Data Center Virtualization and Cloud Computing Infrastructure

Kh. Rashedul Arefin

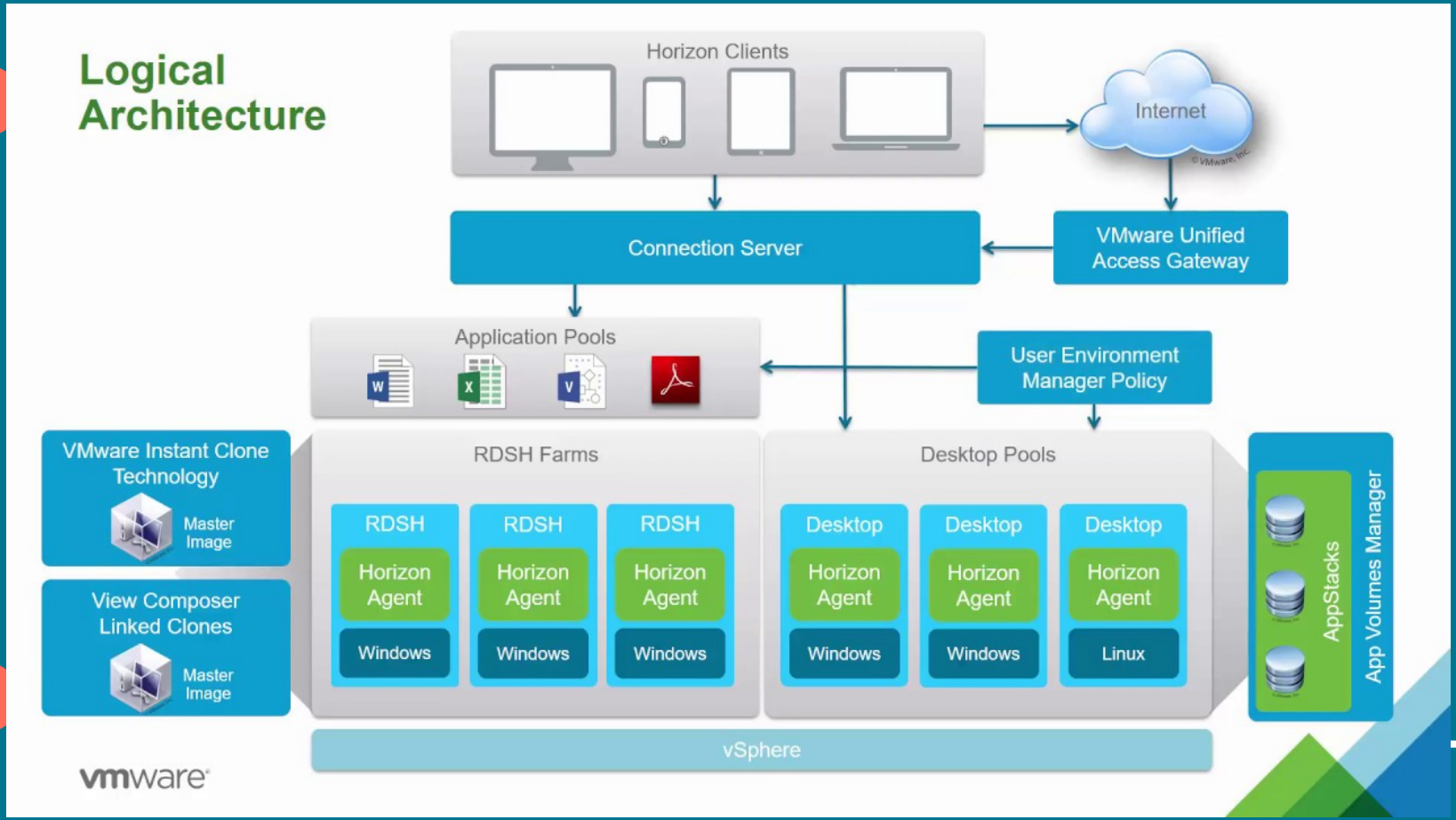
TABLE OF CONTENTS

Virtual Desktop Infrastructure (VDI)

- Virtual Desktop Infrastructure (VDI) is a virtualization technology that hosts a Desktop Operating System on a Centralized Server in Data Center
- A Variation of Client-Server Computing Model
- Sometimes refered to as Server-Based Computing

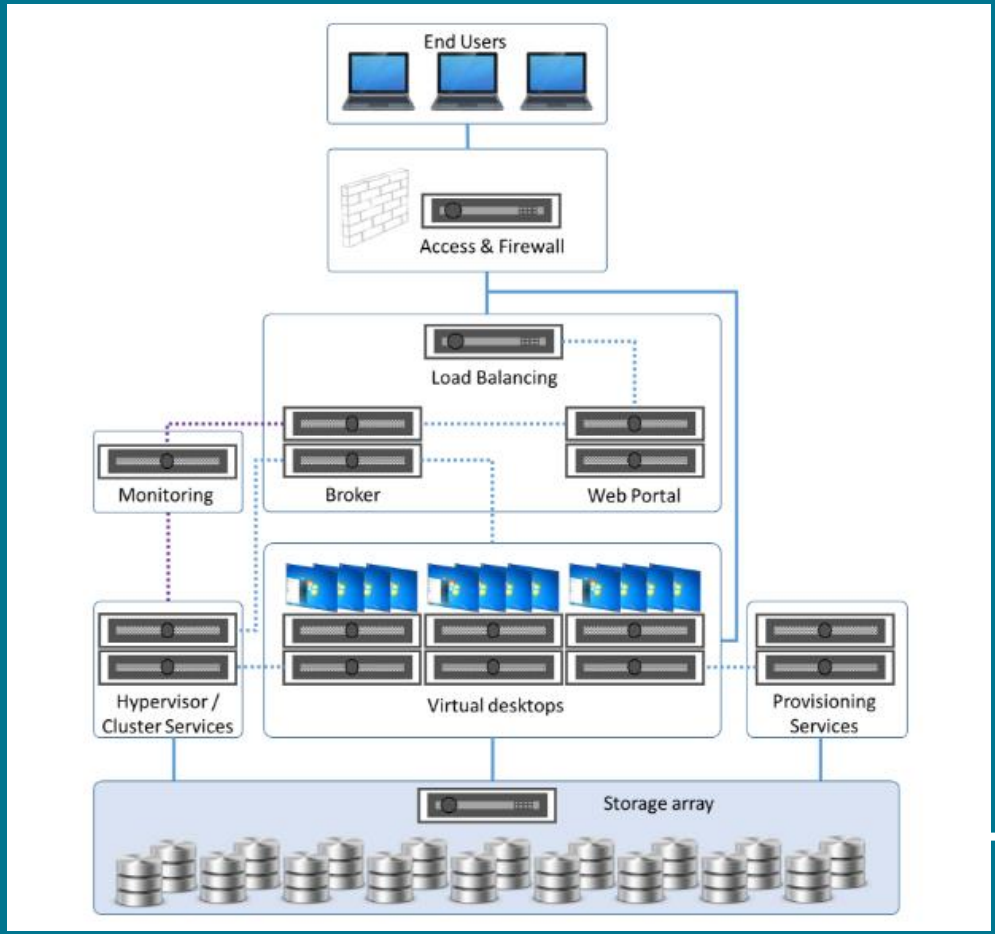
Types	Usage	Benefits
• Persistent • Non-persistend	• Remote Work • Flexibility / BYOD • Security • Task / Shift Duty	• Mobility • Cost Savings • Security • Centralized Management

VDI Logical Architecture

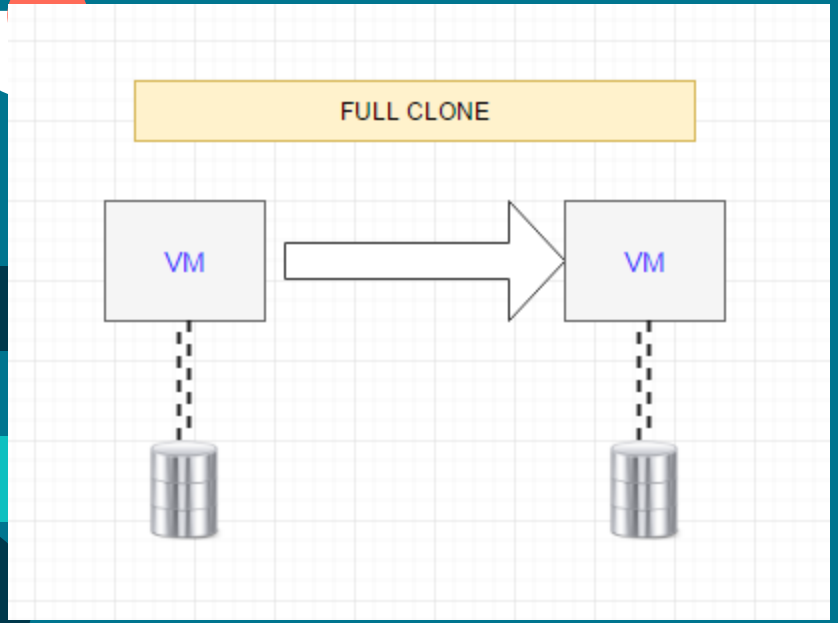


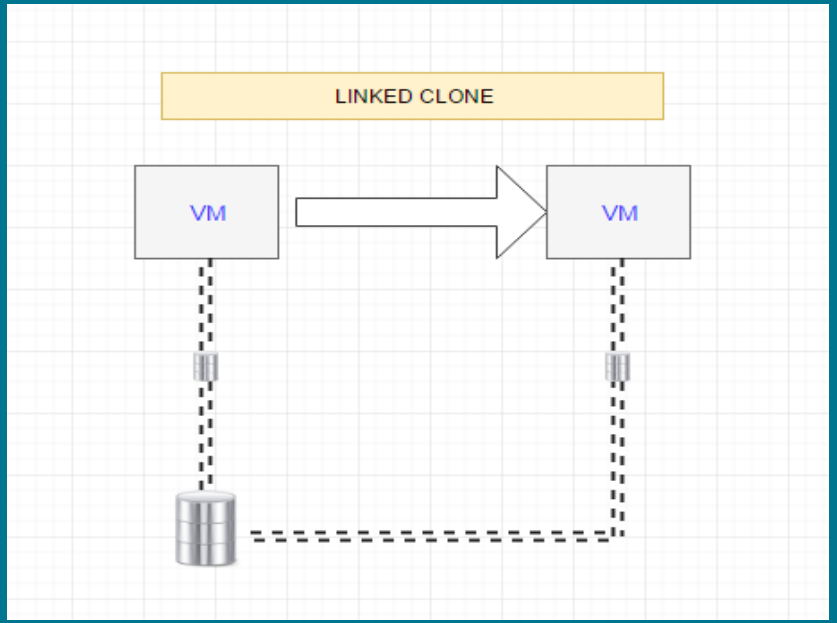
VDI Components and Architecture

- Firewall & Load Balancer
- Web Portal
- Connection Broker
- Monitoring
- Virtual Desktops
- Hypervisors
- Provisioning Services
- Compute and Storage
- Networks



Provisioning of VDI

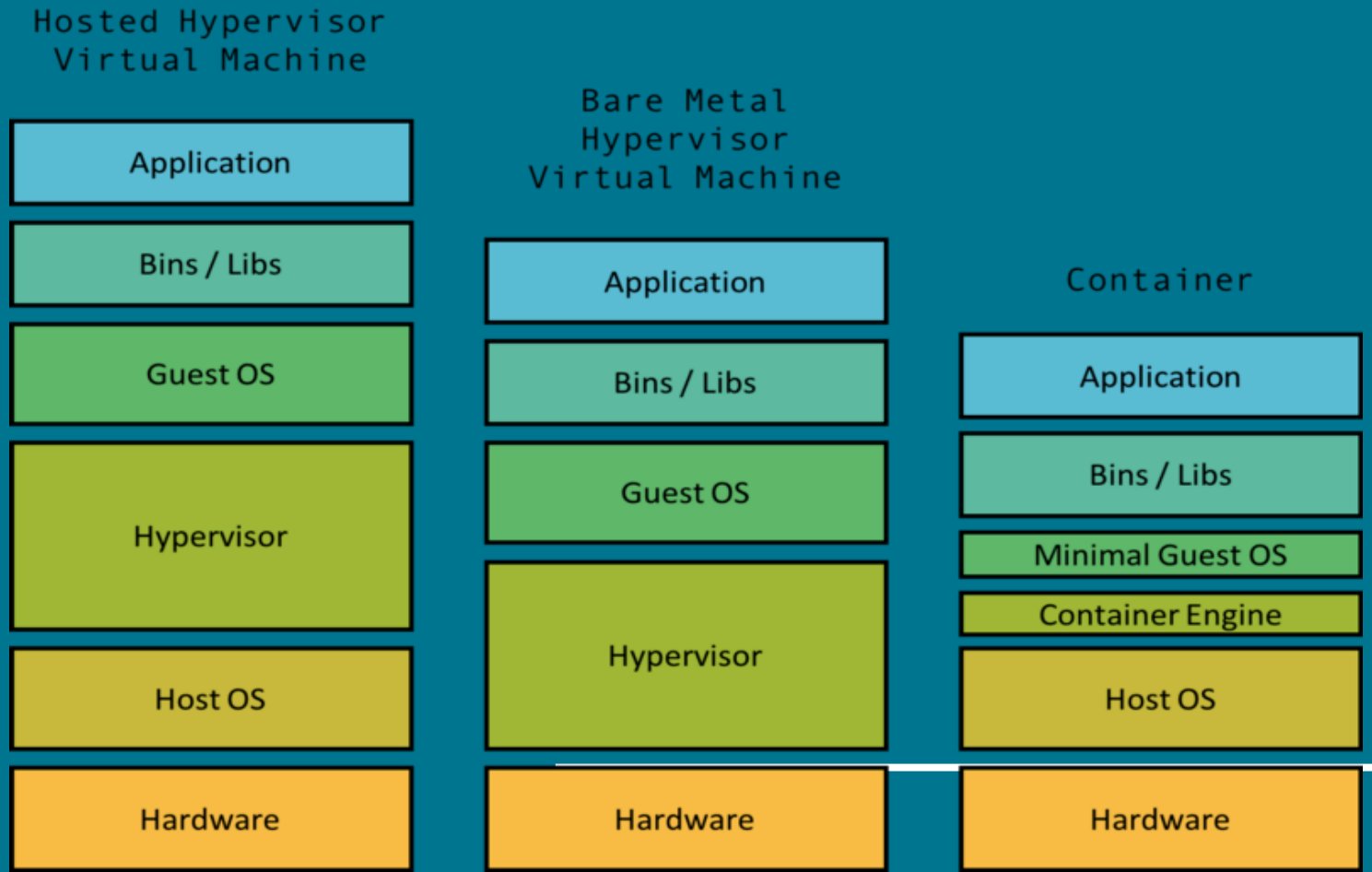




Operating System (OS) Level Virtualization

- Inserts a virtualization layer inside the Operating System
- VM is often called VE, VPS or simply Container
- Container is look like a real server
- Container has its own set of process, file system, user accounts, network interface, IP Address, routing table, firewall rules and other personal settings
- Share the same Operating System Kernel
- Also called Single-OS image virtualization

Hypervisor and Container Architecture



Evolution of Container

cgroups
- Isolates & Controls the resources for user spaces

namespaces
- Collection of processes that share same resources limitations
- A Computer can have multiple namespaces
- Each namespace is allocated resources enforced by Kernel

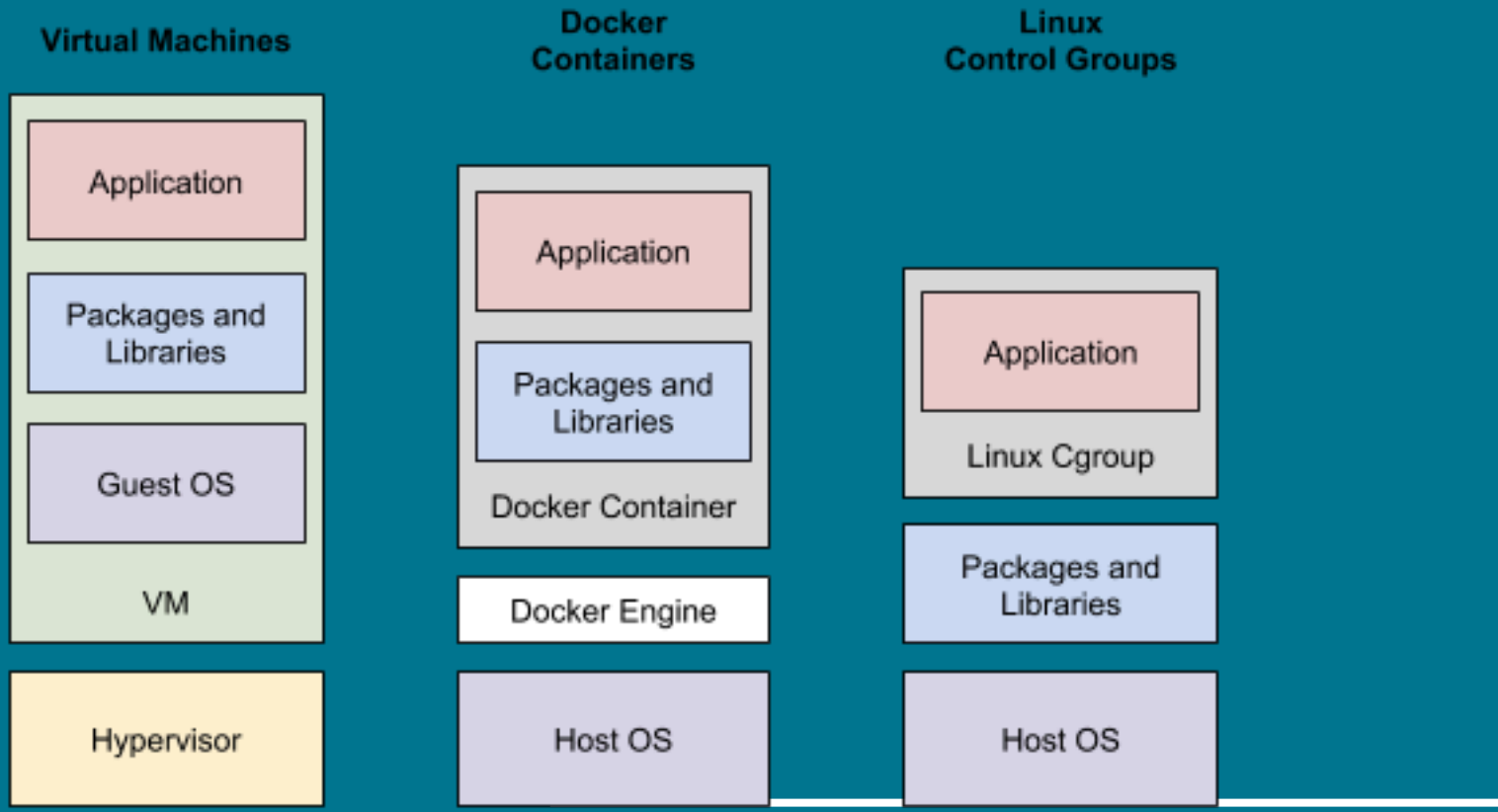
namespace isolation
- Its not new
- Linux have many kinds of namespace isolations

cgroup isolation
- Processes within a cgroup namespace are independent of processes of other namespace

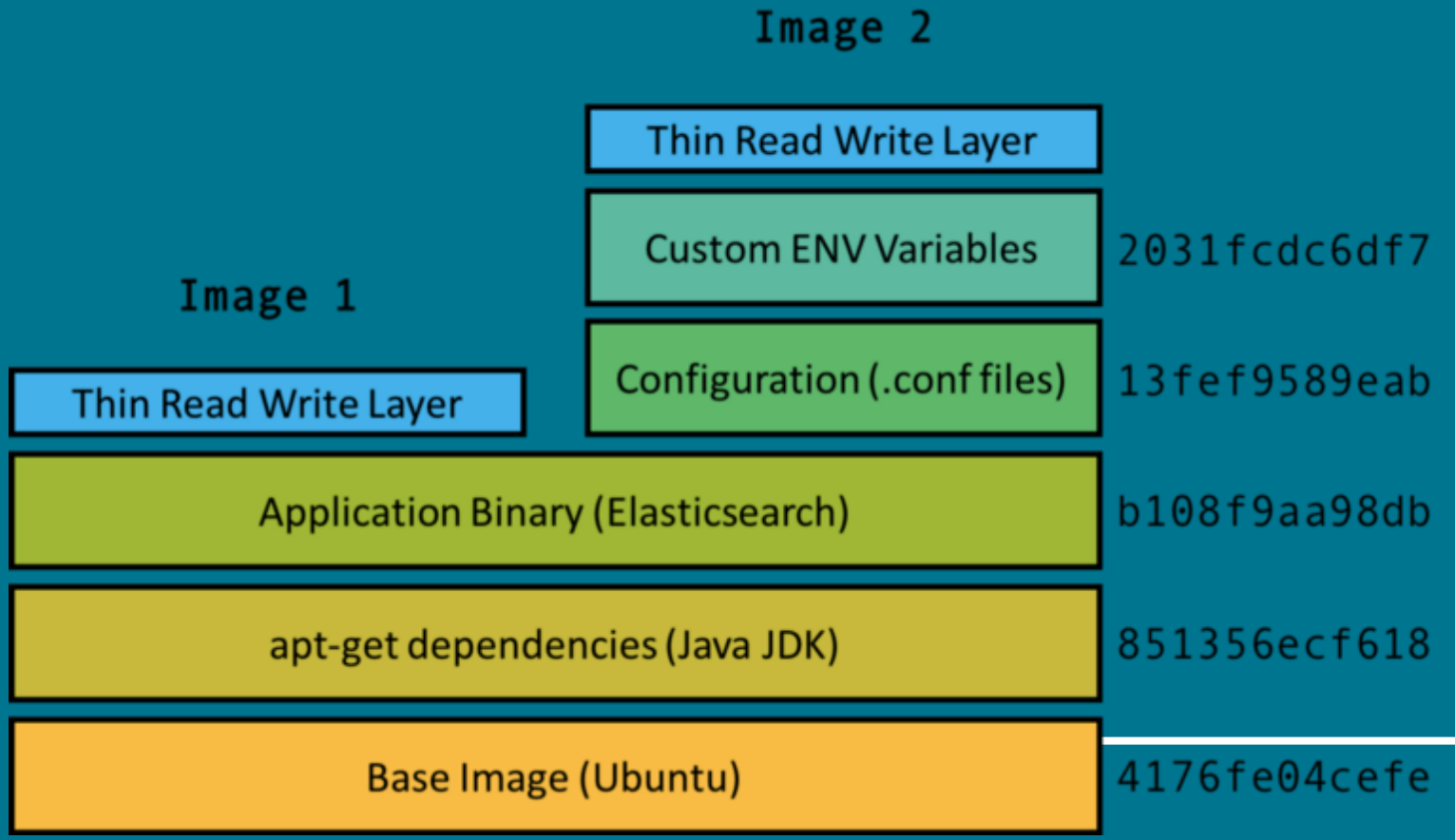
Linux container (LXC)
- First implementation of today's Container
- Create separate virtual environment with separate process and networking space (user space)

Docker
- Most widely used container technology
- Earlier version was built on top of LXC

Architecture of Container



Architecture of Container



Benefits of Container Compare to VM

- Containers are lightweight, hence can run more containers per host
- Consume less resources
- Compatibility issues (different application runs on different platform)
- Share resources with underlying Host Machine with user space and process isolations
- Container can start nearly instantly
- Containers are portable and can regenerate a system environment with required software, irrespective of underlying Host Operating System

Types of Storage

Primary

- Also referred as Memory
- Directly accessed by CPU
- Small capacity
- Very fast
- Volatile

Secondary

- Not directly accessible to CPU
- Also known as Auxiliary Memory
- Require I/O channel to transfer data to Primary Storage
- Slower Access Time
- More capacity than Primary Storage

Tertiary

- Refers to removable mass storage
- Data Access Time is much longer
- Lowest cost per data unit

Data Access Methods

Blocks

- Simply a sequence of bytes
- Hard Drive blocks can be mapped to a disk sector
- Small Computer Systems Interface (SCSI)
- Mainframe Storage Access
- Advanced Technology Attachment (ATA)

Files

- A set of contiguous data bytes
- Also contain metadata
- Network File System (NFS)
- Common Internet File System (CIFS)

Records

- Similar structure to files
- Highly structured
- Open DataBase Connectivity (ODBC)
- Java DataBase Connectivity (JDBC)
- Structured Query Language (SQL)

Storage Components

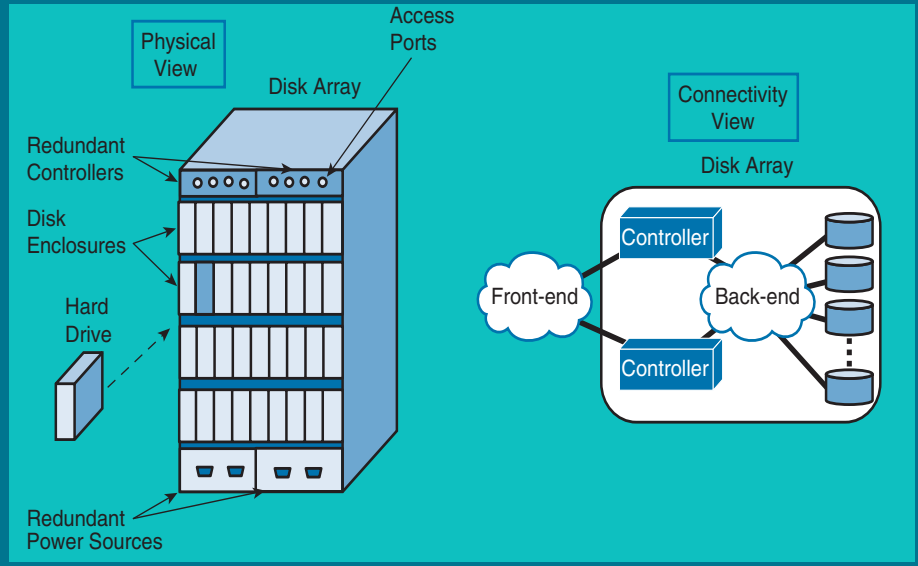
HDD

Disk Array

Tape Library

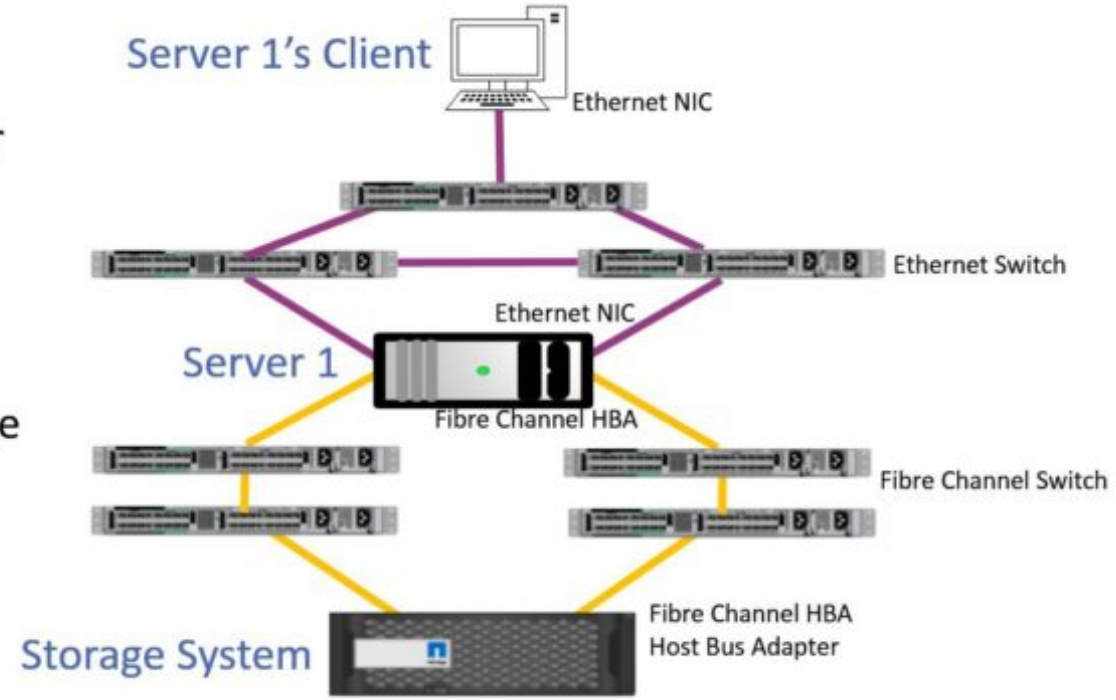
Connectivity

Protocol

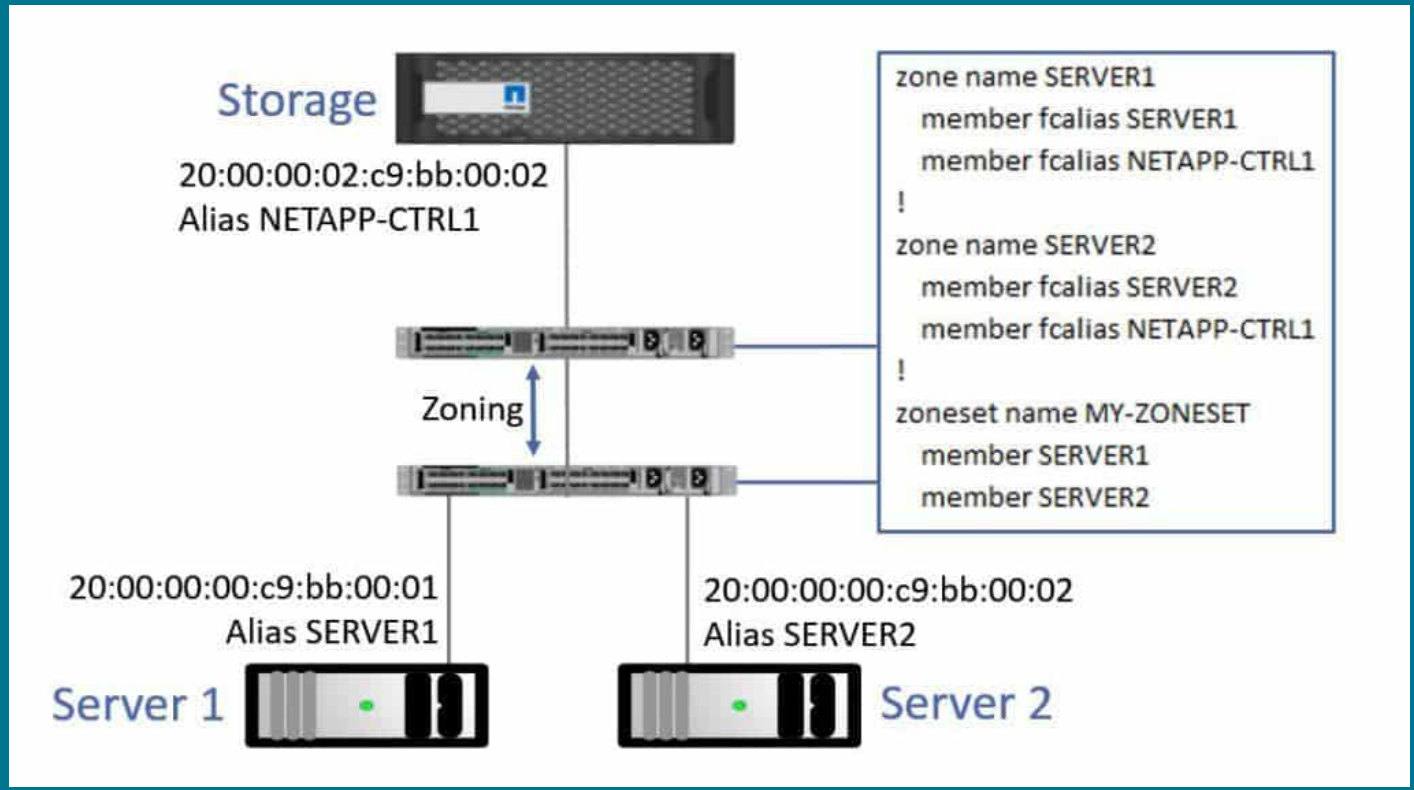


Enterprise Storage Systems - SAN

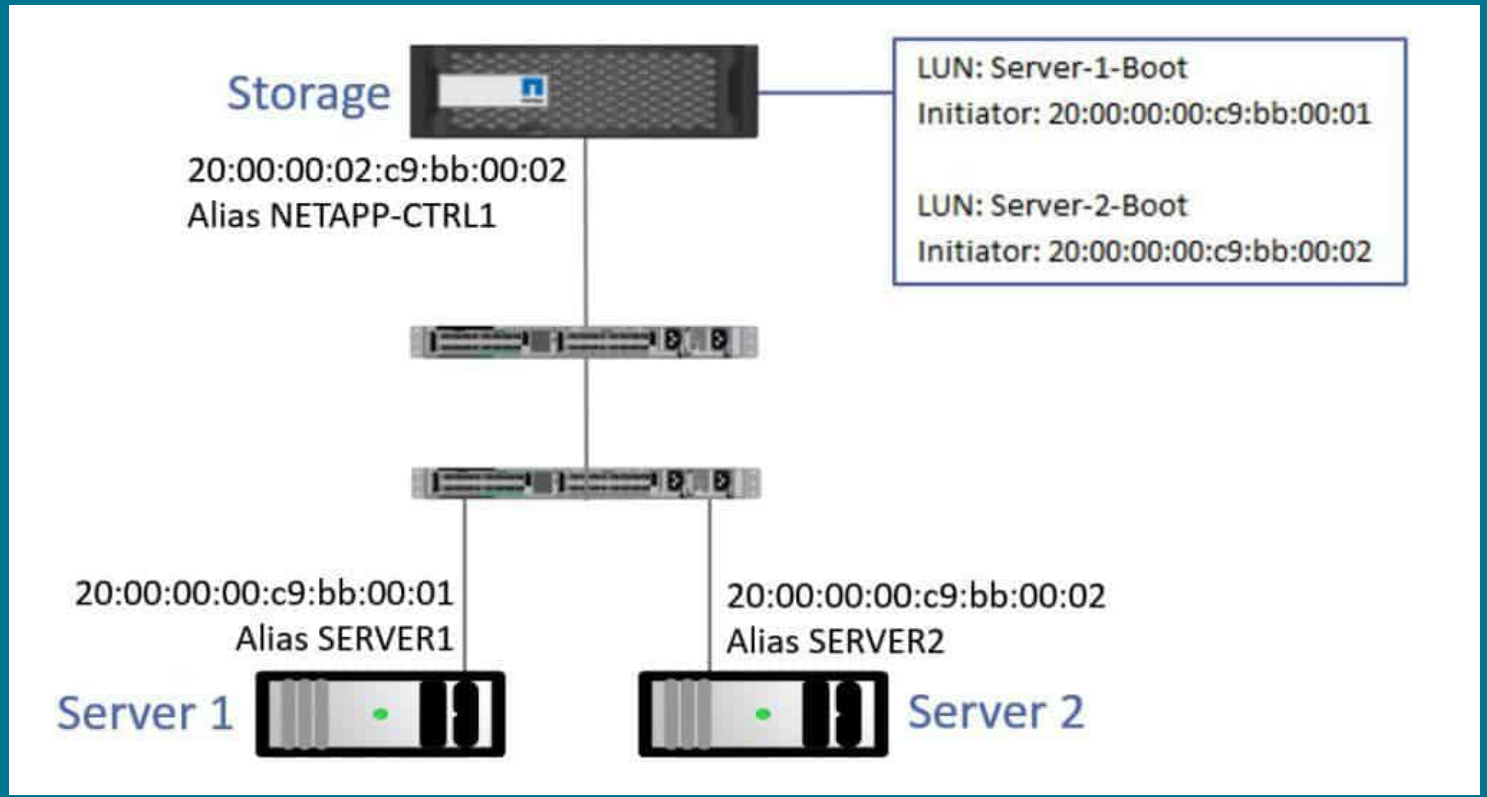
- Client to Server Ethernet Data Network
- Server to Storage Fibre Channel Network



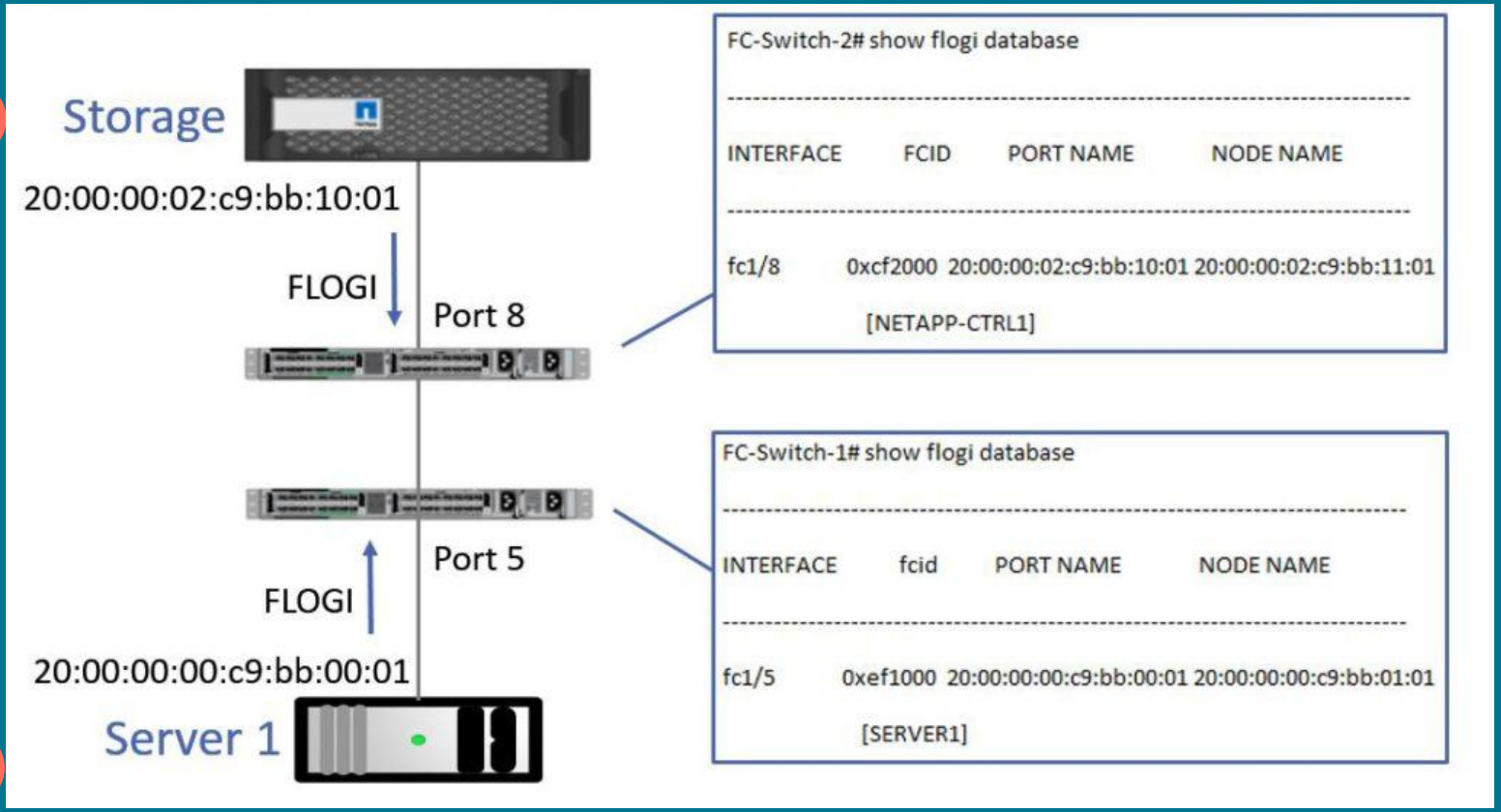
SAN Zoning


Storage
20:00:00:02:c9:bb:00:02
Alias NETAPP-CTRL1
Zoning
zone name SERVER1
member fcalias SERVER1
member fcalias NETAPP-CTRL1
!
zone name SERVER2
member fcalias SERVER2
member fcalias NETAPP-CTRL1
!
zoneset name MY-ZONESET
member SERVER1
member SERVER2
20:00:00:00:c9:bb:00:01
Alias SERVER1
20:00:00:00:c9:bb:00:02
Alias SERVER2
Server 1
Server 2

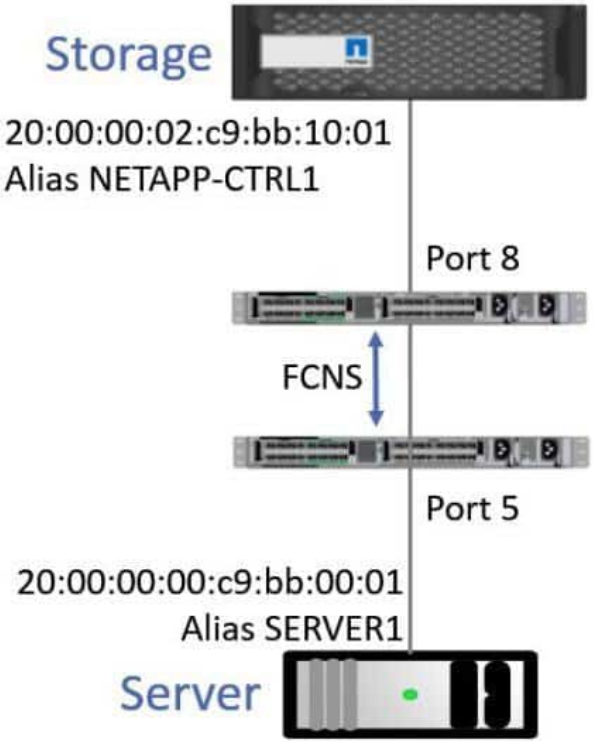
LUN Masking


Storage
20:00:00:02:c9:bb:00:02
Alias NETAPP-CTRL1
LUN: Server-1-Boot
Initiator: 20:00:00:00:c9:bb:00:01
LUN: Server-2-Boot
Initiator: 20:00:00:00:c9:bb:00:02
20:00:00:00:c9:bb:00:01
Alias SERVER1
20:00:00:00:c9:bb:00:02
Alias SERVER2
Server 1
Server 2

FLOGI


Storage
20:00:00:02:c9:bb:10:01
FLOGI
Port 8
Port 5
FLOGI
20:00:00:00:c9:bb:00:01
Server 1
FC-Switch-2# show flogi database
INTERFACE FCID PORT NAME NODE NAME
fc1/8 0xcf2000 20:00:00:02:c9:bb:10:01 20:00:00:02:c9:bb:11:01
[NETAPP-CTRL1]
FC-Switch-1# show flogi database
INTERFACE fcid PORT NAME NODE NAME
fc1/5 0xef1000 20:00:00:00:c9:bb:00:01 20:00:00:00:c9:bb:01:01
[SERVER1]

FC Name Services



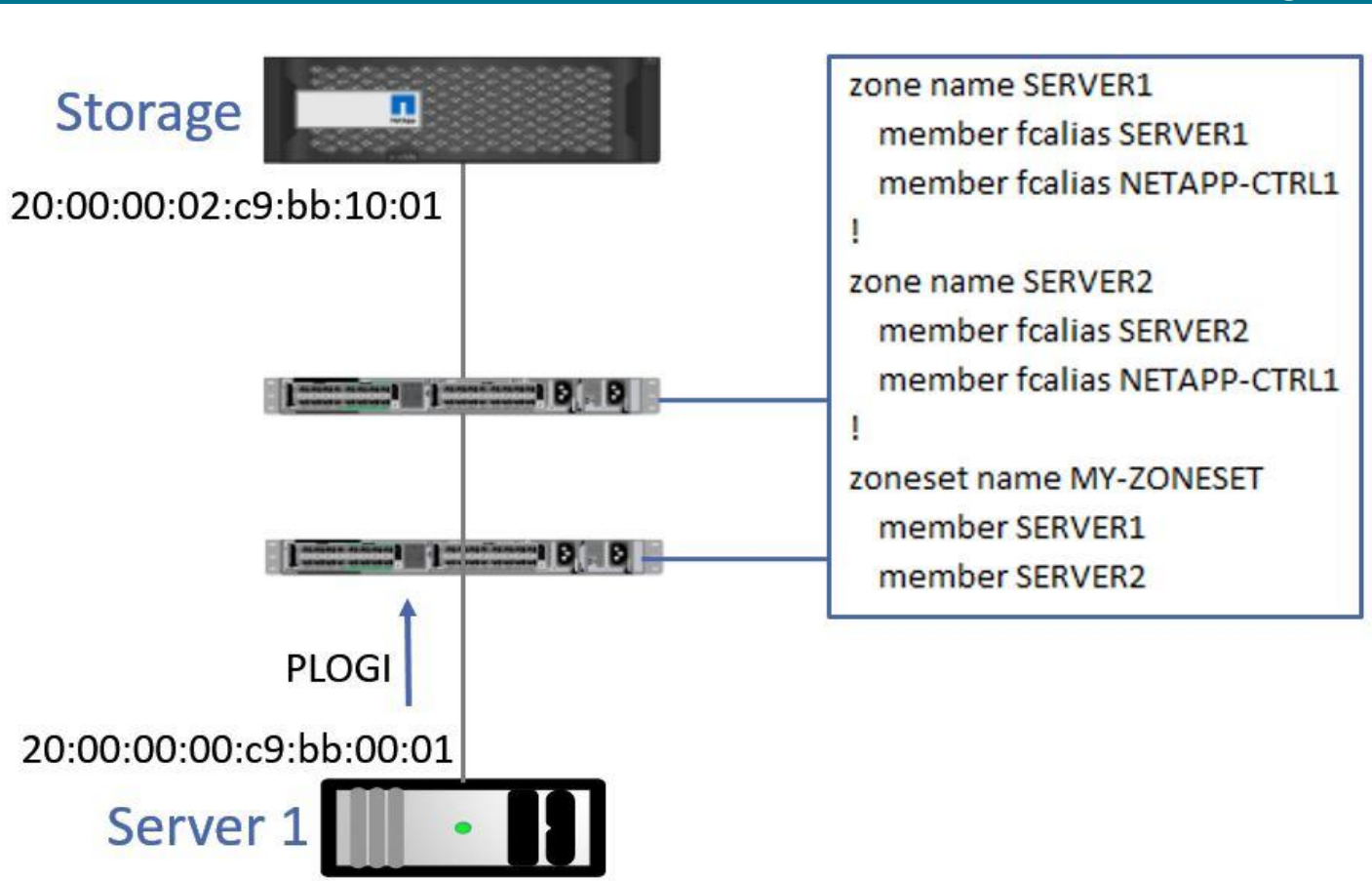
FC-Switch-2# show fcns database

FCID	TYPE	PWWN	
0xef1000	N	20:00:00:00:c9:bb:00:01	[SERVER1]
0xcf2000	N	20:00:00:02:c9:bb:10:01	[NETAPP-CTRL1]

FC-Switch-1# show fcns database

FCID	TYPE	PWWN	
0xef1000	N	20:00:00:00:c9:bb:00:01	[SERVER1]
0xcf2000	N	20:00:00:02:c9:bb:10:01	[NETAPP-CTRL1]

Port Login


Storage
20:00:00:02:c9:bb:10:01
zone name SERVER1
member fcalias SERVER1
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member fcalias SERVER2
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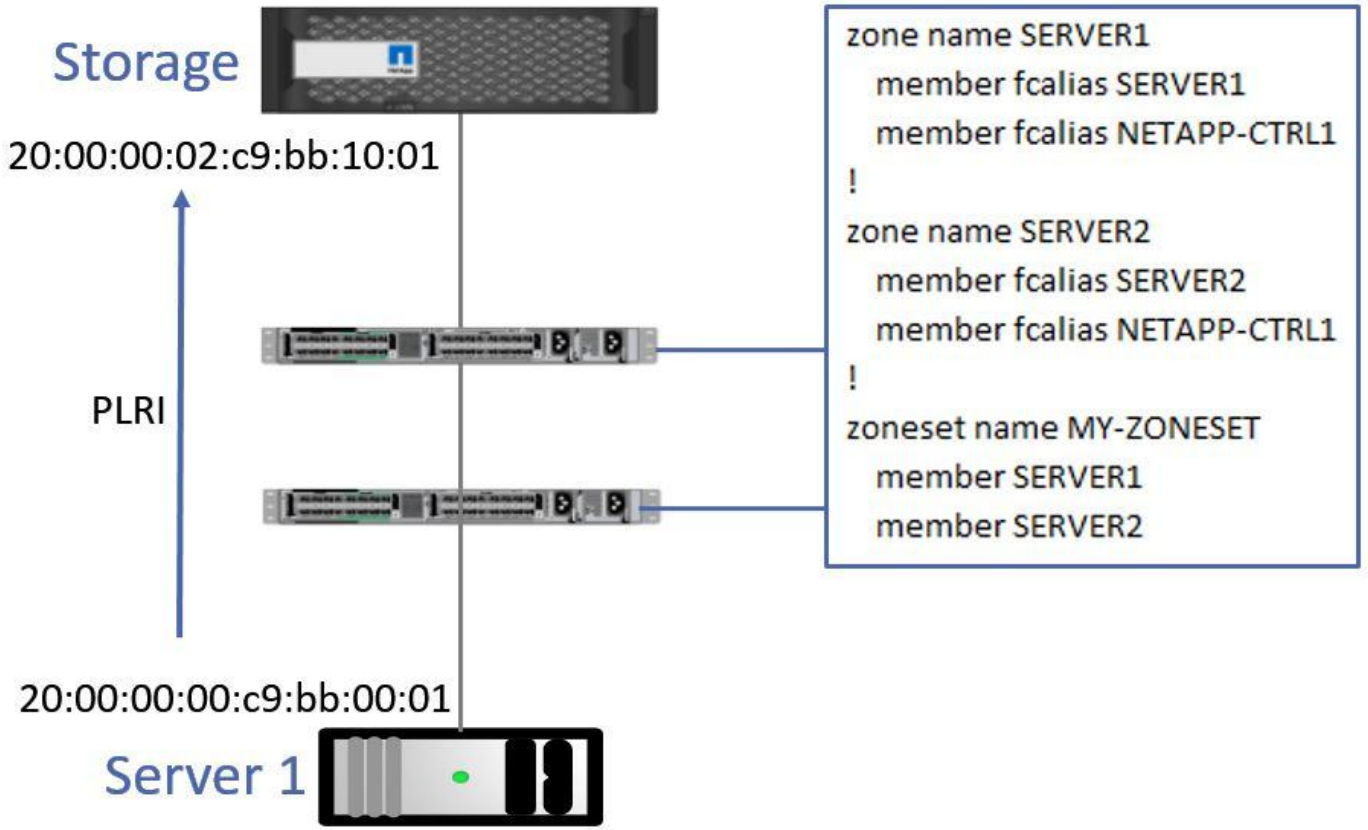
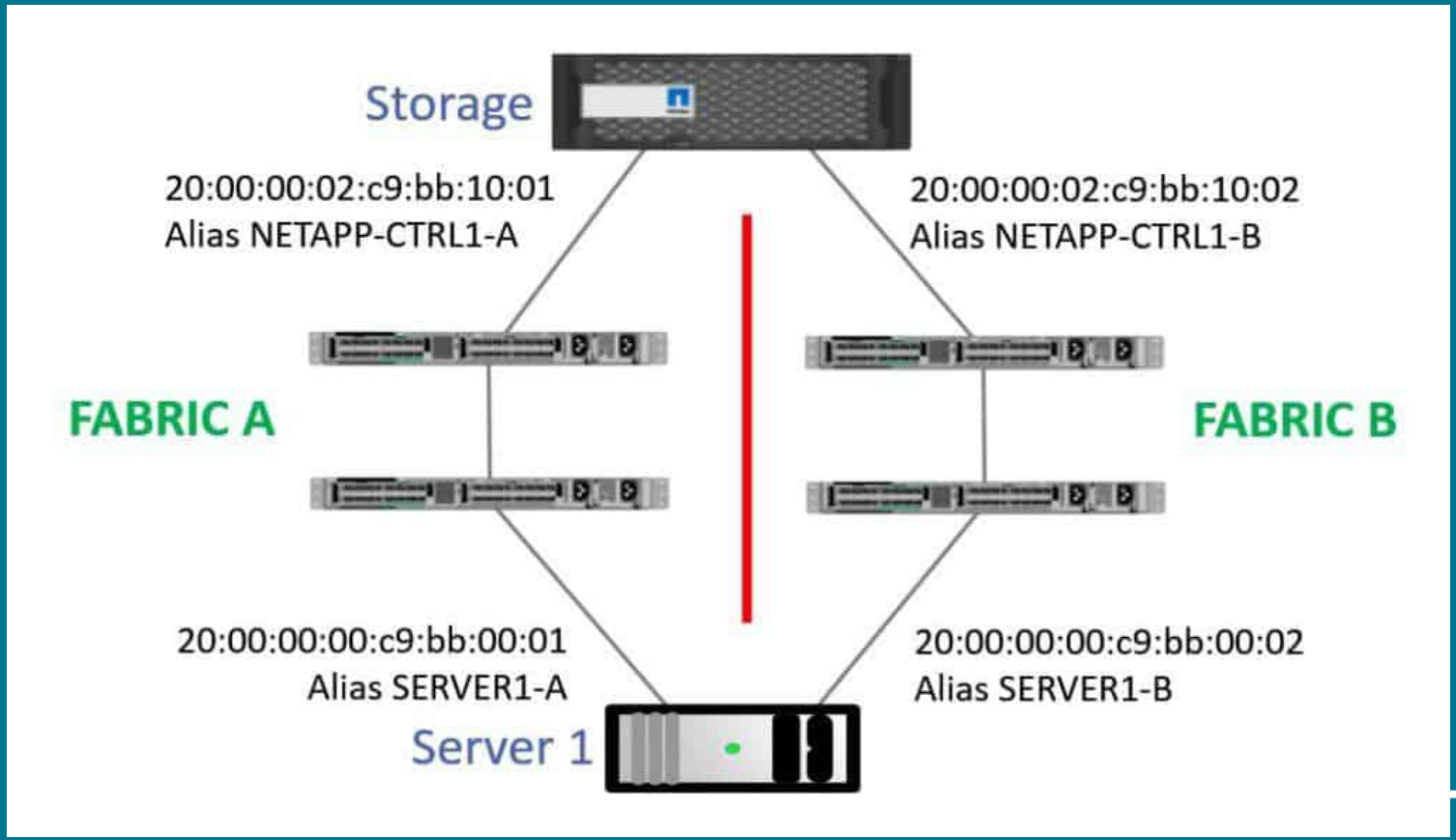
!
zoneset name MY-ZONESET
member SERVER1
member SERVER2
PLOGI
20:00:00:00:c9:bb:00:01
Server 1

Process Login



SAN Multipathing

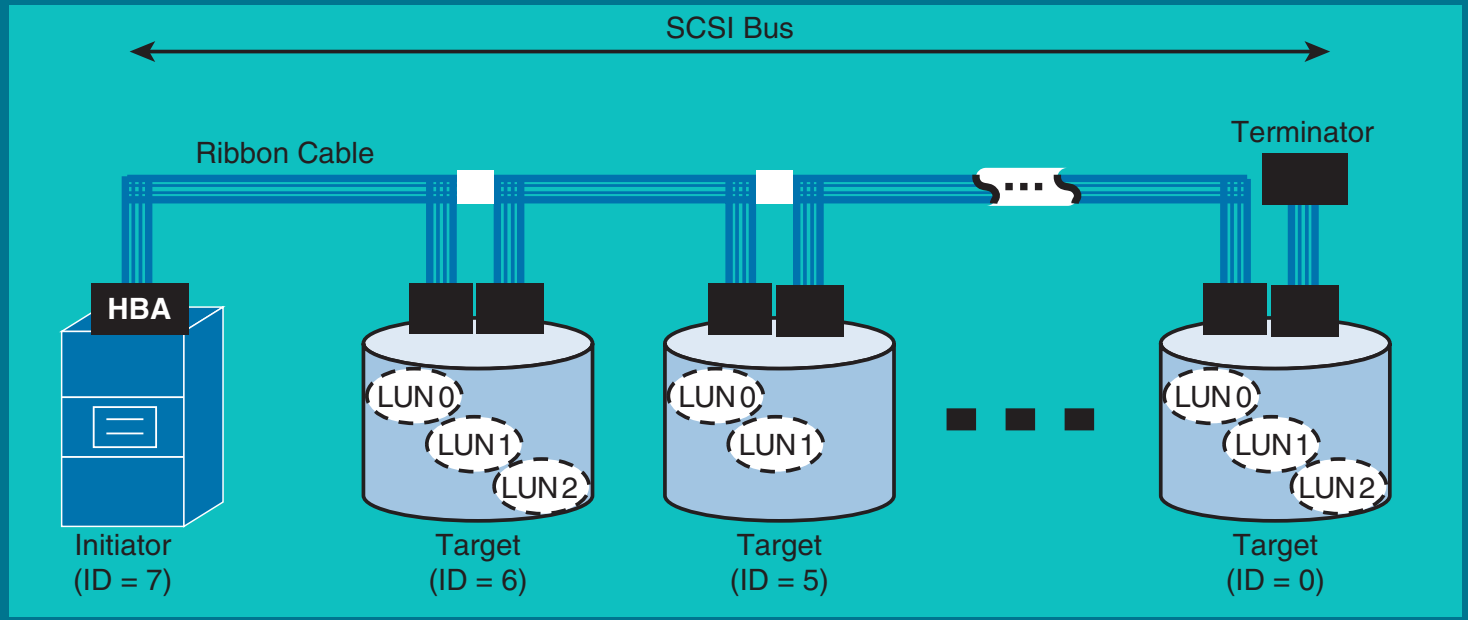


Storage Virtualization

Storage made available to applications without concern of its physical location, underlying interfaces, its implementation technology, platform and available resources

Distance	• Remote storage device appear as local device
Size	• Multiple smaller volume appear as a large volume
Spread	• Data is spread over multiple physical disks
File Systems	• Windows, Linux, Unix all use same storage device
Virtual Interface	• A SCSI disk connected to a computer without SCSI Interface
Advantages	• High Availability, Disaster Recovery, Improved Performance, Sharing

Storage Virtualization Techniques



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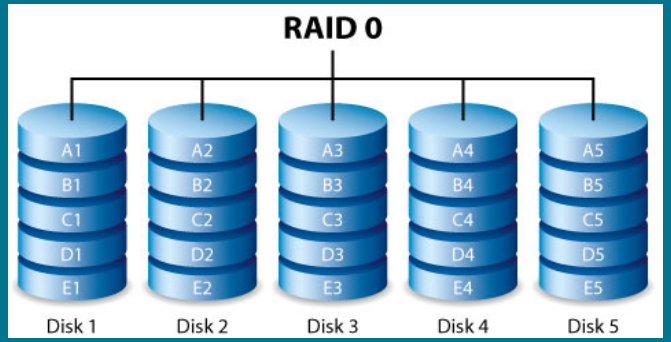

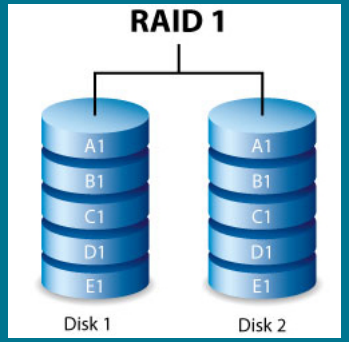

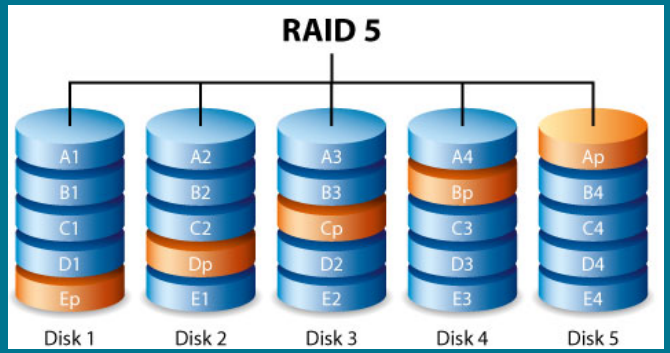

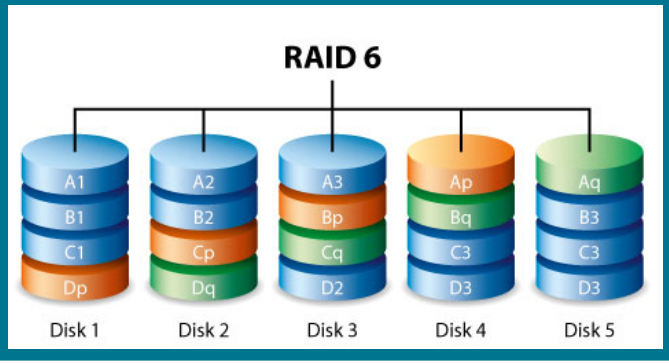

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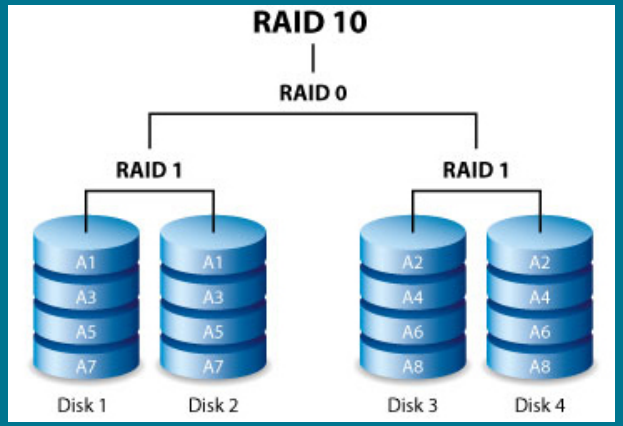

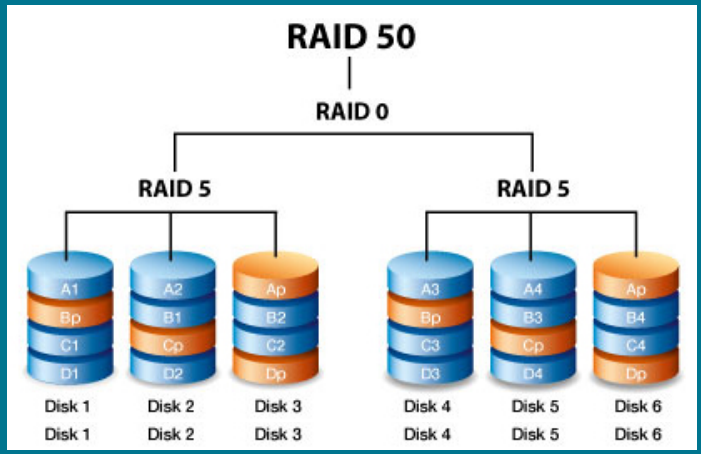

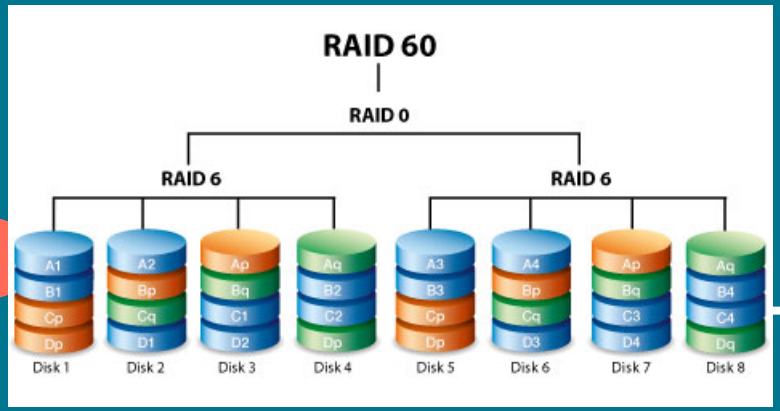

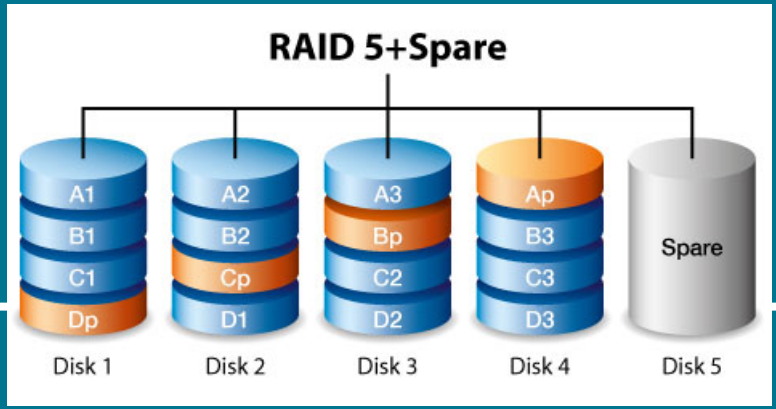

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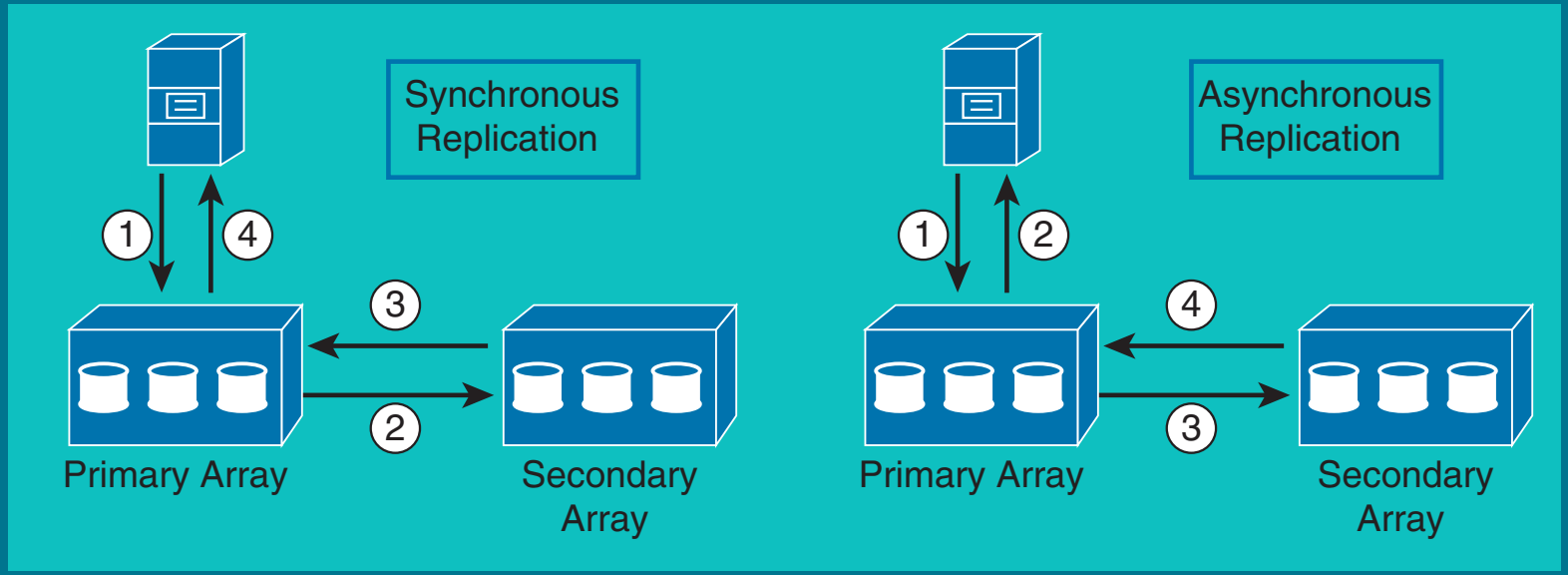

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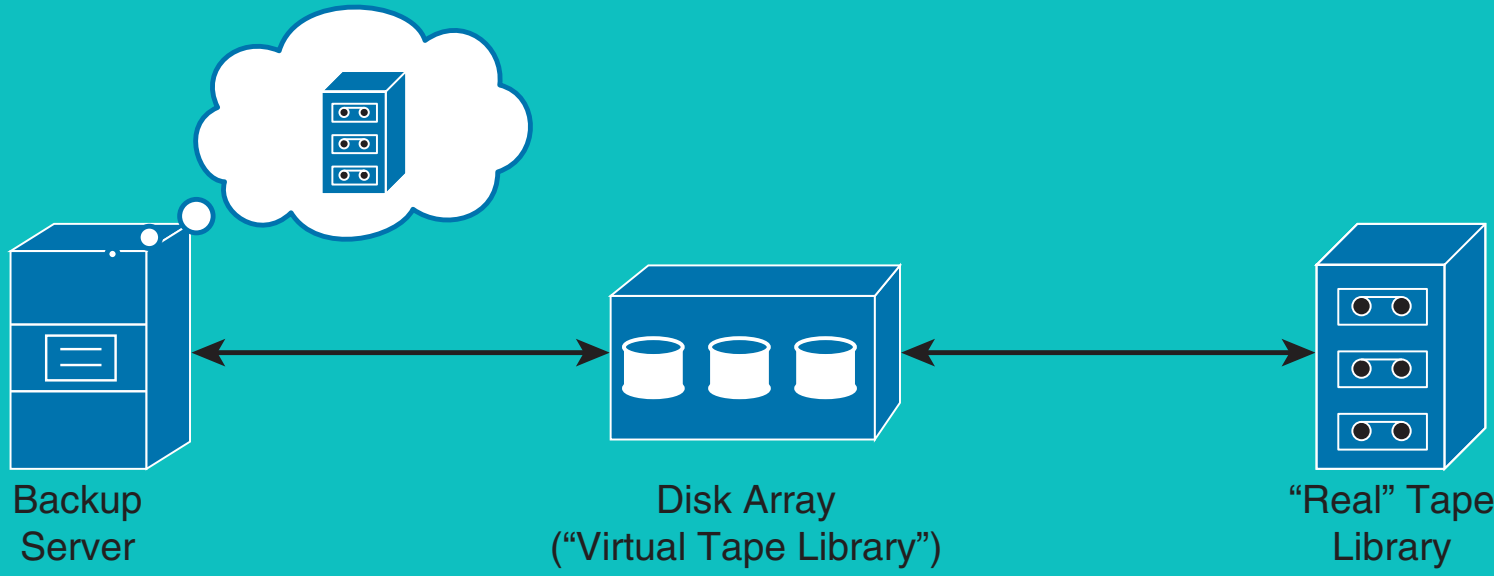

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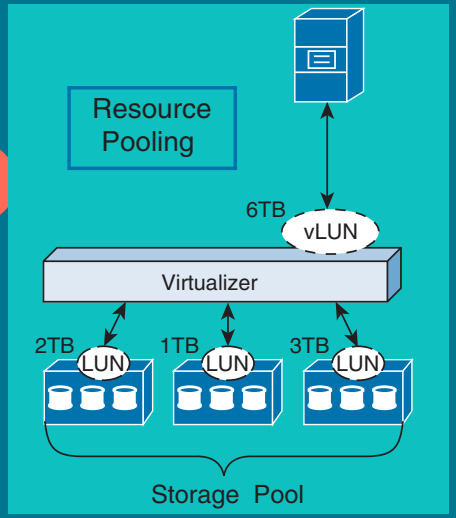

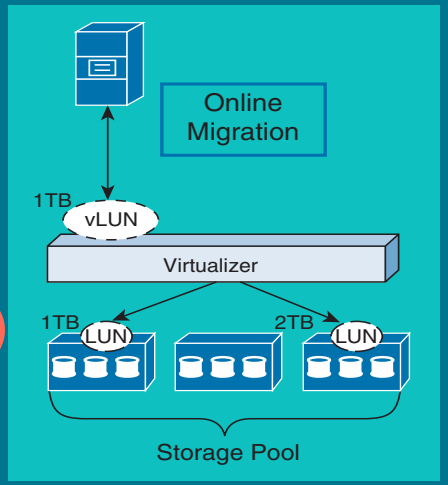

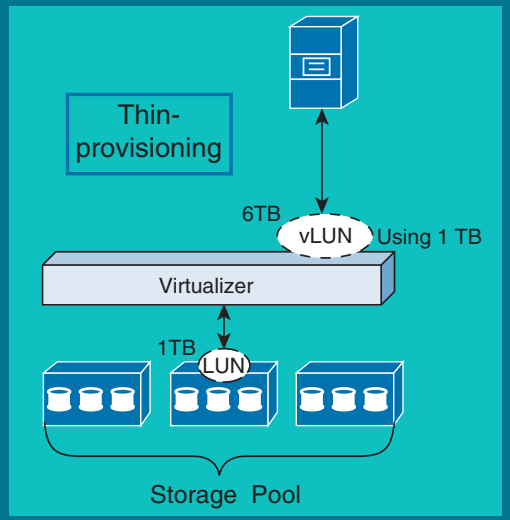

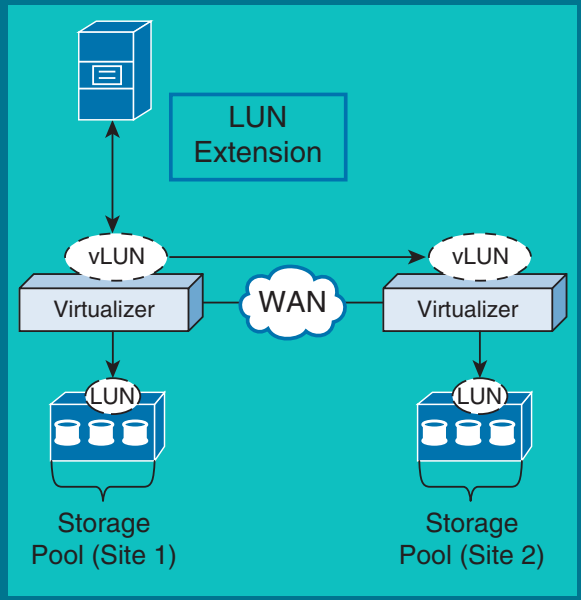

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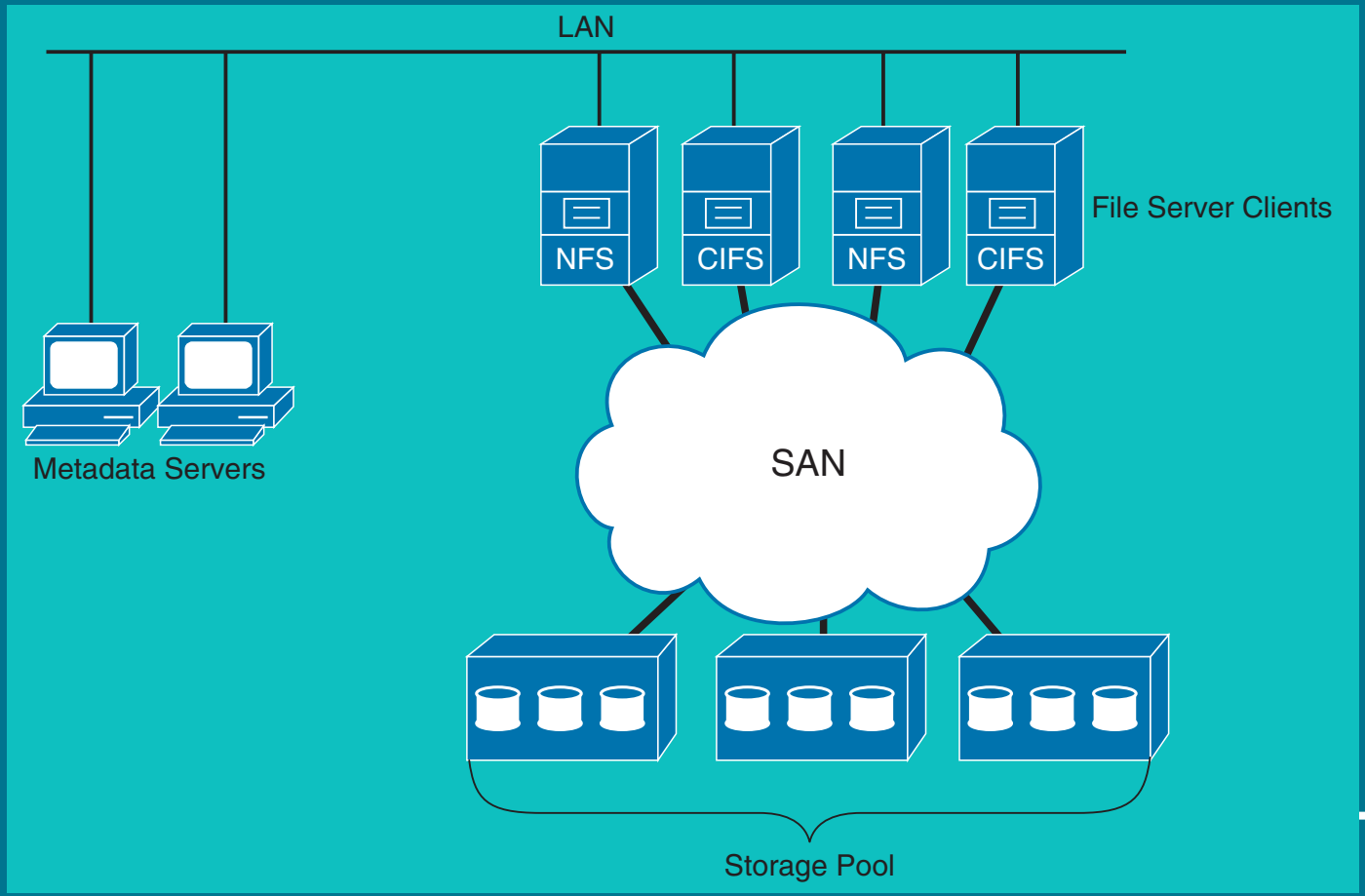

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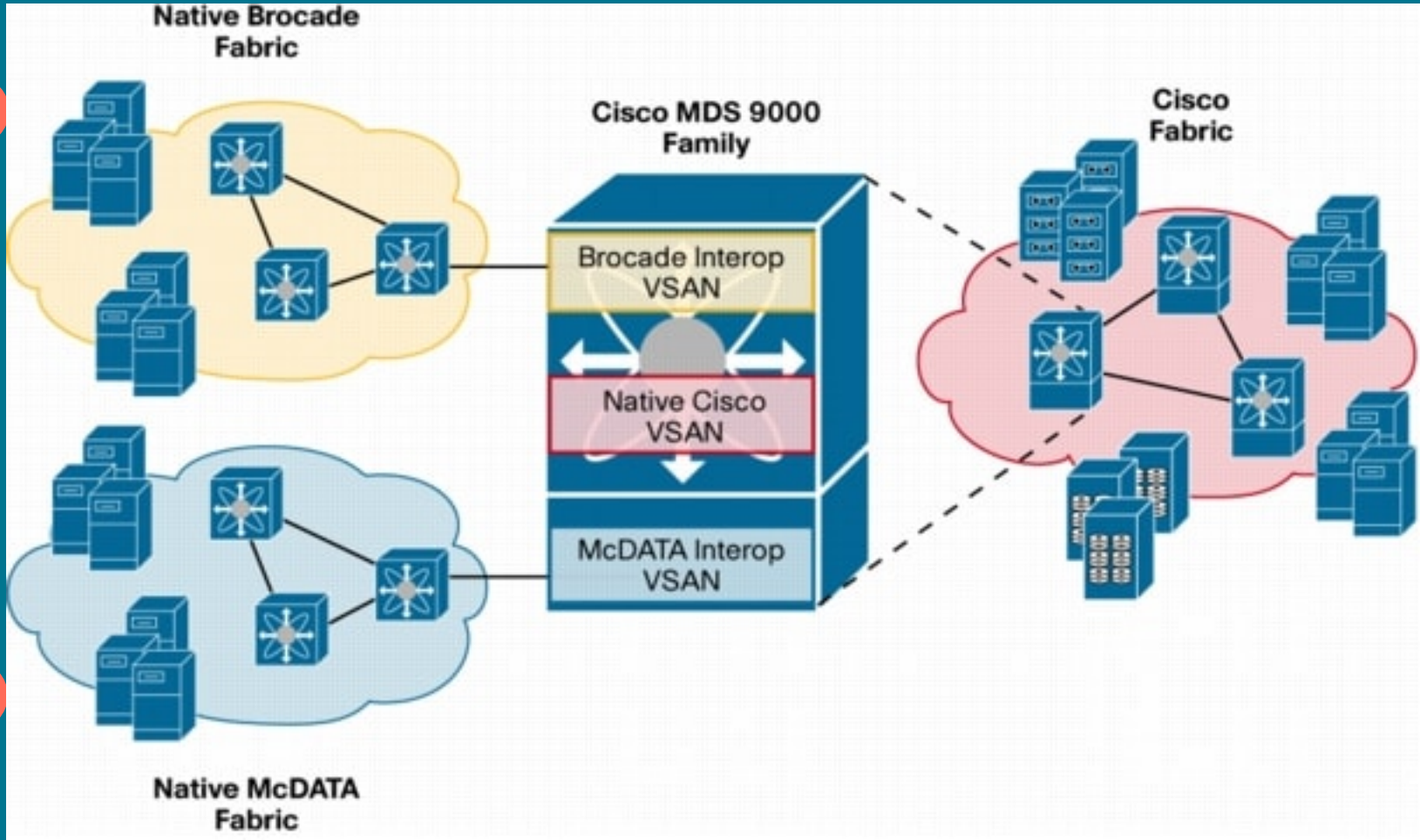

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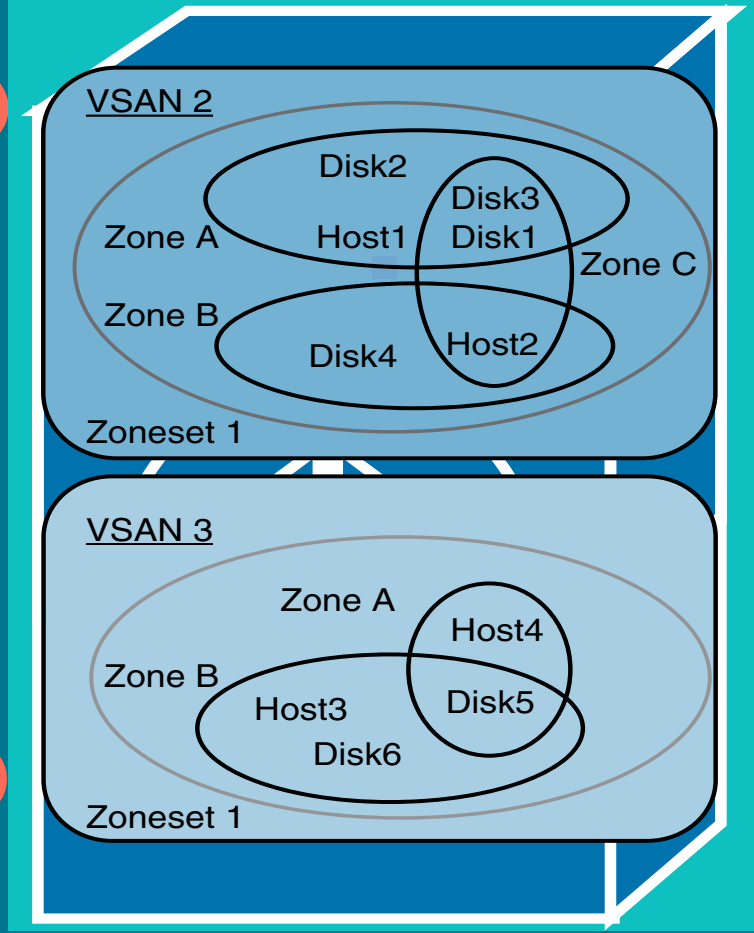

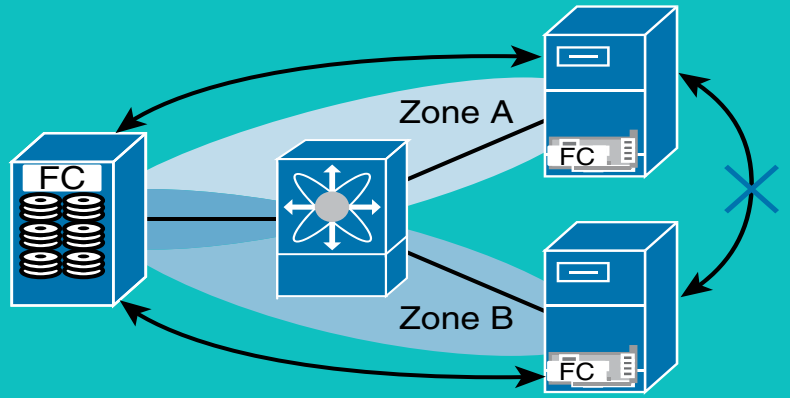

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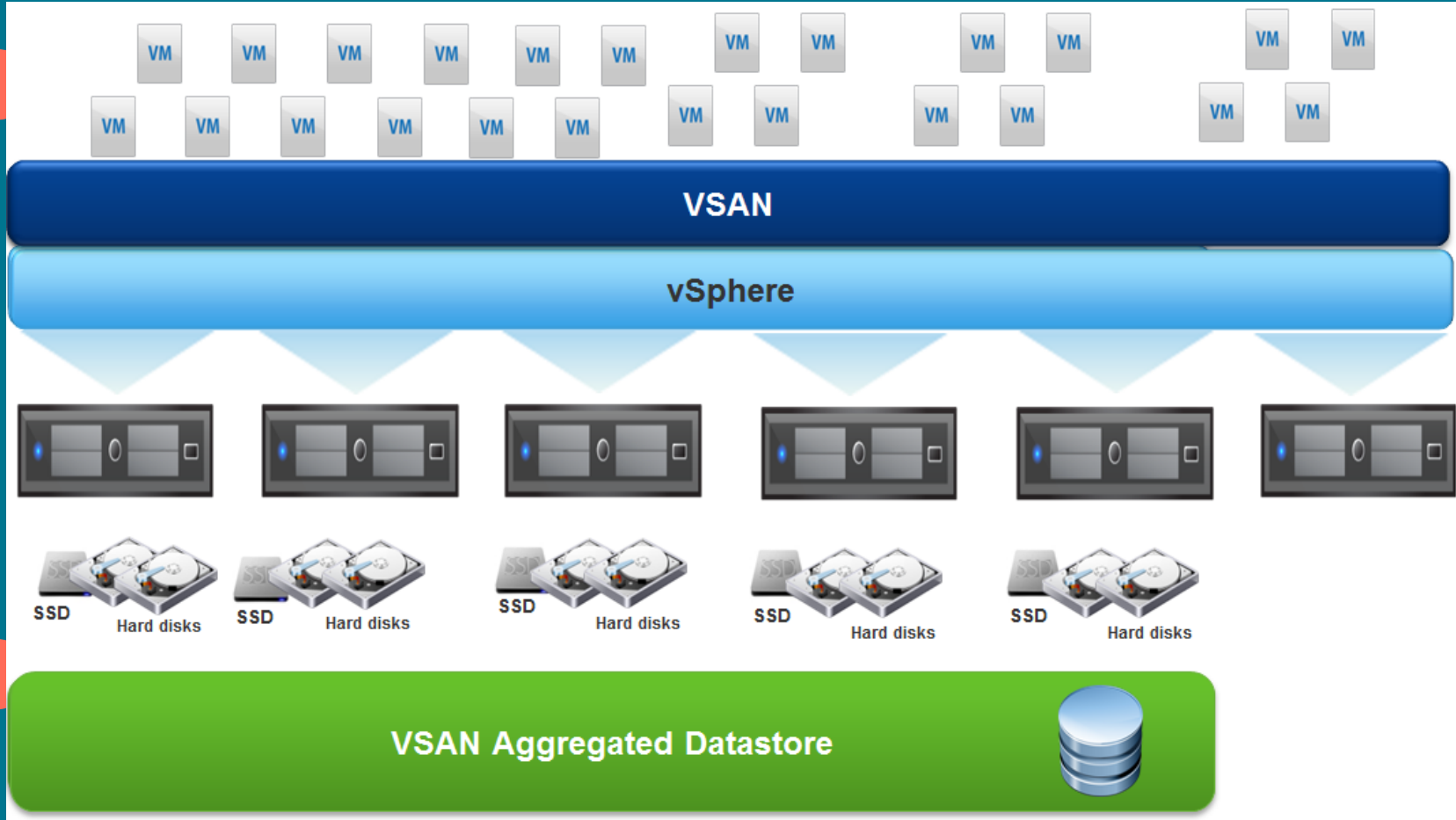


Thank You