NETAPP STORAGE INTRODUCTION

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Types of Data

- Data can be classified as:
  - Structured
  - Unstructured
- Majority of data being created is unstructured

email Attachments   PDFs

Unstructured (90%)

X-rays

Manuals

Instant Messages

Images

Documents

Forms

Web Pages

Contracts

Rich Media

Invoices

Audio, Video

Structured (10%)

Database
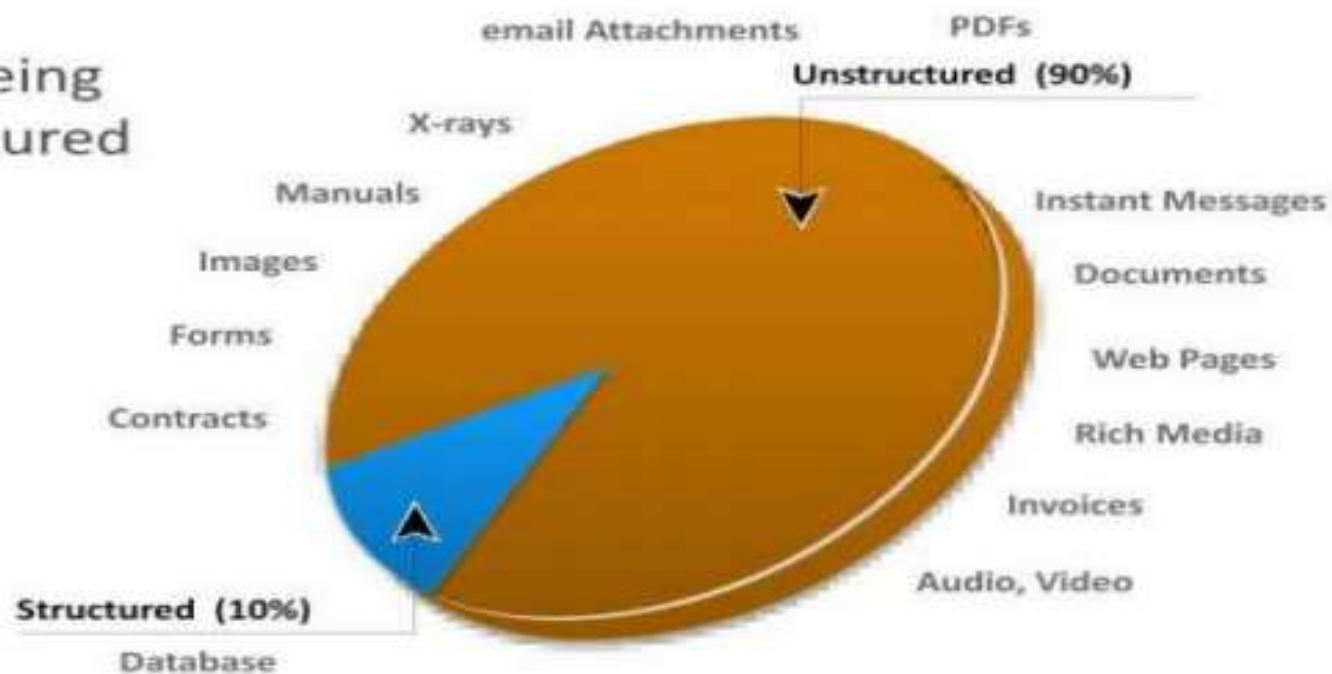
ONTAP 9.5 Supported Hardware Systems

January 2019

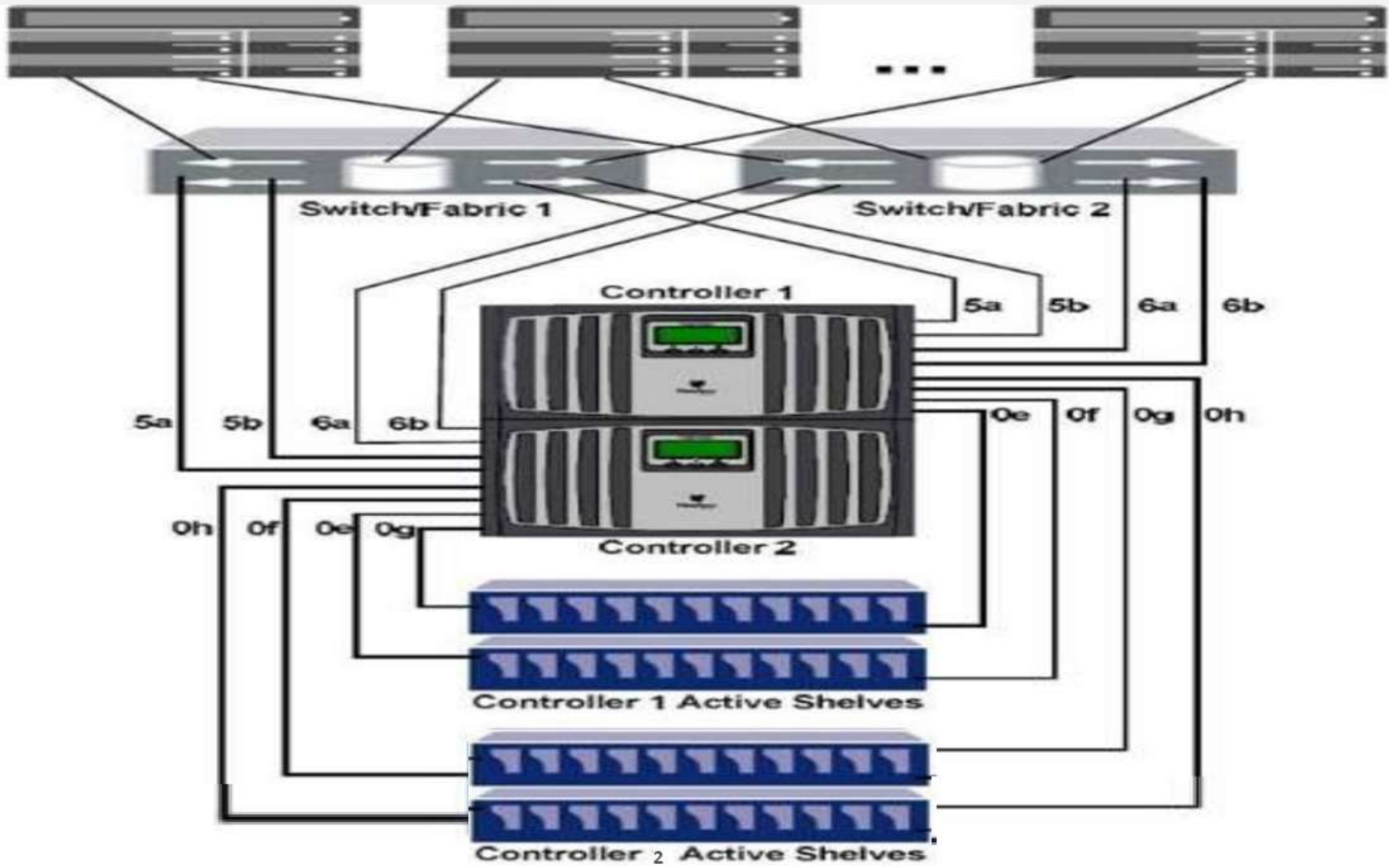| AFF		FAS	
	Enterprise Level		
	• AFF A800 • AFF A700 • AFF A700s	• FAS9000	
	Mid Level		
	• AFF A300	• FAS8200	
	Entry Level		
	• AFF A220 • AFF A200	• FAS2700 • FAS2600	

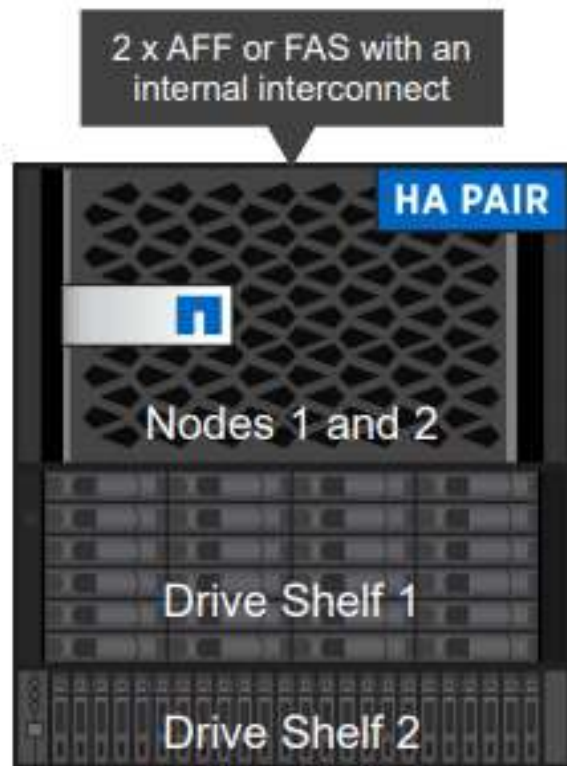NOTE: See the Hardware Universe for technical details.

NetApp has a storage system to support the performance and budget needs of all customers. FAS storage systems generally have a corresponding AFF model that is built on the same hardware. The same is not true of AFF systems, which fill an expanding array of needs and price points as flash-based storage supplants disk-based storage.

Supported Cluster Configurations

Single-Node	Two-Node Switchless	Multinode Switched	MetroCluster

Single-Node

Two-Node Switchless

Node 1 — Node 2

Multinode Switched

Cluster Switches

Nodes 1 - 8

MetroCluster

300km

Node 1
Node 3

Node 2
Node 4

Switch/Fabric 1

Switch/Fabric 2

Controller 1

5a   5b   6a   6b

5a   5b   6a   6b

0e   0f   0g   0h

0h   0f   0e   0g

Controller 2

Controller 1 Active Shelves

Controller 2 Active Shelves

High-Availability Pair

2 x AFF or FAS with an internal interconnect

HA PAIR
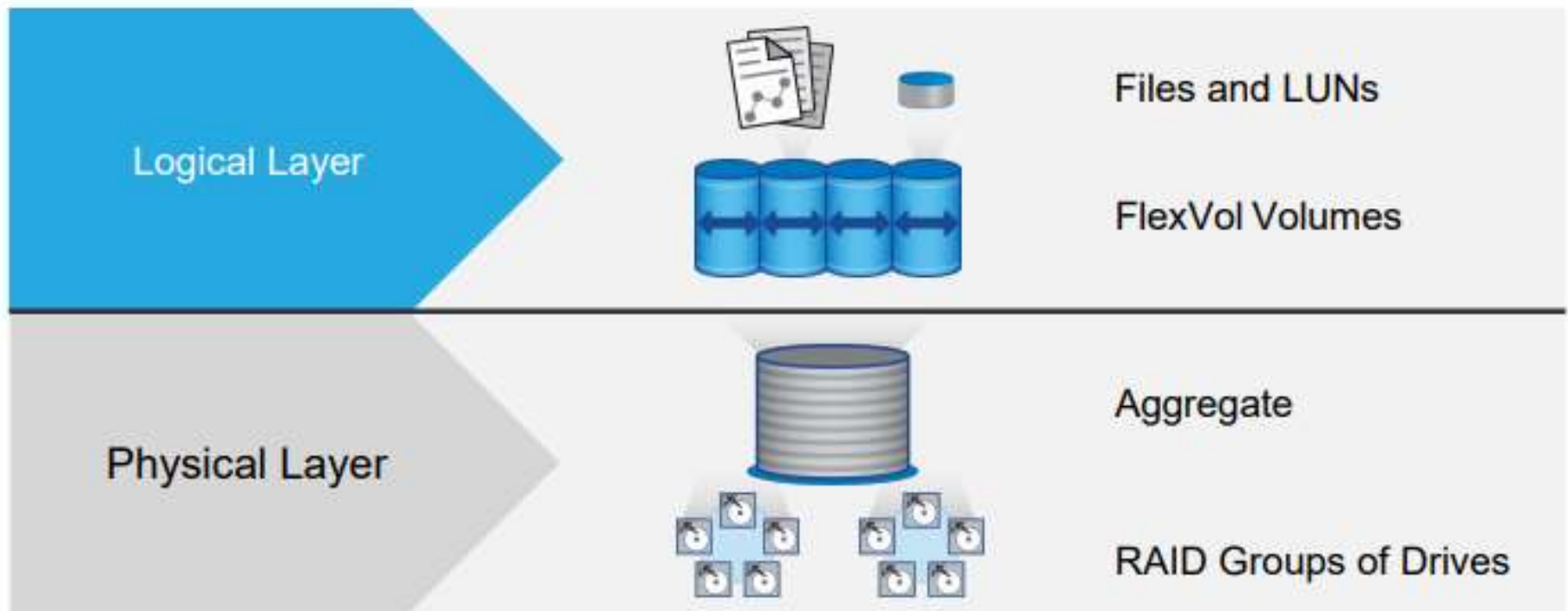
Nodes 1 and 2

Drive Shelf 1

Drive Shelf 2

- Characteristics of a high-availability (HA) pair:
  - Two connected nodes in a partnership
  - Nodes that connect to the same drive shelves
  - Nodes that, by default, own the drives on their primary cabling path
  - A partnership in which, if a node fails, the surviving node takes control of the failed partner's drives

- Components of HA pair connections:
  - HA interconnect
  - Multipath HA shelf connectivity

Network

Cluster Interconnect

HA PAIR   HA PAIR

Management Network
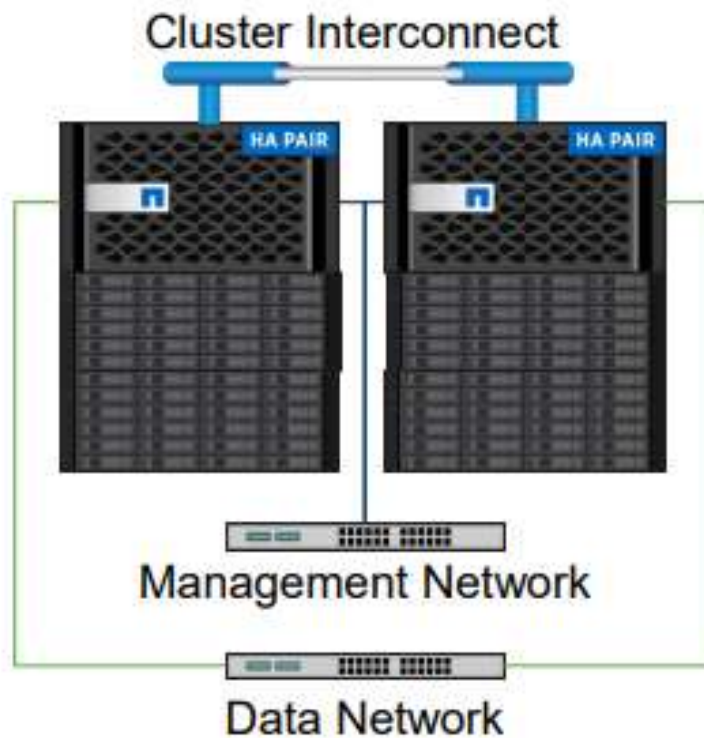
Data Network

- Cluster interconnect:
  - Connection of nodes
  - Private network

- Management network:
  - Cluster administration
  - Ethernet network that can be shared with data
    Recommended practice: dedicated management network

- Data network:
  - One or more networks for data access from clients or hosts
  - Ethernet, FC, or converged network

ONTAP Storage Architecture

Logical Layer

Files and LUNs

FlexVol Volumes

Physical Layer

Aggregate

RAID Groups of Drives

1

Why RAID?

> **RAID**
>
> It is a technique that combines multiple disk drives into a logical unit (RAID set) and provides data protection due to disk failure.

* Due to mechanical components in a disk drive it offers limited performance

* An individual drive has a certain life expectancy and is measured in MTBF:

    ▸ For example: If the MTBF of a drive is 750,000 hours, and there are 1000 drives in the array, then the MTBF of the array is 750 hours (750,000/1000)

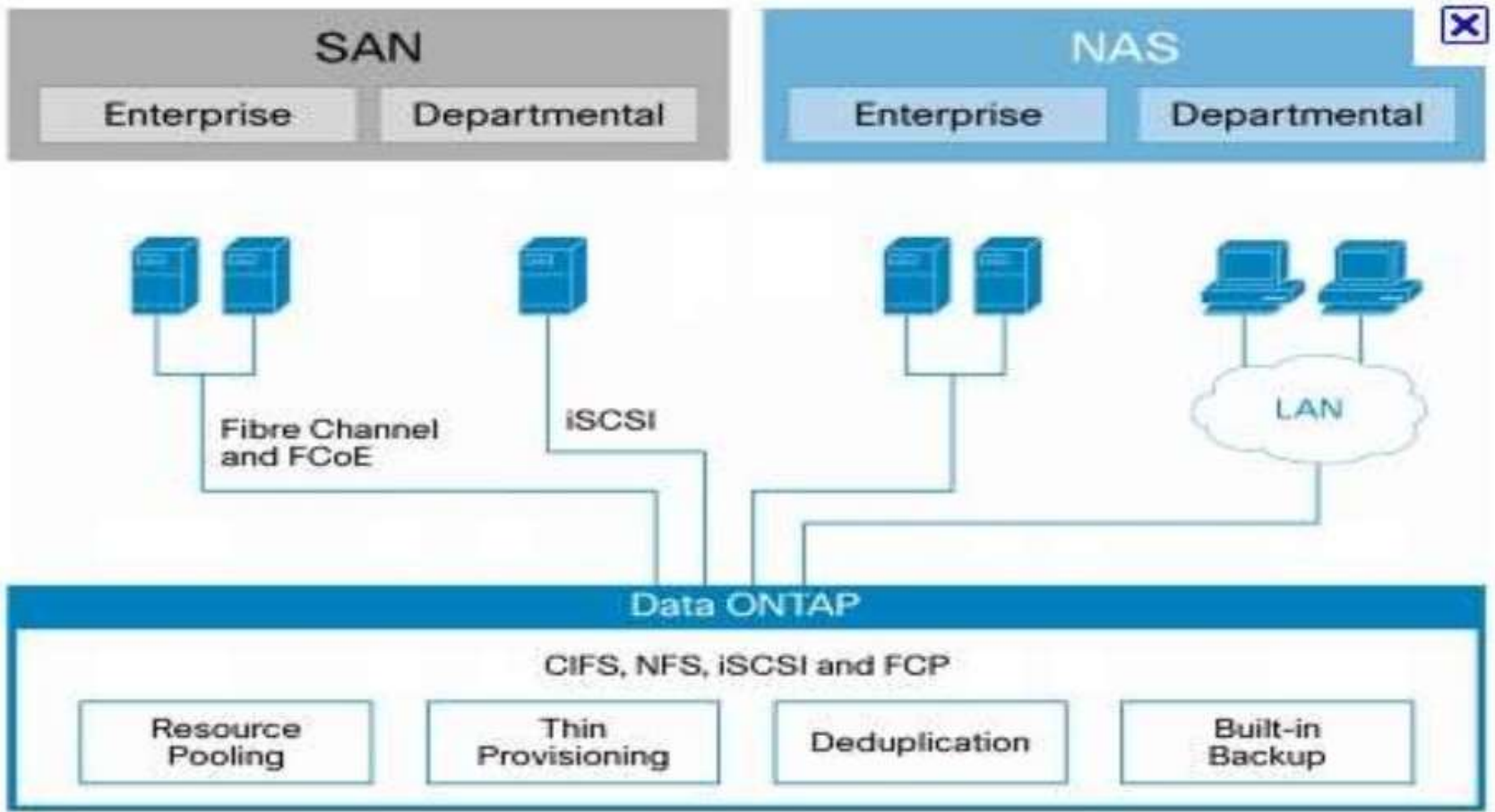* RAID was introduced to mitigate these problems

RAID Levels

- Commonly used RAID levels are:
  - RAID 0 – Striped set with no fault tolerance
  - RAID 1 – Disk mirroring
  - RAID 1 + 0 – Nested RAID
  - RAID 3 – Striped set with parallel access and dedicated parity disk
  - RAID 5 – Striped set with independent disk access and a distributed parity
  - RAID 6 – Striped set with independent disk access and dual distributed parity
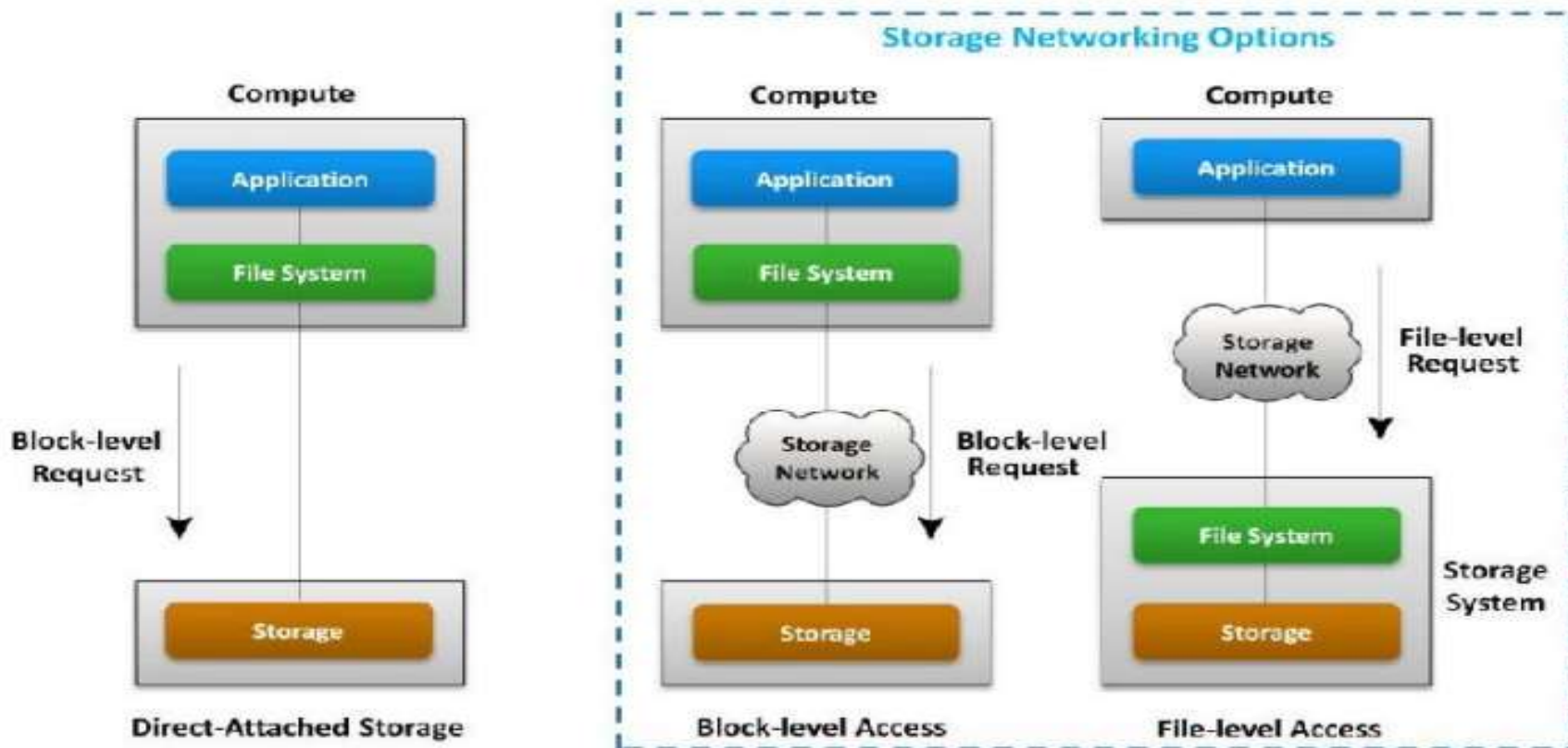
Data LIFs
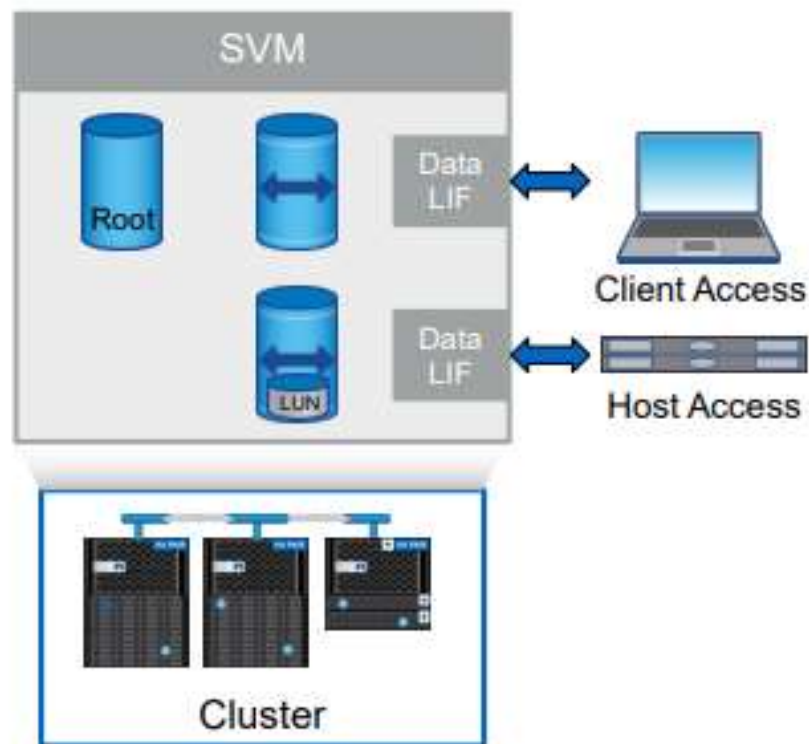
- **NAS data LIFs:**
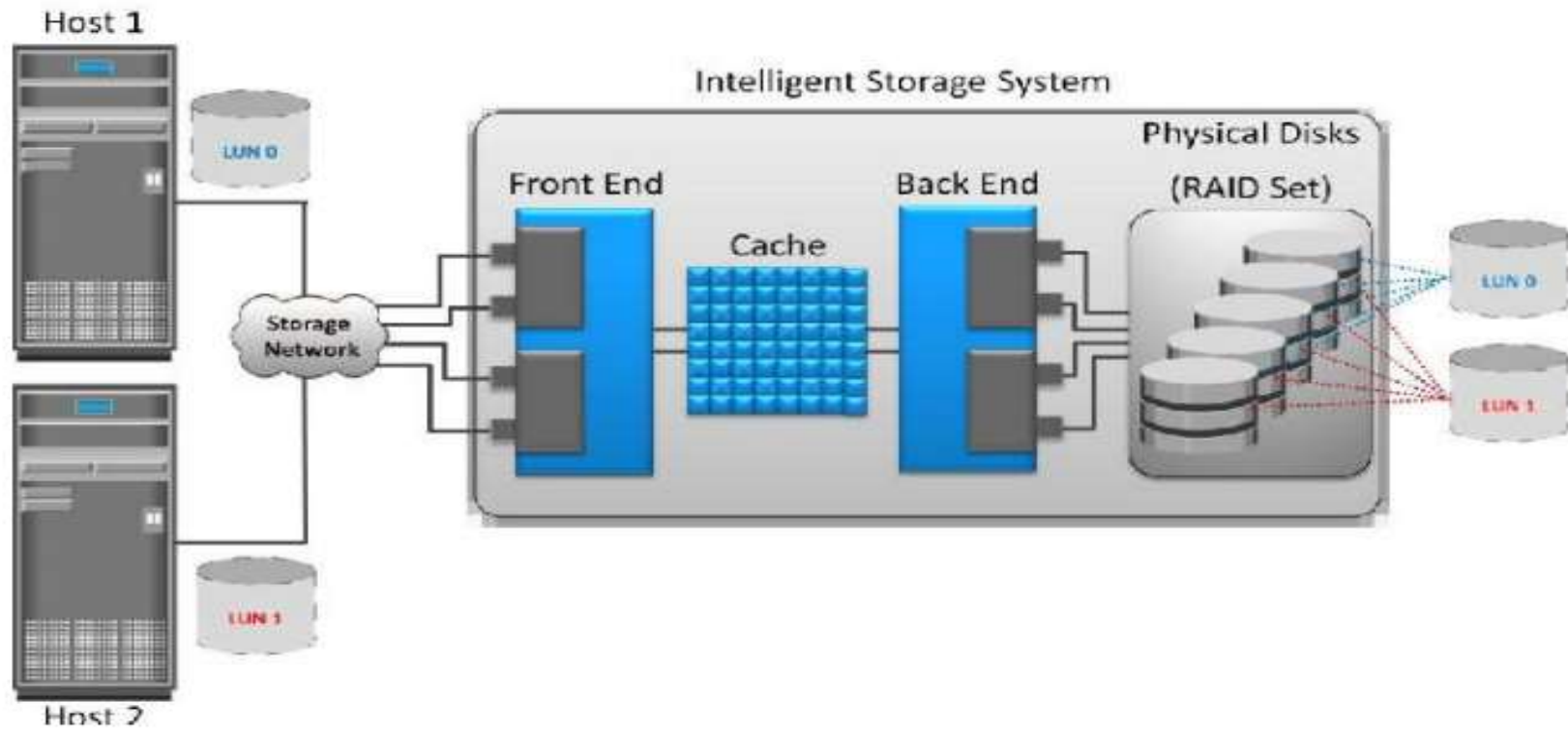 - Multiprotocol (NFS, CIFS, or both)
  - Manually or automatically assigned IP addresses
  - Failover or migration to any node in the cluster

- **SAN data LIFs:**
  - Single protocol (FC or iSCSI):
    - An FC LIF is assigned a worldwide port name (WWPN) when it is created.
    - iSCSI LIF IP addresses can be assigned manually or automatically.
  - No failover
  - Restrictions on migration

Host Access to Storage

Storage Networking Options

Direct-Attached Storage
- Compute
  - Application
  - File System
- Block-level Request
- Storage

Block-level Access
- Compute
  - Application
  - File System
- Storage Network
- Block-level Request
- Storage

File-level Access
- Compute
  - Application
- Storage Network
- File-level Request
- File System
- Storage
- Storage System

Traditional Storage Provisioning

Storage Terminology

NAS

- Network Attached storage
- File level data storage connected to a computer network providing data access to heterogenous network clients

Client/Server

- Computing architecture implemented over a computer network, allows devices to share files and resources

CIFS or SMB (Windows) and NFS (UNIX)

- Two most common used NAS protocols

Share, export

- A CIFS server makes data available via shares, a Unix server makes data available via exports

Drive mapping, mounting

- CIFS clients typically map a network drive to access data stored on a server, Unix clients typically mount the remote resource

Storage Terminology

SAN

- Storage Area Network
- Provides block level access to client systems

LUN

- Logical unit number
- A disk, presented by a SAN, to a host OS that looks like a locally attached disk to the host OS

Target

- The machine that offers a disk (LUN) to another machine, in other words Storage

Initiator

- The machine that expects to see a disks, in other words host OS