



Algebra
visoko učilište

NAS

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File-based Storage System (NAS)

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

- Describe NAS components and architectures
- Discuss NAS file sharing methods
- Discuss file-level virtualization and tiering



Lesson 1: NAS Components and Architecture

This lesson covers the following topics:

- Components of NAS
- NAS architectures
- NAS file access methods
- NAS I/O operations



File Sharing Environment

- File sharing enables users to share files with other users
- Creator or owner of a file determines the type of access to be given to other users
- File sharing environment ensures data integrity when multiple users access a shared file at the same time
- Examples of file sharing methods:
 - File Transfer Protocol (FTP)
 - Peer-to-Peer (P2P)
 - Network File System (NFS) and Common Internet File System (CIFS)
 - Distributed File System (DFS)

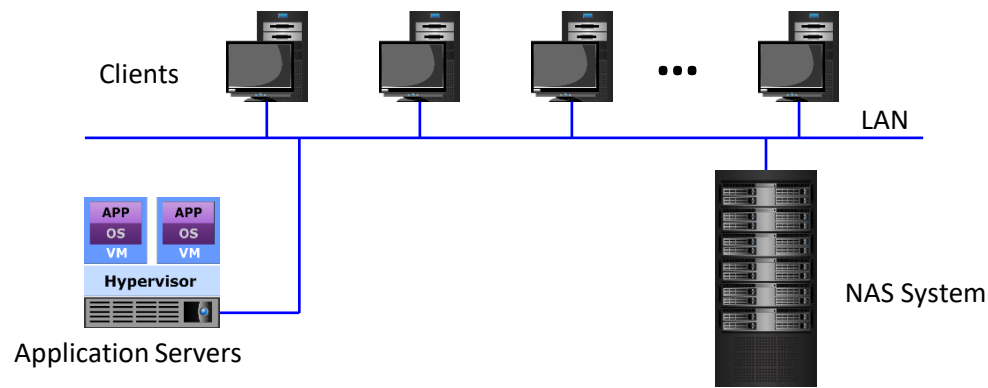


What is NAS?

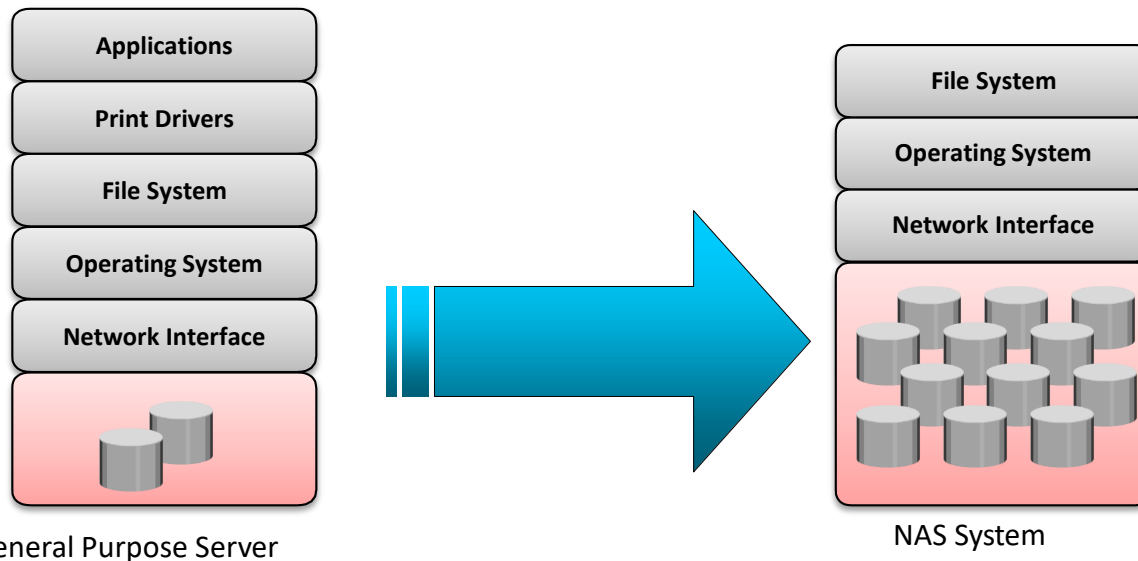
NAS

An IP-based, dedicated, high-performance file sharing and storage device.

- Enables NAS clients to share files over IP network
- Uses specialized operating system that is optimized for file I/O
- Enables both UNIX and Windows users to share data



General Purpose Servers Vs. NAS Devices



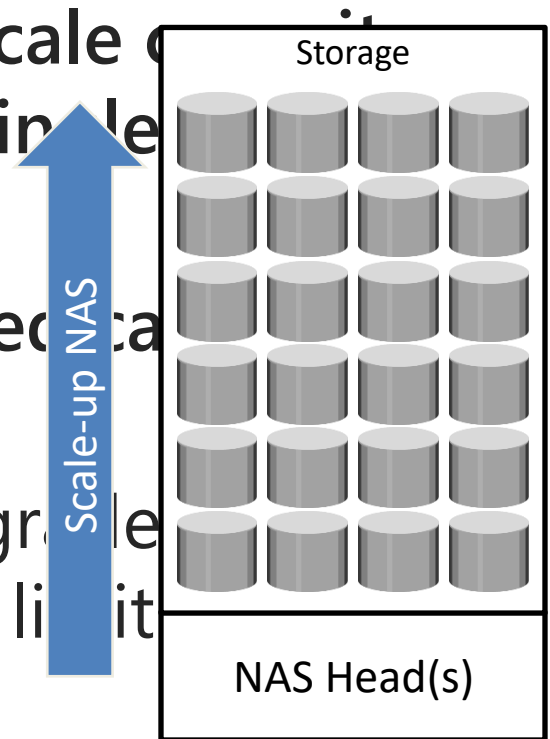
Components of NAS System

- **Controller/NAS head consists of:**
 - CPU, memory, network adaptor, and so on
 - Specialized operating systems installed
- **Storage**
 - Supports different types of storage devices
- **Scalability of the components depends on NAS architecture**
 - Scale-up NAS
 - Scale-out NAS



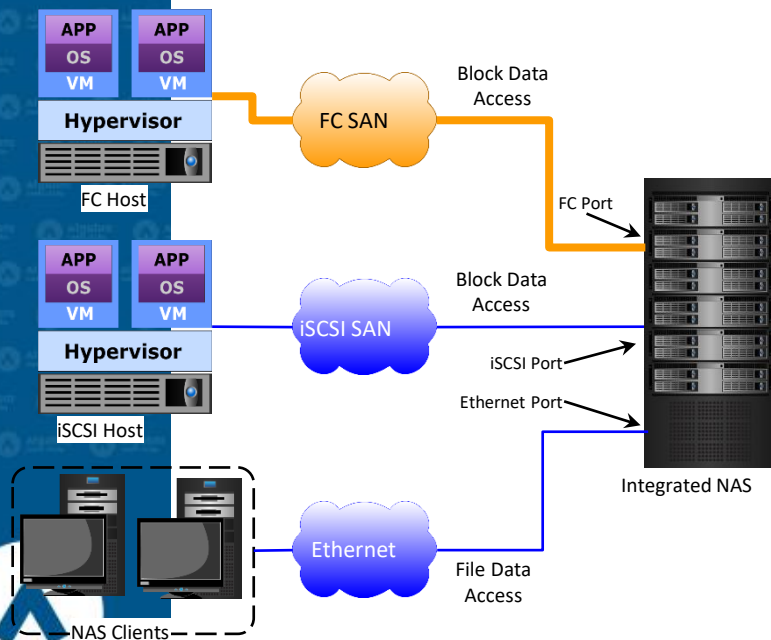
Scale-up NAS

- Provides capability to scale capacity and performance of a single system
- NAS systems have a fixed capacity ceiling
 - Performance may degrade as reaching the capacity limit

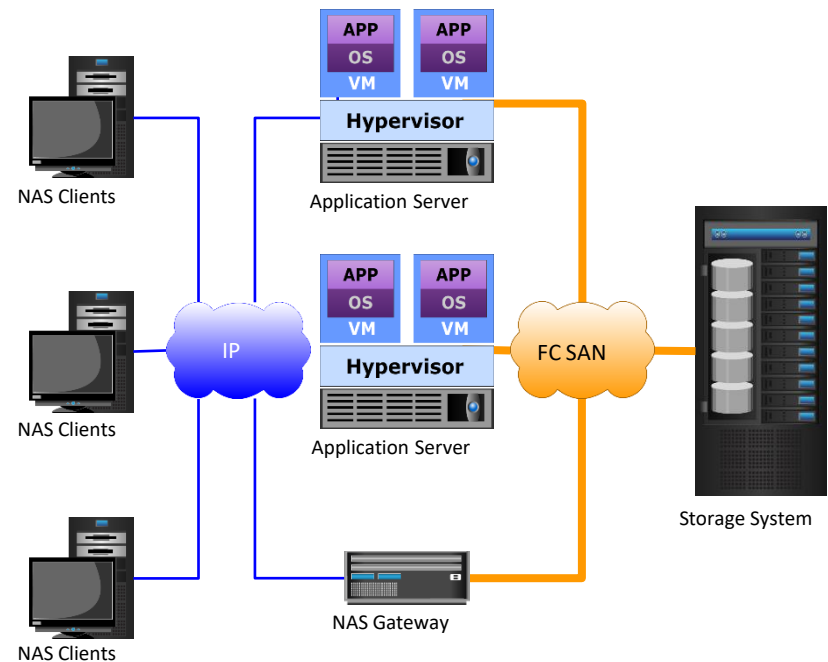


Scale-up NAS (Cont'd)

- Integrated NAS and Gateway NAS



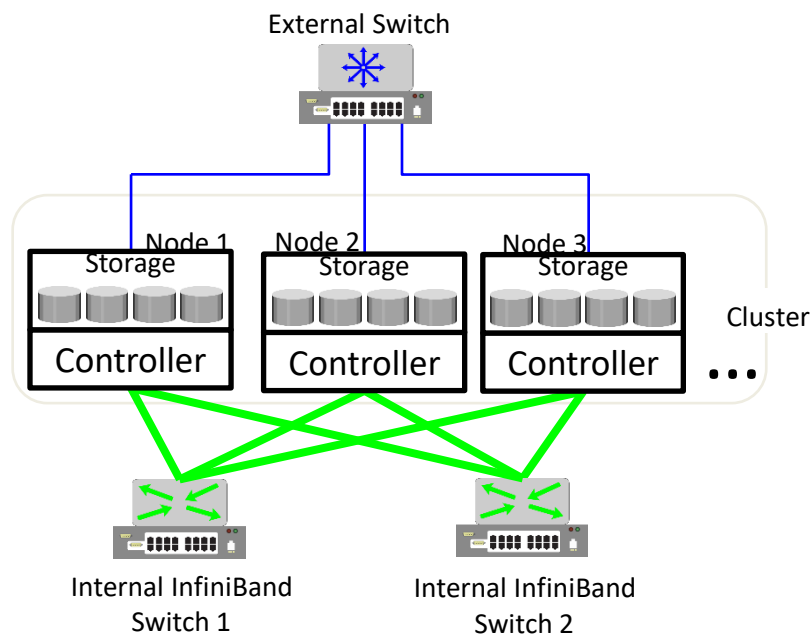
Integrated NAS



Gateway NAS

Scale-out NAS

- Pools multiple nodes in a cluster to work as a single NAS device
- Scales performance and/or capacity non-disruptively
- Creates a single file system that runs on all nodes in the cluster
 - Clients, connected to any node, can access the entire file system
 - File system grows dynamically as nodes are added
- Stripes data across nodes with mirror or parity protection



NAS File Access Methods

- Common Internet File System (CIFS)
- Network File System (NFS)
- Hadoop Distributed File System (HDFS)



Common Internet File System

- **Client-server application protocol**
 - An open variation of the Server Message Block (SMB) protocol
- **Enables clients to access files that are on a server over TCP/IP**
- **Stateful Protocol**
 - Maintains connection information regarding every connected client
 - Can automatically restore connections and reopen files that were open prior to interruption

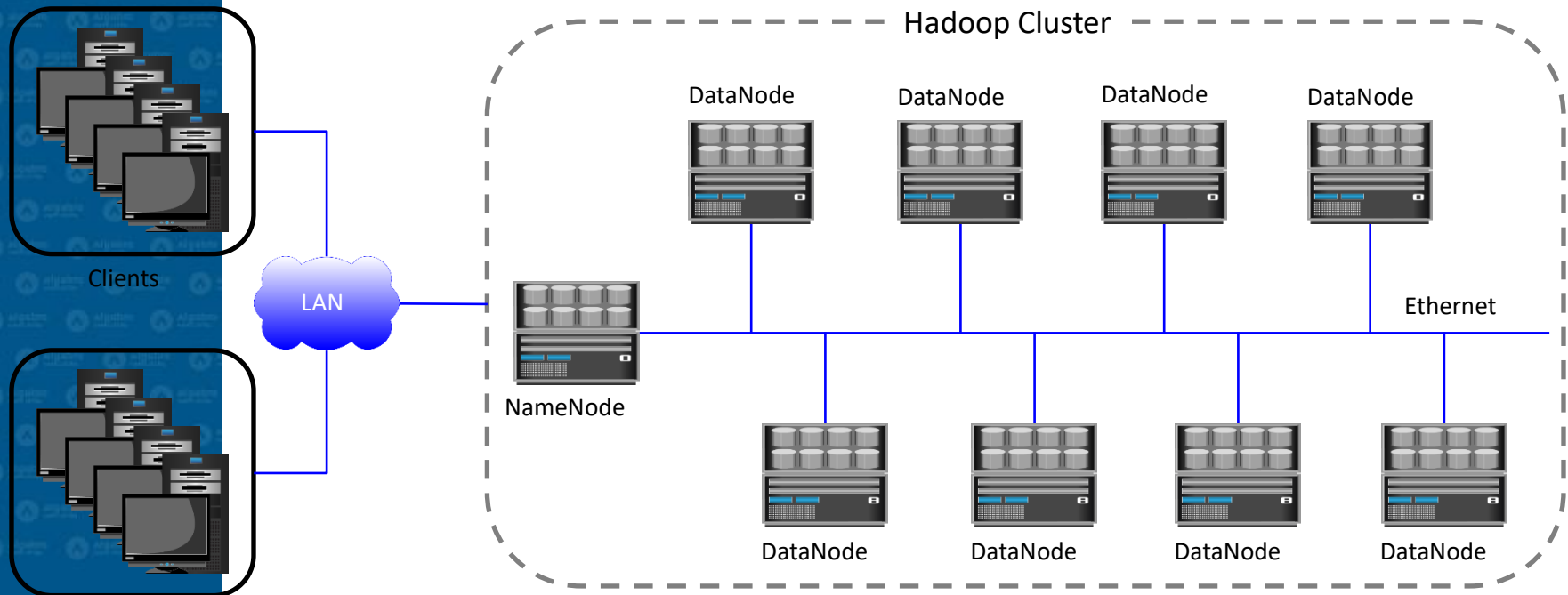


Network File System

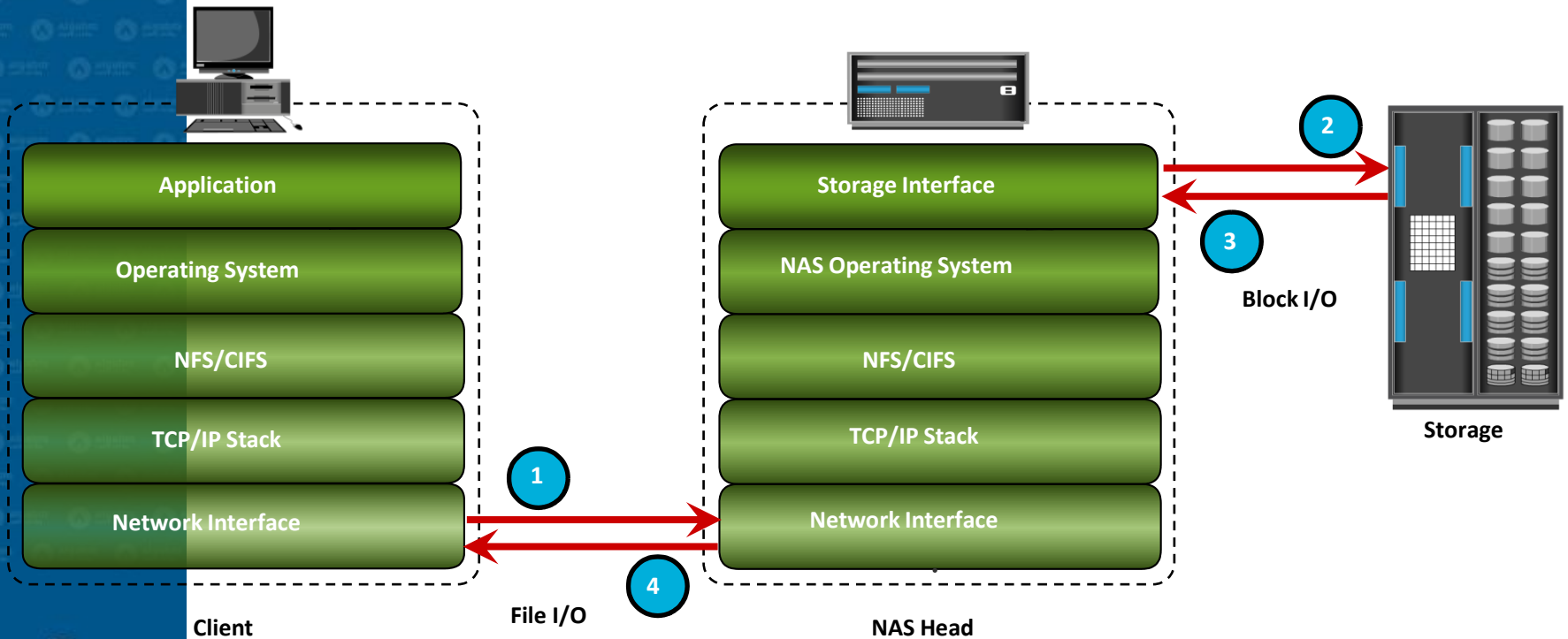
- Client-server application protocol
- Enables clients to access files that are on a server
- Uses Remote Procedure Call (RPC) mechanism to provide access to remote file system
- Currently, three versions of NFS are in use:
 - NFS v2 is stateless and uses UDP as transport layer protocol
 - NFS v3 is stateless and uses UDP or optionally TCP as transport layer protocol
 - NFS v4 is stateful and uses TCP as transport layer protocol



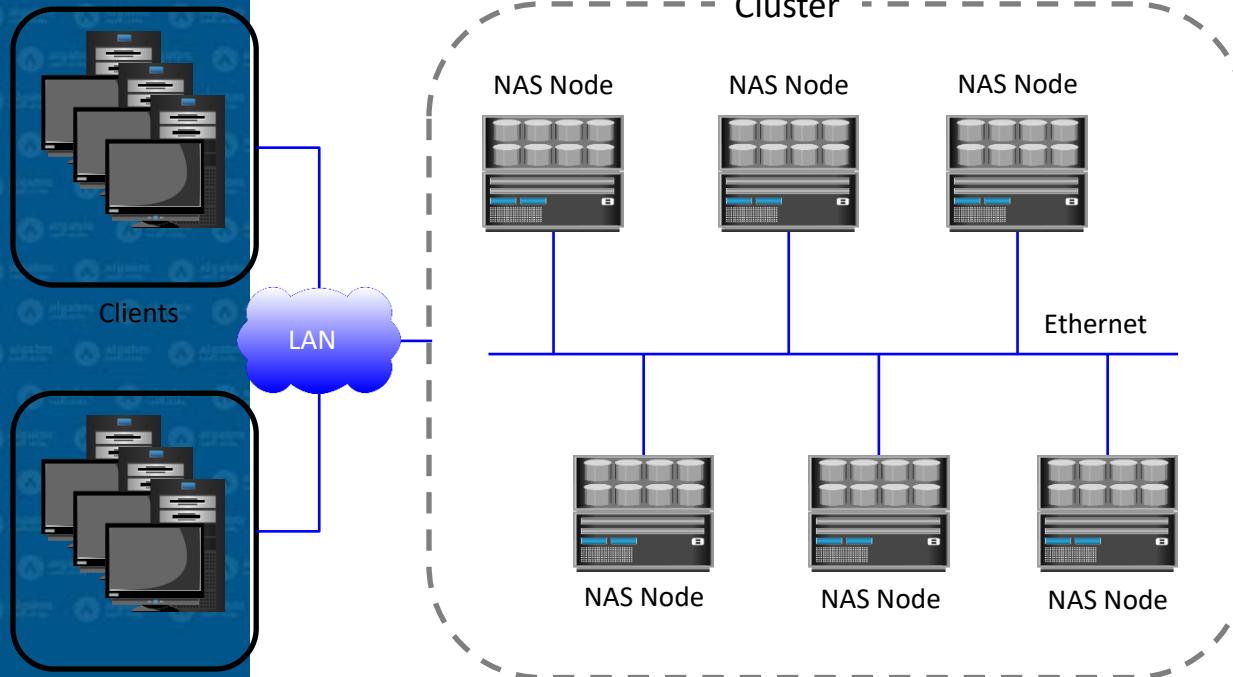
Hadoop Distributed File System



Scale-up NAS I/O Operation



Scale-out NAS I/O Operation



Write Operation

1. Client sends a file to the NAS node
2. Node to which the client is connected receives the file
3. File is striped across the nodes

Read Operation

1. Client requests a file
2. Node to which the client is connected receives the request
3. The node retrieves and rebuilds the file and gives it to the client



Lesson 2: File-level Virtualization and Tiering

This lesson covers the following topics:

- File-level virtualization
- Storage tiering
- NAS use case

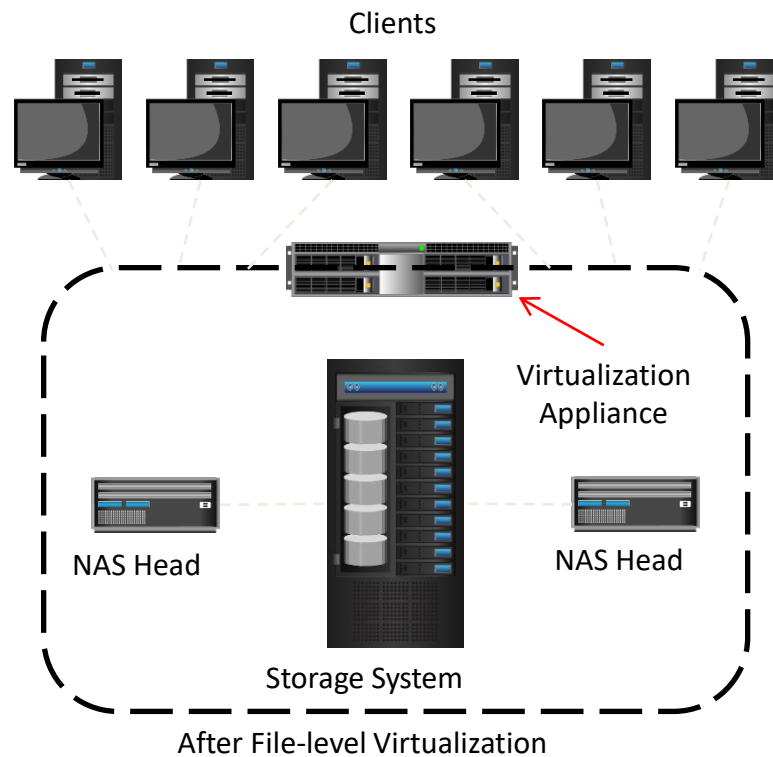
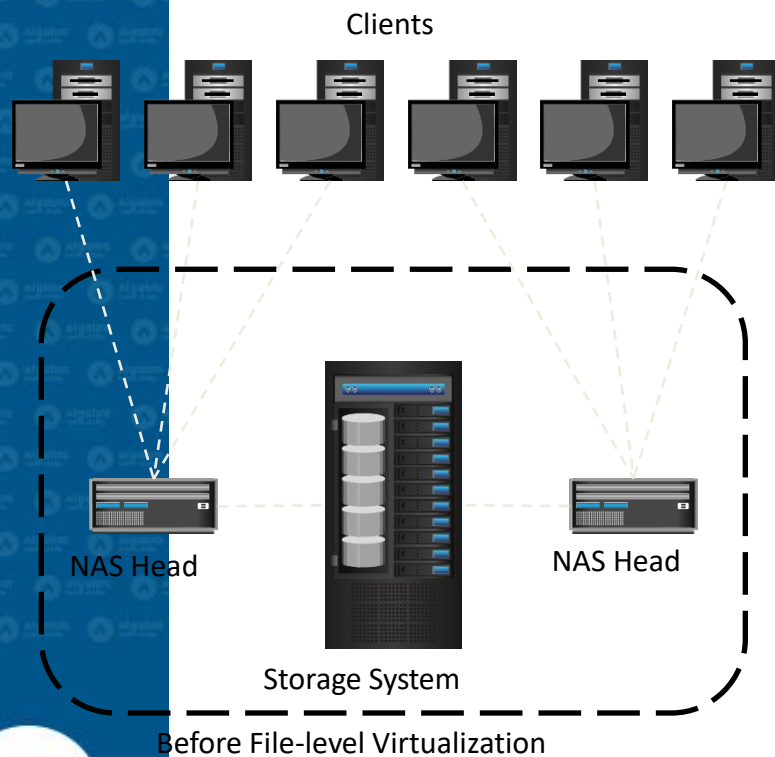


What is File-level Virtualization?

- Eliminates dependency between data accessed at the file-level and the location where the files are physically stored
- Enables users to use a logical path, rather than a physical path, to access files
- Uses global namespace that maps logical path of file resources to their physical path
- Provides non-disruptive file mobility across file servers or NAS devices



Before and After File-level Virtualization



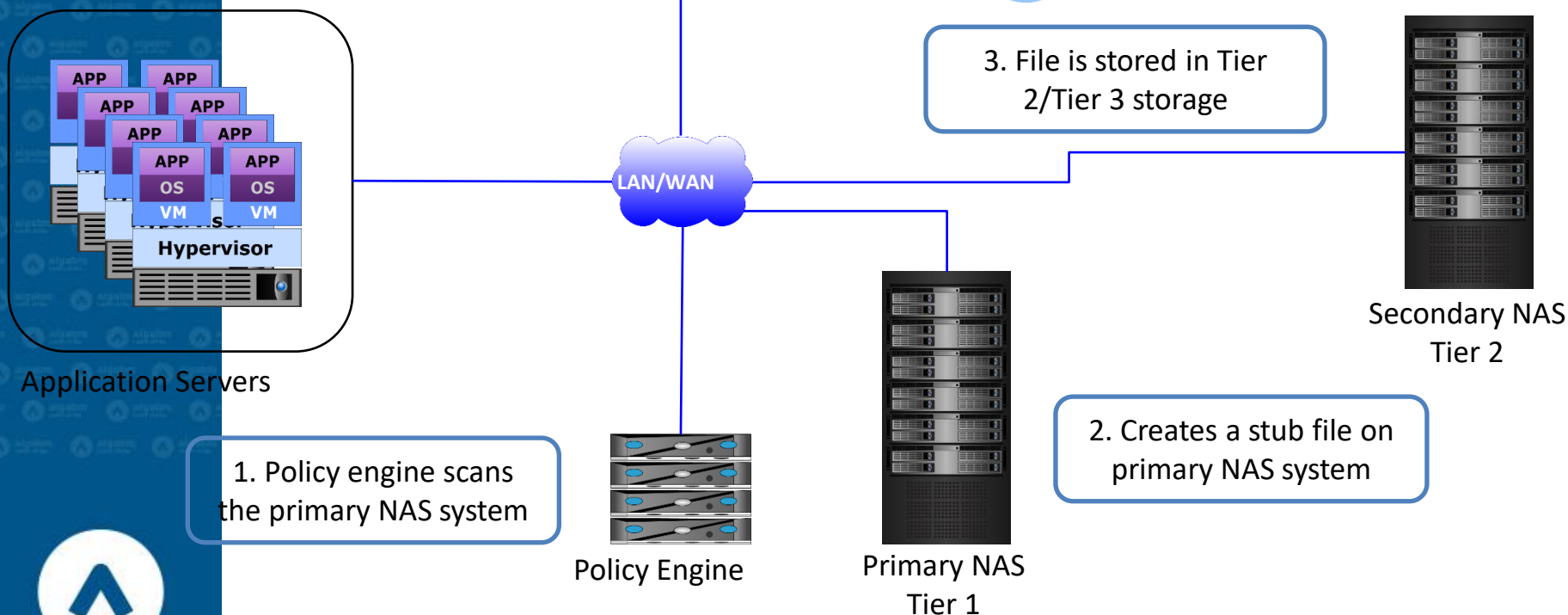
File-level Storage Tiering

- Moves files from higher tier to lower tier
- Storage tiers are defined based on cost, performance, and availability parameters
- Uses policy engine to determine the files that are required to move to the lower tier
- Predominant use of file tiering is archival



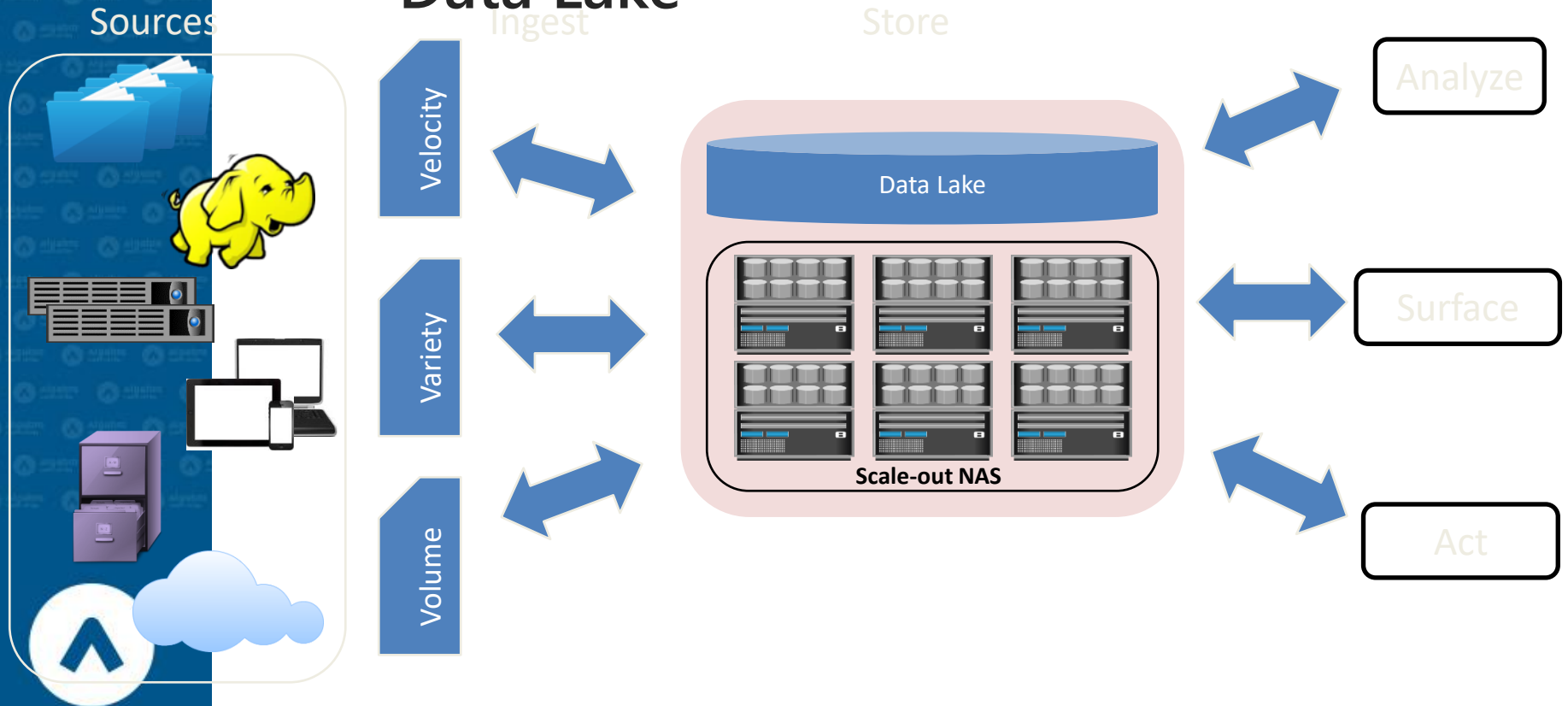
File-level Storage Tiering (Cont'd)

- Inter-array Tiering and Cloud Storage Tiering



Use-case for Scale-out NAS

- Data Lake





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