PowerStore 301 Topics

99.9999% Availability

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2020/6/11

DELL Technologies

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DELL Technologies PowerStore

Designed for the data decade

Data-centric

Design optimizes performance, scalability and efficiency for any workload

Intelligent

Programmable, autonomous infrastructure that optimizes system resources and simplifies management

Adaptable

Flexible architecture, deployment and consumption models provide choice and investment protection

CONTINUOUSLY MODERN & HIGHLY ADAPTABLE ALL-FLASH STORAGE

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PowerStore/T model Networking Overview & Networking Deployment

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PowerStore/T Networking Overview

- PowerStore network means a subset of IP addresses in a single subnet within an L2 broadcast domain.
  - IP address range, network prefix, gateway, VLAN
- Deployment planning document supplied with every PowerStore
- PowerStore/T requires multiple distinct networks to operate
  - **Management Network**
    - (User configuration Required) Cluster management
  - **Storage Network**
    - (User configuration Required) iSCSI Front-end, Remote replication, Import volume to PowerStore, NAS
  - **ICM(Intra-Cluster Management Network)**
    - Internal cluster management traffic. *Not user configurable*
  - **ICD(Intra-Cluster Data Network)**
    - Data mobility in the cluster. *Not user configurable*
  - IDN(Initial Discovery Network)
    - Used during deployment, *Not user configurable*
  - Inter-appliance Node Inter-connect
    - Node-to-node communication via backplane

Bold 4 networks are shown in PowerStore Manager GUI.

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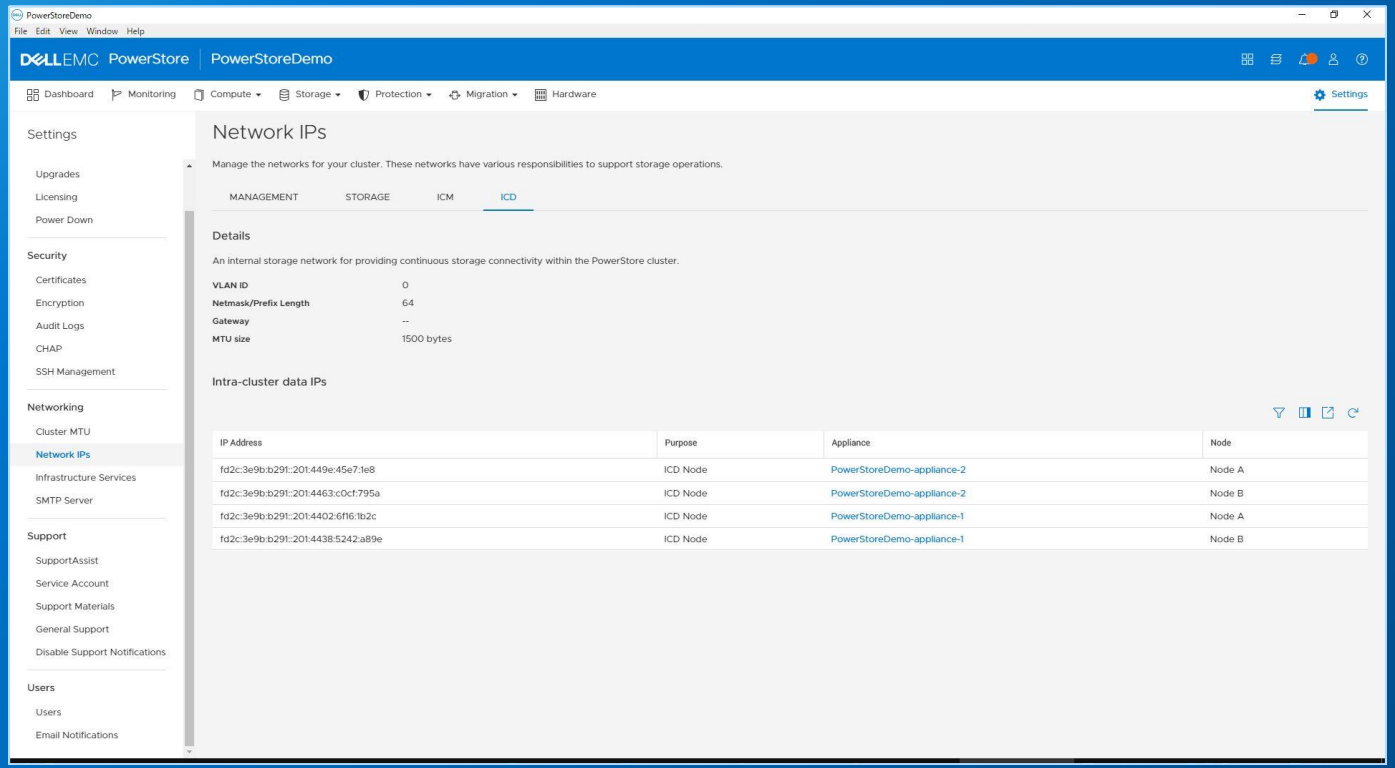
[GUI] PowerStore/T Networking Overview



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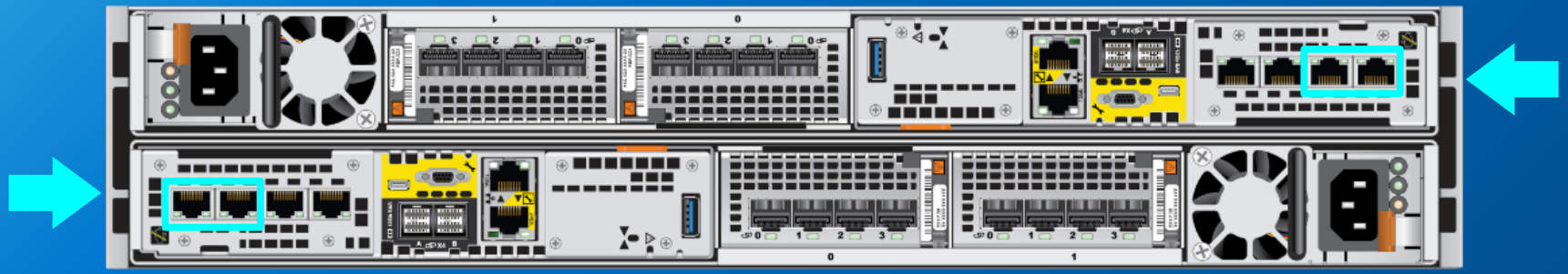
PowerStore/T Networking Overview

System-bond



- PowerStore/T contain a System-bond by default
- Ports 0 and 1 of 4-Port Mezz card are automatically bonded together in LACP mode
- This bond is essential to the networking configuration and CANNOT be removed
- System-bond provides high availability to cluster data and metadata traffic

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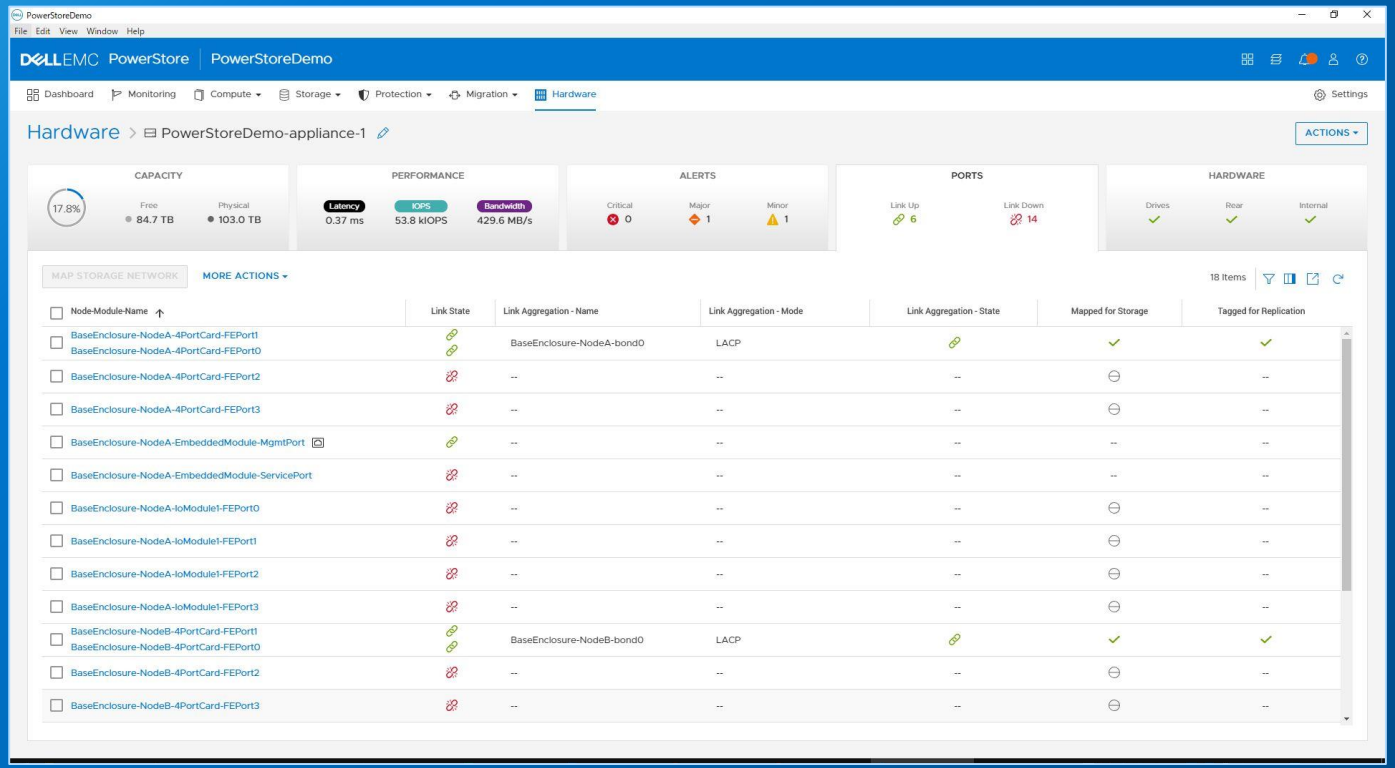
[GUI] System-bond



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PowerStore/T Networking Overview

Network Reconfiguration

- Networking reconfiguration is supported after the Cluster has been configured
  - Management Network
    - Change to IPv4 or IPv6
    - Modify IP addresses, subnet, gateway, VLAN or MTU
    - Nondisruptive operation to I/O
    - No management actions allowed during reconfiguration
- Storage Network
    - Change to IPv4 or IPv6
    - Modify IP addresses, subnet, gateway, VLAN or MTU
    - Disruptive operation to I/O
      - Must stop all I/O prior to reconfiguring
      - Manually reattach external hosts to new target IPs

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PowerStore/T Networking Overview

Storage Network Scaling

- PowerStore/T models support 32Gb/s FC I/O Modules for SAN connectivity
  - Traditional block and vVol storage presented to external hosts over FC
- iSCSI Storage network can be scaled up to support more iSCSI targets
  - Only one storage network is supported
  - Cannot scale to additional VLANs or subnets
- The following components are available for iSCSI port scaling:
  - Ports 2 & 3 of 4-Port Mezz
  - 4-Port I/O Modules
- No additional link aggregation can be configured
  - System-bond cannot be expanded

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PowerStore/T Networking Overview

Configure Network Switches

- Customers can use 3rd-party switches
  - Reference DELL Technologies eLab for complete list of qualified switches
- When selecting Network switches to deploy with PowerStore/T
- Use Non-blocking network switches
- Use enterprise grade network switches
- Utilize a minimum of 10GbE interfaces

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PowerStore/T Networking Deployment

Network Switches - OOB Management

- PowerStore T model deployments require OOB(Out-of-Band) Management switch connectivity
  - 1x OOB Management switch is required
  - 2x OOB Management switch is supported for High Availability
  - The document and this presentation outline 1x OOB Management
- OOB Management switch can be configured with or without a management VLAN
  - Switch ports must support untagged native VLAN traffic for system discovery
- Reference DELL Technologies eLab for complete list of qualified switches

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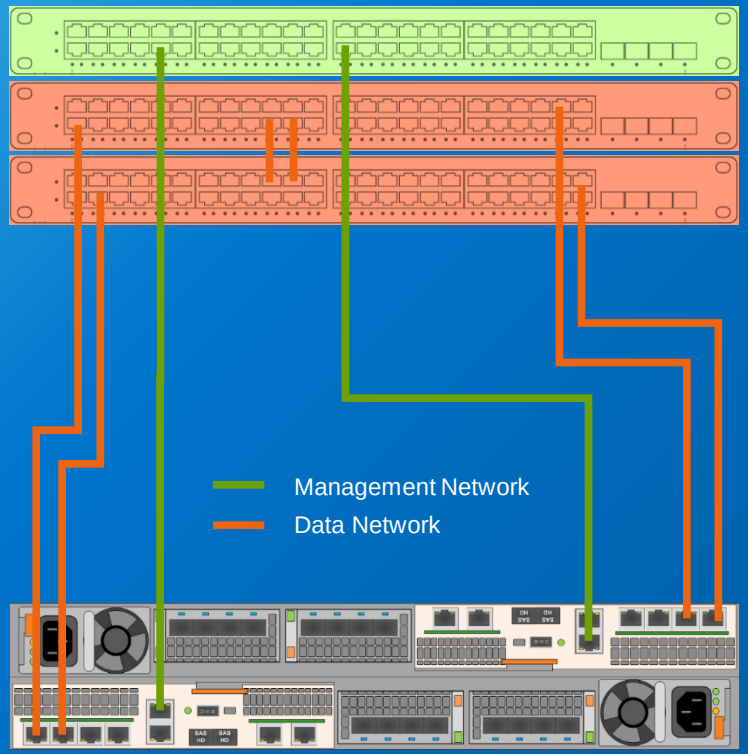
PowerStore/T Networking Deployment
Network Cabling



- Management Network
  - 1x OOB Management network switch
    - 2x OOB Management network switches are supported for High Availability
  - Onboard 1GbE Ports(RJ45)
- Data Network
  - 2x ToR(Top-of-Rack) Network Switches
  - Bonded 4-Port Mezz Ports 0 & 1
  - Layer 2 inter-connect
- Diagram depicts minimal required cabling
  - PowerStore Cluster will alert on Not having dual redundant network switches

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PowerStore/T Networking Deployment

Configure Network Switches - Topology

- *Recommended Configuration-* VLTi(Virtual Link Trunking inter-connect)
  - OR 3rd-party OR 3rd-party equivalent capability
  - Creates a single logical switch out of two physical network switches
  - Automatic configuration of VLANs on VLTi interface
  - Synchronized MAC tables support faster failover
  - Supports link aggregation across 2 physical network switches
    - Best practice is to configure LACP on network switch side to support the PowerStore/T System-bond
    - Provides full bandwidth potential across System-bond
- (Alternative Options) LACP(Dynamic LAG) or Static LAG or reliable L2 Uplinks
  - Provides connectivity between 2 physical network switches
  - Static LAG/L2 Uplinks: System-bond will be degraded
    - System-bond ports presented in active/passive states
    - Bandwidth potential limited to 50% on System-bond
    - However High Availability remains

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PowerStore/X model Networking Overview & Networking Deployment

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PowerStore/X Networking Overview

- PowerStore network means a subset of IP addresses in a single subnet within an L2 broadcast domain.
  - IP address range, network prefix, gateway, VLAN
- Deployment planning document supplied with every PowerStore
- PowerStore/X requires multiple distinct networks to operate
  - **Management Network**
    - (User configuration Required) Cluster management
  - **Storage Network**
    - (User configuration Required) iSCSI Front-end, Remote replication, Import volume to PowerStore, NAS
  - **vMotion Network**
    - (User configuration Required) vMotion traffic
  - **ICM(Intra-Cluster Management Network)**
    - Internal cluster management traffic. *Not user configurable*
  - **ICD(Intra-Cluster Data Network)**
    - Data mobility in the cluster. *Not user configurable*
  - Inter-appliance Node Inter-connect
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Bold 4 networks are shown in PowerStore Manager GUI.

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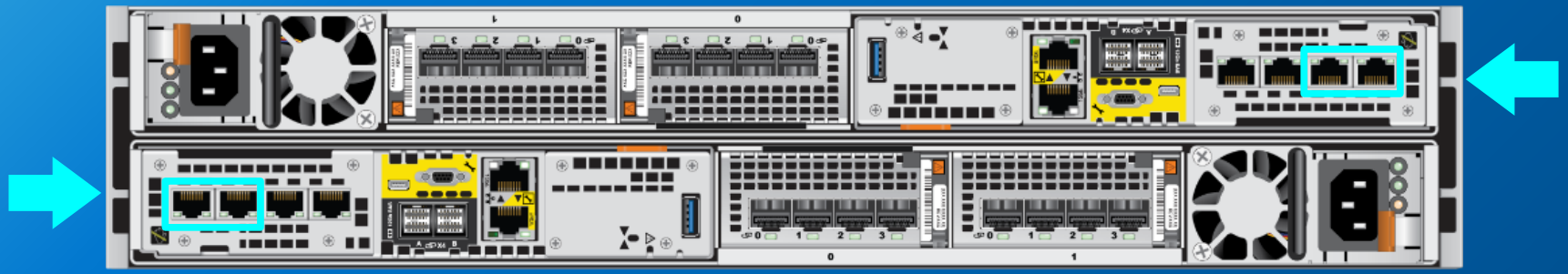
PowerStore/X Networking Overview

Teaming on ESXi



- PowerStore/X implements various port teaming configurations
  - This provides high availability for network traffic
- PowerStore/X requires 4-Port Mezz Ports 0 & 1 cabled at a minimum
  - ESXi networking is configured to support cabling all 4 ports on the 4-Port Mezz
- NO Link Aggregation configuration on the network switch side

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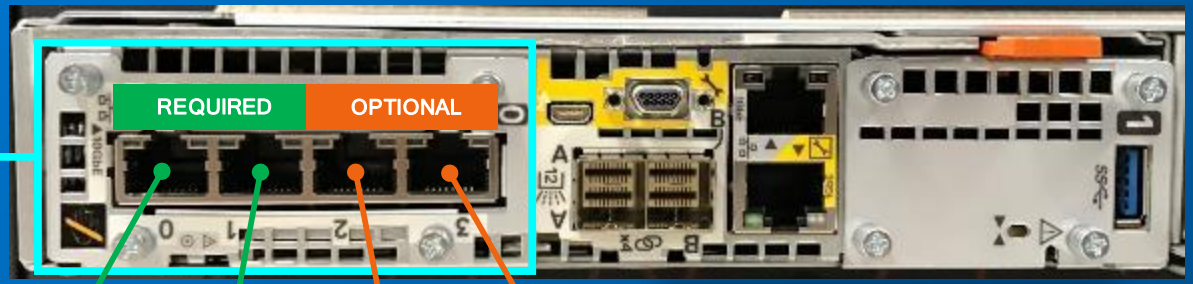
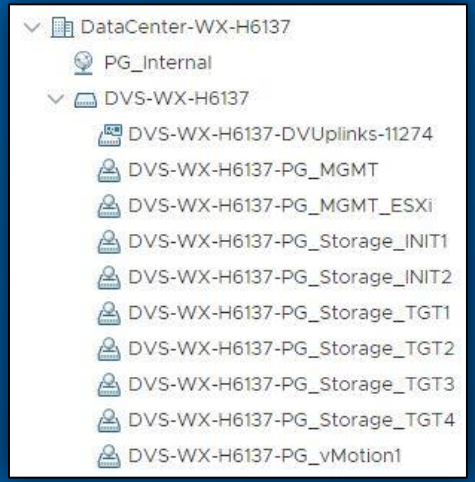
PowerStore/X Networking Overview

Port Mapping Between ESXi and PowerStore/X

4-Port Mezz(1 per Node)
25GBASE-SR
10GBASE-SR OR
10GBASE-T



ESXi DVS Port Group	PowerStore/X Network	Uplink 1	Uplink 2	Uplink 3	Uplink 4
DVS-DVS-PG_MGMT	Management, Initial Discovery Network	Active	Active	Standby	Standby
DVS-PG_MGMT_ESXi	Management	Active	Active	Standby	Standby
DVS-PG_Storage_INIT1	Storage	Active	Unused	Unused	Unused
DVS-PG_Storage_INIT2	Storage	Unused	Active	Unused	Unused
DVS-PG_Storage_TGT1	Storage	Active	Standby	Standby	Standby
DVS-PG_Storage_TGT2	Storage	Standby	Active	Standby	Standby
DVS-PG_Storage_TGT3	Storage	Standby	Standby	Active	Standby
DVS-PG_Storage_TGT4	Storage	Standby	Standby	Standby	Active
DVS-PG_vMotion1	vMotion	Standby	Standby	Active	Standby



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PowerStore/X Networking Overview

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    - No management actions allowed during reconfiguration
  - Storage Network
    - Change to IPv4 or IPv6
    - Modify IP addresses, subnet, gateway, VLAN or MTU
    - Disruptive operation to I/O
      - Must stop all I/O prior to reconfiguring
      - Manually reattach external hosts to new target Ips
  - vMotion Network
    - Modify IP addresses, subnet, gateway, VLAN or MTU
    - No vMotion sessions allowed during reconfiguration
- Tenant networks can be added to the DVS and modified as needed through vSphere

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PowerStore/X Networking Overview

Storage Network Scaling

- PowerStore/X do not support additional 10/25GbE I/O Modules
- PowerStore/X support 32Gb/s FC I/O Modules for SAN connectivity
  - Traditional block and vVol storage presented to external hosts over FC
- iSCSI Storage network can be scaled up to support more iSCSI targets
  - Only one storage network is supported
  - Cannot scale to additional VLANs or subnets
- The following components are available for iSCSI port scaling
  - Remaining 2 ports(Port 2 & 3) of 4-Port Mezz
- NO additional Link Aggregation can be configured

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PowerStore/X Networking Deployment

Configure Network Switches

- Customers can use 3rd-party switches
  - Reference DELL Technologies eLab for complete list of qualified switches
- When selecting Network switches to deploy with PowerStore/X
- Use Non-blocking network switches
- Use enterprise grade network switches
- Utilize a minimum of 10GbE interfaces

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PowerStore/X Networking Deployment

Network Switches - Management

- PowerStore/X deployments do not use an OOB(Out-of-Band) Management switch
- Management is in-band on 4-Port Mezz Port 0 & 1
- This ensures high availability for management traffic to vCenter
- Switch ports must support untagged native VLAN traffic for system discovery

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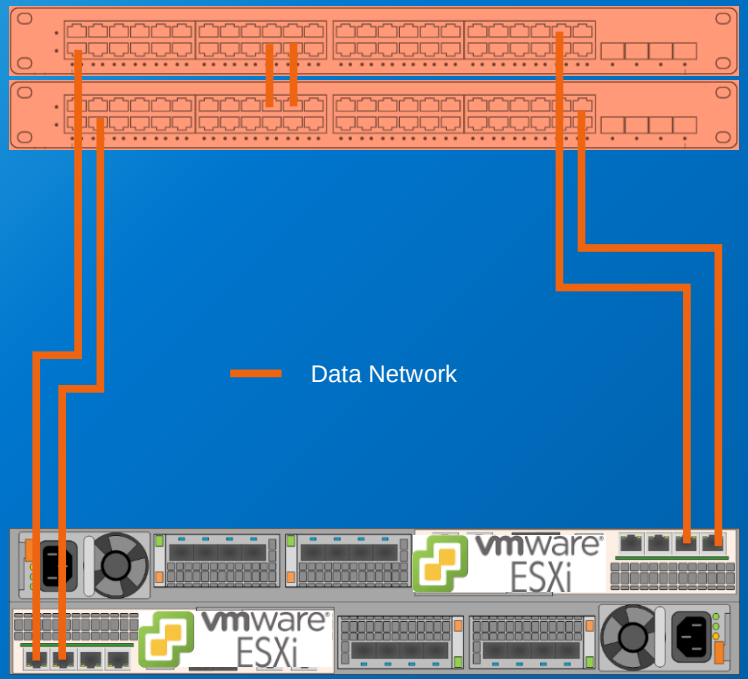
PowerStore/X Networking Deployment

Network Cabling



- Data Network
  - 2x ToR(Top-of-Rack) Network Switches
  - Bonded 4-Port Mezz Ports 0 & 1
  - L2 inter-connect
- Diagram depicts minimal required cabling
- PowerStore Cluster will alert on Not having dual redundant network switches

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PowerStore
HIGH AVAILABILITY

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PowerStore Cluster HA

Master Appliance

- Each Cluster contains a Master appliance that runs all Control-Path services
- Master appliance specific services include
  - Global Management IP address
  - Primary Management DB
  - Cluster High Availability(Pacemaker)
- All other appliances are standby appliances from master Control-Path perspective
  - They run a subset of control path services to manage themselves and communicate with master
  - These appliances still serve I/O, only standby in regard to Master appliance specific services
- Master appliance specific services will failover to standby appliance if needed
  - Effectively creating new Master appliance

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PowerStore Cluster HA

Cluster Quorum

- A quorum is defined a N/2+1 appliances being in active communication
- With only 2 appliances, any appliance failure or network failure results in loss of quorum
  - A service procedure exists to restore system management, in case of extended appliance outage
    - Non-destructively detaches (and then reattaches) failed appliance from cluster to restore quorum
- With 3 appliances, a single appliance failure or single network partition can be tolerated
  - Quorate partition continues to provide cluster management

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PowerStore Cluster HA

Cluster Quorum – When Quorum is Lost…

- Management operations are blocked until quorum is restored
  - This ensures cluster data integrity and solves for split-brain issues
- IO will not be shut down, IO is handled by Platform/Appliance HA at Appliance-level
  - IO will continue to run if possible
- Snapshots and Replication will be shutdown
  - Scheduled snapshots will be paused on all Appliances in the cluster
  - Replication will be paused on all Appliances in the cluster

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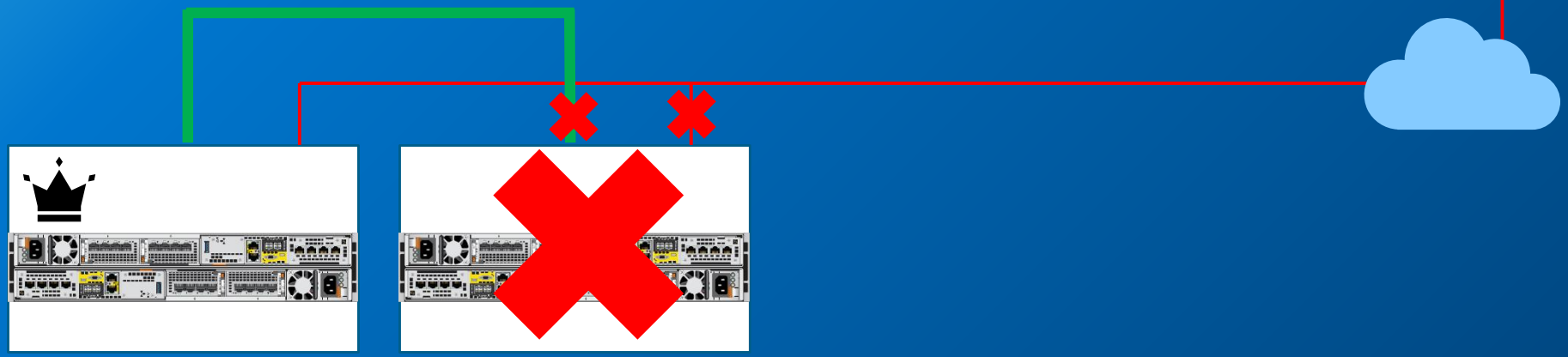
PowerStore Cluster HA

Cluster Quorum - 2 Appliances…

- Appliance 2 fails
- Quorum is lost!
- Management operations blocked
- Appliance 1 continues to serve IO



Appliance 1

Appliance 2

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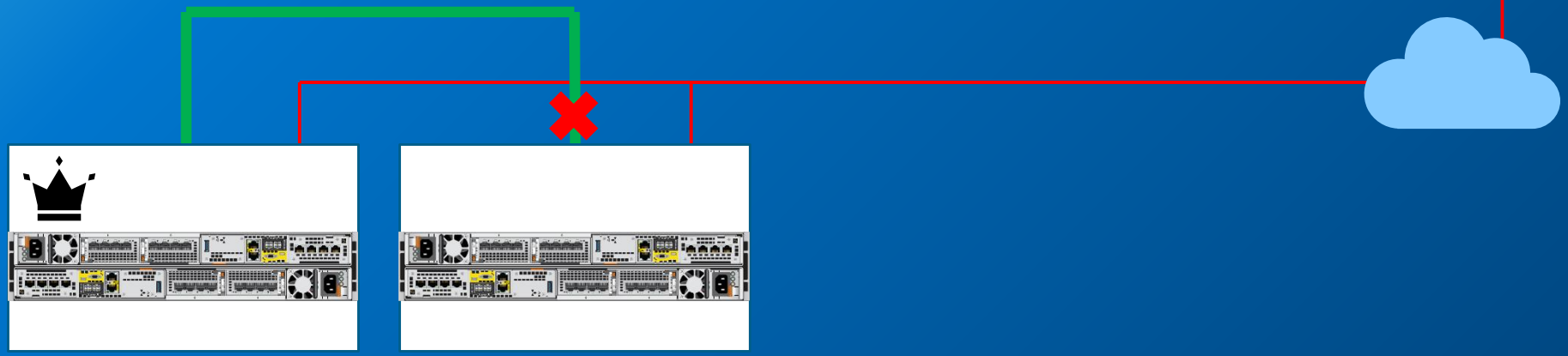
PowerStore Cluster HA

Cluster Quorum - 2 Appliances…

- Appliance 2 is isolated
- Quorum is lost!
- Management operations blocked
- Appliance 1 & 2 continue to serve IO



Appliance 1

Appliance 2

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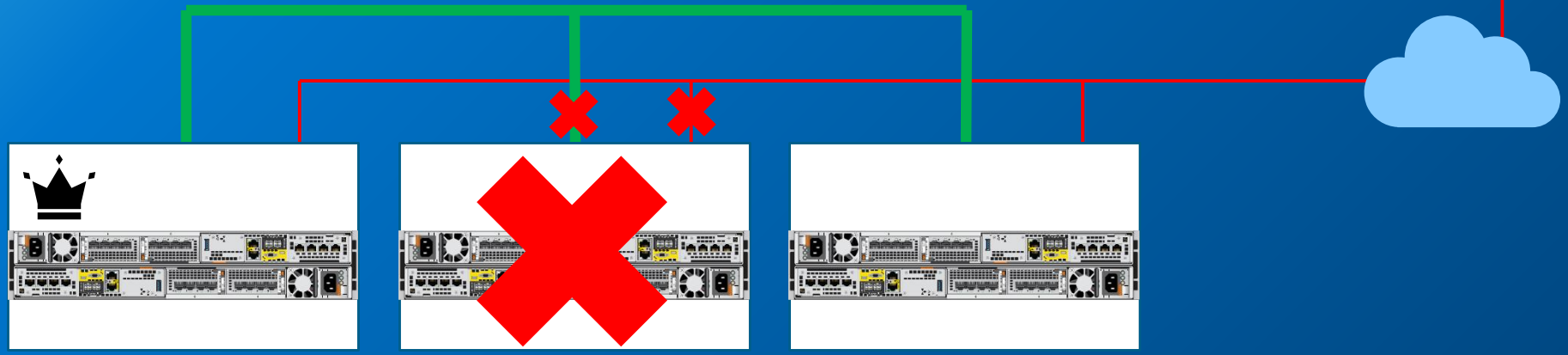
PowerStore Cluster HA

Cluster Quorum - 3 Appliances…

ICM/ICD (Mezz)
Host Connectivity (IO Modules)

- Appliance 2 fails
- Quorum remains
- Management operations continue
- Appliance 1 & 3 continue to serve IO



Appliance 1 Appliance 2 Appliance 3

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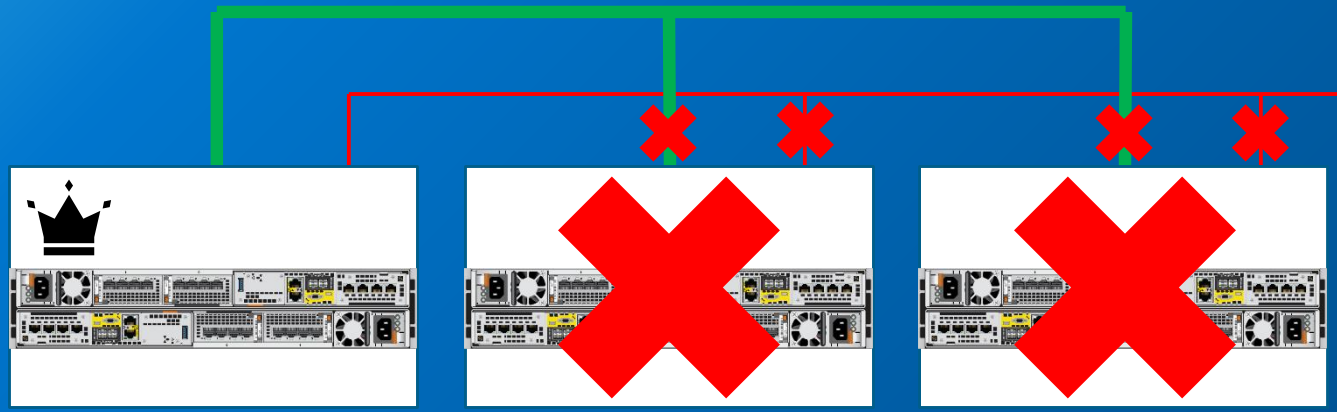
PowerStore Cluster HA

Cluster Quorum - 3 Appliances…

ICM/ICD (Mezz)
Host Connectivity (IO Modules)

- Appliance 2 & 3 fail
- Quorum is lost!
- Management operations blocked
- Appliance 1 continues to serve IO



Appliance 1 Appliance 2 Appliance 3

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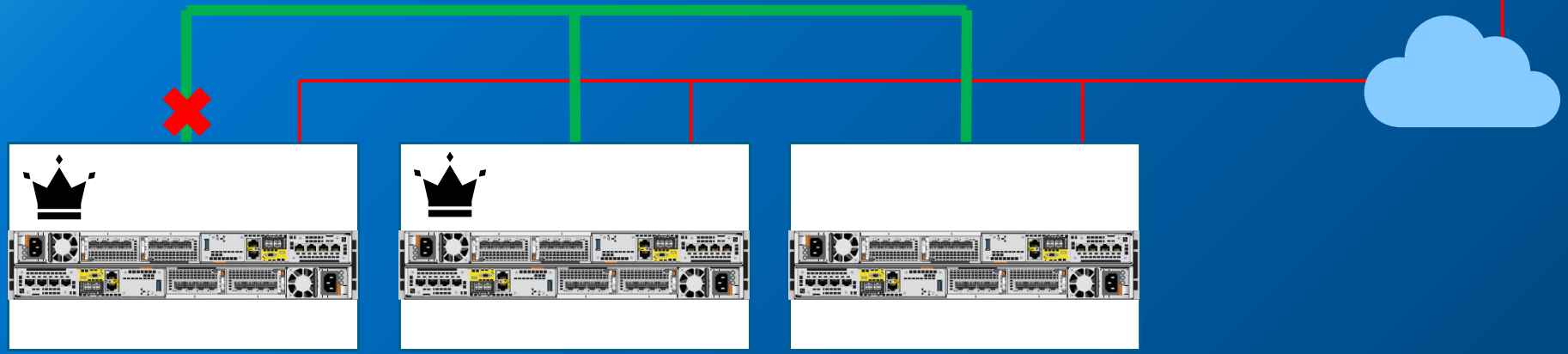
PowerStore Cluster HA

Cluster Quorum - 3 Appliances…

ICM/ICD (Mezz)
Host Connectivity (IO Modules)

- Appliance 1 is isolated
- Quorum remains

- Management operations continue
- Appliance 2 promoted to Master
- All appliances continue to serve IO



Appliance 1 Appliance 2 Appliance 3

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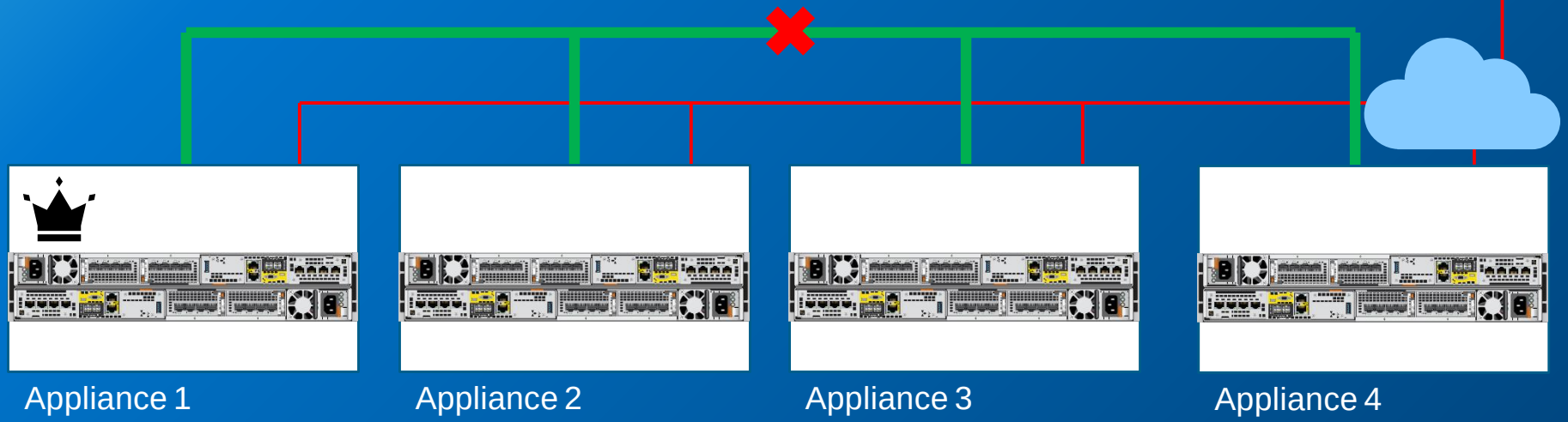
PowerStore Cluster HA

Cluster Quorum - 4 Appliances…

- Appliance 3 & 4 isolated
- Quorum remains

- Management operations continue
  - Appliance 1 & 2 only
- All appliances continues to serve IO



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Question & Answer

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