Private Cloud

Ravi Mula
Research Associate
Dept. of CS

Outline

1. Cloud Classifications - PaaS, SaaS, IaaS, FaaS
2. Terminology
3. Traditional vs Hyper-converged Architectures
4. Nutanix
    a. Architecture
    b. Data Management & Features
5. Demo

Cloud Classifications

Platform as a Service (PaaS)

- Bitnami
  - PHP
  - Java
  - Python
  - Node
  - Ruby
  - WordPress, Drupal,...

Software as a Service (SaaS)

- YouTube
- Gmail
- Google Apps
- GoToMeeting

Infrastructure as a Service (IaaS)

- Public Cloud
  - Amazon Web Services (AWS)
  - MS Azure
- Private Cloud
  - VMWare
  - Nutanix

Function as a Service (FaaS)

- AWS Lambda
- Google Cloud Functions
- Azure Cloud Functions
- Iron.io
- IBM OpenWhisk (Has an open source version)

Terminology

Node

- Contains Processors, Memory, HDD, SSD.
- Runs a standard Hypervisor
- Host - ESXi, Hyper-V.

Block (Nutanix)

- A rackable unit (2U)
- Contains up to 4 Nodes
- In some cases - each Node is a block

Cluster

- Set of Blocks that forms a Nutanix Distributed File System or Acropolis Distributed File System
- >= 3 Nodes

Storage

- Storage Pool
  - Group of physical storage devices (SSD or HDD) for the cluster
  - Spans across Multiple Nodes

- Container
  - Logical Segment of a Storage Pool
  - Contains a group of VM’s or vDisks (files)

Storage

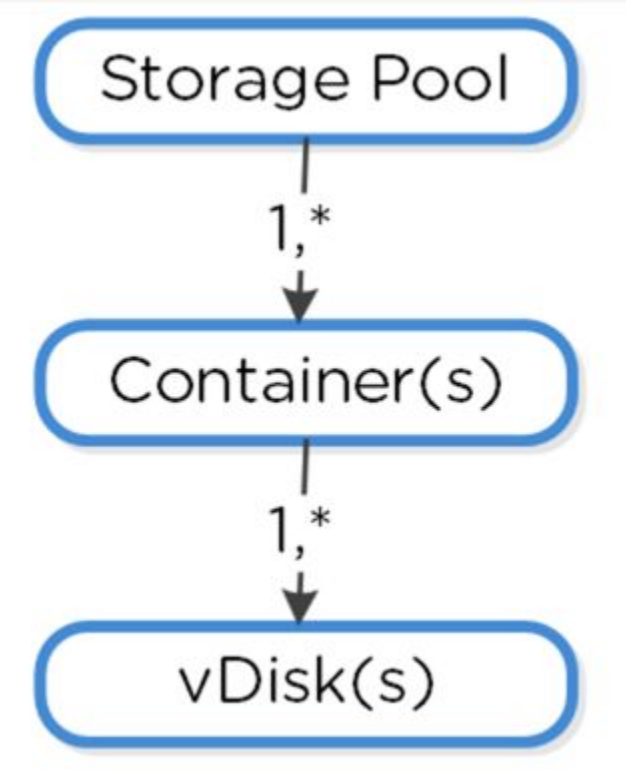
vDisk

- Provides required storage to VM’s
- Subset of a Container

Data Store

- Logical Container that contains files for VM operations

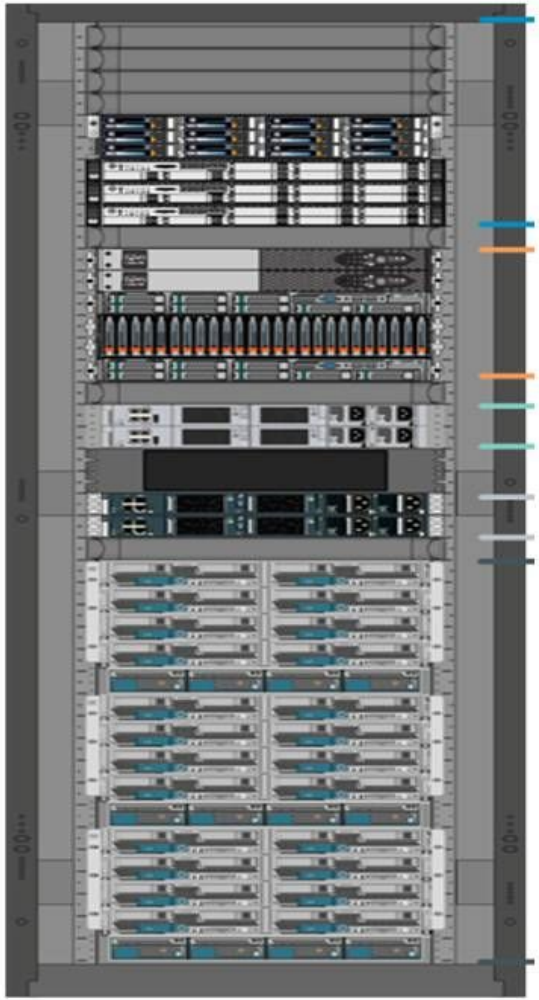
Storage Hierarchy



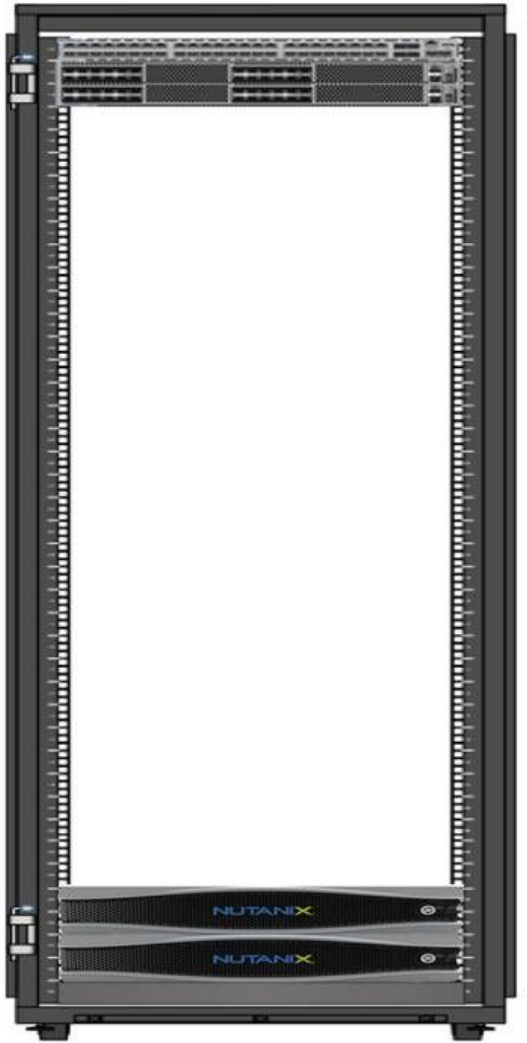
Traditional vs Hyper Converged

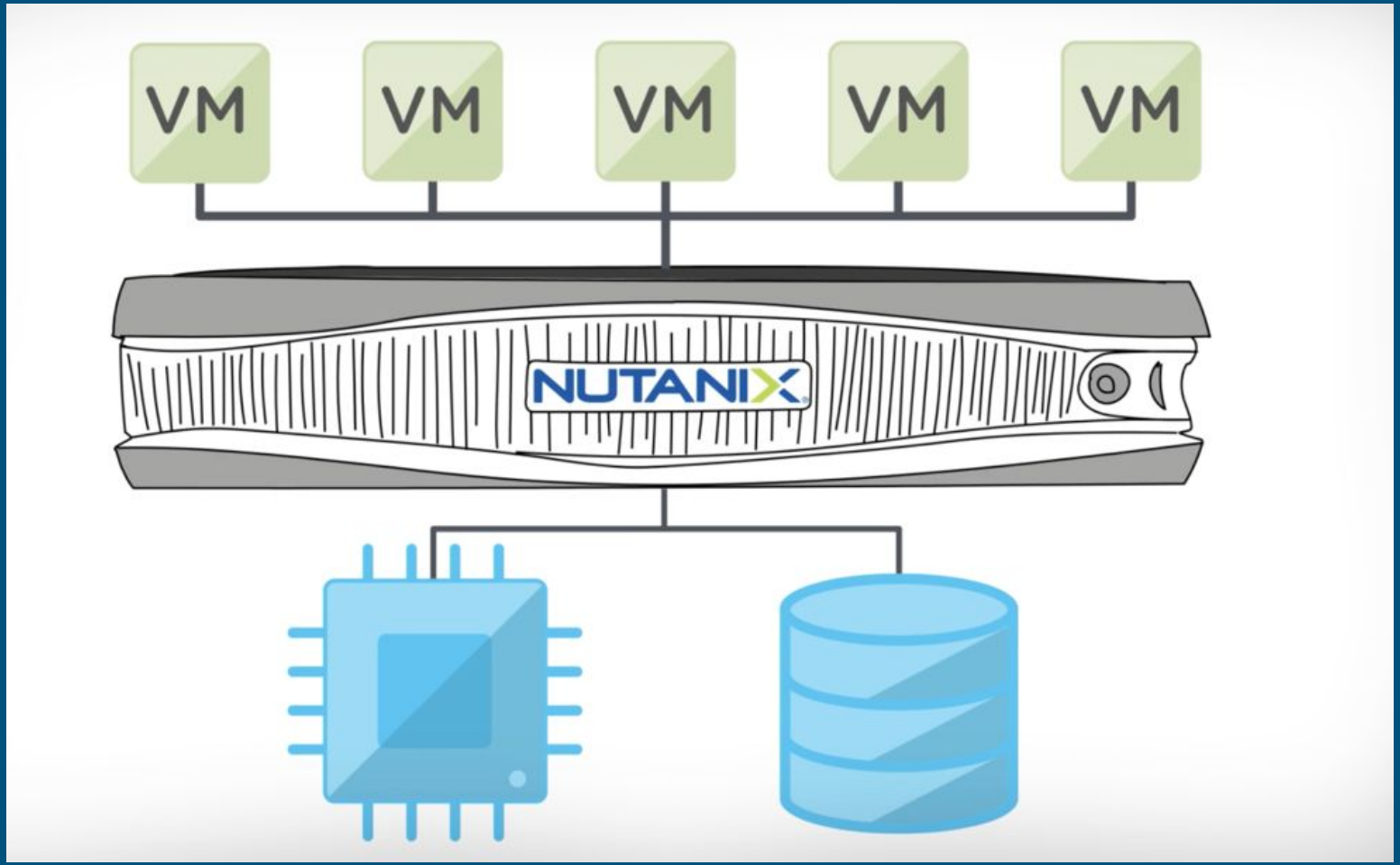
- Compute Nodes
- Storage Arrays
- Network Switches

- Node
  - Compute
  - Storage
    - HDD
    - SSD



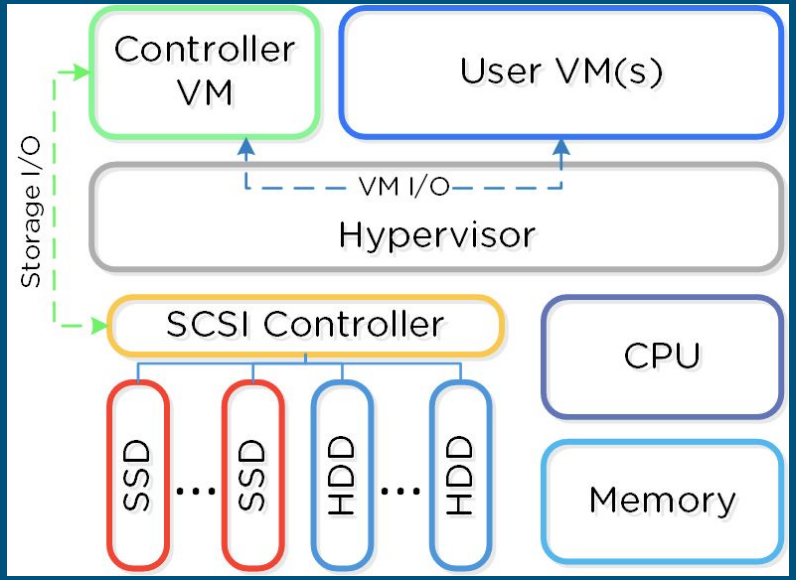
VS.



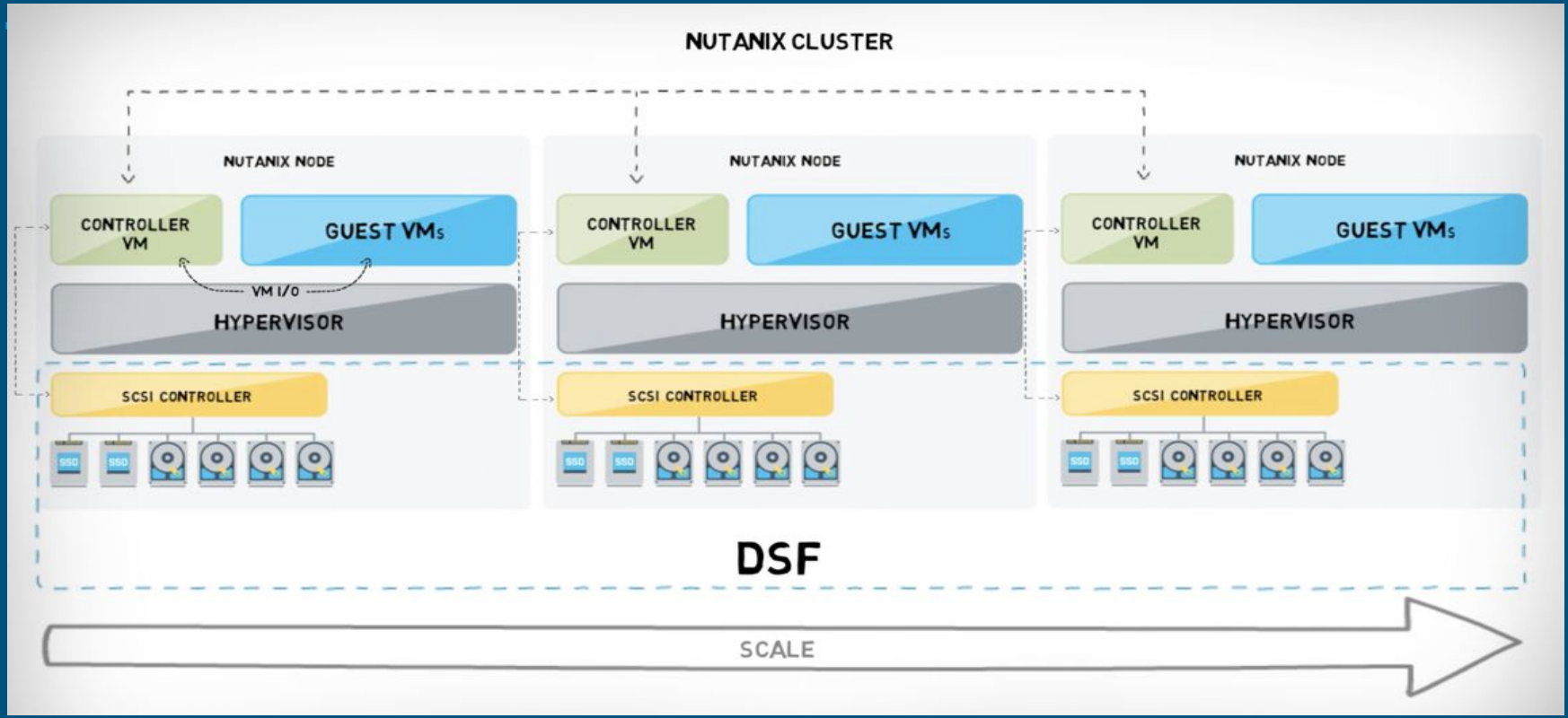

VM
VM
VM
VM
VM
NUTANIX

Nutanix

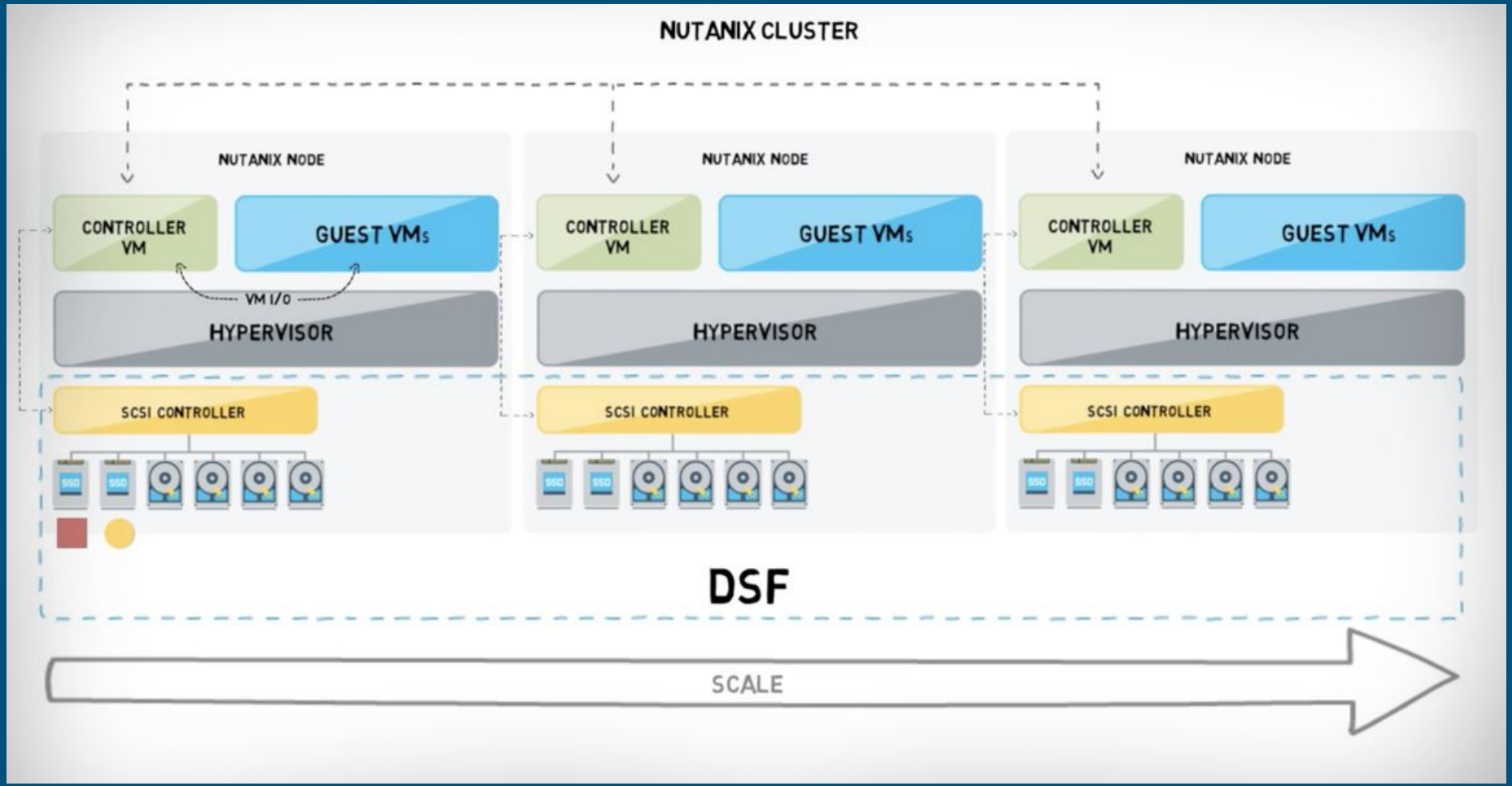
Cluster Architecture



Cluster Architecture (Contd..)



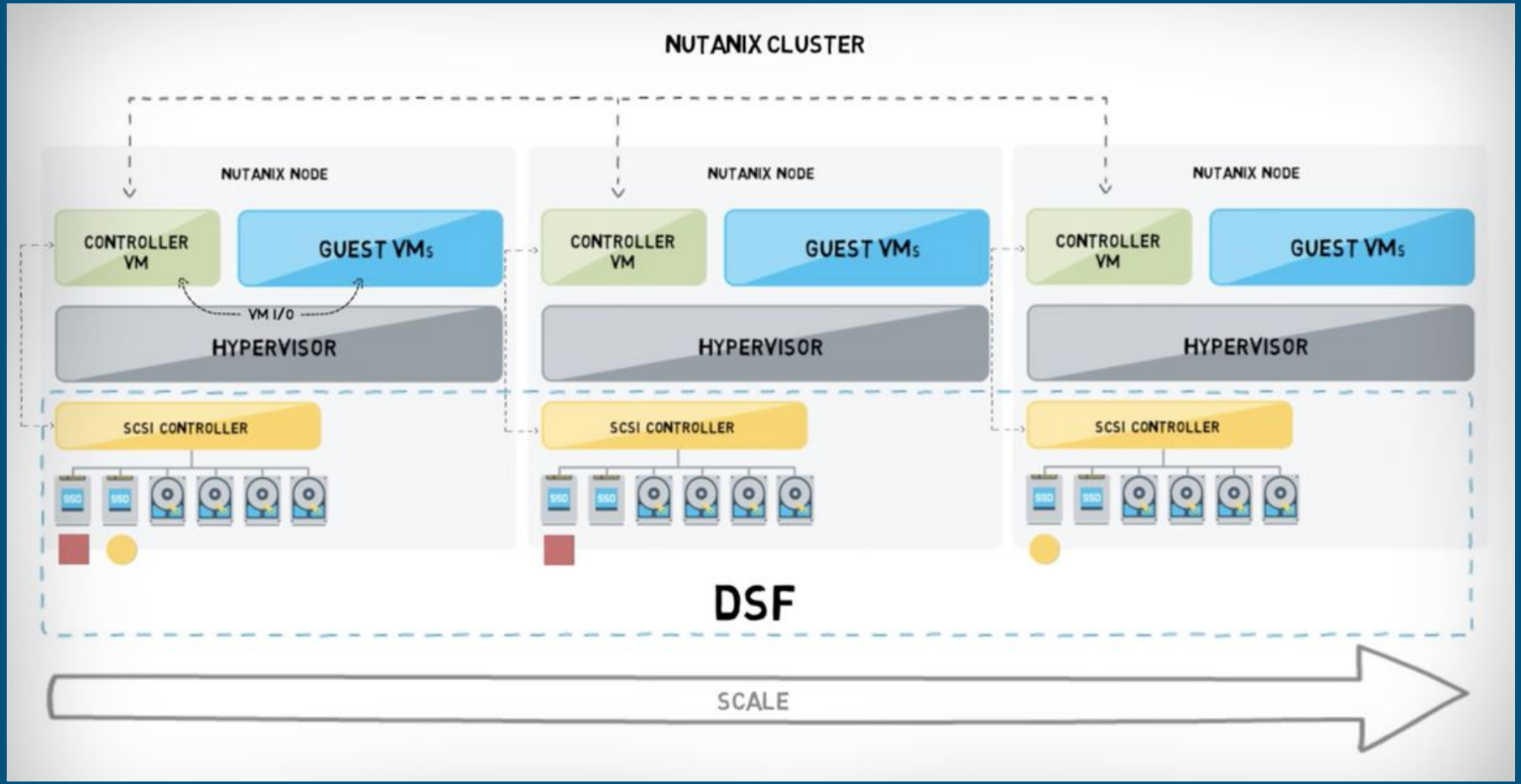
Data Management
&
Features


NUTANIX CLUSTER
NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
NUTANIX NODE
CONTROLLER VM
GUEST VMs
HYPERVISOR
SCSI CONTROLLER
SSD
NUTANIX NODE
CONTROLLER VM
GUEST VMs
HYPERVISOR
SCSI CONTROLLER
SSD
DSF
SCALE

Replication

- Multiple Copies of Data are Stored
- Data Resiliency
- Ensures Protection against Failures

- RF2
  - 2 Copies
  - Can tolerate 1 Node Failure
  - 3 Nodes are needed
- RF3
  - 3 Copies
  - Can tolerate failure up to 2 Nodes
  - 5 Nodes are needed

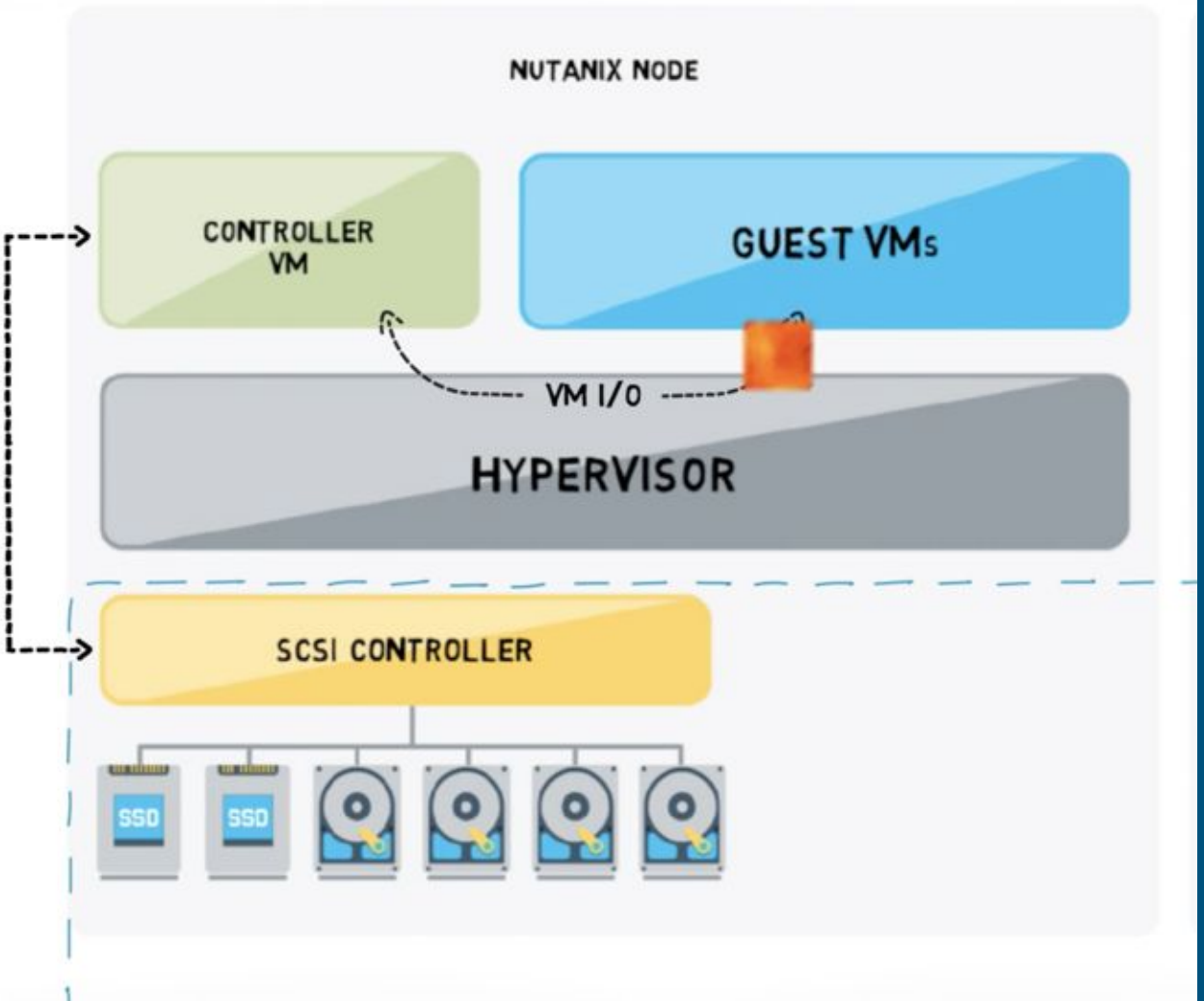

NUTANIX CLUSTER
NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
NUTANIX NODE
CONTROLLER VM
GUEST VMs
HYPERVISOR
SCSI CONTROLLER
SSD
NUTANIX NODE
CONTROLLER VM
GUEST VMs
HYPERVISOR
SCSI CONTROLLER
SSD
DSF
SCALE

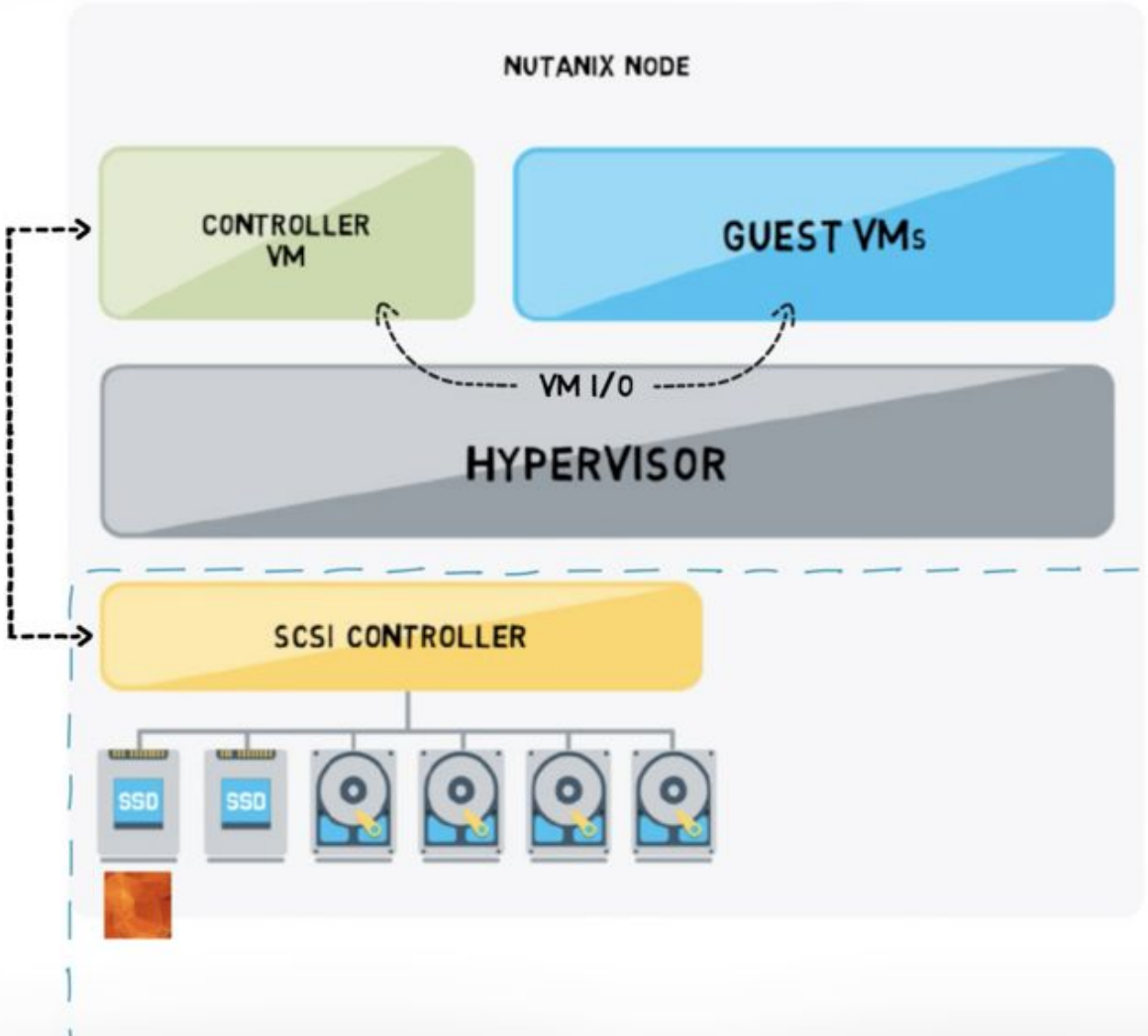
MapReduce Tiering

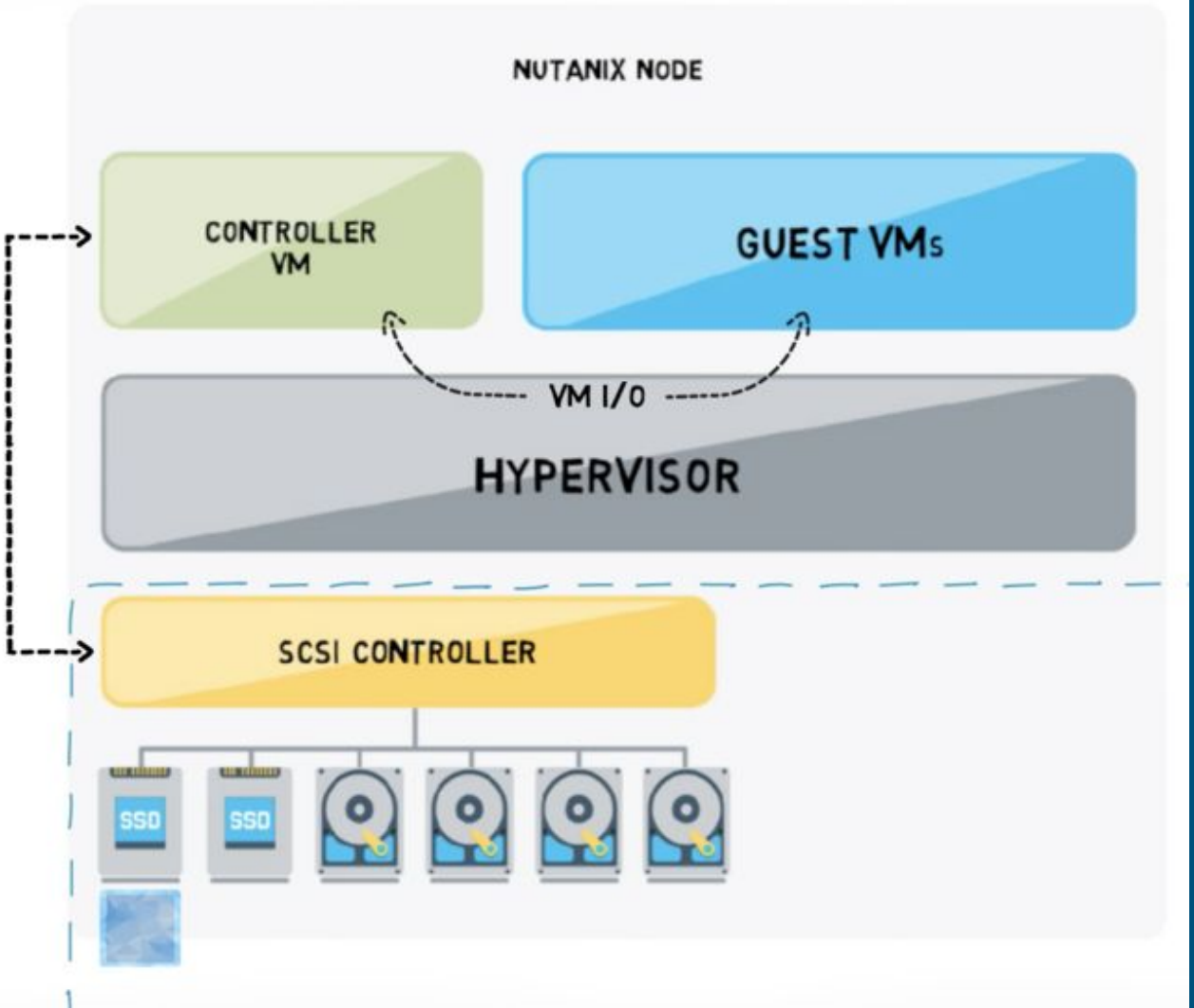
The Nutanix cluster dynamically manages data based on how frequently it is accessed

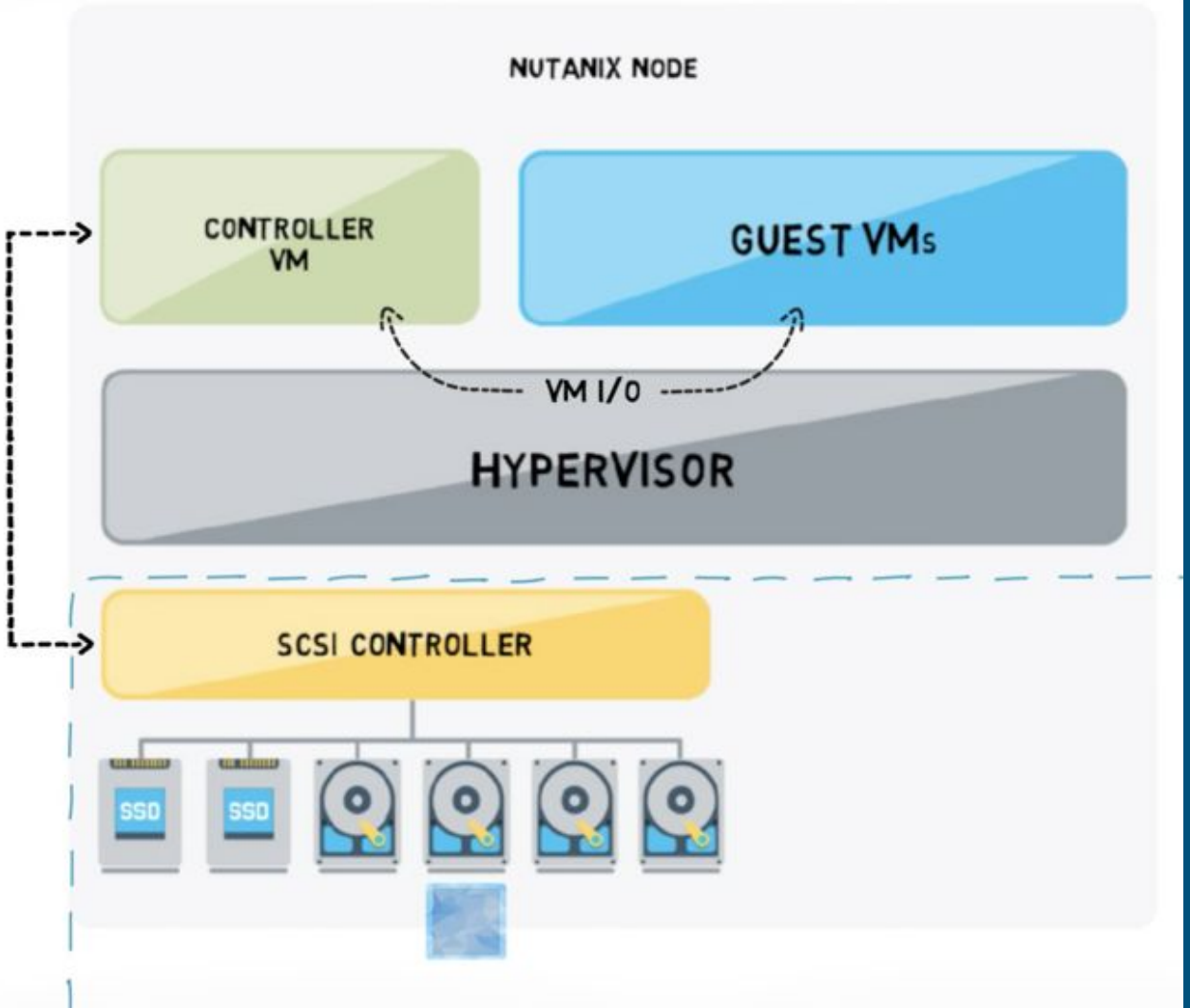
Frequently-accessed, or "hot" data is kept on SSD tier, while "cold" data is migrated to the HDD tier. Data that is accessed frequently is again moved back to the SSD tier.

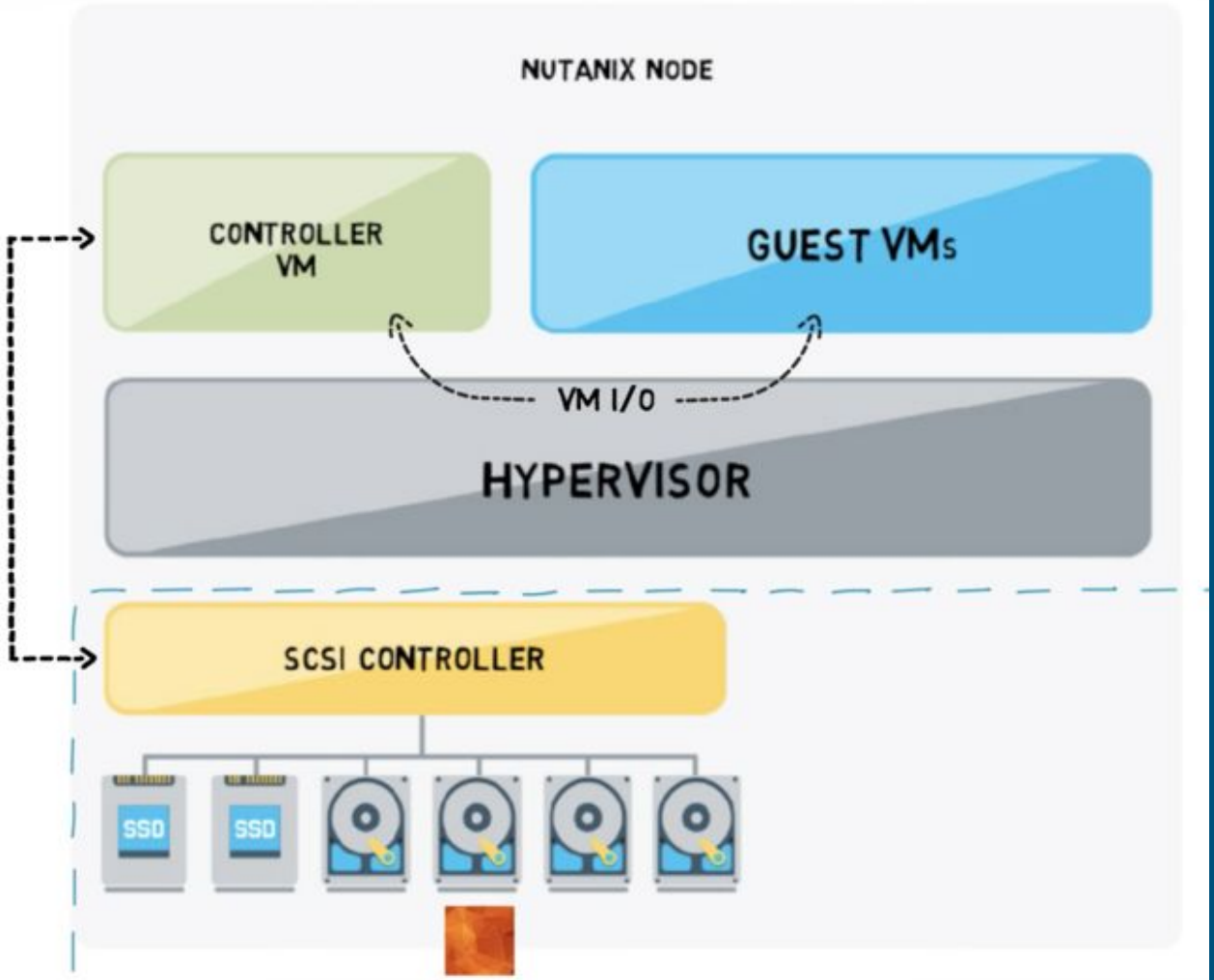
If a guest VM repeatedly accesses a block of data on a remote host, the local controller VM migrates that data to the SSD tier of the local host, reducing Network Latency

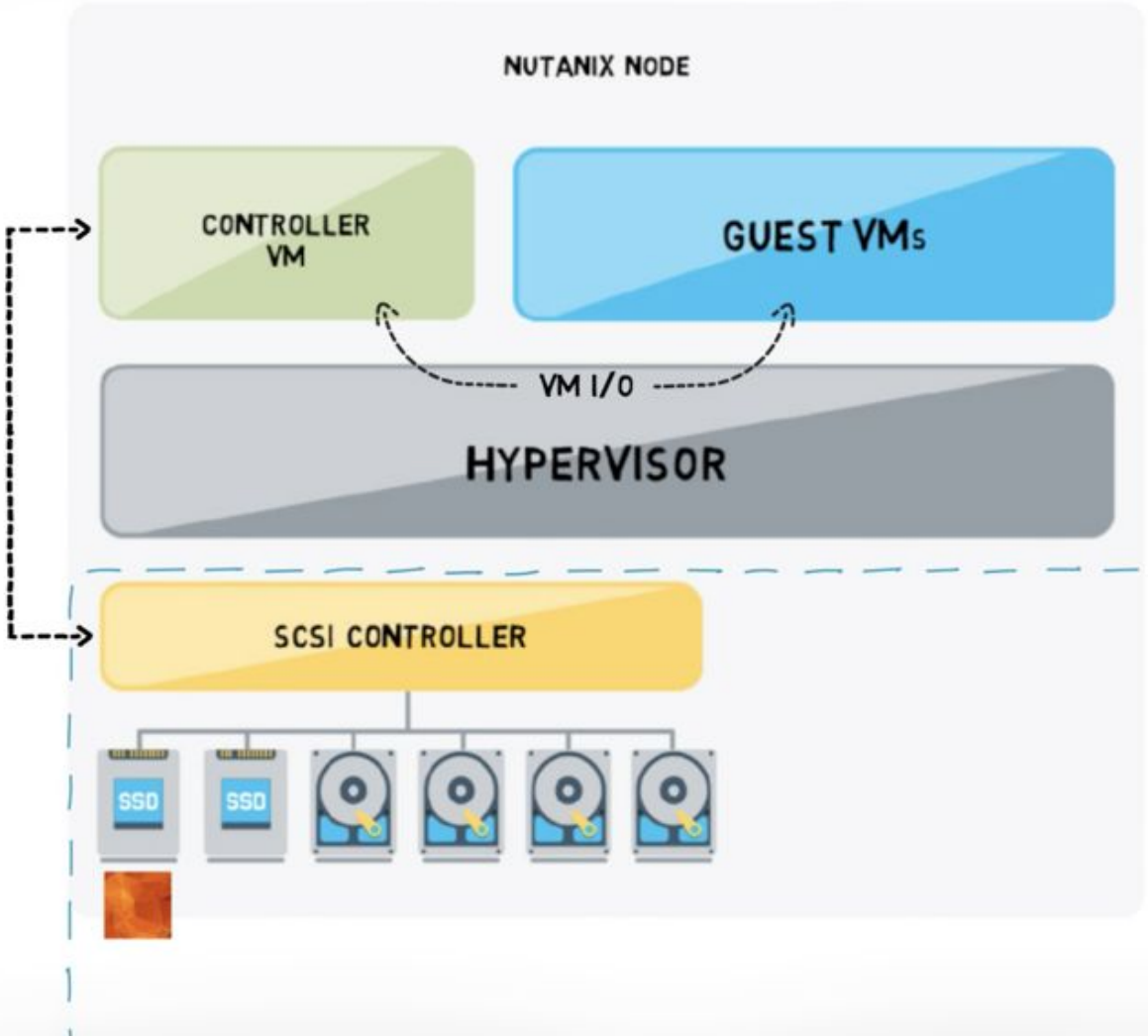

NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
SSD


NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
SSD

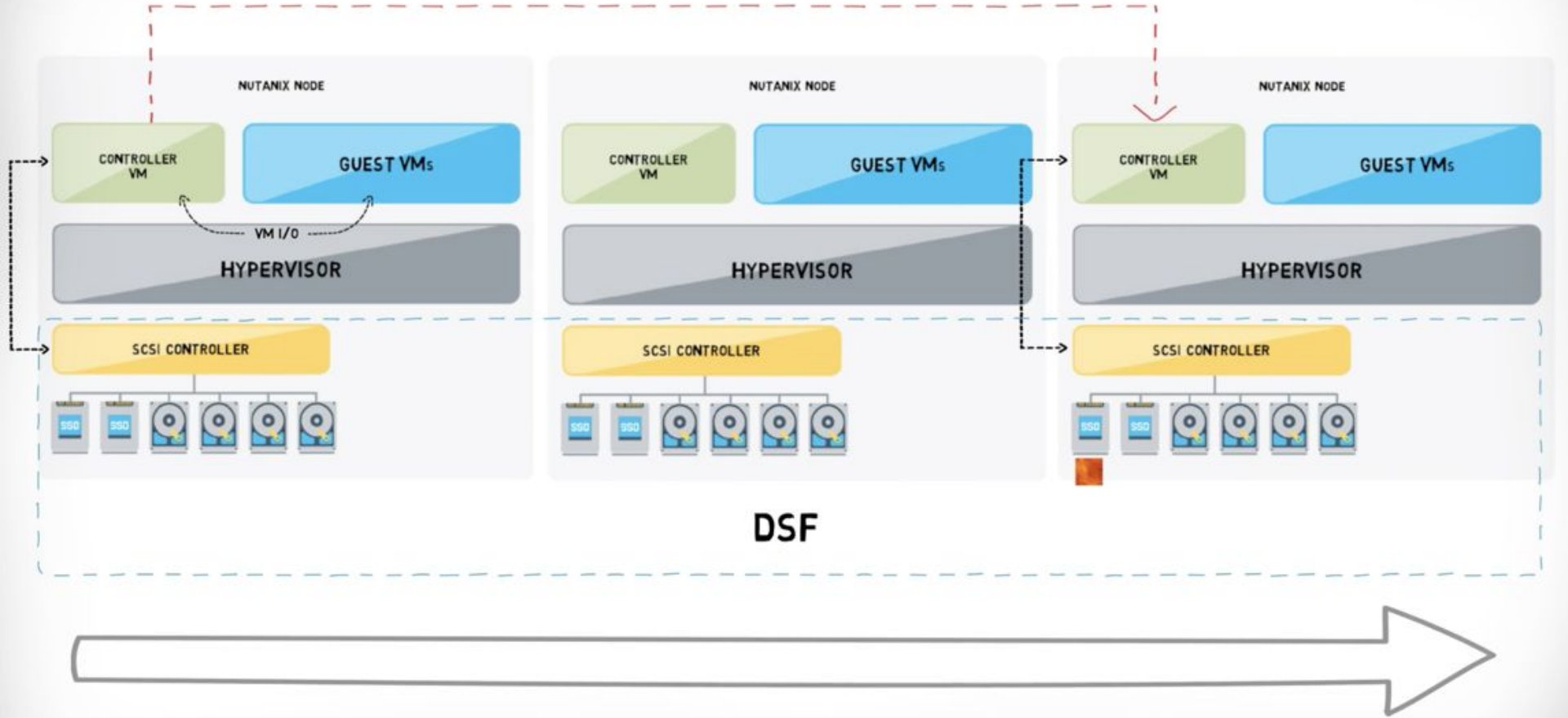

NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
SSD


NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
SSD

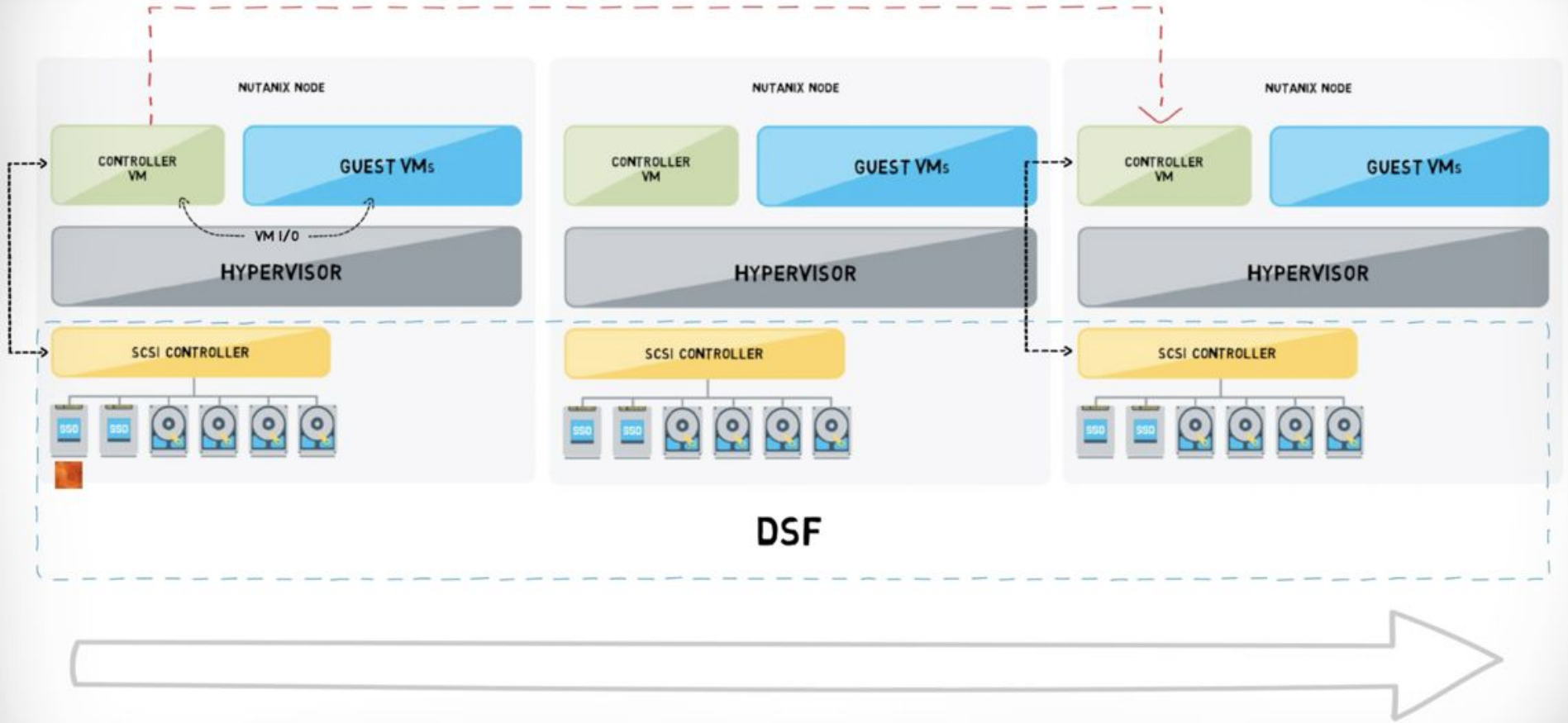

NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
SSD


NUTANIX NODE
CONTROLLER VM
GUEST VMs
VM I/O
HYPERVISOR
SCSI CONTROLLER
SSD
SSD

MAP REDUCE TIERING



MAP REDUCE TIERING



Live Migration

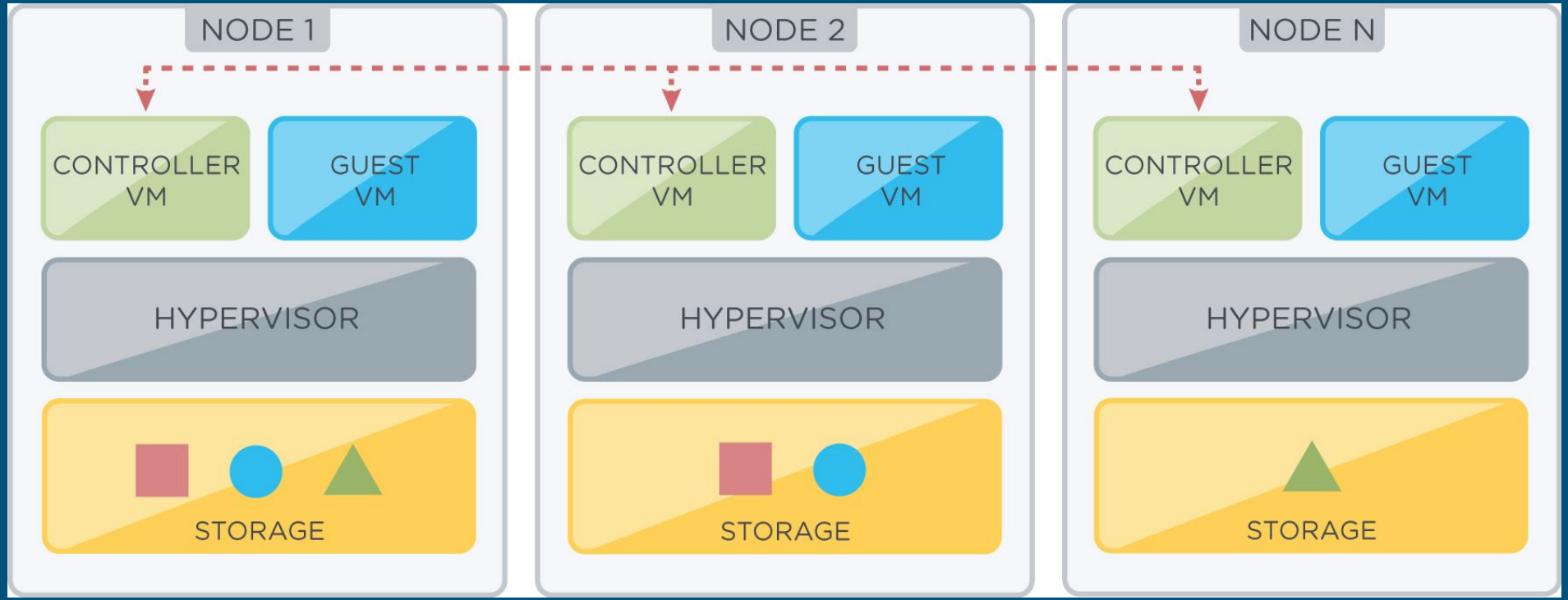
Live Migration of VM’s across Node, whether initiated manually or automatically happens with ZERO downtime

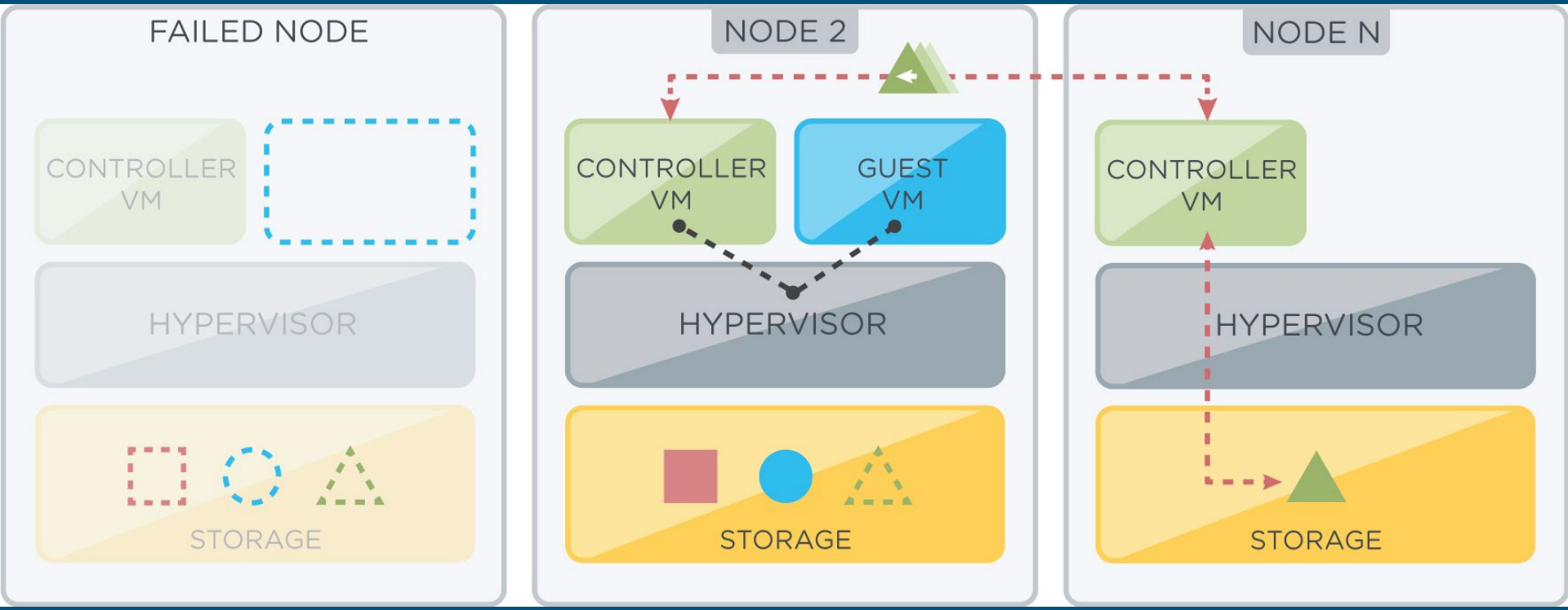
Scenarios when it can occur are

- Load of Node on which VM is running is high and other are free
- Node Failure
- Initiated Manually

High Availability

- Reserves Half Resources
- Each VM takes Double the resources allocated
  - Second VM starts immediately once the Primary one goes down
- ZERO downtime


NODE 1
CONTROLLER VM
GUEST VM
HYPERVISOR
STORAGE
NODE 2
CONTROLLER VM
GUEST VM
HYPERVISOR
STORAGE
NODE N
CONTROLLER VM
GUEST VM
HYPERVISOR
STORAGE


FAILED NODE
CONTROLLER VM
HYPERVISOR
STORAGE
NODE 2
CONTROLLER VM
GUEST VM
HYPERVISOR
STORAGE
NODE N
CONTROLLER VM
HYPERVISOR
STORAGE

Demo

Thanks!!