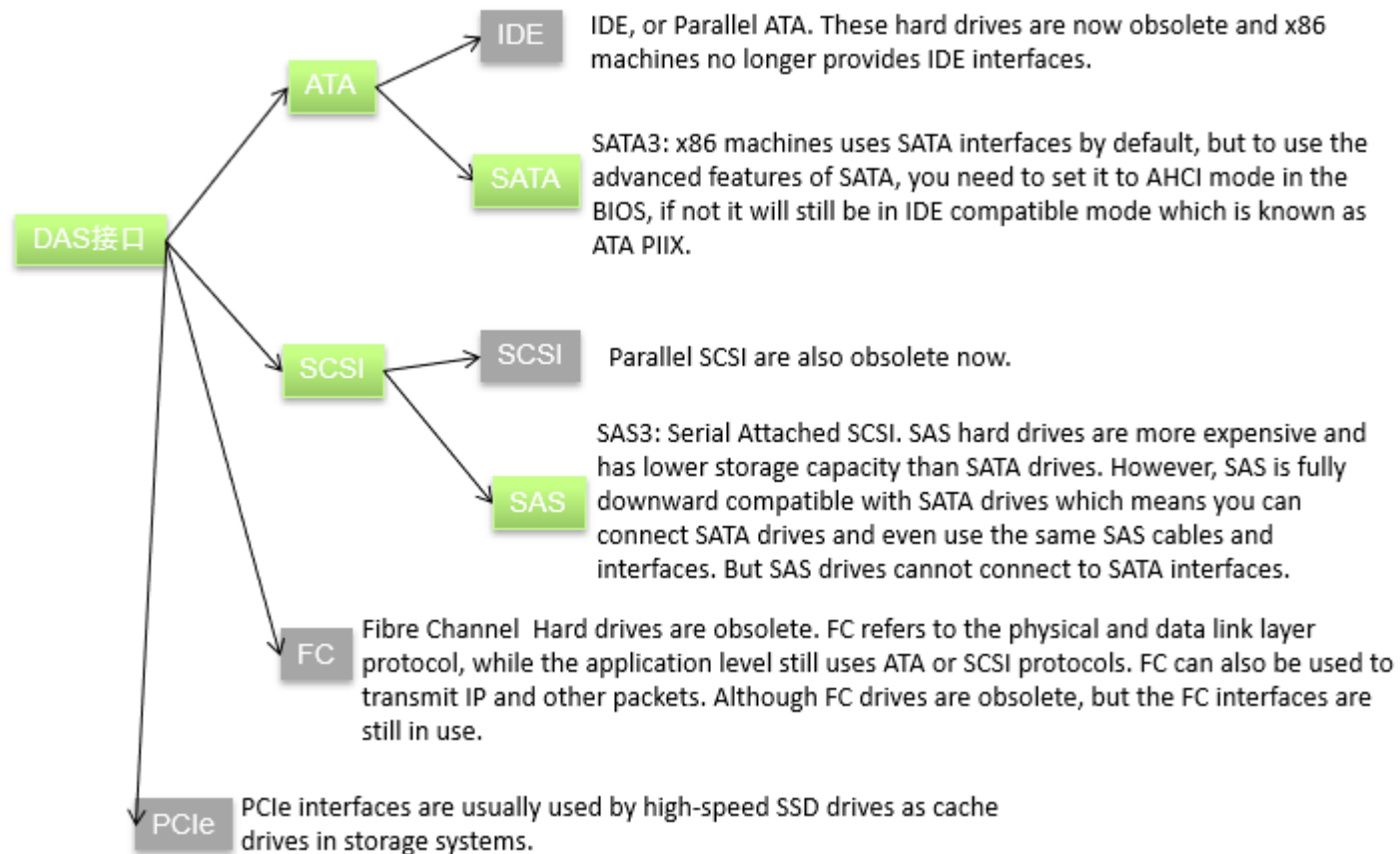


DAS (Direct Attached Storage)



- Storage Devices are directly connected to the hosts.
- No centralized management of data.
- Low storage capacity utilization.
- Poor expansion capabilities.

Block Storage Based Physical Local Hard Disk DAS System



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Challenges Faced By DAS Storage



Challenges Faced By DAS Storage

- Poor Scalability and Expansion Capabilities
 - Limited number of ports connecting to the host.
 - Limited number of disks.
 - Distance limitations.
- System needs to be offline during the maintenance of Internal DAS.
- Poor Resource Sharing Capabilities
 - Hard to share the front service ports and storage space of storage arrays.
 - Causes isolated resource islands or silos: For example, DAS system that is low in space cannot use the unutilized storage space of other DAS storage devices.

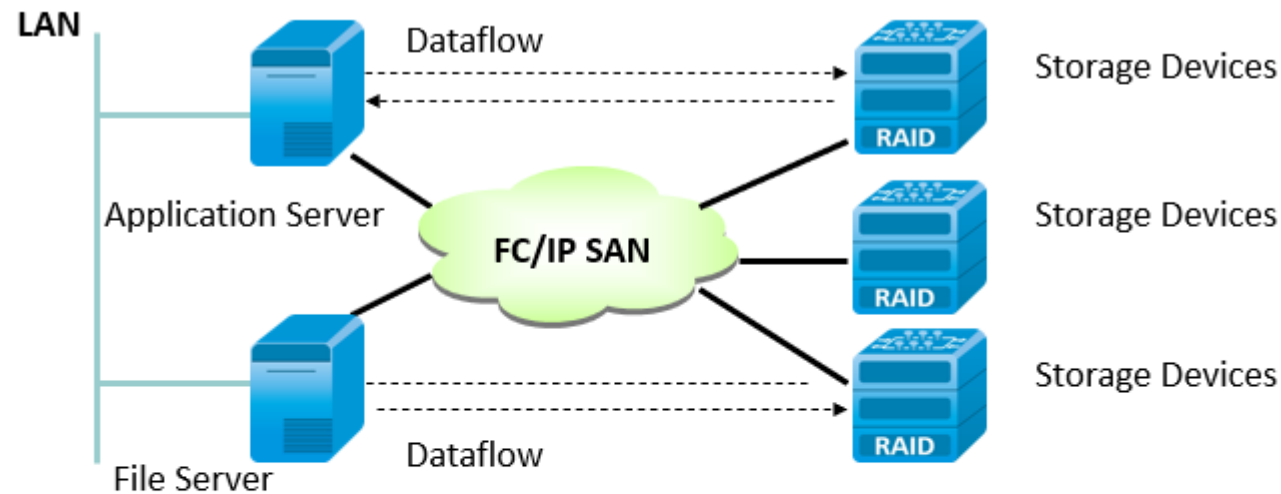
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SAN - Storage Area Network

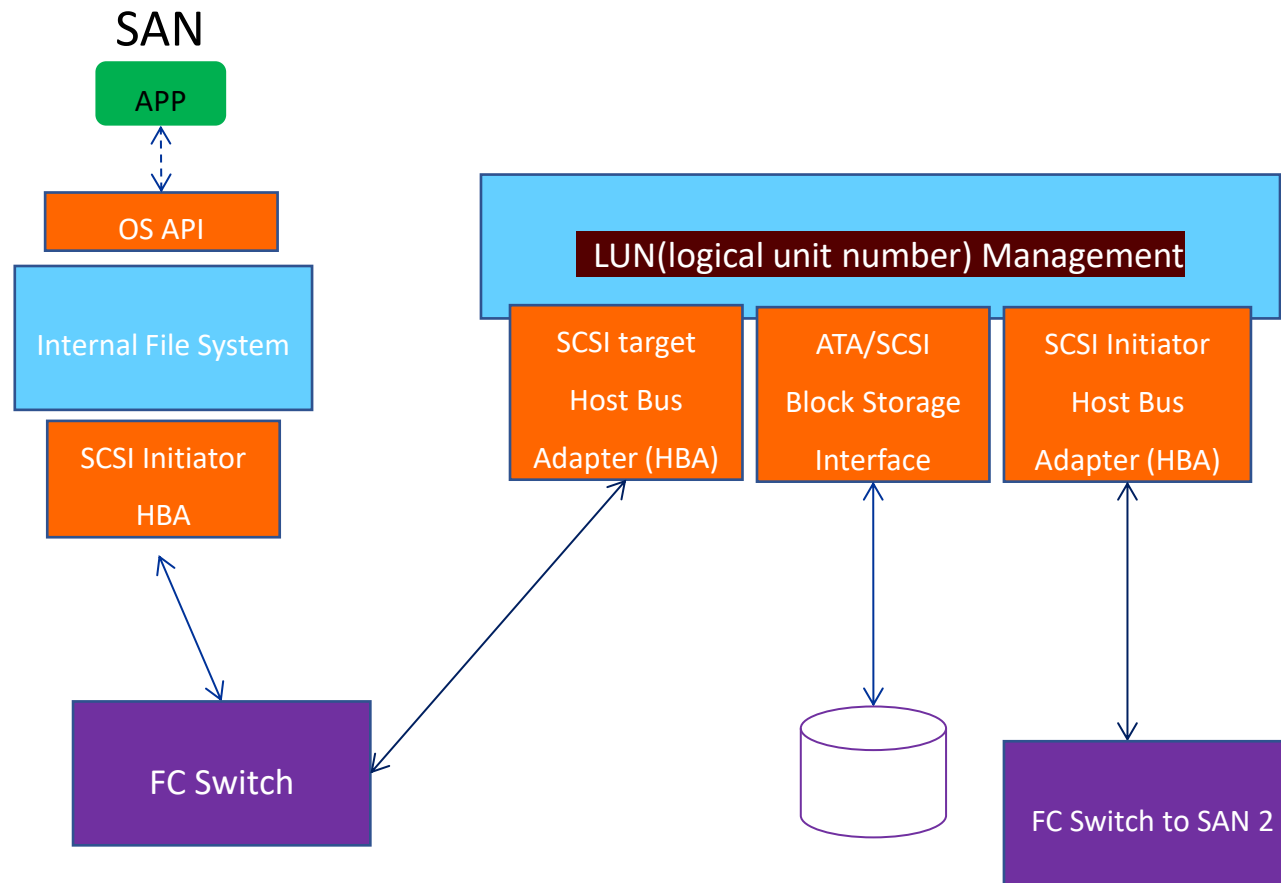


SAN (Storage Area Network)

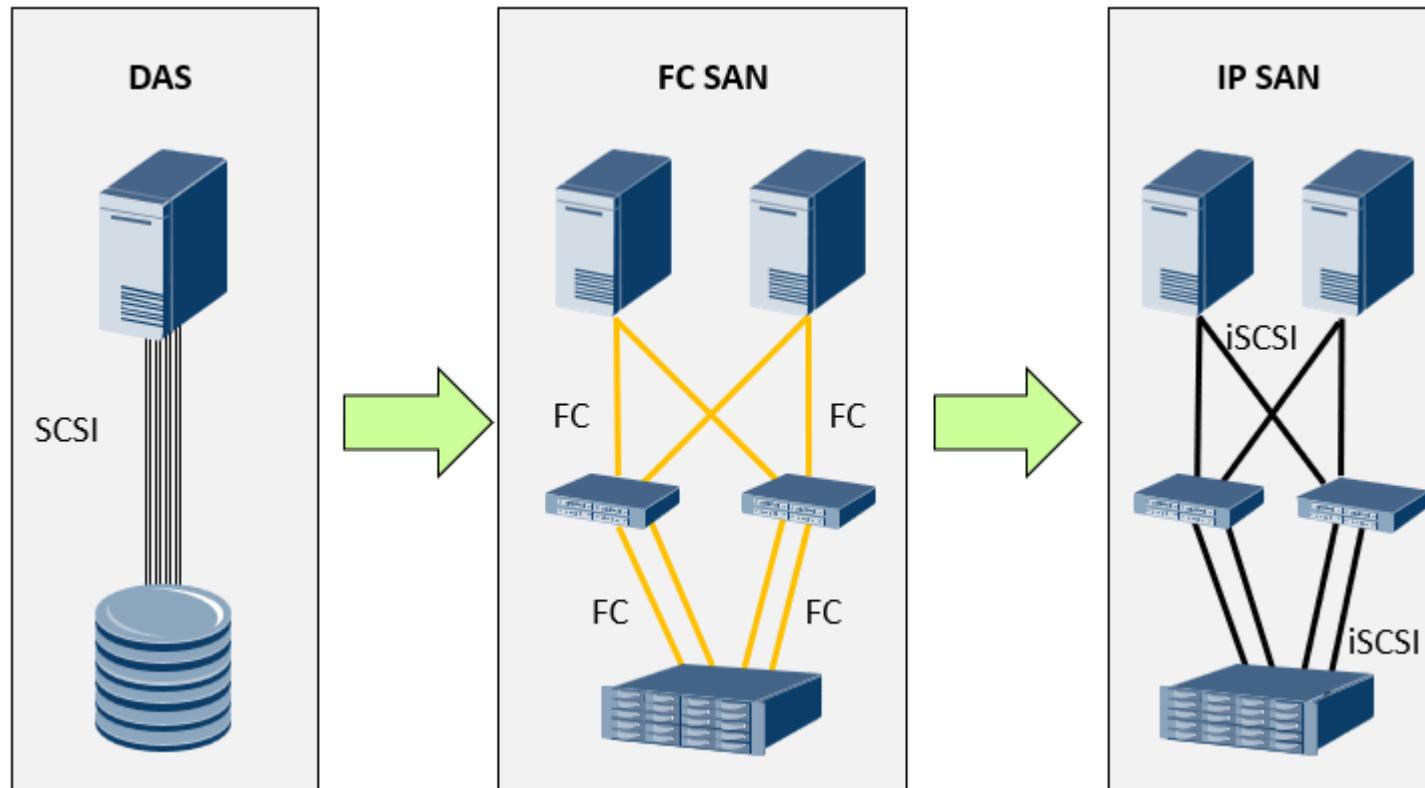


- Host and Storage Devices can be independently expanded.
- SAN: Storage Area Network provides data transmission between the host and storage devices, it has high data transmission rate in internal networks.
- High rate of storage capacity utilization.

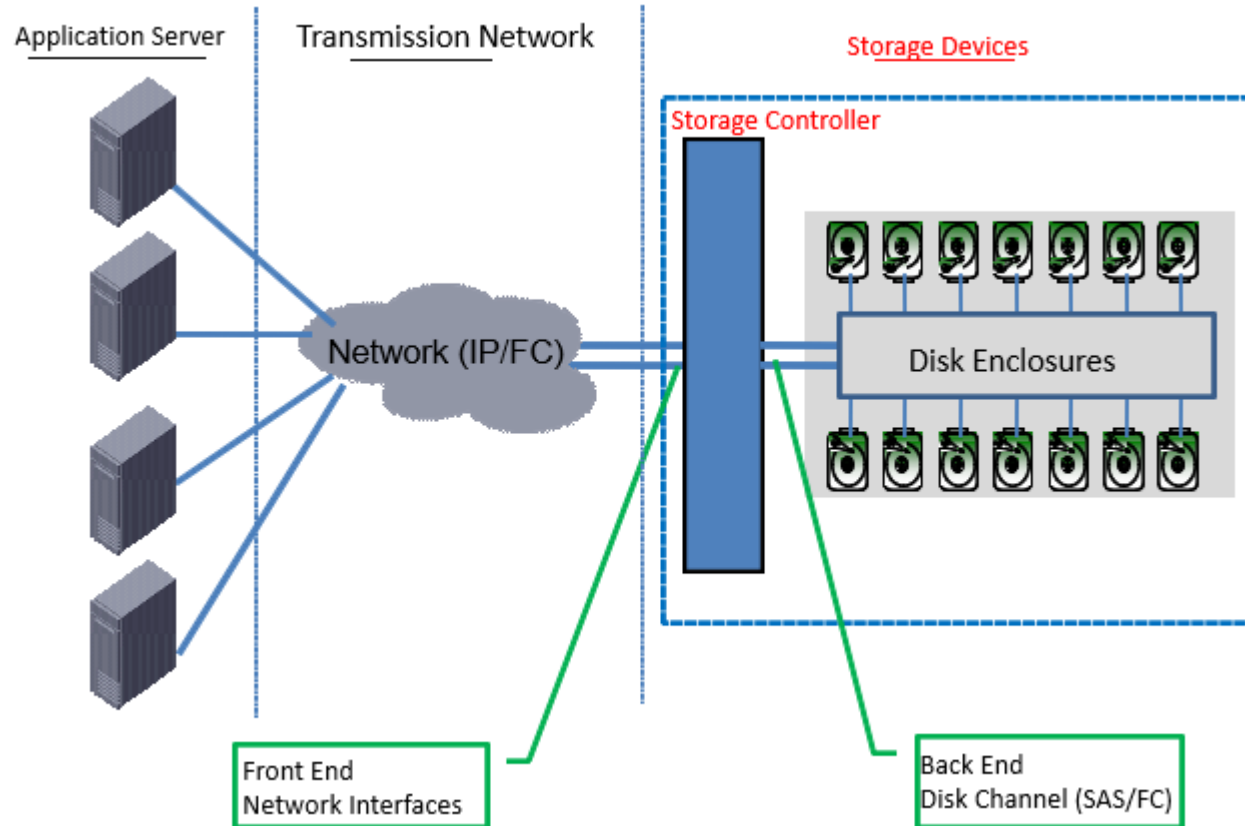
Block Storage based Virtualized Network Disk SAN System



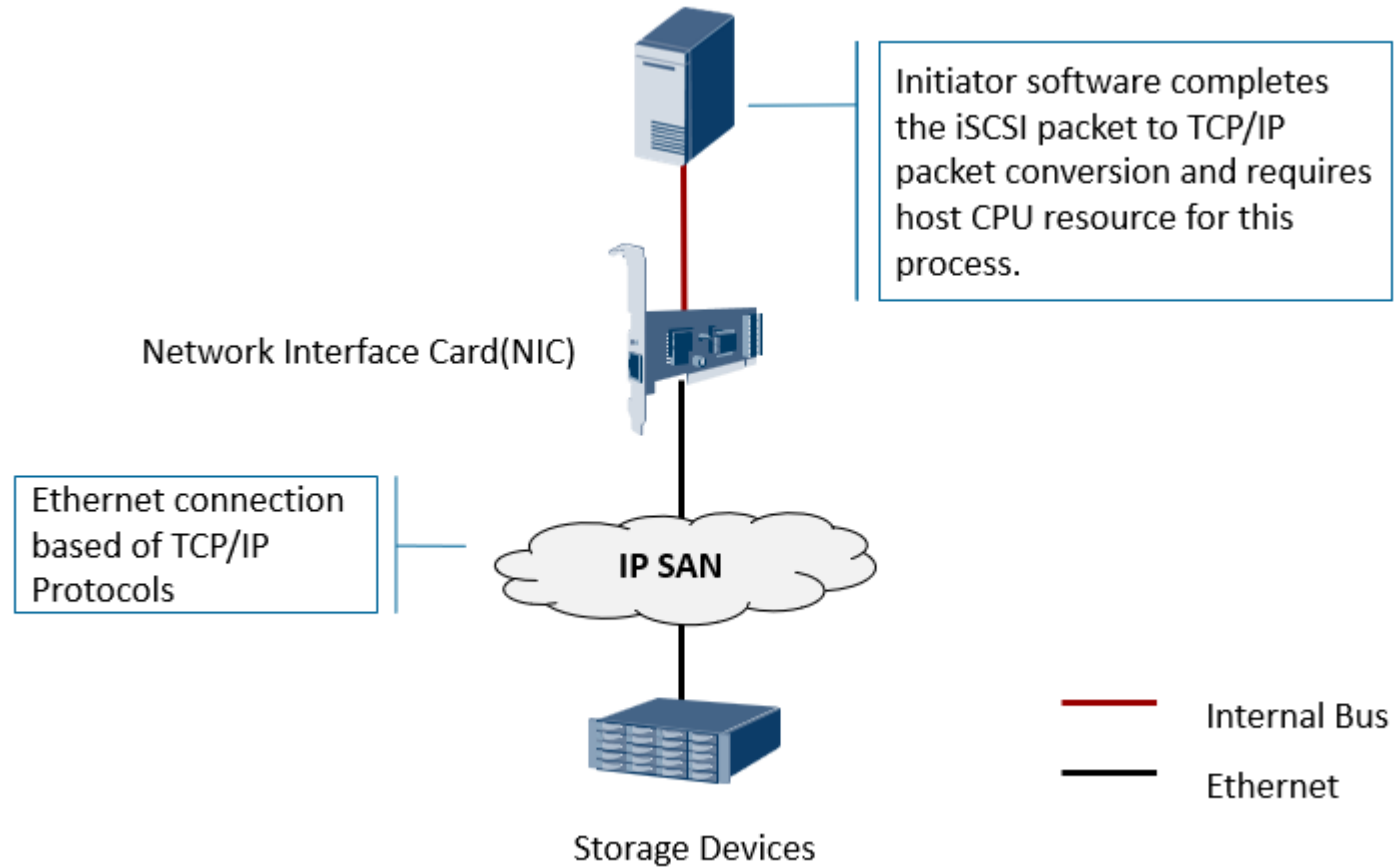
FC SAN and IP SAN



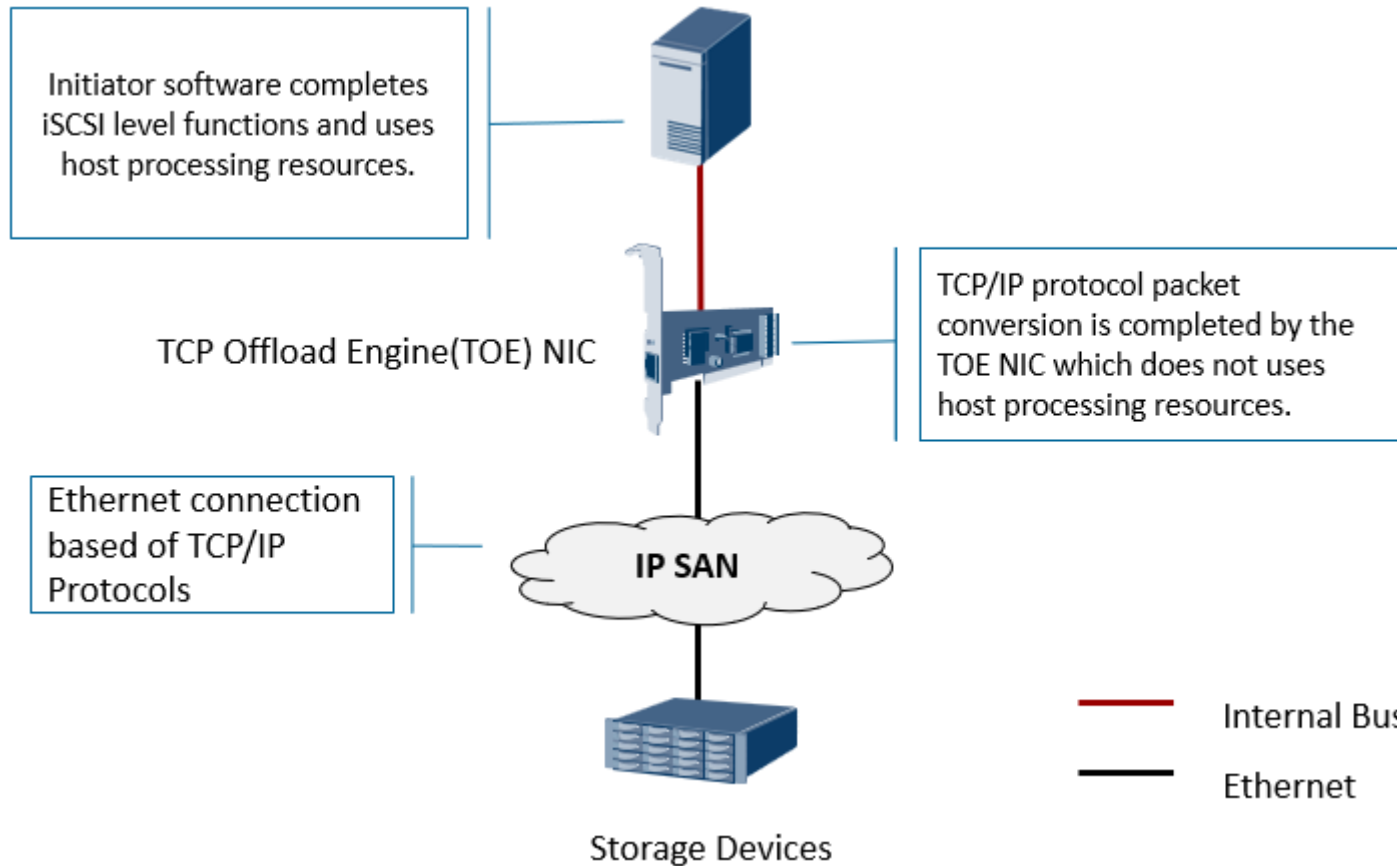
Components of a SAN System



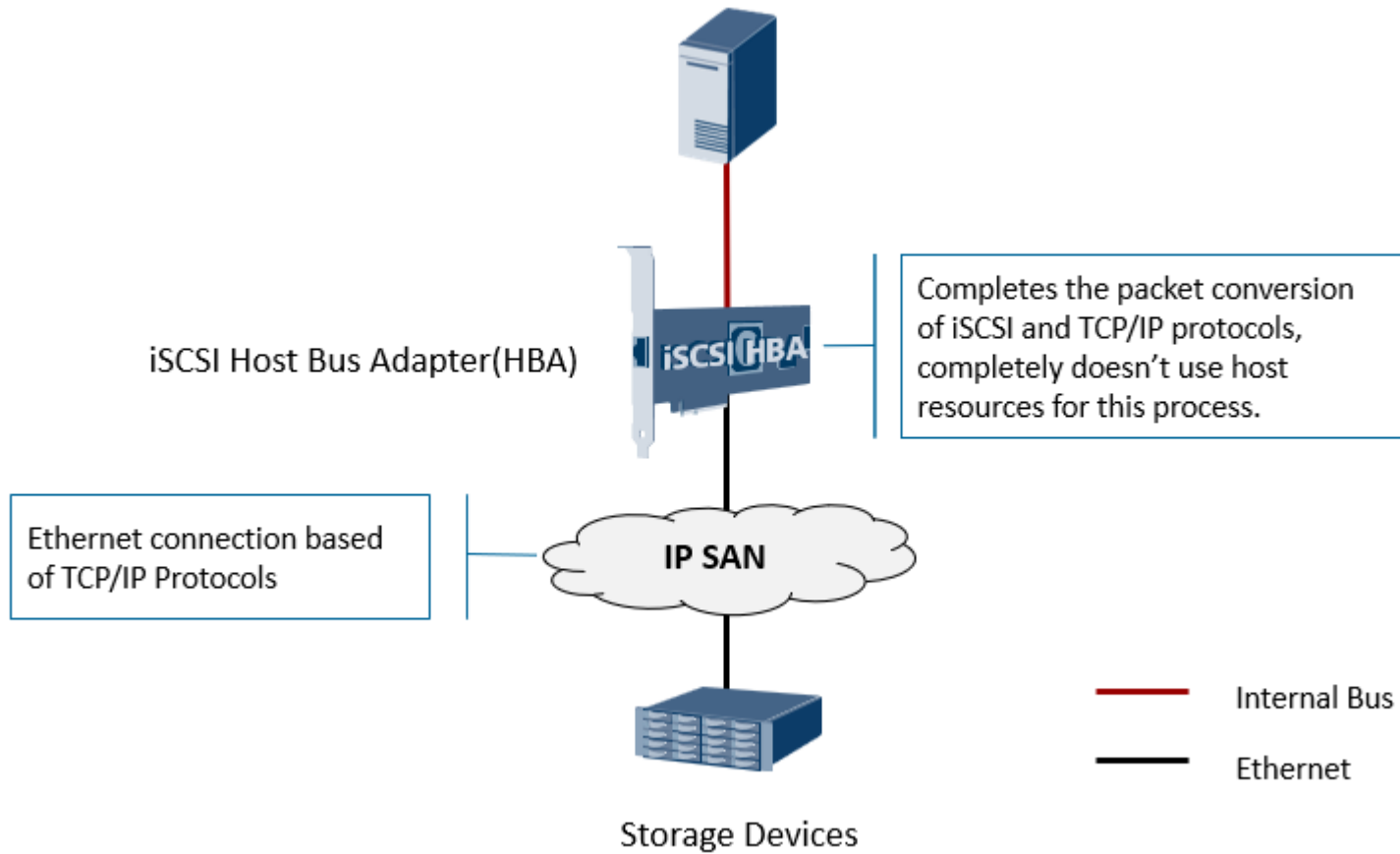
NIC + Initiator Software



TOE NIC + Initiator Software



iSCSI HBA Card



Comparison between FC SAN and IP SAN

Description	FC SAN	IP SAN
Network Speed	4Gb、8Gb、16Gb	1Gb、10Gb、40Gb
Network Architecture	Custom built optical network and HBA cards.	Uses existing IP networks.
Transmission Distance	Limited by optical transmission distance.	Theoretically no distance limitation.
Management & Maintenance	Complex management and technologies.	Easy operation like normal IP devices.
Compatibility	Poor compatibility.	Compatible with all IP network devices.
Performance	Very high transmission and read/write performance.	Mainstream of 1Gb/s, and 10 Gb/s speed is still growing.
Cost	Purchase (FC Switches, HBA cards, FC Disk Arrays),and Maintenance (Train Personnel, System Configuration and Monitoring) costs are high.	Compared to FC SAN, the purchase and maintenance cost are lower with higher ROI.
Disaster Recovery	Disaster recovery hardware and software cost are high.	Can achieve local and remote disaster recovery with lower cost.
Security	Higher security.	Lower security.

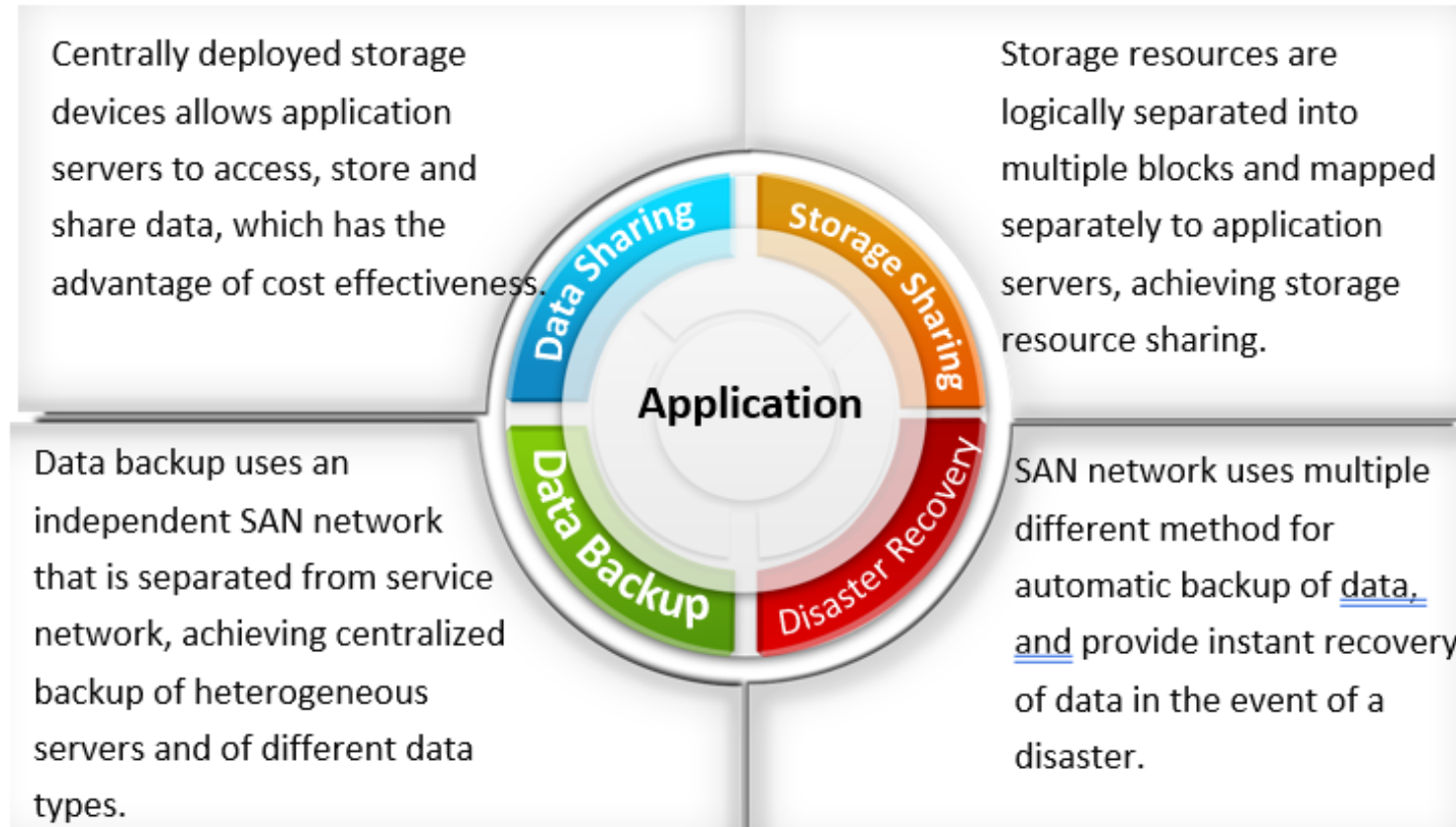
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SAN Storage Application



SAN Storage Application



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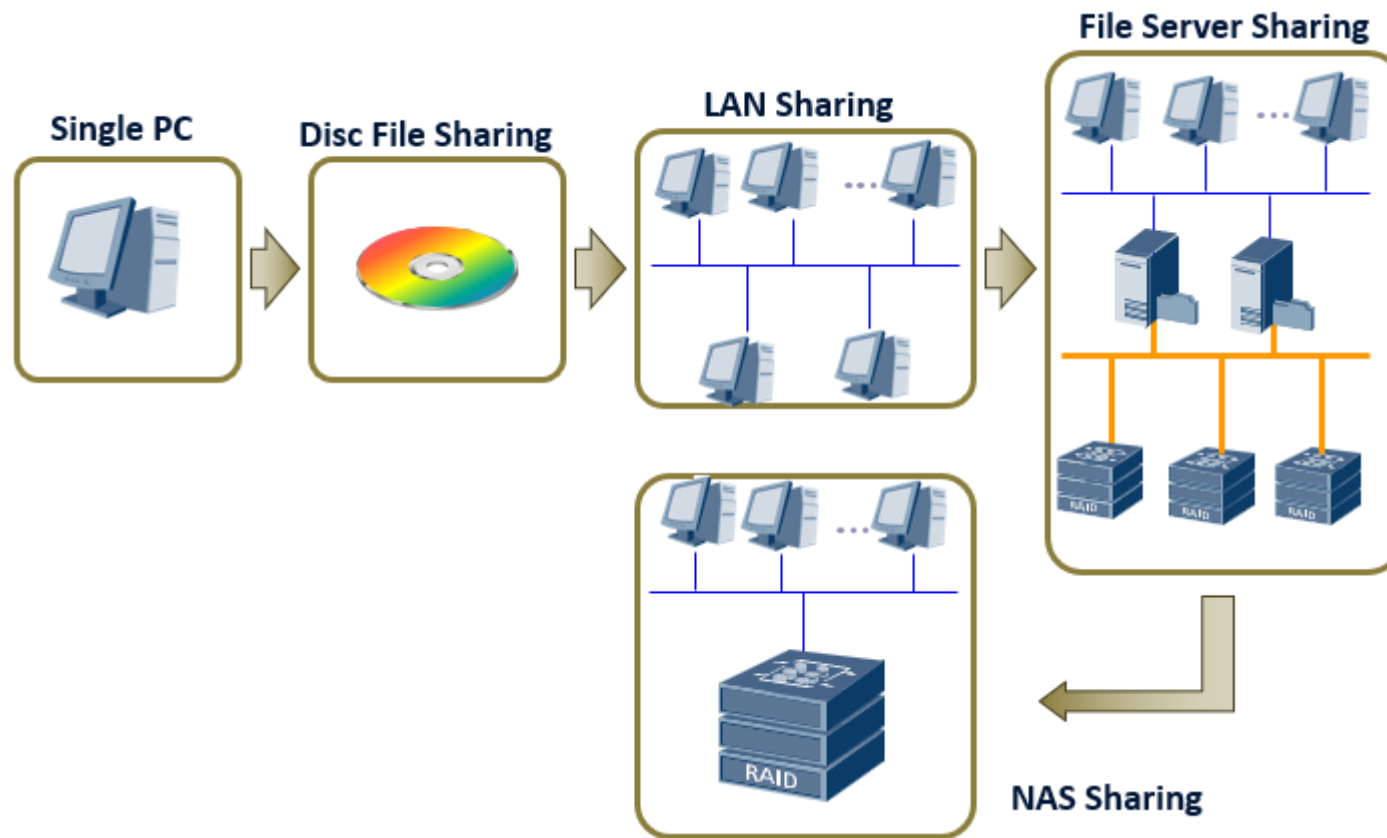
File Sharing



File Sharing Environment

- File system is used for storing and organizing data in a structured form.
- File Sharing:
 - Access data through network storage.
 - File system needs to be mounted before it can be used.
- In the traditional Client/Server model, remote file sharing can be achieved through file sharing protocols such as:
 - FTP (File Transfer Protocol)
 - DFS (Distributed File System)

Evolution of File Sharing Technologies



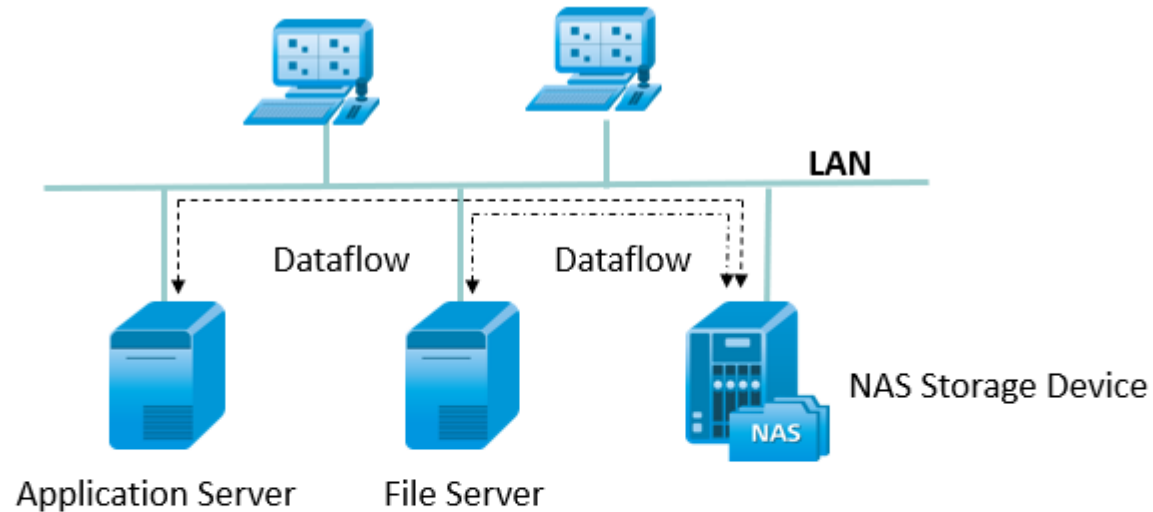
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NAS - Network Attached Storage

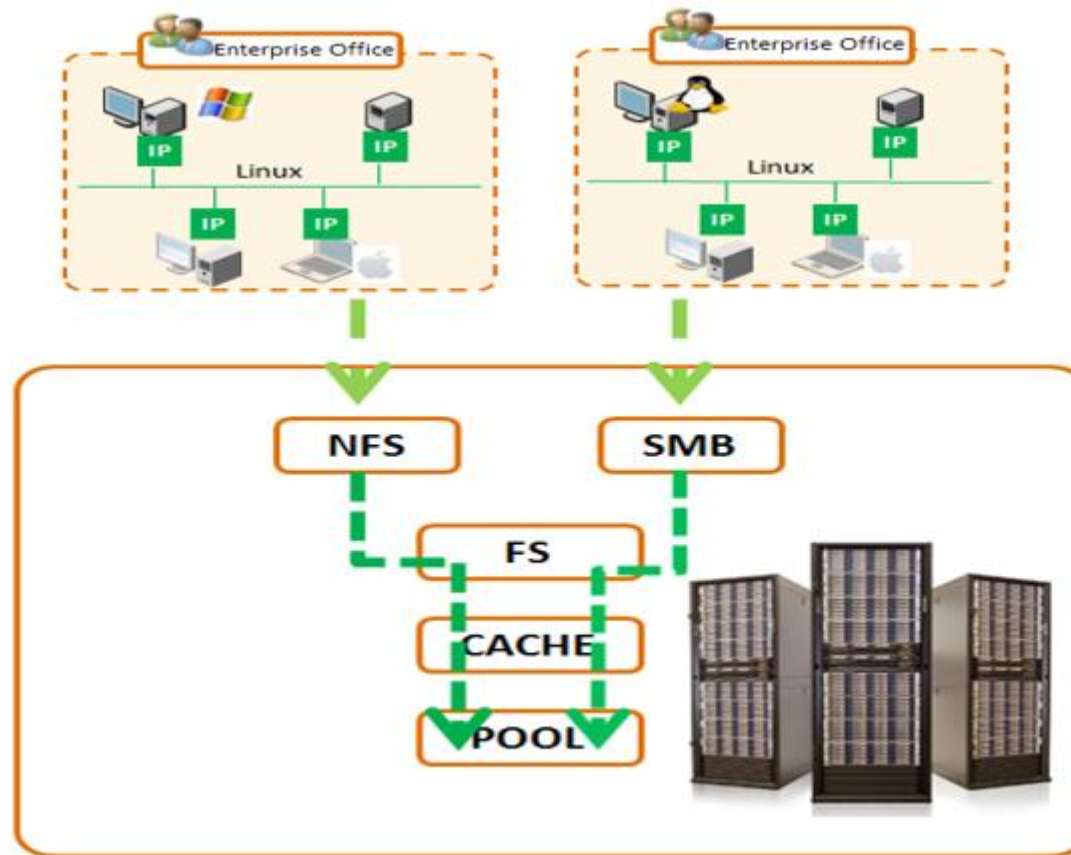


NAS (Network Attached Storage)



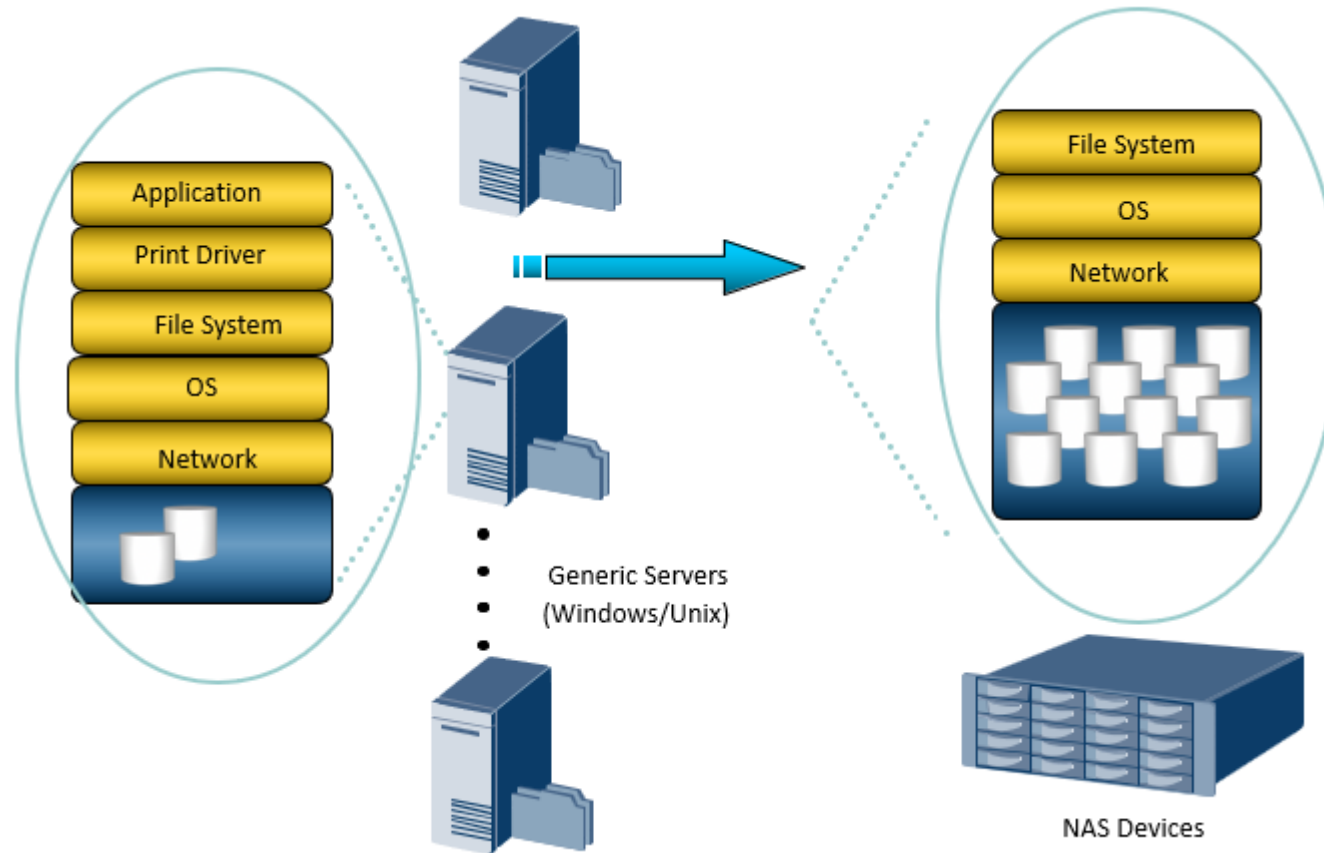
- NAS (Network Attached Storage), refers to storage devices that connects to network that is able to provide data storage and file services.
- It supports network file sharing protocols such as CIFS and NFS.
- NAS actually can be considered as a optimized file server.

Common NAS Protocols



- NFS
- CIFS
- FTP
- HTTP
- NDMP

Generic Server and NAS Devices



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Benefits of NAS



Benefits of NAS

- Supports comprehensive and global access to information.
- Increases efficiency.
- Increases flexibility.
- Centralized storage.
- Simplifies management.

Benefits of NAS

- Scalability and Expansion.
- High availability through local clustering.
- Provides safe integrated environment for storage (user authentication and role management)

Comparison of DAS, NAS and SAN



Comparison of DAS, NAS and SAN (1)

Storage System Architecture	DAS	NAS	SAN
Data Transmission Protocol	SCSI/FC/ATA	TCP/IP	FC
Data Transfer Object	Block	File	Block
Uses Standard File Sharing Protocols	No	Yes (NFS/CIFS...)	No
Centralized Management	Not Exactly	Yes	Requires Management Tools
Increases Server Efficiency	No	Yes	Yes
Disaster Tolerance	Low	High	High, Dedicated Solutions

Comparison of DAS, NAS and SAN (2)

Storage System Architecture	DAS	NAS	SAN
Suitable Clients	SME Servers, JBOD	SME, Monitoring, Broadcasting	Large Enterprises, Data Centers
Application Environment	Local Area Network(LAN). Low file sharing level, independent operating platform, and less server management	Local Area Network(LAN). High file sharing level, high demand in heterogeneous storage format.	Fibre Channel Storage Network. Complex network environment, high file sharing level, heterogeneous OS platform, high number of servers.
Capacity Expansion Capabilities	Low	Medium	High

Summary

- Data Center Storage Network.
- Network Architecture of DAS, SAN and NFS.
- Advantages and Disadvantages of DAS, SAN and NFS Network Technologies.



Thank You