
TOMORROW starts here.
cisco
Cisco live!

CCIE Data Centre

BRKCRT-8003

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CCIE Data Centre Exam Program Manager

CCIE Data Centre & Routing and Switching # 28081

Cisco live!

Session Abstract

- The session introduces the new CCIE Data Centre expert certification. The objective of the session is to give an overview of the program including written and lab exam details in addition to guidelines on preparation and resources, exam tips and other test taking strategies. The session will provide a understanding of the technologies covered in both the written and the lab exam. We will discuss UCS, Nexus 1k, Fabricpath, Storage Networking FCoE and how these and other networking skills will be required for the exam and your career path.

Disclaimer

- Not all topics discussed today appear on every exam
- For time reasons, we are unable to discuss every feature and topic possible on the exam
- Exam is subject to change at any time

Agenda

Section 1	**CCIE Program Overview**
Section 2	**CCIE Data Centre Overview – Written Exam**
Section 3	**CCIE Data Centre Overview – Lab Exam**
Section 4	**CCIE DC Topic 1 – Cisco DC Infrastructure (NXOS)**
Section 5	**CCIE DC Topic 2 – Storage Networking**
Section 6	**CCIE DC Topic 3 – Unified Computing**
Section 7	**CCIE DC Topic 4 – Virtualisation**
Section 8	**Preparation & Study**

Cisco Certified Internetwork Export (CCIE)

Program Overview

CCIE Data Centre Overview

- Data Centre is one of the most dynamic areas in the industry
- Data Centre is on top agenda to all organisations
- There is an ever-growing demand for Data Centre professionals in the industry

Cisco Certifications

learningnetwork.cisco.com

CCIEs Worldwide

- Most highly respected IT certification
  - for more than 20+ years!
- Industry standard
  - validating expert skills and experience
- Demonstrate strong commitment and investment to networking career, life-long learning, and dedication to remaining an active CCIE

CCIE and CCDE Tracks

Routing & Switching

- Expert level knowledge of networking across LAN and WAN interfaces and variety of routers and switches
- Solve complex connectivity problems to increase bandwidth, improve response times, maximize performance, and support global operations

Security

- Expert level knowledge of security and VPN solutions
- Demonstrate in-depth understanding of Layer 2 and 3 network infrastructure; Solid understanding of Windows, Unix, Linux and HTTP, SMTP, FTP and DNS

Voice

- Expert level knowledge of Cisco Voice over IP (VoIP) products and solutions
- Capable of building and configuring complex end-to-end telephony network, troubleshooting and resolving VoIP-related problems

Design

- Expert level knowledge of network design principles for the Layer 2 and 3 network infrastructure
- Capable of assessing and translating network business requirements into technical designs

Data Centre

- Expert level knowledge of Data Centre Technologies, including DC infrastructure, storage, compute and virtualisation
- Capable of building, configuring, and troubleshooting an end-to-end virtualised Data Centre using Cisco DC technologies

Service Provider

- Expert level knowledge of IP fundamentals and technologies Expertise in building an extensible service provider network
- Expert level knowledge to troubleshoot and maintain complex service provider networks

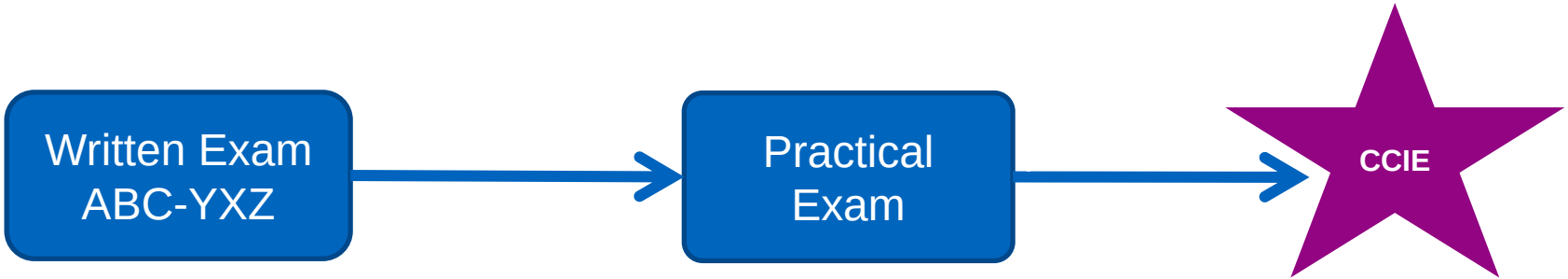
SP Operations

- Expert level knowledge of SP IP NGN technologies
- Capable of troubleshooting SP networks, managing SP processes (incident, fault, change, configuration, and performance), and knowledge of NMS technology

Wireless

- Expert level knowledge of WLAN technologies
- Provides next step for individuals interested in a career in managing or working with Cisco wireless technologies

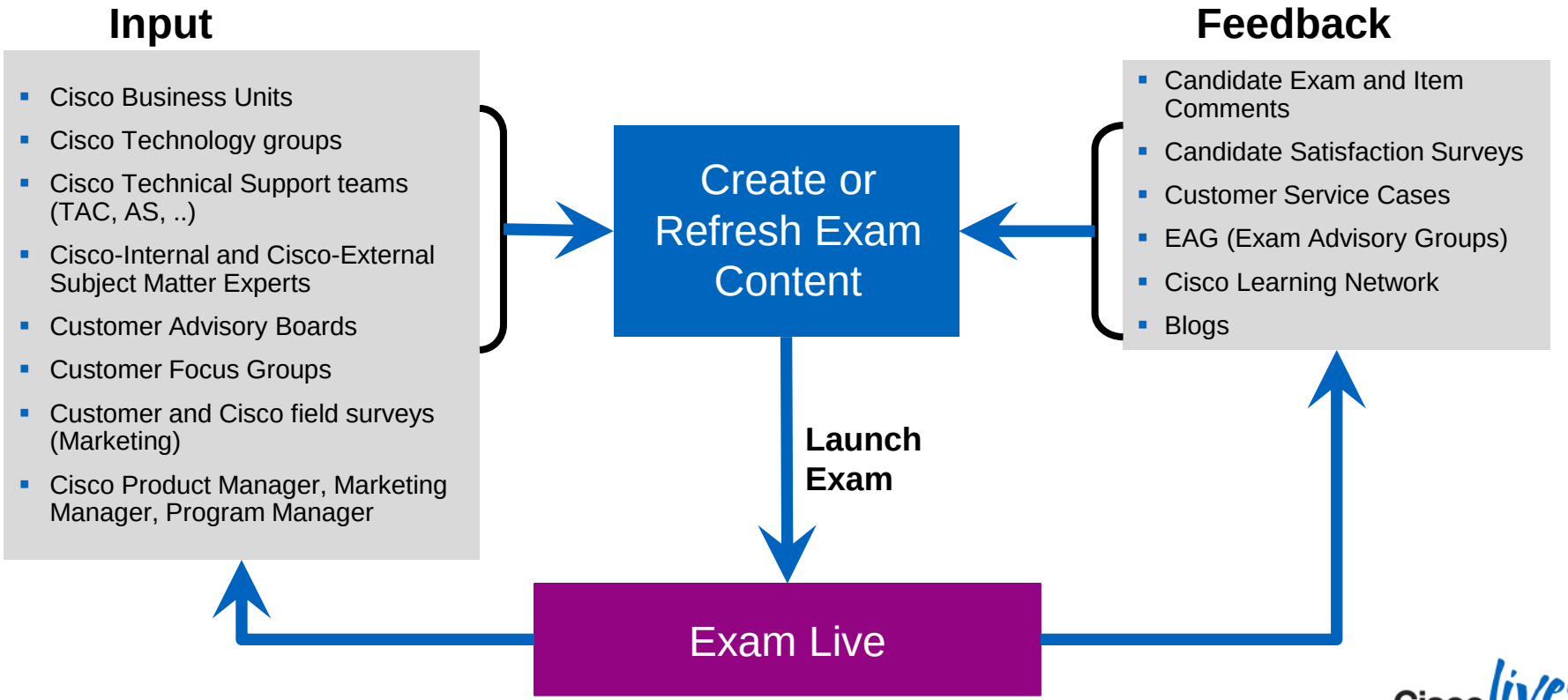
Certification Process



- Pearson
- 2 hours
- Multiple choices
- Flash items
- No documentation
- Immediately scored

- Select Cisco locations
- 8 hours
- Configurations
- Troubleshooting
- Cisco documentation
- Scored within 48h

Proactive and Holistic Candidate Feedback

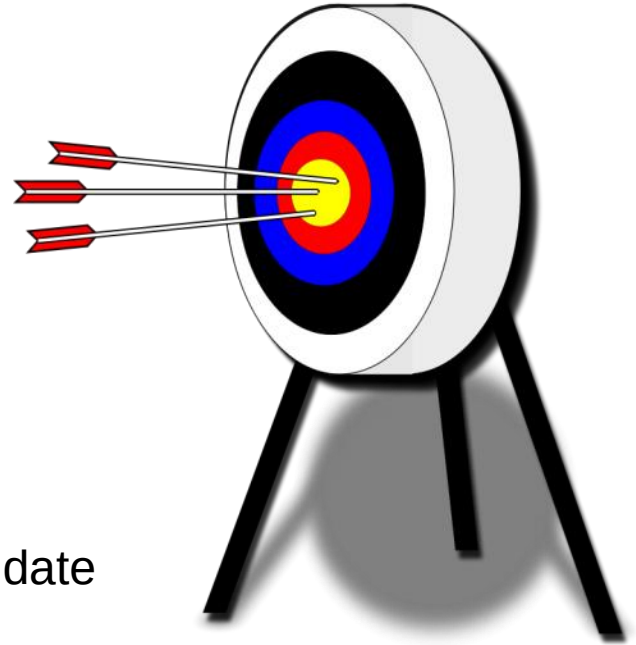


Performance Assessment

- Validity
- Reliability
- Fairness

- Congruency
- Relevancy

- Intended use of the test scores
- Definition of Minimally Qualified Candidate



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CCIE Data Centre

Written Exam Overview

CCIE Data Centre Written Exam (350-080) version 1.0 Curriculum Overview

#	Topic	% in exam
1.0	Cisco Data Centre Architecture	10%
2.0	Cisco Data Centre Infrastructure-Cisco NX-OS	20%
3.0	Cisco Storage Networking	15%
4.0	Cisco Data Centre Virtualisation	20%
5.0	Cisco Unified Computing System	30%
6.0	Cisco Application Networking Services	5%

Full blueprint available on the Cisco Learning Network:
https://learningnetwork.cisco.com/docs/DOC-13984

Step 1: CCIE DC Written Exam: #350-080

- Available worldwide at any Pearson VUE testing facility for ~$350 USD. Costs may vary due to exchange rates and local taxes (VAT, GST)
- Two-hour exam with 90-110 multiple-choice questions usually
- Closed book; no outside reference materials allowed
- Pass/Fail results are available immediately following the exam; the passing score is set by statistical analysis and is subject to periodic change
- Waiting period of five calendar days to retake the exam
- Candidates who pass a CCIE written exam must wait a minimum of six months before taking the same number exam
- From passing written, candidate must take first lab exam attempt within 18 months
- No “skip-question” functionality

Written Exam Objective

- The goal of the DC written exam is to test concepts and theoretical knowledge of Cisco Data Centre Technologies in the blue print
- Awareness of industry standard best practices, standard bodies, policy frameworks, and common RFC/BCP’s
- Lays foundation for Data Centre lab exam

Written Exam: Sample Question 1 MC-SA

Q. **What it is the best description of the FCoE Initiation Protocol FIP function?**

A. It is required to establish the point-to-point FCoE links with the first switch in the path
B. It is required to establish the point-to-point FCoE links with any switch across multiple Ethernet segment
C. It is not used to build the FCoE links
D. It is used to ensure lossless transport

Written Exam: Sample Question 2 MC-MA

Q: **Which of the following server characteristics cannot be configured via the UCS service profile? (select all that apply)**

A. The number of vNICs and vHBAs to present to the OS
B. The server boot order
C. The amount of CPU and memory to present to the OS.
D. The server BIOS settings
E. The operating system to install

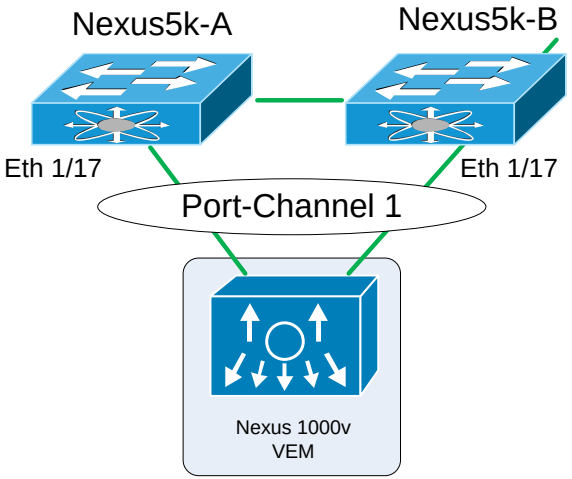
Written Exam: Sample Question 3 Exhibit

```
Nexus5k-B# show run

interface Ethernet1/17
  switchport mode trunk
  channel-group 17 mode active

interface port-channel17
  switchport mode trunk
  vpc 39

Nexus5k-B# show vpc 17
 vPC status
----------------------------------------------------------------------------
id     Port        Status Consistency Reason                     Active vlans
------ ----------- ------ ----------- -------------------------- -----------
17      Po17         up     success     success                   100-200
```



Q: Which of the following port-channel modes is appropriate for this topology?

A. lacp port-channel
B. vPC-HM with manual subgroups
C. static port-channel
D. vPC-HM mac-pinning

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CCIE Data Centre

Lab Exam Overview

CCIE Data Centre Lab Exam version 1.0 Curriculum Overview

#	Topic	% in exam
1.0	Cisco Data Centre Infrastructure-Cisco NX-OS	30%
2.0	Cisco Storage Networking	20%
3.0	Cisco Data Centre Virtualisation	10%
4.0	Cisco Unified Computing System	30%
5.0	Cisco Application Networking Services	10%

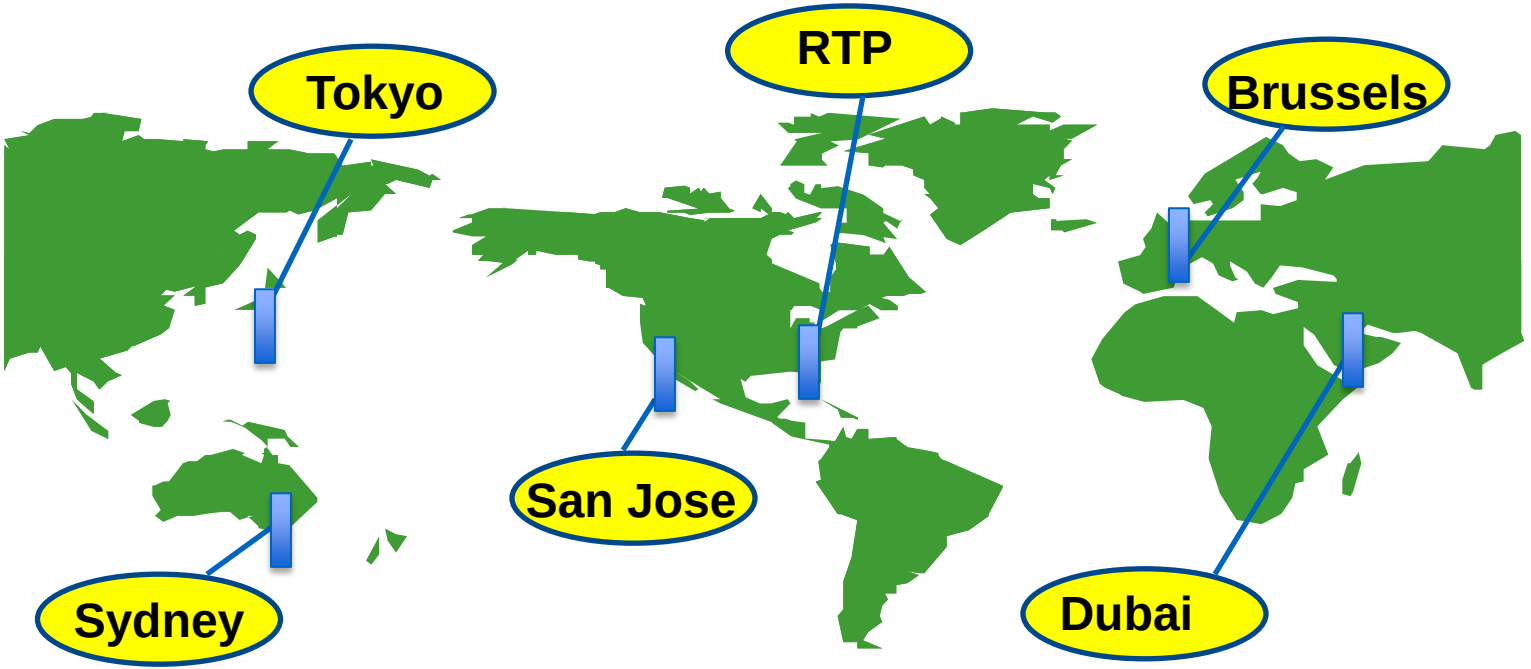
Full blueprint available on the Cisco Learning Network:
https://learningnetwork.cisco.com/docs/DOC-13992

CCIE Data Centre Lab Exam

- Candidates build a data Centre configuration based on supplied specifications
- Eight-hour exam requires working configurations and troubleshooting to demonstrate expertise
- Must achieve a pass mark scored from several sections that cover configuration and troubleshooting as per lab exam blueprint
- The point values for each question are shown on the exam
- Some questions depend upon completion of previous parts of the network

https://learningnetwork.cisco.com/community/certifications/ccie_data_center

CCIE Data Centre Lab Locations:



CCIE DC Lab Locations

Data Centre Lab Exam:
Equipment and Software Versions

The lab exam tests any feature that can be configured on the equipment and the NXOS versions indicated below. Occasionally, you may see more recent NXOS versions installed in the lab, but you will not be tested on the new features of a release unless indicated below.

- MDS 9222i
- Nexus 7009
- Nexus 5548
- Nexus 2224 / 2232
- Nexus 1000v
- UCS C200 Series Server
- UCS-6248 Fabric Interconnects
- UCS-5108 Blade Chassis (B200)
- Cisco Application Control Engine Appliance - ACE4710
- Dual attached JBODs

Note the version change in the exam Blueprint!!

- NXOS v6.x on Nexus 7000 Switches
- NXOS v5.x on Nexus 5000 Switches
- NXOS v4.2.x on Nexus 1000v
- NXOS v5.x on MDS 9222i Switches
- UCS Software release 2.x for UCS-6248 Fabric Interconnect
- Software Release A5(1.x) for ACE 4710
- Cisco Data Centre Manager software v5.x

CCIE DC Lab Exam:
Pre-Configuration

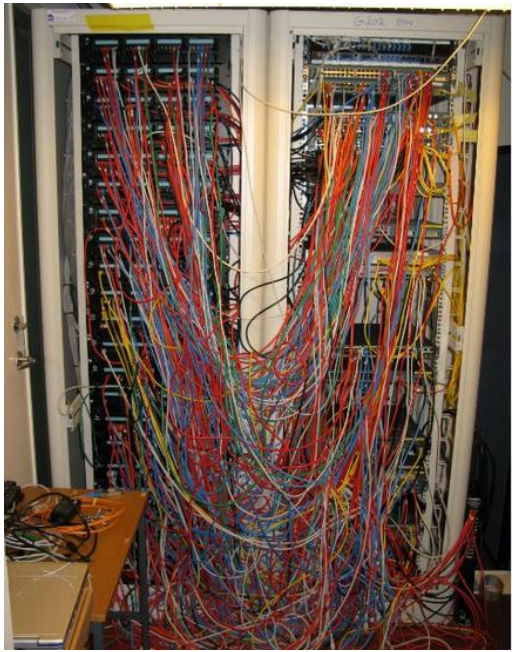
The Routers and Switches in Your Topology Are Preconfigured With:

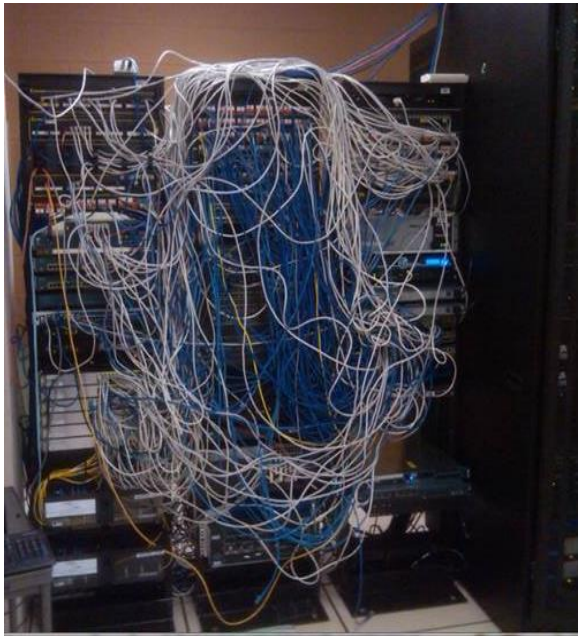
- Basic IP addressing, hostname, passwords
- All pre-configured passwords are ‘cisco’
- Please read all instructions carefully

Do NOT change any pre-configuration on any devices unless explicitly stated in a question

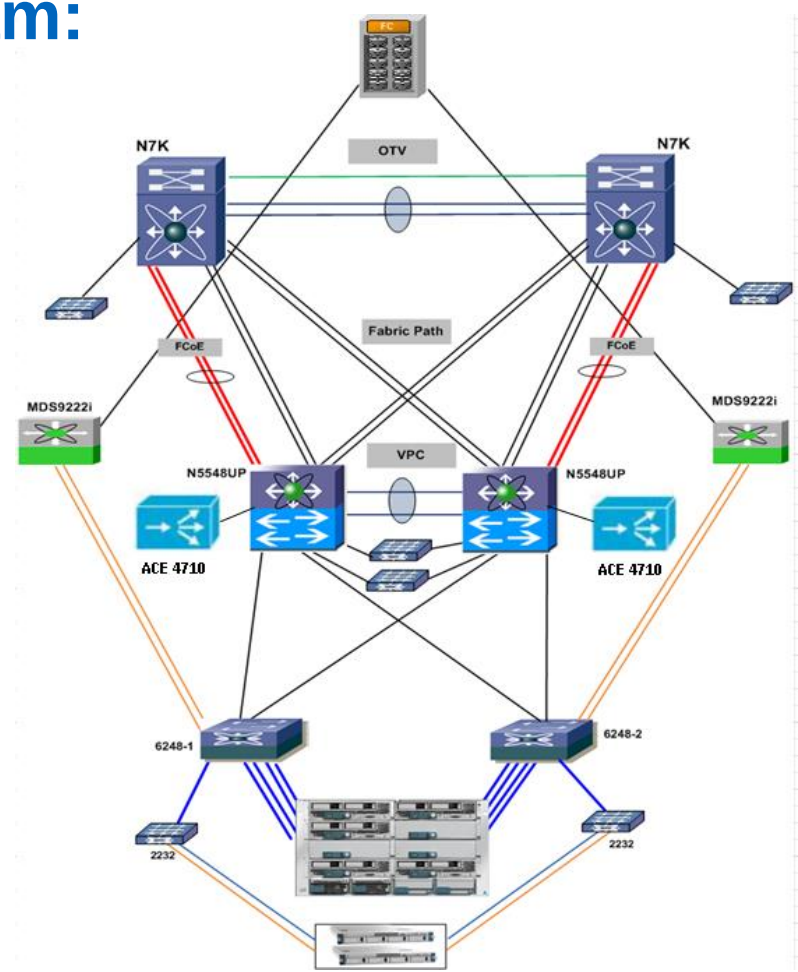
CCIE DC Lab Exam:
Sample Topology

Fully





CCIE DC Lab Exam:
Sample Topology



CCIE Lab Exam:
Grading

- Proctors grade all lab exams
- Automatic tools aid proctors with simple grading tasks
- Automatic tools are never solely responsible for lab exam grading—proctors are
- Proctors complete grading of the exam and submits the final score within 48 hours
- No partial credit awarded on questions
- Points are awarded for working solutions only
- Some questions have multiple solutions

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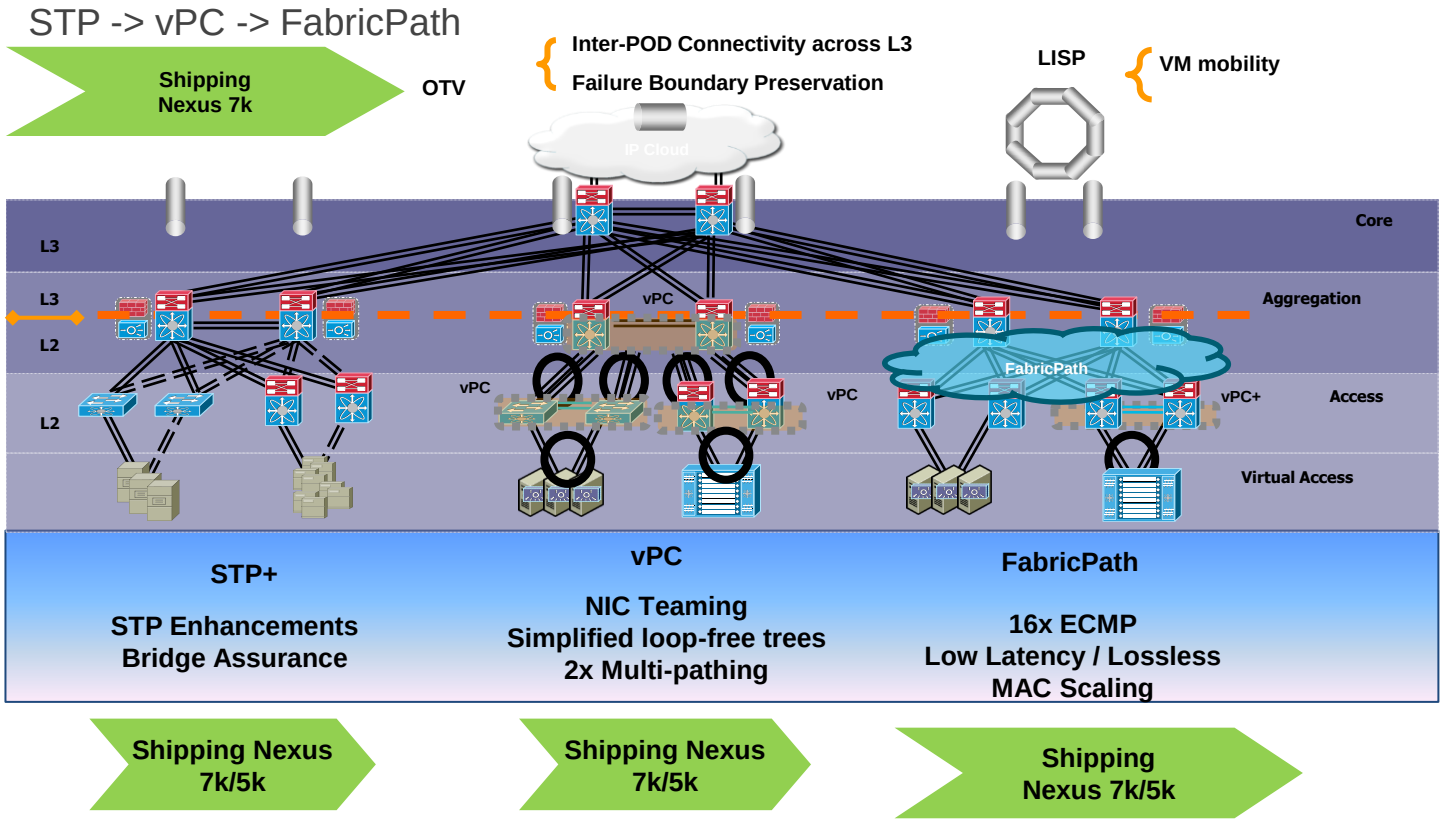
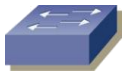
CCIE Data Centre

Cisco Data Centre Infrastructure – NXOS FabricPath

Introduction to FabricPath
Intelligent L2 Domains Evolution

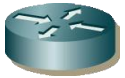


Cisco FabricPath Goal



Switching

- Easy Configuration
- Plug & Play
- Provisioning Flexibility



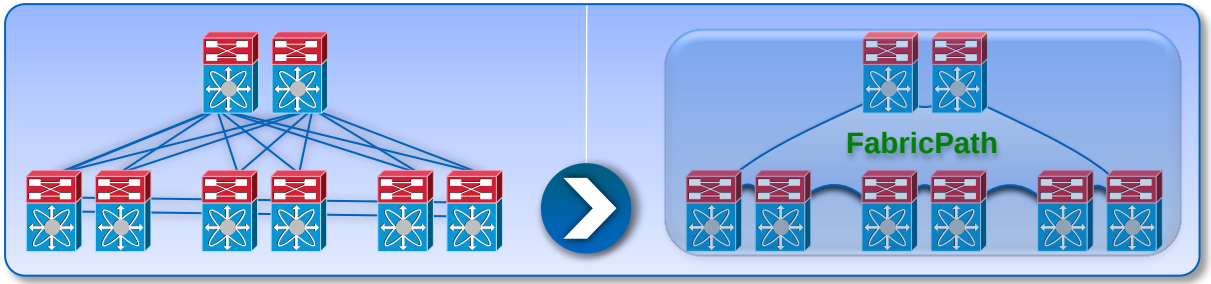
Routing

- Multi-pathing (ECMP)
- Fast Convergence
- Highly Scalable

FabricPath

"FabricPath brings Layer 3 routing benefits to flexible Layer 2 bridged Ethernet networks"

FabricPath: An Ethernet Fabric
Turn the Network into a Fabric



- Connect a group of switches using an **arbitrary** topology
- With a simple CLI, aggregate them into a Fabric:

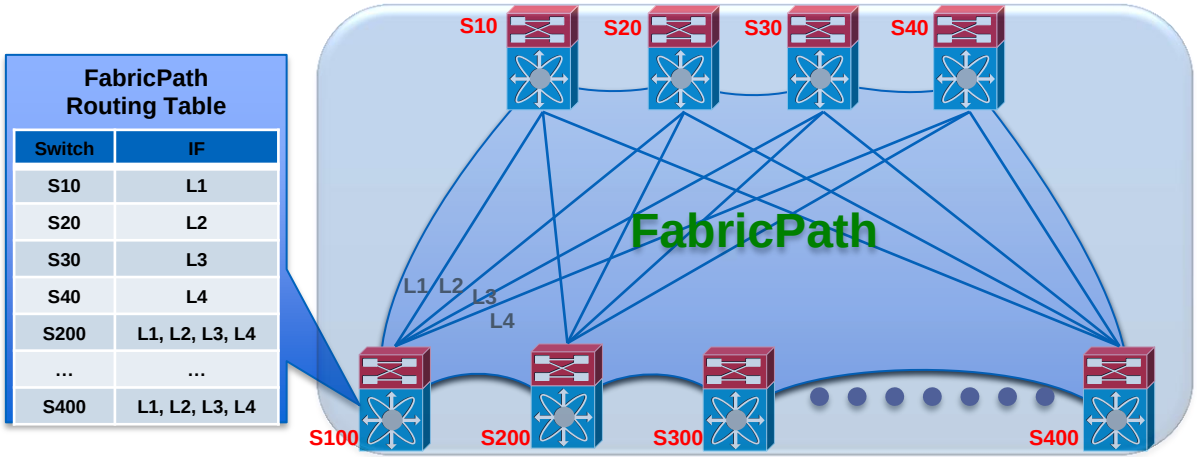
```
N7K(config)# interface ethernet 1/1
N7K(config-if)# switchport mode fabricpath
```

- No STP inside. An open protocol based on L3 technology provides Fabric-wide intelligence and ties the elements together.

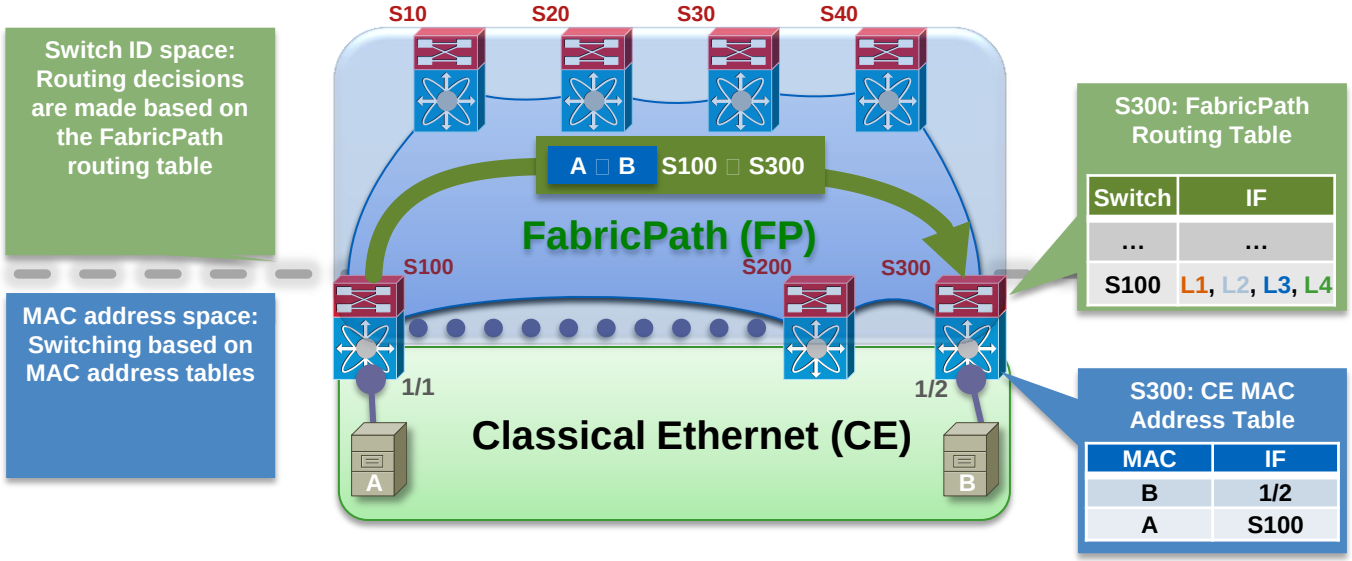
FabricPath Technical Overview
New Control Plane

Plug-n-Play L2 IS-IS Manages Forwarding Topology

- IS-IS assigns addresses to all FabricPath switches automatically
- Compute shortest, pair-wise paths
- Support equal-cost paths between any FabricPath switch pairs



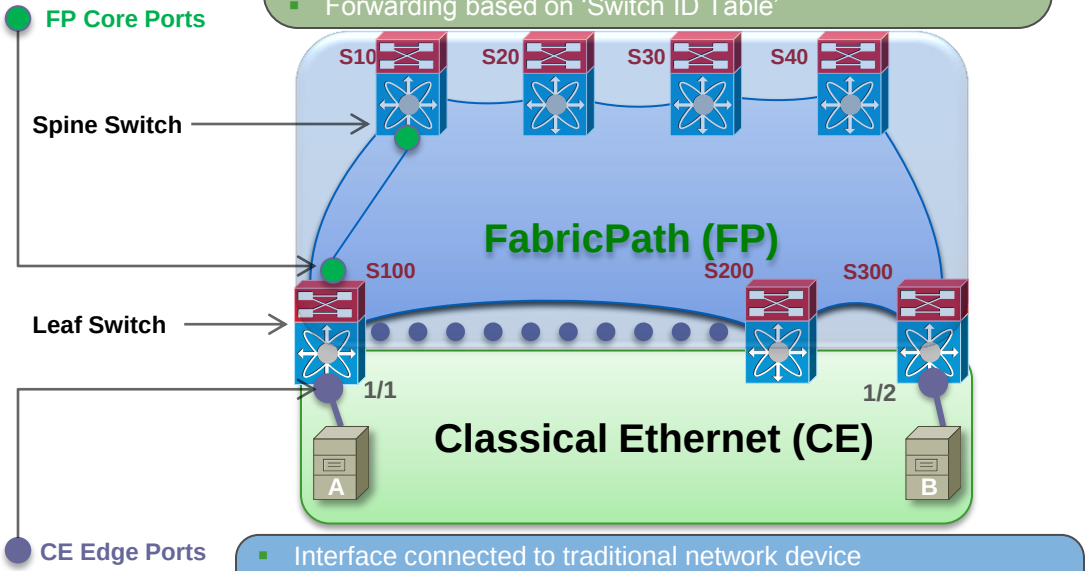
FabricPath Technical Overview
New Data Plane



- The association MAC address/Switch ID is maintained at the edge
- Traffic is encapsulated across the Fabric

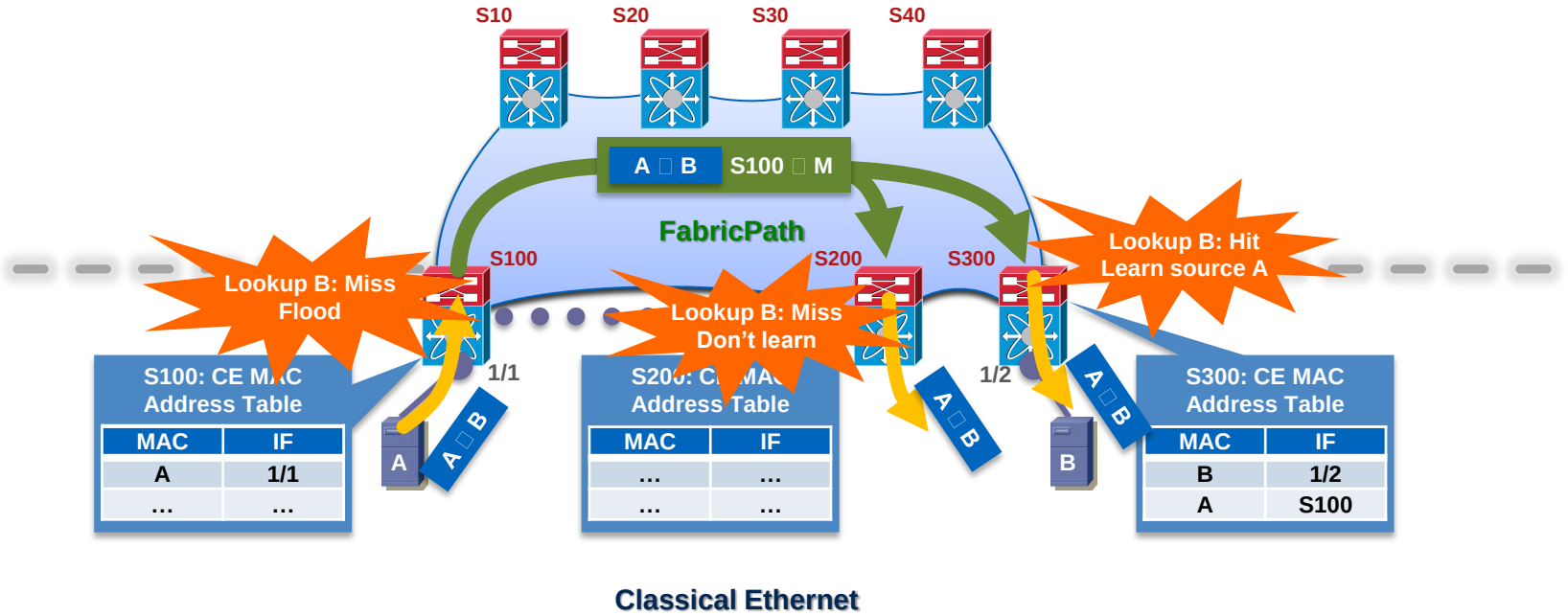
FabricPath Technical Overview
Terminology

- Interface connected to another FabricPath device
- Sends/receives traffic with FabricPath header
- Does not run spanning tree
- Does not perform MAC learning!
- Exchanges topology info through L2 ISIS adjacency
- Forwarding based on 'Switch ID Table'

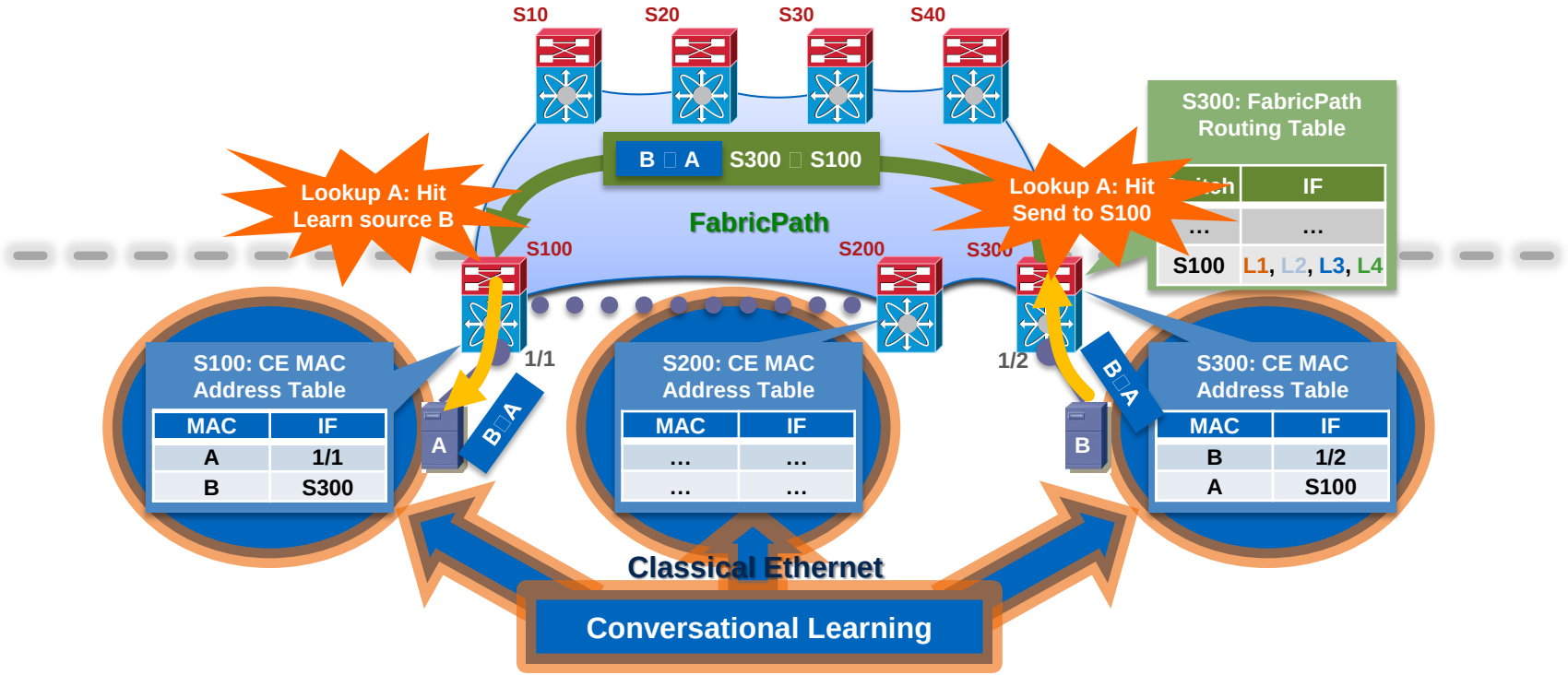


- Interface connected to traditional network device
- Sends/receives traffic in standard 802.3 Ethernet frame format
- Participates in STP domain
- Forwarding based on MAC table

FabricPath MAC Learning
Unknown Unicast



FabricPath MAC Learning
Known Unicast, Conversational Learning



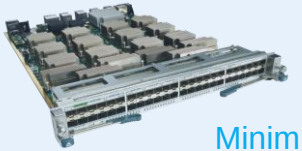
FabricPath:
Hardware Support

Nexus 7000

Only F-series module support FabricPath:

N7K-F132XP-15

Minimum Software: NX-OS 5.1(1)



N7K-F248XP-25

Minimum Software: NX-OS 6.0(1)

Nexus 5500

N5K-C5548P-FA
N5K-C5548UP-FA

N5K-C5596UP-FA

Minimum Software: NX-OS 5.1(3)N1(1)

Nexus 2000 (FEX)

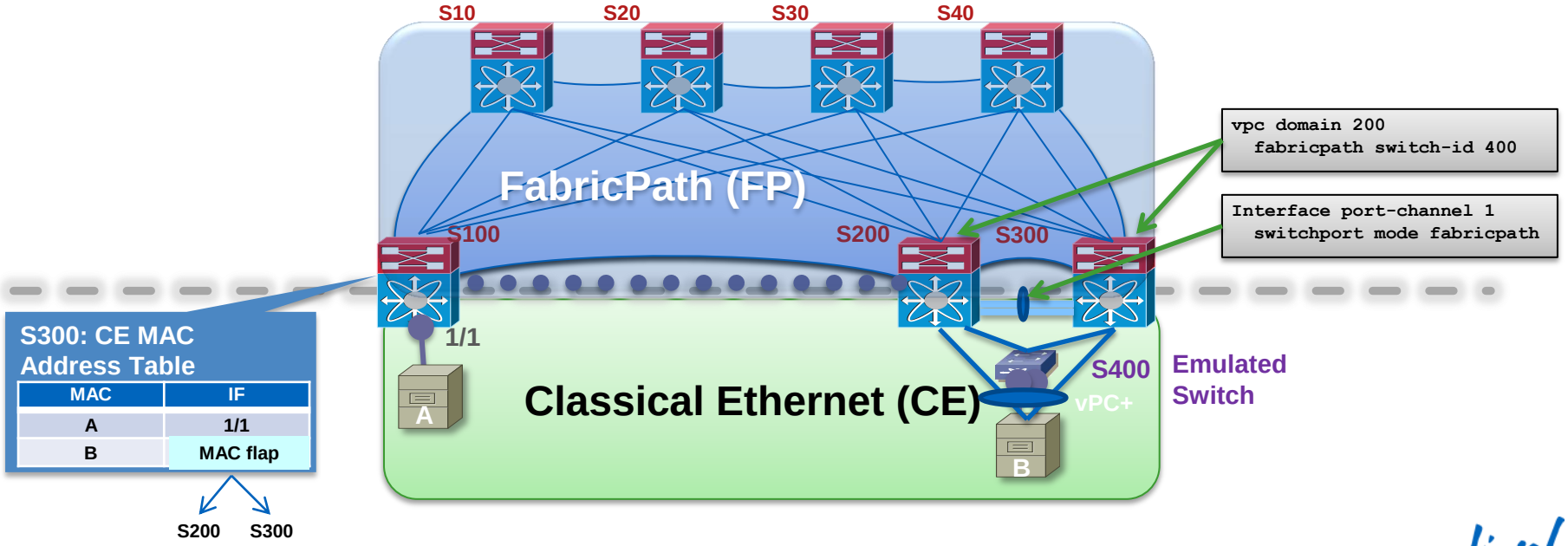
FabricPath supported on Nexus 2000 platforms when connected to NEXUS 5500 chassis or NEXUS 7000 F2 series I/O Module

FEX Host Interfaces can be configured as CE edge ports

Supported FEX models: 2224TP, 2248TP, 2248TP-E, 2232PP, 2232TM

FabricPath and vPC+

- MAC flap issue, if FabricPath edge switches are vPC peers
- Emulated switch is used to present vPC peers as single switch to FabricPath network
- FabricPath network see emulated switch reachable via S200 and S300.



FabricPath Configuration
Default Settings

- FabricPath not enabled by default
- Once FabricPath is enabled, Conversational MAC Learning is enabled on all FP Core interfaces (cannot be disabled)
- Conversational MAC Learning is not enabled for CE interfaces
- All VLAN's are in CE mode by default

FabricPath Configurations
Checklist

1. Ensure you have Nexus devices that supports FabricPath.
2. System is running minimum NX-OS 5.1.1 (Nexus 7000) / NX-OS 5.1.3 (Nexus 5500) software release
3. Obtain and install “Enhanced Layer 2” license. You will need to obtain the host id of the switch “`show license host-id`”
4. Install the license “`install license <file>`”
5. Install FabricPath feature set – FabricPath depends on several discrete processes and functions; ensures all required system plugins loaded into memory by issuing “`install feature-set fabricpath`”

FabricPath Configurations
Plug-and-Play

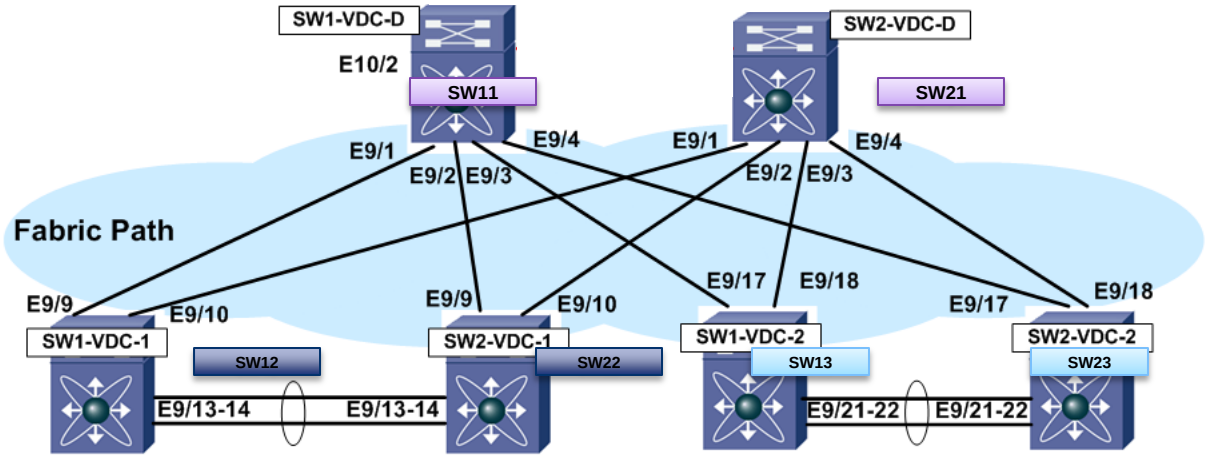
Once FabricPath feature-set installed:

1. Enable FabricPath feature set
   - `feature-set fabricpath`
2. Define FabricPath VLANs
   - `vlan <range>`
   - `  mode fabricpath`
3. Identify FabricPath interfaces
   - `interface <name>`
   - `  switchport mode fabricpath`

- FabricPath devices will form adjacencies, exchange unicast and multicast routing information, and begin forwarding traffic

Sample Lab Question : FabricPath

- Configure FabricPath as shown in the topology below
  - SW11 and SW21 are spine switches
  - SW12, SW22, SW13, and SW23 are leaf switches
  - Make sure VLAN 100 and 101 are reachable via FabricPath



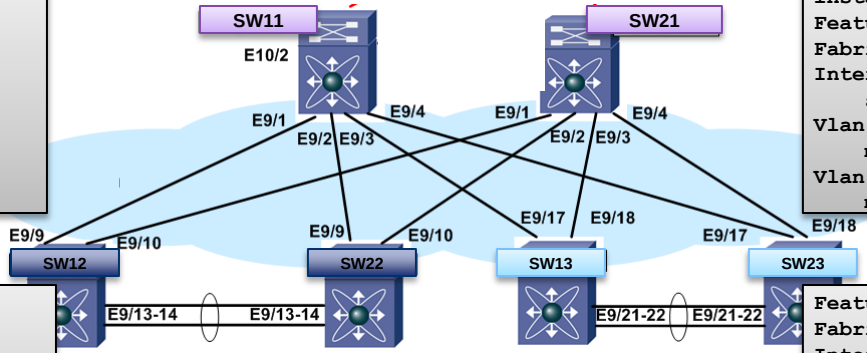
Solution:

SW11

```
install feature-set fabricpath
Feature-set fabricpath
Fabricpath switch-id 11
Interface ethernet 9/1-4
   switchport mode fabricpath
Vlan 100
    mode fabricpath
Vlan 101
   mode fabricpath
```

SW21

```
install feature-set fabricpath
Feature-set fabricpath
Fabricpath switch-id 21
Interface ethernet 9/1-4
    switchport mode fabricpath
Vlan 100
    mode fabricpath
Vlan 101
    mode fabricpath
```



SW12

```
Feature-set fabricpath
Fabricpath switch-id 12
Interface ethernet 9/9-10
   switchport mode fabricpath
Vlan 100
   mode fabricpath
Vlan 101
    mode fabricpath
```

SW23

```
Feature-set fabricpath
Fabricpath switch-id 23
Interface ethernet 9/17-18
    switchport mode fabricpath
Vlan 100
    mode fabricpath
Vlan 101
    mode fabricpath
```

SW22

```
Feature-set fabricpath
Fabricpath switch-id 22
Interface ethernet 9/9-10
   switchport mode fabricpath
Vlan 100
   mode fabricpath
Vlan 101
   mode fabricpath
```

SW13

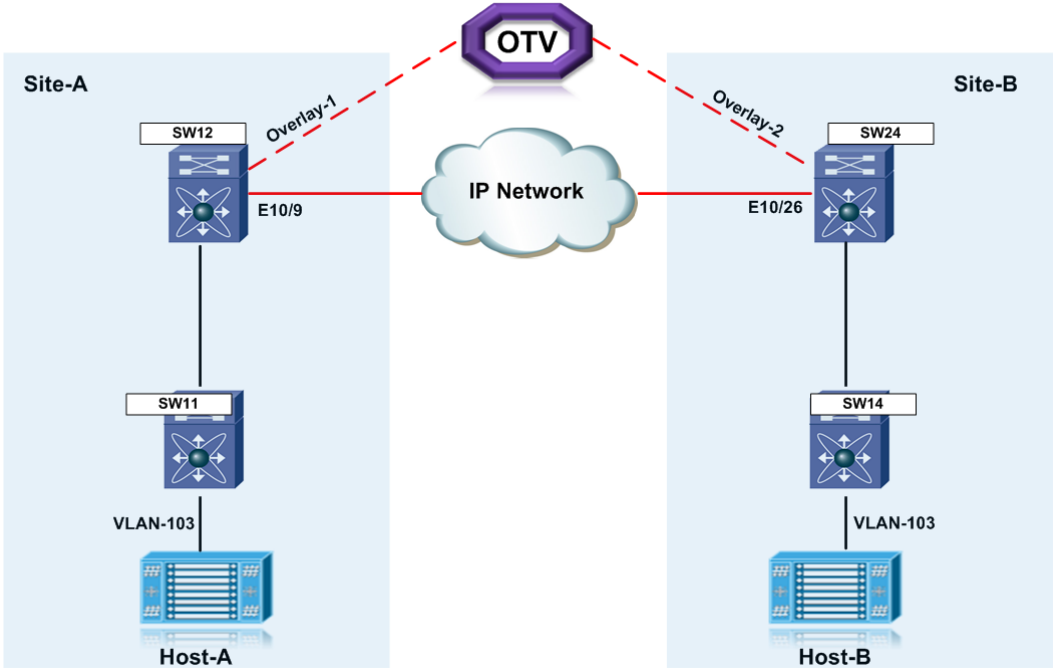
```
Feature-set fabricpath
Fabricpath switch-id 13
Interface ethernet 9/17-18
   switchport mode fabricpath
Vlan 100
   mode fabricpath
Vlan 101
   mode fabricpath
```

Sample Lab Question : OTV

Configure OTV on SW12 and SW24 to Extend VLAN 103 between Site-A and Site-B.

SW12 and SW24 can reach each other using IP network.

IP network is multicast enabled.



Solution:

```
!Configure the physical interface that OTV uses to reach
!the DCI transport infrastructure
interface ethernet 10/9
 ip address <IP-Address>
 ip igmp version 3
 no shutdown

!Configure the VLAN that will be extended on the
!overlay network
vlan 103

!Configure OTV including the VLANs that will be extended.

feature otv
otv site-identifier 10
interface Overlay1
 otv control-group 239.1.1.1
 otv data-group 232.1.1.0/28
 otv join-interface ethernet 10/9
!Extend the configured VLAN
 otv extend-vlan 11
 no shutdown
```

```
!Configure the physical interface that OTV uses to reach
!the DCI transport infrastructure
interface ethernet 10/26
 ip address <IP-Address>
 ip igmp version 3
 no shutdown

!Configure the VLAN that will be extended on the
!overlay network
vlan 103

!Configure OTV including the VLANs that will be extended.

feature otv
otv site-identifier 11
interface Overlay2
 otv control-group 239.1.1.1
 otv data-group 232.1.1.0/28
 otv join-interface ethernet 10/26
!Extend the configured VLAN
 otv extend-vlan 11
 no shutdown
```

Sample Lab Question : VDC

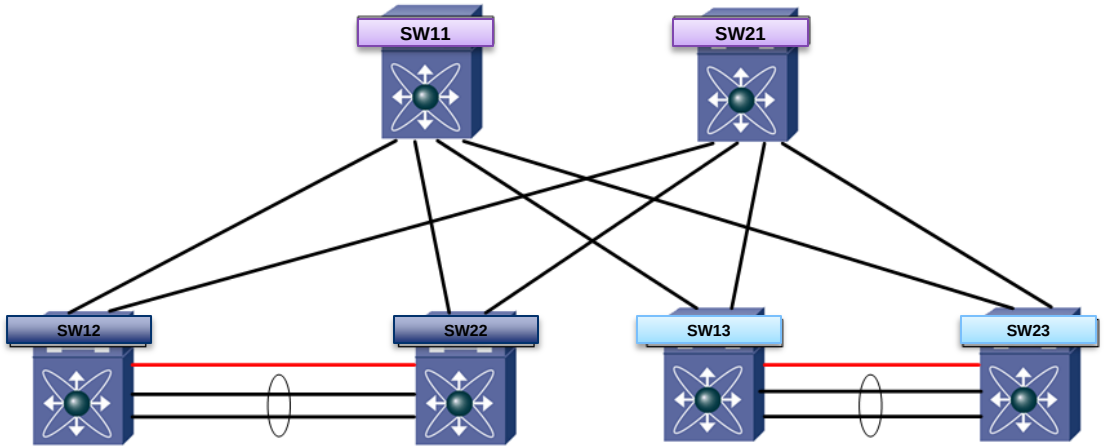
- Create Following VDCs and Assign ports as outlined below:

Nexus 7000 Switch-1

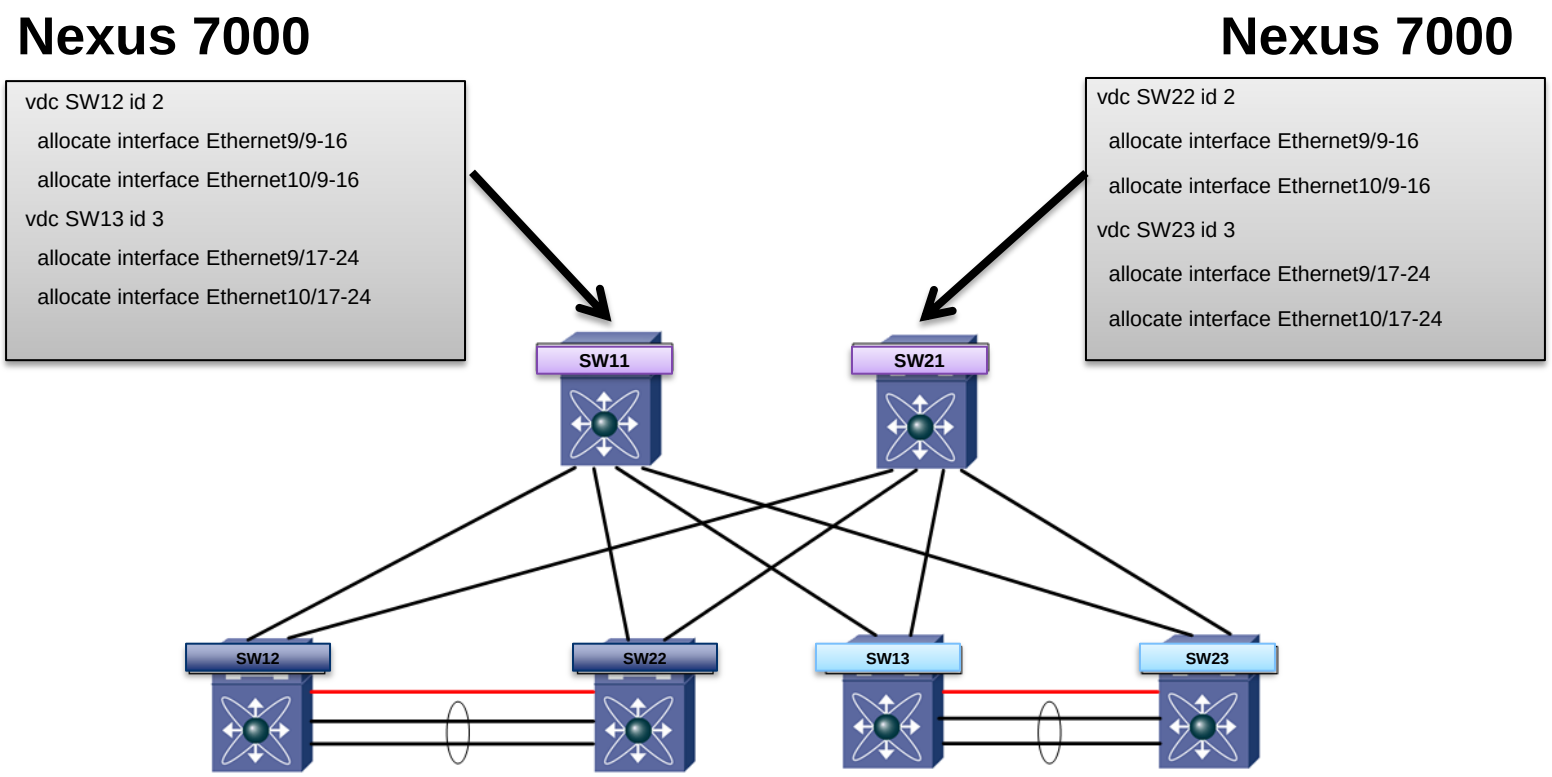
VDC Name	Ports
SW11	E9/1-8,E10/1-8
SW12	E9/9-16,E10/9-16
SW13	E9/17-24,E10/17-24

Nexus 7000 Switch-2

VDC Name	Ports
SW21	E9/1-8,E10/1-8
SW22	E9/9-16,E10/9-16
SW23	E9/17-24,E10/17-24



Solution:



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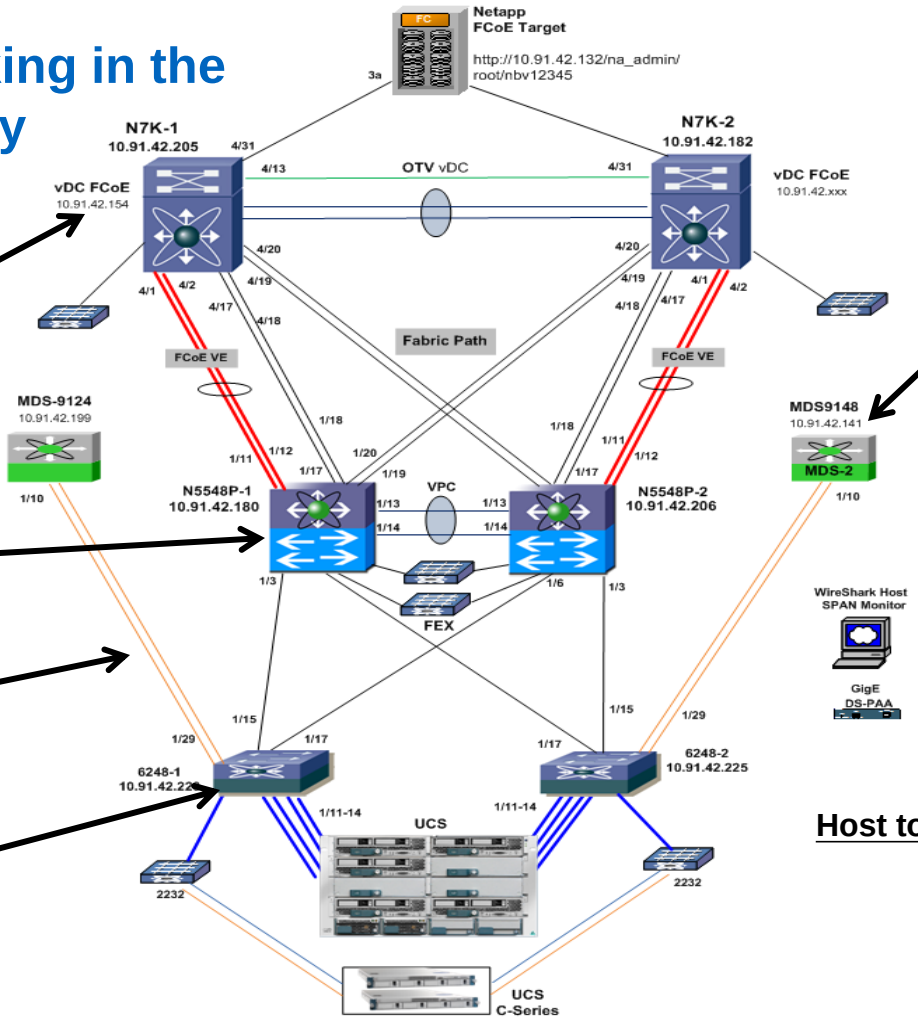
Section 6	**CCIE DC Topic 3 – Unified Computing**
Section 7	**CCIE DC Topic 4 – Nexus 1000v**
Section 8	**Preparation & Study**

Storage Networking

Storage Area Networking in the CCIE Sample Topology



MDS Switches w/ attached Storage

Fibre Channel configuration & Troubleshooting within the Nexus N5K & N7K

Fibre Channel Technologies SAN Port-Channel & F-Port Trunking

UCS Fabric Interconnect SAN Interface, Switch Mode or NPV Mode

Host to Storage Zoning

Glossary of Terms

- SAN – Storage Area Network. A network of switches, typically fibre channel used for carrying SCSI or FICON traffic
- FC – Fibre Channel. A protocol used to carry SCSI or FICON packets containing IO commands from a server to a storage array
- SCSI – Small Computer System Interface. A bus based system or protocol used to carry block based storage commands
- iSCSI – An IP based protocol capable of carrying SCSI commands to and from storage devices
- FICON – The protocol used to carry mainframe based IO
- MDS – The Cisco family of Data Centre switches capable of carrying fibre channel traffic
- VSAN – Virtual SANs. A feature capable of creating logical SANs on a physical SAN infrastructure
- FCIP – Fibre Channel over IP. The protocol used to tunnel fibre channel packets over an IP infrastructure. Used for extending a Fibre Channel SAN over long distances

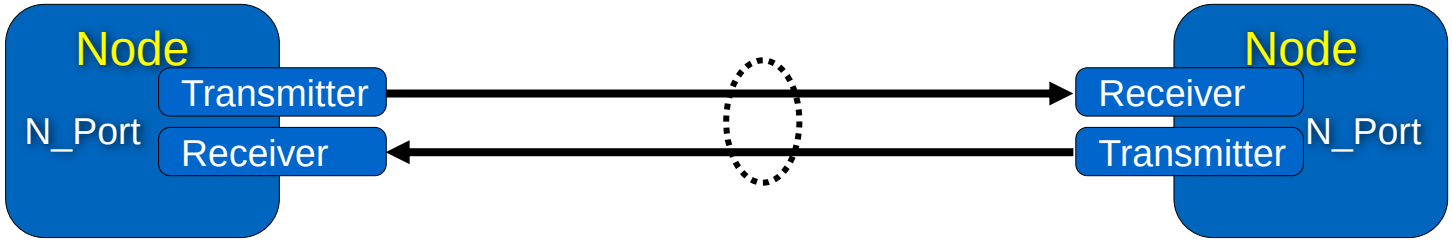
Storage Area Networking

Fibre Channel

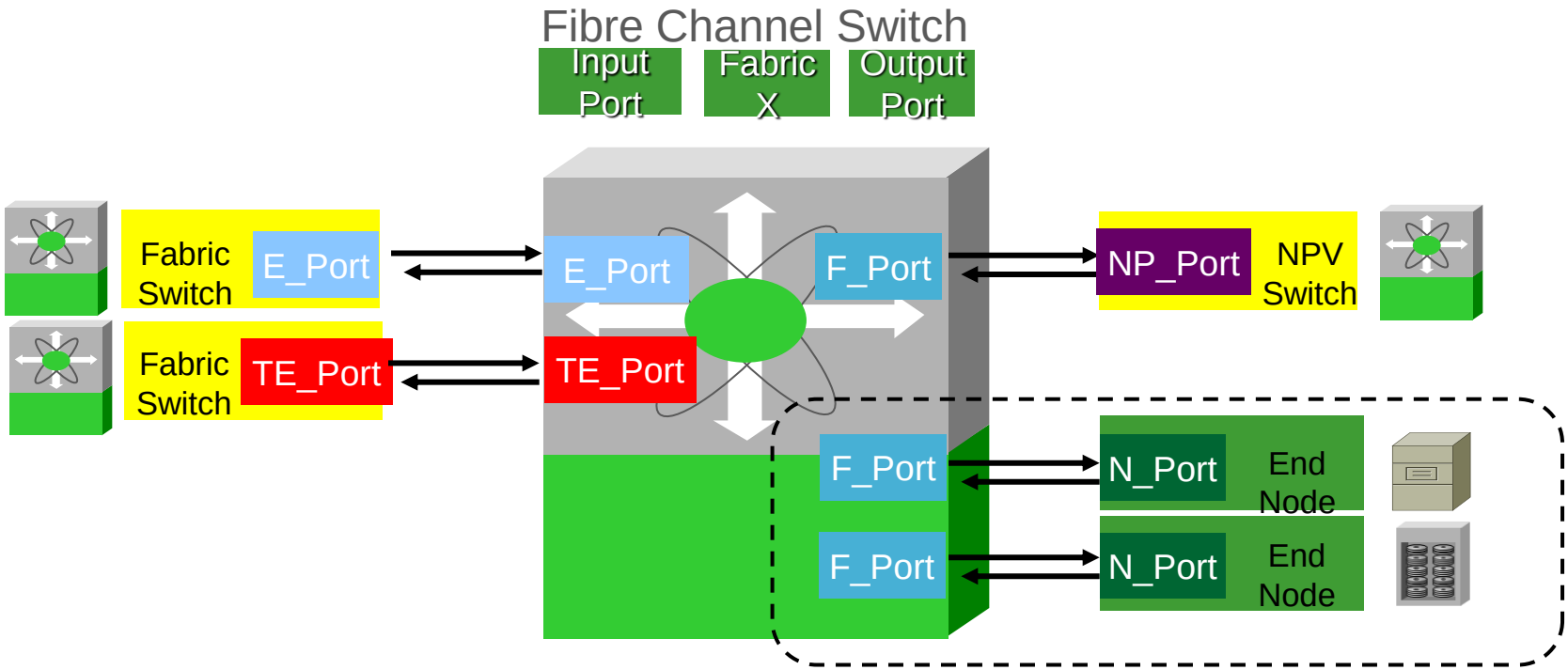
Fibre Channel Communications Model

Fibre Channel Has Many Similarities to IP (TCP)

- Point to point oriented – Facilitated through device login
  - Similar to TCP session establishment
- N_Port to N_Port connection – Logical node connection point
  - Similar to TCP/UDP sockets
- Flow Controlled – Hop-by-hop and End-to-End basis
  - Similar to TCP flow control – Different mechanism (no drops)
- Acknowledged – For certain classes of traffic, none for others
  - Similar to TCP / UDP acknowledgement models
- Multiple connections allowed per device
  - Similar to multiple TCP / UDP sockets

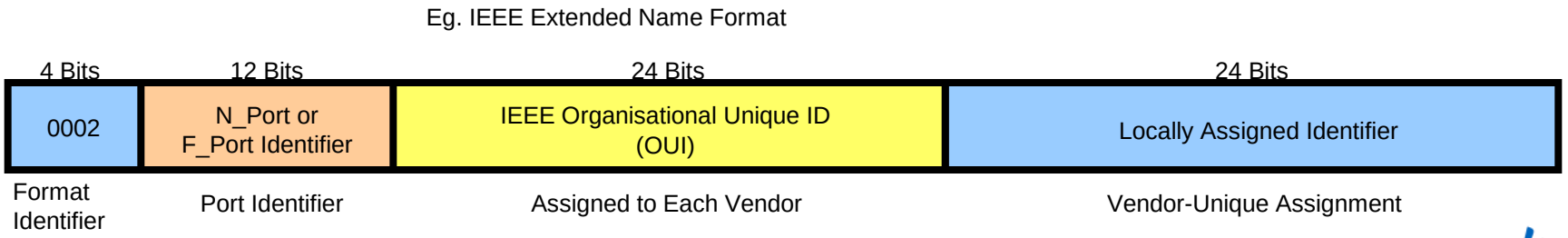


Fibre Channel Port Types



Fibre Channel Addressing
World Wide Names (WWN)

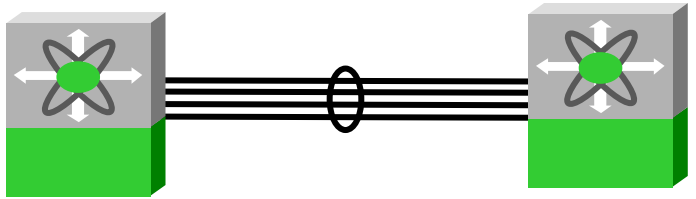
- WWNs are used as burnt-in unique addresses assigned to fabric switches, ports, and nodes by the manufacturer
  - Each switch is assigned a WWN at time of manufacture
  - Each switch port is assigned a WWN at the time of manufacture
  - Each HBA is assigned a WWN at the time of manufacture
- WWNs are created using a MAC address and a prefix to ensure a globally unique address
- These addresses are registered in the fabric and mapped to an FC_ID



Fibre Channel Fabric Topology
Trunking and Channeling

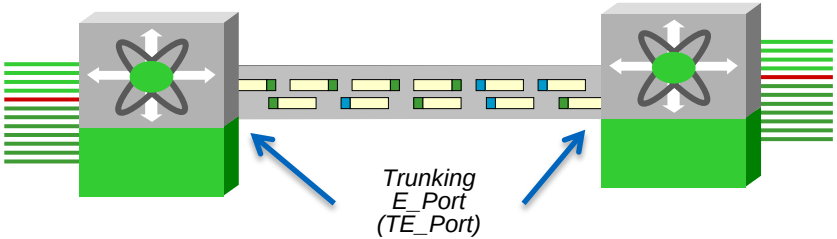
Port Channels

- Higher aggregate bandwidth
- Hardware-based load balancing
- Only supported on switch to switch connections (E_Port to E_Port and NP_Port to F_Port)



Trunking

- Trunking E_Port (TE_Port)
- Carries tagged frames from multiple VSANs
- Enhanced ISL (EISL) link

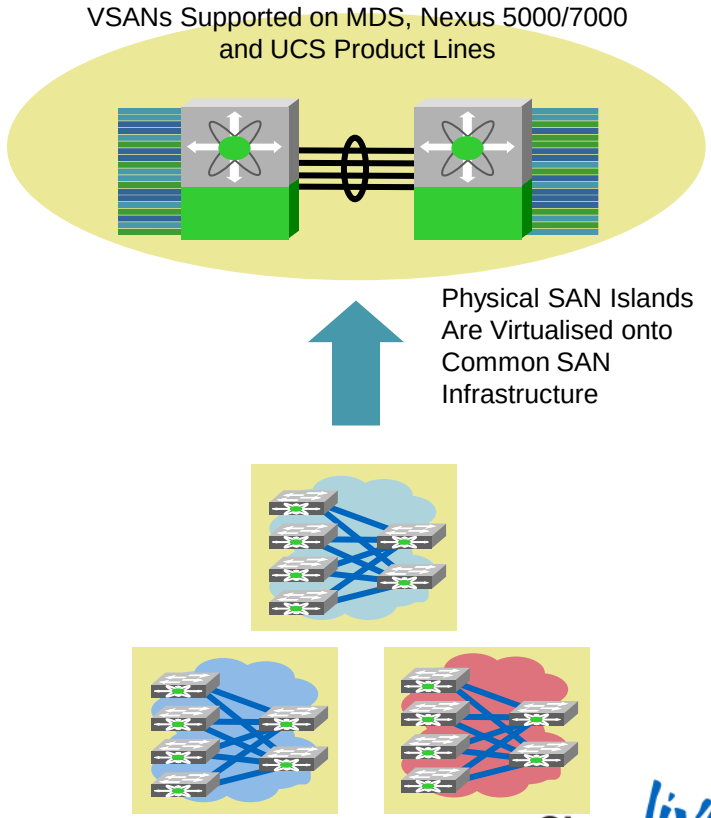


Standardisation of 'Enhanced' Capabilities Is Less Mature in the Fibre Channel Fabric than You May Be Used to in the Ethernet and IP World

Virtual SANs (VSANs)
VLAN or 802.1q for FC

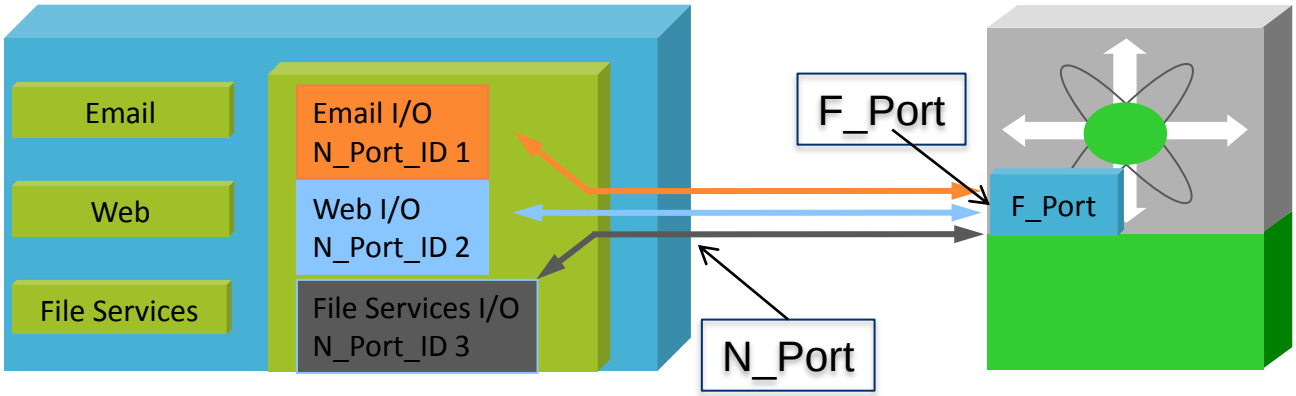
A Virtual SAN (VSAN) Provides a Method to Allocate Ports within a Physical Fabric and Create Virtual Fabrics

- Analogous to VLANs in Ethernet
- Virtual fabrics created from larger cost-effective redundant physical fabric
- Reduces wasted ports of a SAN island approach
- Fabric events are isolated per VSAN which gives further isolation for High Availability
- FC Features can be configured on a per VSAN basis.



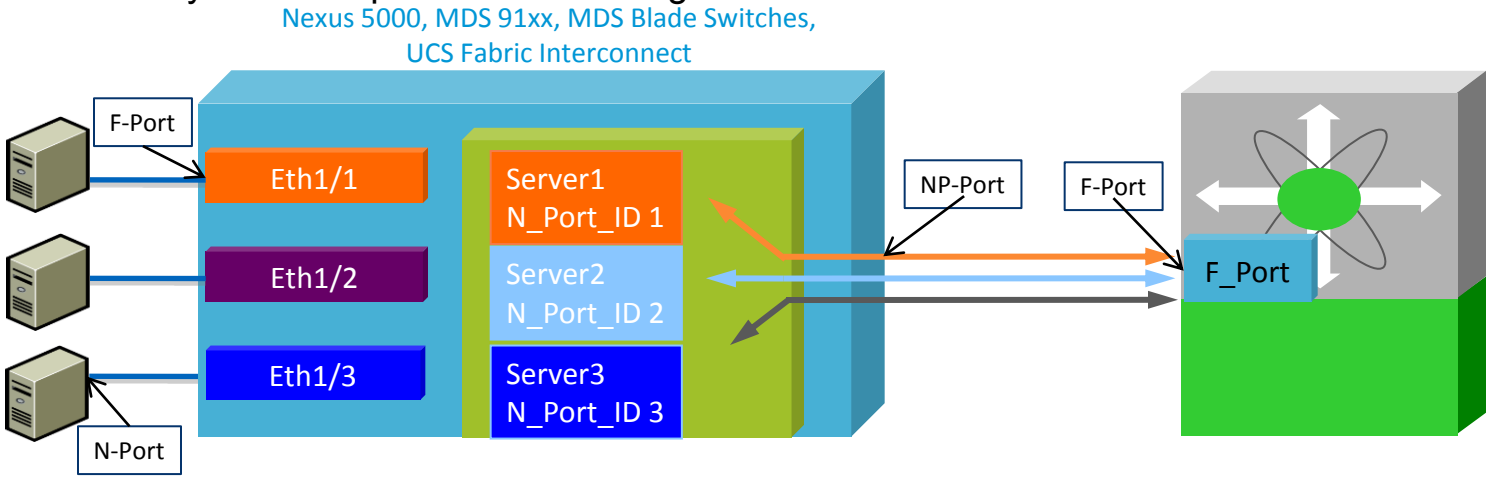
What is NPIV?

- N-Port ID Virtualisation (NPIV) provides a means to assign multiple FCIDs to a single N_Port
- Allows multiple applications to share the same Fibre Channel adapter port
- Different pWWN allows access control, zoning, and port security to be implemented at the application level
- Usage applies to platforms such as VMWare, MS Virtual Server and Citrix



What is NPV

- N-Port Virtualiser (NPV) utilises NPIV functionality to allow a “switch” to act like a server performing multiple logins through a single physical link
- Physical servers connected to the NPV switch login to the upstream NPIV core switch
  - Physical uplink from NPV switch to FC NPIV core switch does actual “FLOGI”
  - Subsequent logins are converted (proxy) to “FDISC” to login to upstream FC switch
- No local switching is done on an FC switch in NPV mode
- FC edge switch in NPV mode Does not take up a Domain ID
- Scalability will be dependent on FC “login” limitation



Storage Area Networking
FCoE

Protocol Organisation

FCoE Is Really Two Different Protocols:

FCoE Itself

- Is the data plane protocol
- It is used to carry most of the FC frames and all the SCSI traffic

FIP (FCoE Initialisation Protocol)

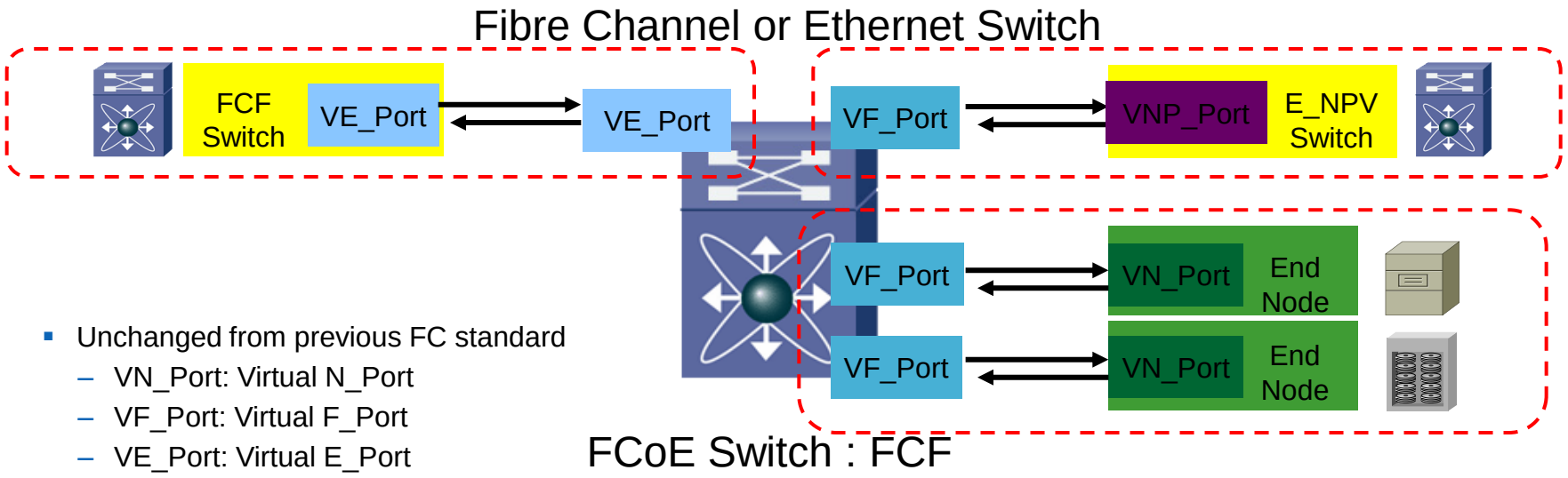
- It is the control plane protocol
- It is used to discover the FC entities connected to an Ethernet cloud
- It is also used to login to and logout from the FC fabric
- Uses unique BIA on CNA for MAC

The Two Protocols Have:

- **Two different Ethertypes**
- **Two different frame formats**
- **Both are defined in FC-BB-5**

http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9670/white_paper_c11-560403.html

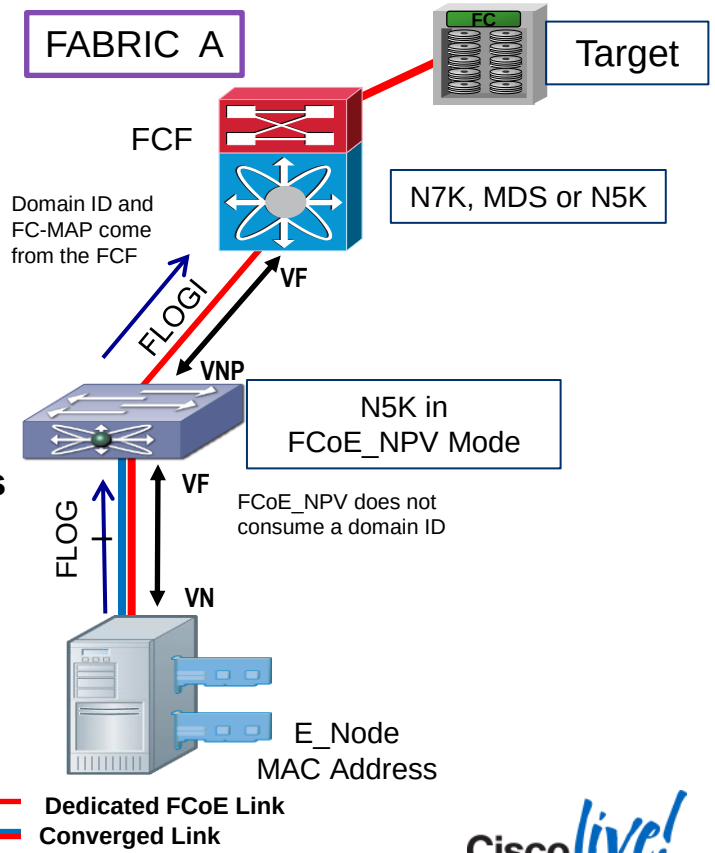
FCoE Port Types



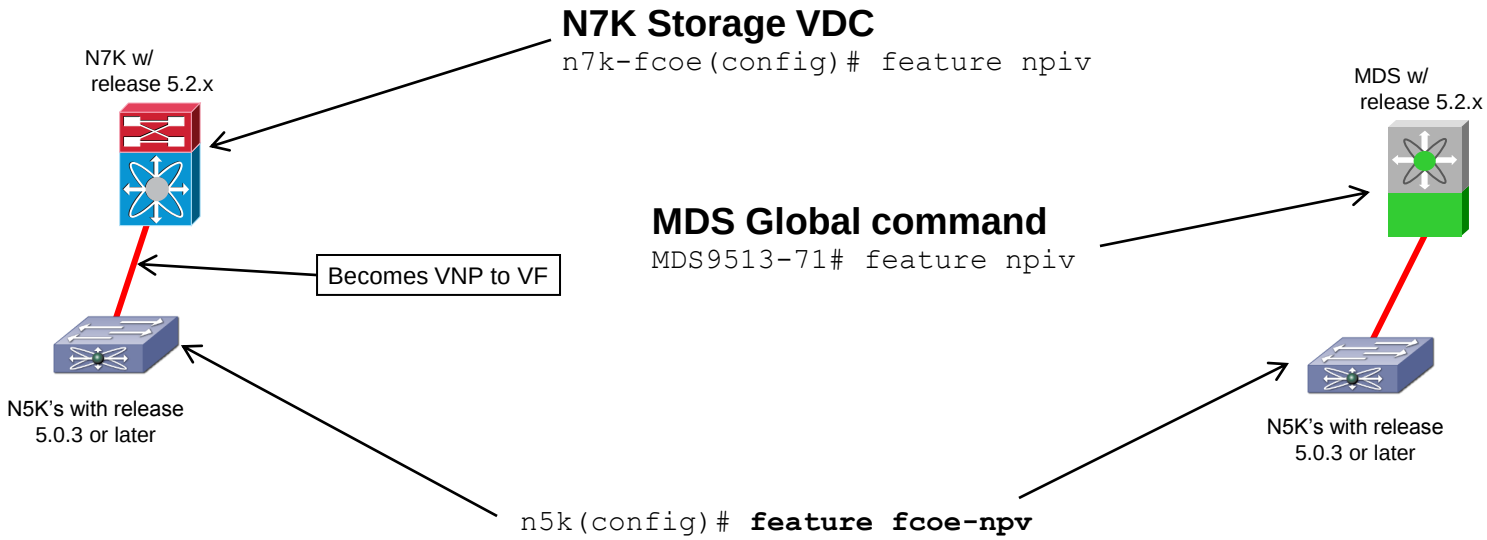
- Unchanged from previous FC standard
  - VN_Port: Virtual N_Port
  - VF_Port: Virtual F_Port
  - VE_Port: Virtual E_Port
- Added to support FCoE
  - FCoE_LEP (FCoE link endpoint): The data forwarding component that handles FC frame encapsulation/decapsulation, and transmission/reception of FCoE frames
  - FCoE Controller: the entity that implements the FIP protocol

What is FCoE-NPV

- **FCoE Pass – through device**
  - All FCoE Switching is performed at the upstream FCF
  - Addressing is pass out by the upstream FCF
- **More FCoE connectivity to hosts without:**
  - Running into the domain ID issue
  - Less-expensive
  - Consistent management
- **Proxy's FIP functions between a CNA and an FCF**
  - FCoE VLAN configuration and assignment
  - FCF Assignment
- **FCoE-NPV load balance logins from the CNAs evenly across the available FCF uplink ports**
  - FCoE-NPV will take VSAN into account when mapping or 'pinning' logins from a CNA to an FCF uplink
- **Operations and management process are in line with today's SAN-Admin practices**
- **Similar to NPV in a native Fibre Channel network**



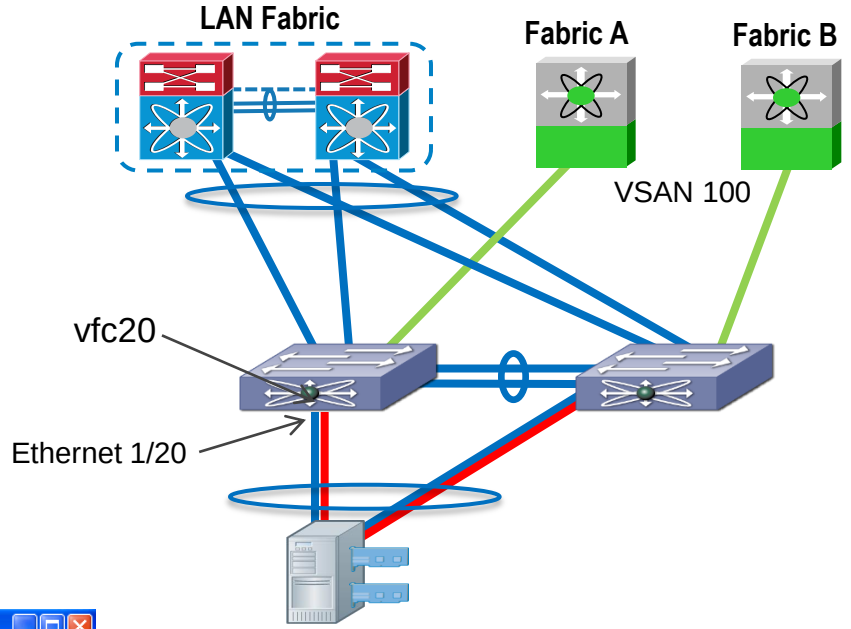
FCoE - NPV configuration Details



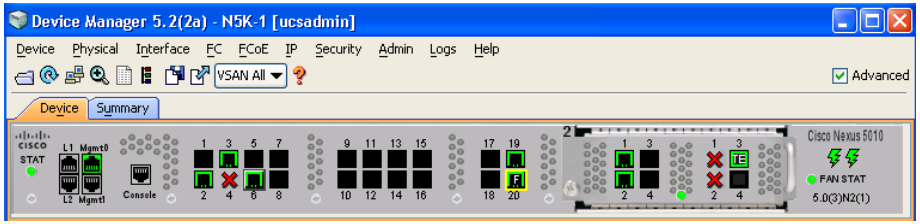
LACP Port-channels can be configured between switches for high availability

FCoE Port Configurations

```
feature fcoe
vlan 100
  fcoe vsan 100

interface vfc20
  bind interface Ethernet1/20
  no shutdown

vsan database
  vsan 100 interface vfc20

interface Ethernet1/20
  switchport mode trunk
  switchport trunk allowed vlan 1,100
  spanning-tree port type edge trunk
```



Can also be configured with DCNM Device Manager



FCoE Multihop Configuration

```
N7K-50-fcoe-1(config-vlan)# interface ethernet 4/11-12
N7K-50-fcoe-1(config-if-range)# switchport mode trunk
N7K-50-fcoe-1(config-if-range)# switchport trunk allowed vlan 50
N7K-50-fcoe-1(config-if-range)# channel-group 50 force mode active
N7k-50-fcoe-1(config-if-range)# no shut
```

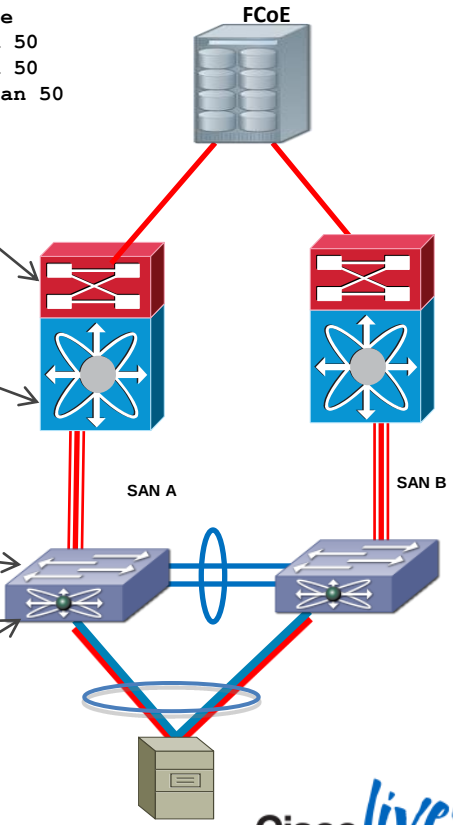
```
N7K-50-fcoe-1(config)# interface vfc-port-channel 50
N7K-50-fcoe-1(config-if)# switchport mode f
N7K-50-fcoe-1(config-if)# switchport trunk allowed vsan 50
N7K-50-fcoe-1(config-if)# no shut
```

```
N7K-50-fcoe(config)# vsan database
N7K-50-fcoe(config-vsan-db)# vsan 50
N7K-50-fcoe(config-vsan-db)# vlan 50
N7K-50-fcoe(config-vlan)# fcoe vsan 50
```

```
n5k-2(config-vlan)# interface ethernet 1/1-2
n5k-2(config-if-range)# switchport mode trunk
n5k-2(config-if-range)# switchport trunk allowed vlan 50
n5k-2(config-if-range)# channel-group 350 mode active
```

```
n5k-2-104(config)# interface vfc350
n5k-2-104(config-if)# switchport mode np
n5k-2-104(config-if)# bind interface port-channel 350
n5k-2-104(config-if)# switchport trun allowed vsan 50
n5k-2-104(config-if)# no shut
```

```
n5k-2-104(config)# vsan database
n5k-2-104(config-vsan-db)# vsan 50
n5k-2-104(config-vsan-db)# vlan 50
n5k-2-104(config-vlan)# fcoe vsan 50
```



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Unified Computing with UCS

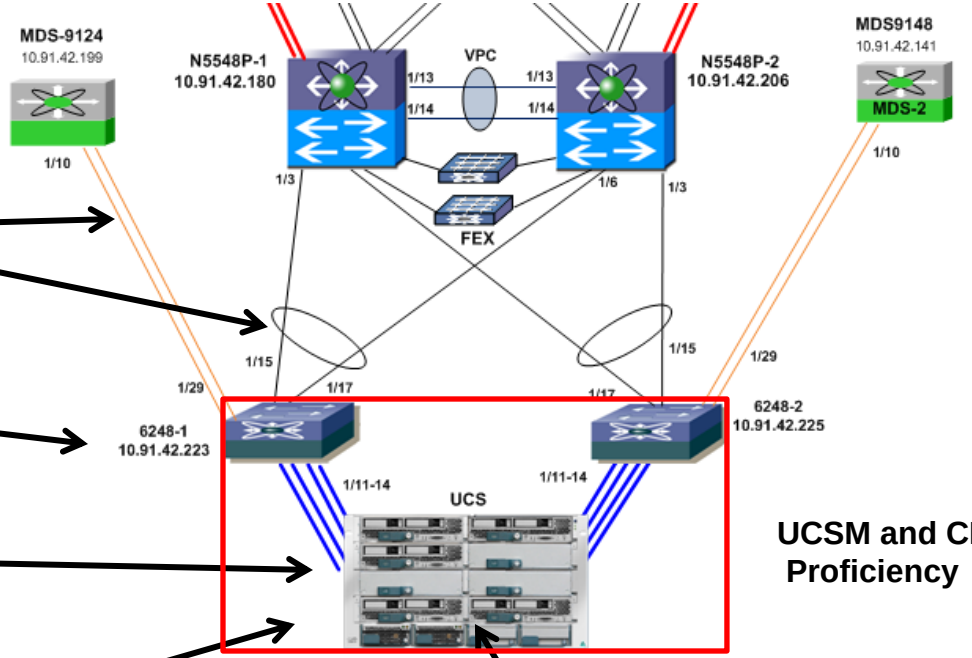
UCS in the CCIE Sample Topology

SAN & LAN connectivity to Northbound switches

NPV and FC switching modes on UCS FI

Blade and component Discovery and base configuration

Address Pools and Profile, Configuration & Deployment



UCSM and CLI Proficiency

Blade SAN booting, FCoE, iSCSI

UCS Physical Building Blocks

UCS Manager
Embedded– manages entire system

UCS Fabric Interconnect
48 Port 10Gb FCoE with Unified Ports

UCS Fabric Extender
Remote line card

UCS Blade Server Chassis
Flexible bay configurations

UCS Server
Industry-standard architecture
Blade and rack-mount, 2 and 4 socket

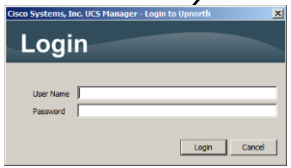
UCS Virtual Adapters
Choice of multiple adapters

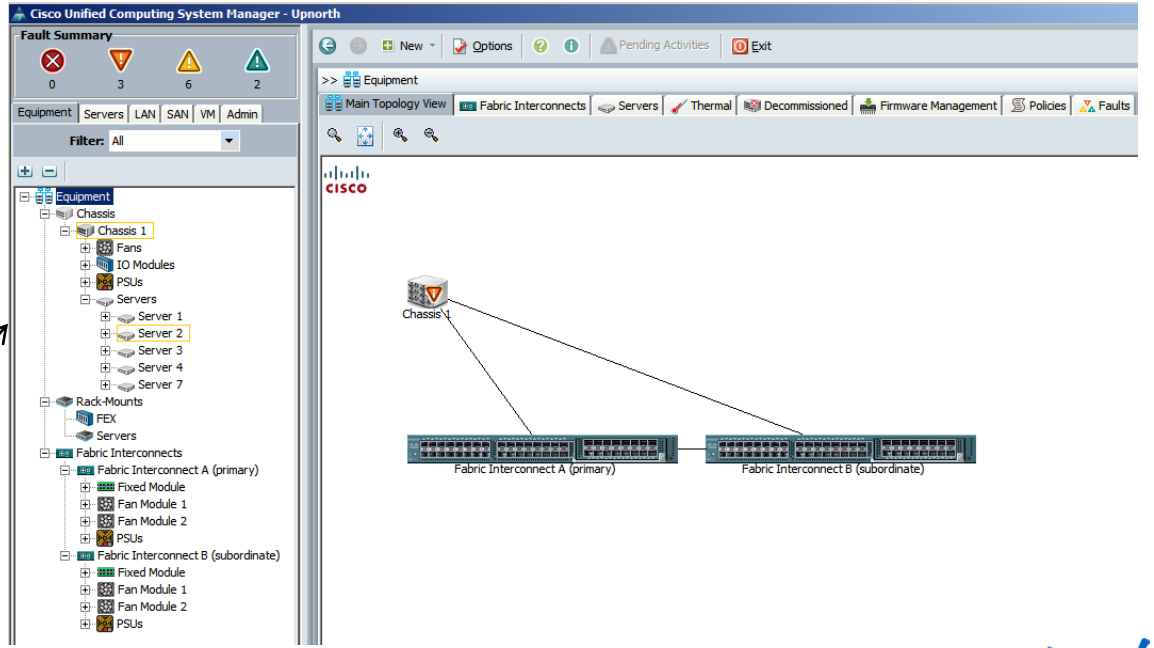
UCS Manager

Complete management and configuration is driven by the GUI interface of the UCSM. FI setup wizard is used to do initial install of IP addresses and start to Cluster.

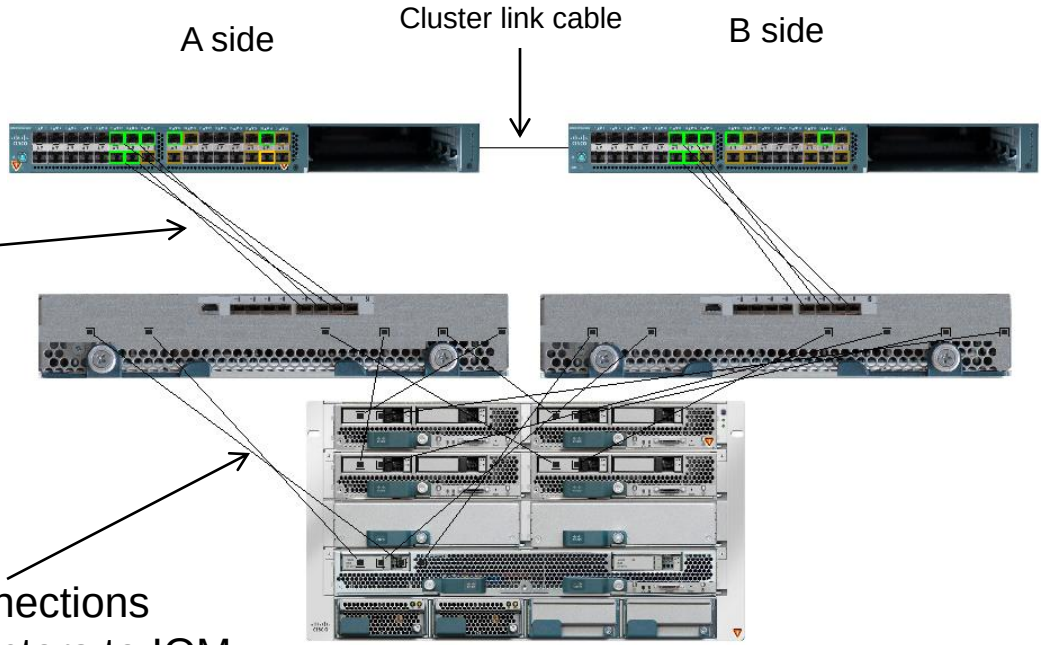
Browser pointed at Cluster IP

Login

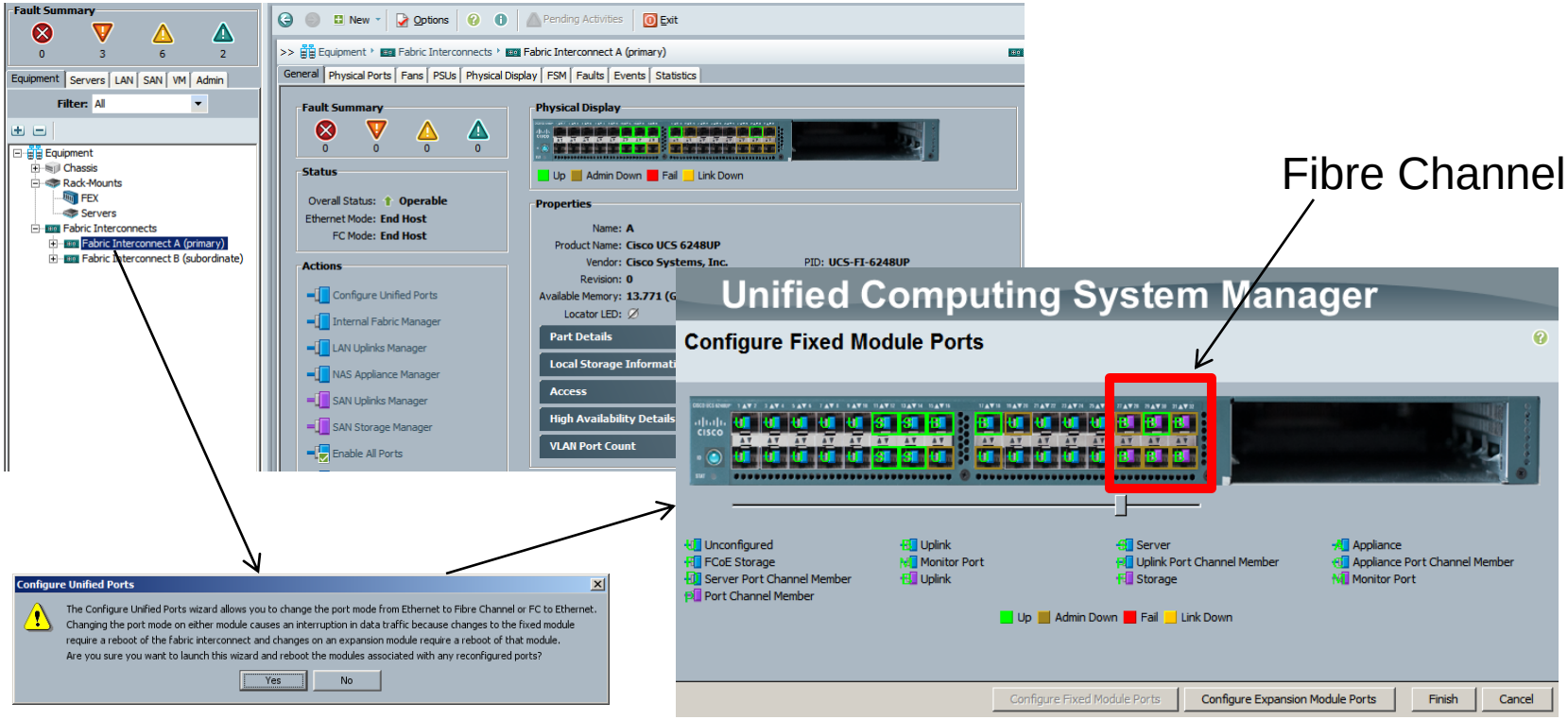




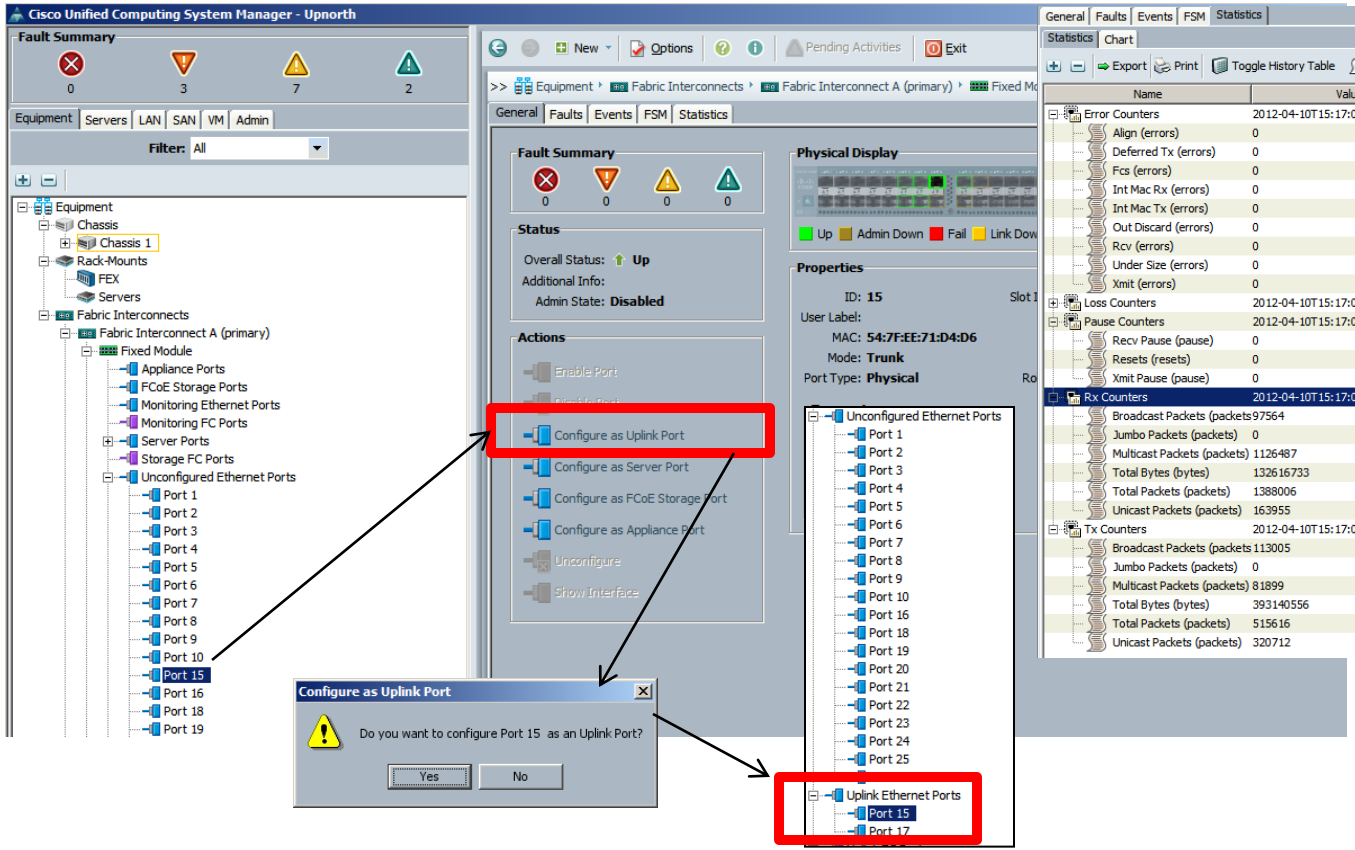
Hybrid View from UCSM GUI



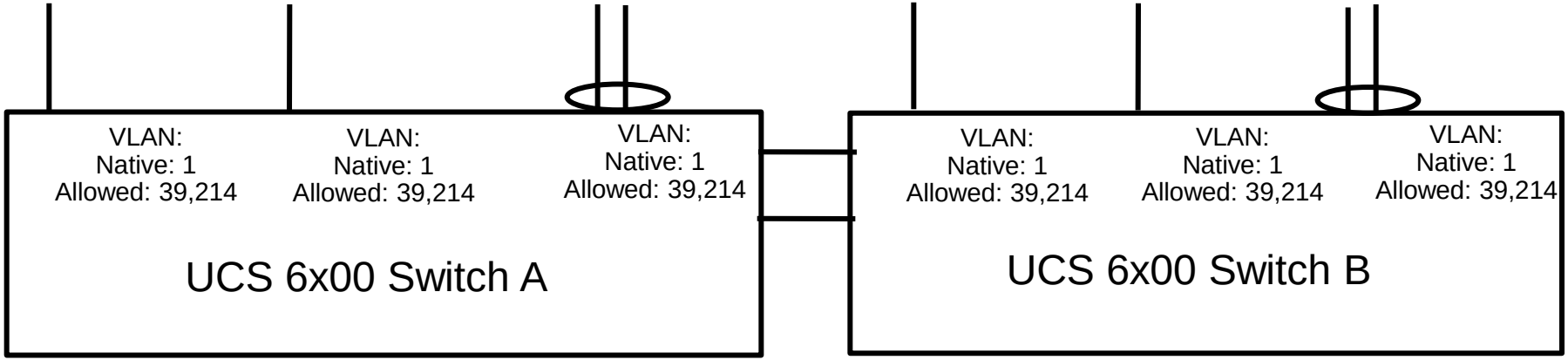
Configuring Unified Ports



Network Interfaces



Northbound Networking with Port Channels



Matching Configurations on Switch North of UCS

- **Regular Ports**
  - Match native VLAN:
    - If not, still “works” but have “strange VLAN translation”
    - Mismatch not recommended
  - Match allowed VLANs
    - subset or superset? Only those that match will get trough
  - Port Channels
    - Must configure matching port channel, *with LACP*
    - Match native/allowed VLANs, as for regular ports

VLAN Troubleshooting
Common Show Commands

```
FarNorth-A# connect nxos
FarNorth-A(nxos)# show vlan ?
  <CR>
  >             Redirect it to a file
  >>            Redirect it to a file in append mode
  access-list   Vlan access list
  access-map    List VLAN access maps
  brief         All VLAN status in brief
  counters      Display counters
  dot1Q         Display dot1q parameters
  fcoe          FCOE Congiguration
  filter        Information about VLAN filters
  id            VLAN status by VLAN id
  internal      Show VLAN manager internal
  name          VLAN status by VLAN name
  private-vlan  Private VLAN information
  summary       VLAN summary information
  |             Pipe command output to filter
```

Need to connect to NXOS
Default connects to primary FI

```
FarNorth-B(nxos)# )# show vlan internal usage

VLAN        DESCRIPTION
---------   ------------------------------------------------------
3968-4031   Multicast
4032        Online diagnostics vlan1
4033        Online diagnostics vlan2
4034        Online diagnostics vlan3
4035        Online diagnostics vlan4
4036-4043   Reserved
4094        Reserved
```

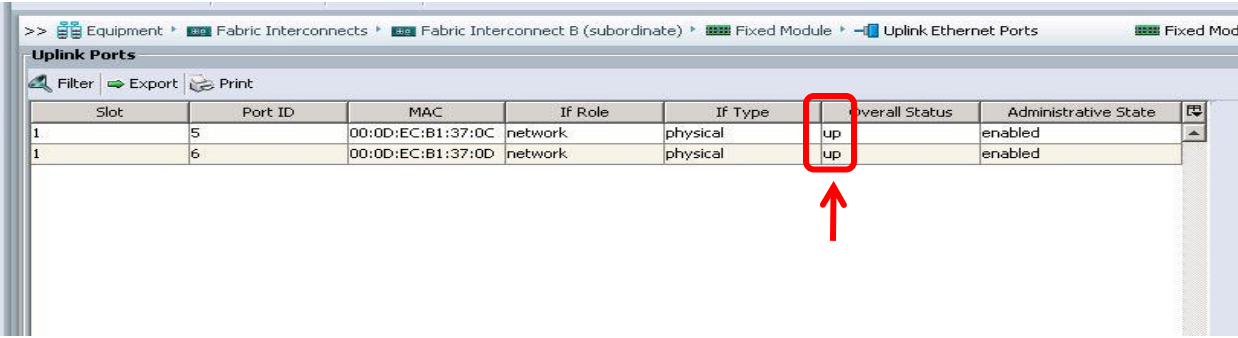
```
FarNorth-B(nxos)# sh vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Eth1/1, Eth1/2, Eth1/3, Eth1/4
                                                Eth1/5, Eth1/6, Eth1/7, Eth1/8
                                                Eth1/9, Eth1/10, Eth1/11
                                                Eth1/12, Eth1/13, Eth1/14
                                                Eth1/17, Eth1/18, Eth1/19
                                                Eth1/20, Eth1/1/1, Eth1/1/2
                                                Eth1/1/3, Eth1/1/4, Eth1/1/5
                                                Eth1/1/6, Eth1/1/8
200  fcoe-vsan-200                    active    veth9510
300  VLAN0300                         active
4044 SAM-vlan-management              active
4047 SAM-vlan-boot                    active
```

Troubleshooting Port Channels

- Are the physical member ports up?

- Port Channel fails to come up
- Ports remain in isolated (I) state




```
CWD-35-03-UCS-250-A(nxos)# show int brief

--------------------------------------------------------------------------------
Ethernet      VLAN    Type Mode   Status  Reason                   Speed     Port
Interface                                                          Ch #
--------------------------------------------------------------------------------
Eth1/1        1       eth  fabric up      none                     10G(D) --
Eth1/2        1       eth  fabric up      none                     10G(D) --
Eth1/3        1       eth  fabric up      none                     10G(D) --
Eth1/4        1       eth  fabric up      none                     10G(D) --
Eth1/5        1       eth  trunk  up      none                     10G(D) 1
Eth1/6        1       eth  trunk  up      none                     10G(D) 1
```

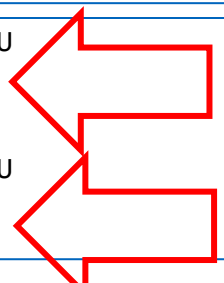
Troubleshooting Port Channels

- Is LACP configured on the upstream Switch?
- Is UCS sending & receiving LACP PDUs?

```
CWD-35-03-UCS-250-A(nxos)# show port-channel summary
Flags:  D - Down        P - Up in port-channel (members)
        I - Individual  H - Hot-standby (LACP only)
        s - Suspended   r - Module-removed
        S - Switched    R - Routed
        U - Up (port-channel)
--------------------------------------------------------------------------------
Group Port-       Type     Protocol  Member Ports
      Channel
--------------------------------------------------------------------------------
1     Po1(SD)     Eth      LACP      Eth1/5(I)    Eth1/6(I)
CWD-35-03-UCS-250-A(nxos)#
```

```
CWD-35-03-UCS-250-A(nxos)# show lacp interface ethernet 1/5 | i PDU
  PDUs sent: 1527580
  PDUs rcvd: 0

CWD-35-03-UCS-250-A(nxos)# show lacp interface ethernet 1/6 | i PDU
  PDUs sent: 1527619
  PDUs rcvd: 0
```



N-Port Virtualisation (NPV) Mode

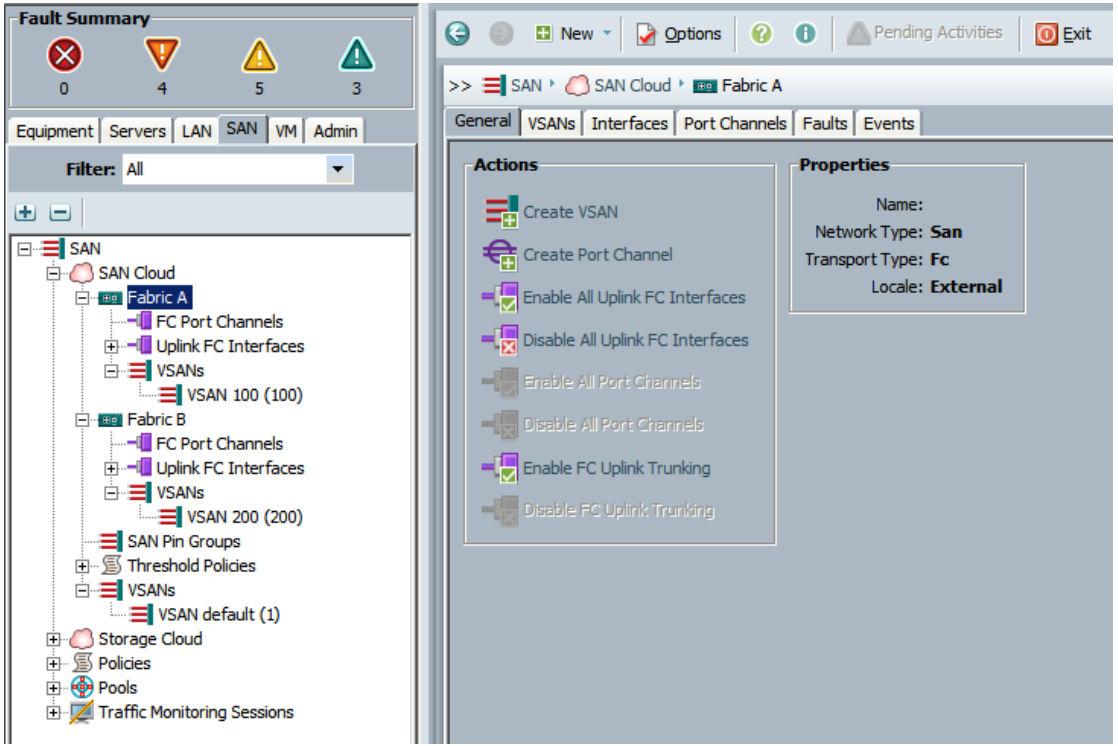
- UCS FI work in NPV mode by default
  - Server-facing ports are regular F ports
  - Uplinks toward SAN core fabric are NP ports
- UCS distributes (relays) FCIDs to attached devices
  - No domain ID to maintain locally
- Zoning, FSPF, DPVM, etc are not configured on the UCS Fabrics
- Domain mgr, FSPF, zone server, fabric login server, name server
  - They do not run on UCS Fabrics
- No local switching
  - All FC traffic routed via the core SAN switches

UCS Operating in FC Switching Mode

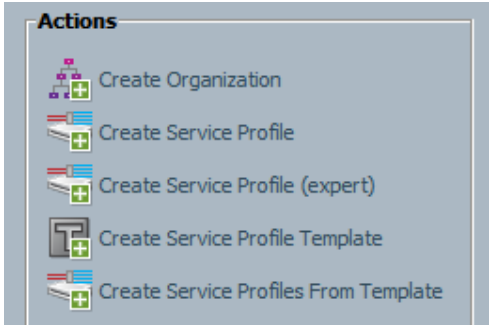
- Global setting: FC Switching Mode (requires a reboot)
- Why? Direct connectivity of FC and FCoE Storage Arrays
  - Connecting a NAS is totally independent of the FC mode of operation
- Be aware of:
  - UCS provides limited FC switching features
    - No zoning configuration
    - No interop mode per VSAN (keep that in mind!)
  - Must still have upstream MDS or Nexus FC switch via FC Uplink
  - Direct connect from Fabric Interconnect to Storage Array FC targets
  - Designed for small scale
  - Limited interoperability with storage ecosystem

VSAN Configurations

- VSAN numbers on UCS should match the VSAN's on Cisco MDS
- VSAN's will be mapped to a VLAN within the UCS, this VLAN is for FC traffic only. The VLAN you choose can be configure as a Data VLAN



The UCS Profile

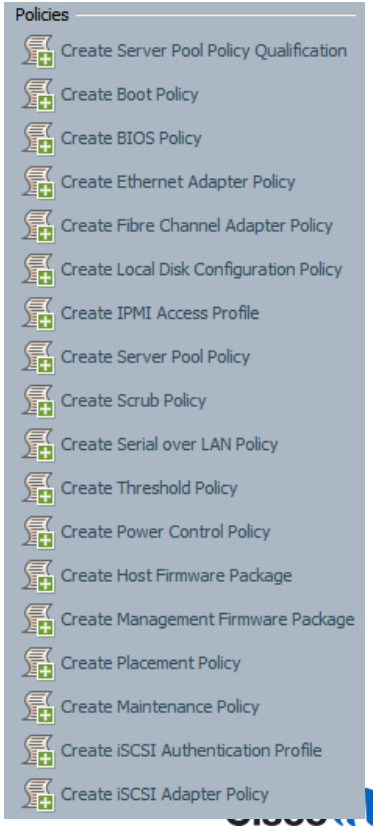


What you will need to do:

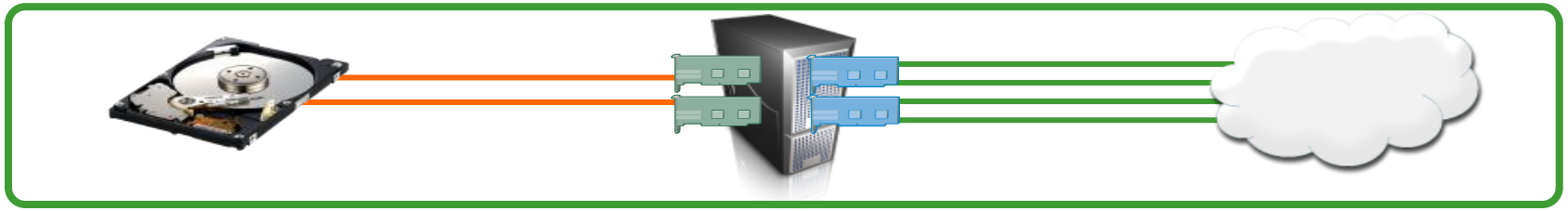
- Create Different Organisations
- Create Service profiles using all methods
- Create Profiles using vHBA's and iSCSI vNICS using different supported MEZZ adaptors
- Create Profiles that boot from Local drives, SAN & iSCSI
- Be able to apply all different Polices to the Profiles

- Associate Profiles to Servers and Boot the O/S

All the above can be Practiced on UCS Simulator



UCS Service Profile Entities



Storage

- Optional Disk usage
- SAN settings
  - LUNs
  - Persistent Binding
- SAN settings
  - vSAN
- Firmware
  - Revisions

Server

- Identity (UUID)
- Adapters
  - Number
  - Type: FC, Ethernet
  - Identity
  - Characteristics
- Firmware
  - Revisions
  - Configuration settings

Network

- Uplinks
- LAN settings
  - VLAN
  - QoS
  - etc…
- Firmware
  - Revisions

UCS Templates

- vNIC
- vHBA
- Service Profile

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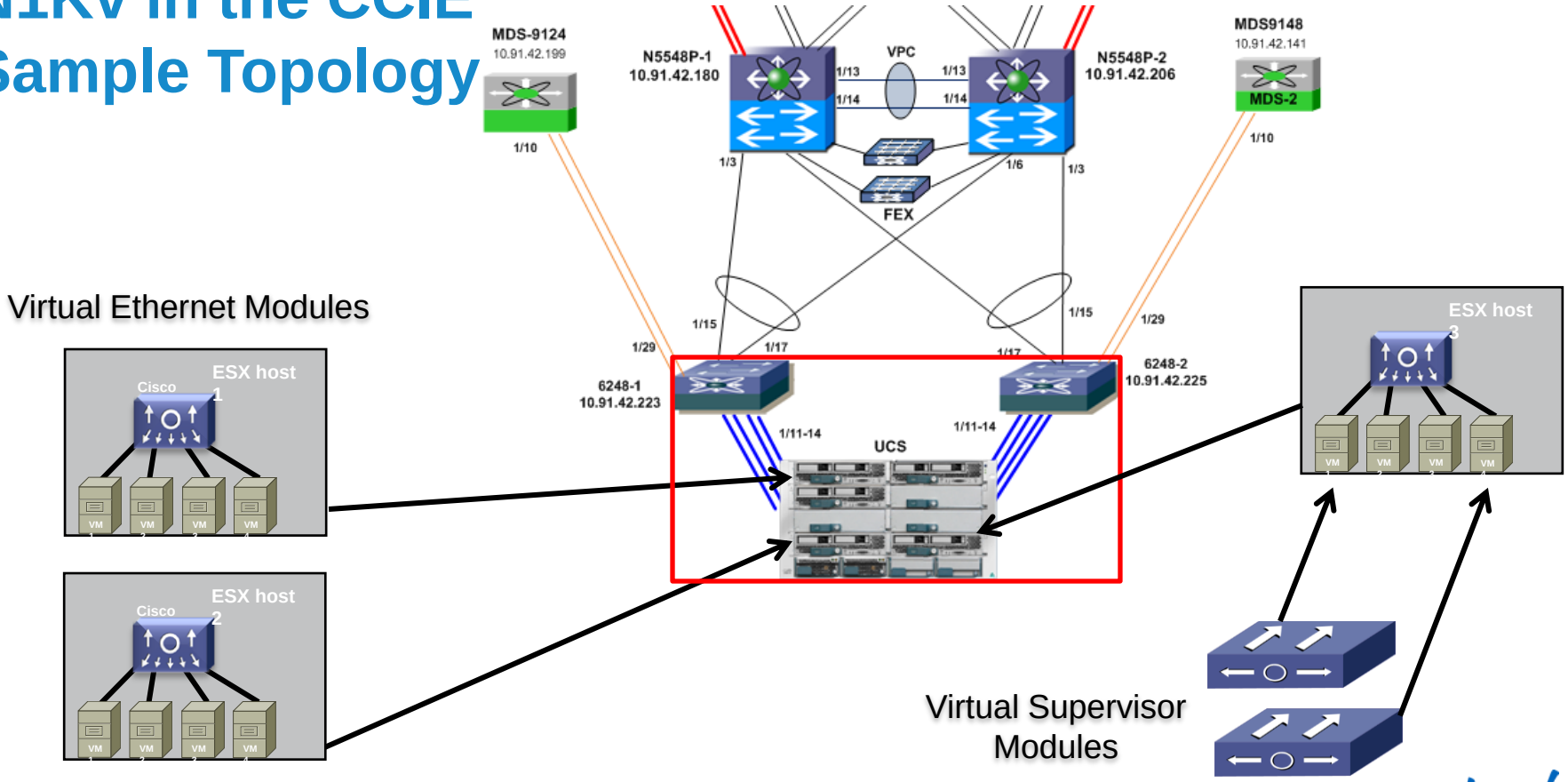
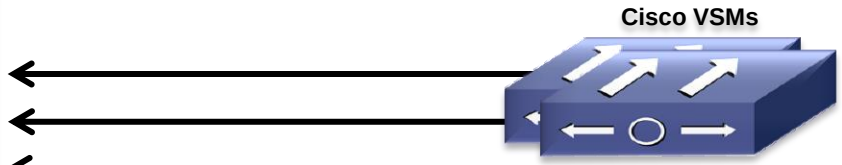
Nexus 1000v

N1Kv in the CCIE Sample Topology



Cisco's Nexus 1000V 'Virtual Chassis' Concept

```
CCIE-pod5-vsm# show module
Mod  Ports  Module-Type                       Model              Status
---  -----  --------------------------------- ------------------ ------------
1    0      Virtual Supervisor Module         Nexus1000V         active *
2    0      Virtual Supervisor Module         Nexus1000V         ha-standby
3    248    Virtual Ethernet Module           NA                 ok
```

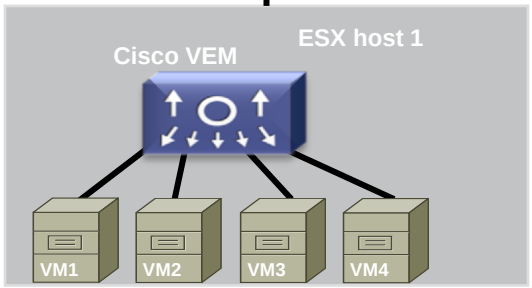


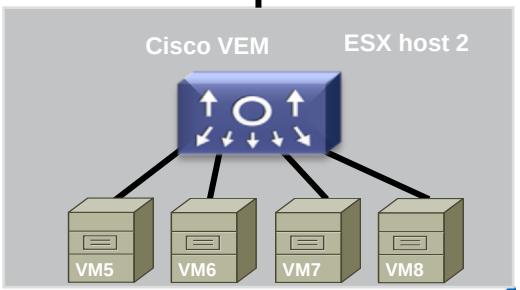
Virtual Supervisor Module(VSM)

- CLI interface -Nexus 1000V
- Leverages NX-OS
- Controls multiple VEMs as a single network device

Virtual Ethernet Module(VEM)

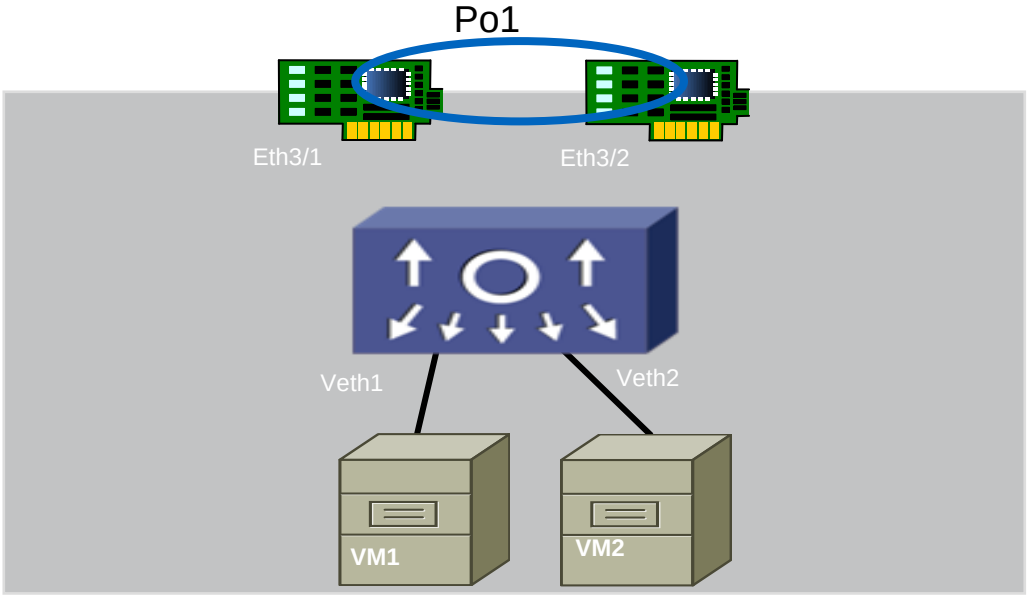
- Replaces Vmware's virtual switch
- Enables advanced switching capability on the hypervisor
- Provides each VM with dedicated 'switch -ports' or 'port-profiles'
- Provides enhanced Security Capabilities (see VSG)





Cisco Nexus 1000V Switch Interfaces

- Ethernet Port (eth)
  - 1 per physical NIC interface
  - Specific to each module
  - vmnic0 = ethx/1
  - Up to 32 per host
- Port Channel (po)
  - Aggregation of Eth ports
  - Up to 8 Port Channels per host
  - 32 interfaces per port
- Virtual Ethernet Port (veth)
  - 1 per VNIC (including SC and VMK)
  - Notation is Veth(port number).
  - No module number is assigned to enable consistent naming when moved
  - 216 per host, 2k per VSM*



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Keeping your Eye on the Prize

- Be prepared to commit to at least 4-8 months
- Studying becomes a work/life commitment
- Home Lab where possible (N1K, UCSPE, VIRL)
- Hands on Experience is a MUST (Remote labs included)
- Plan your success!
  - Set milestones/goals and do what's needs to be done to achieve them.

Pop Quiz Next

Pop Quiz

- Count the # of “F”s on this page

FINISHED FILES ARE OFTEN THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS...

How many did you count?

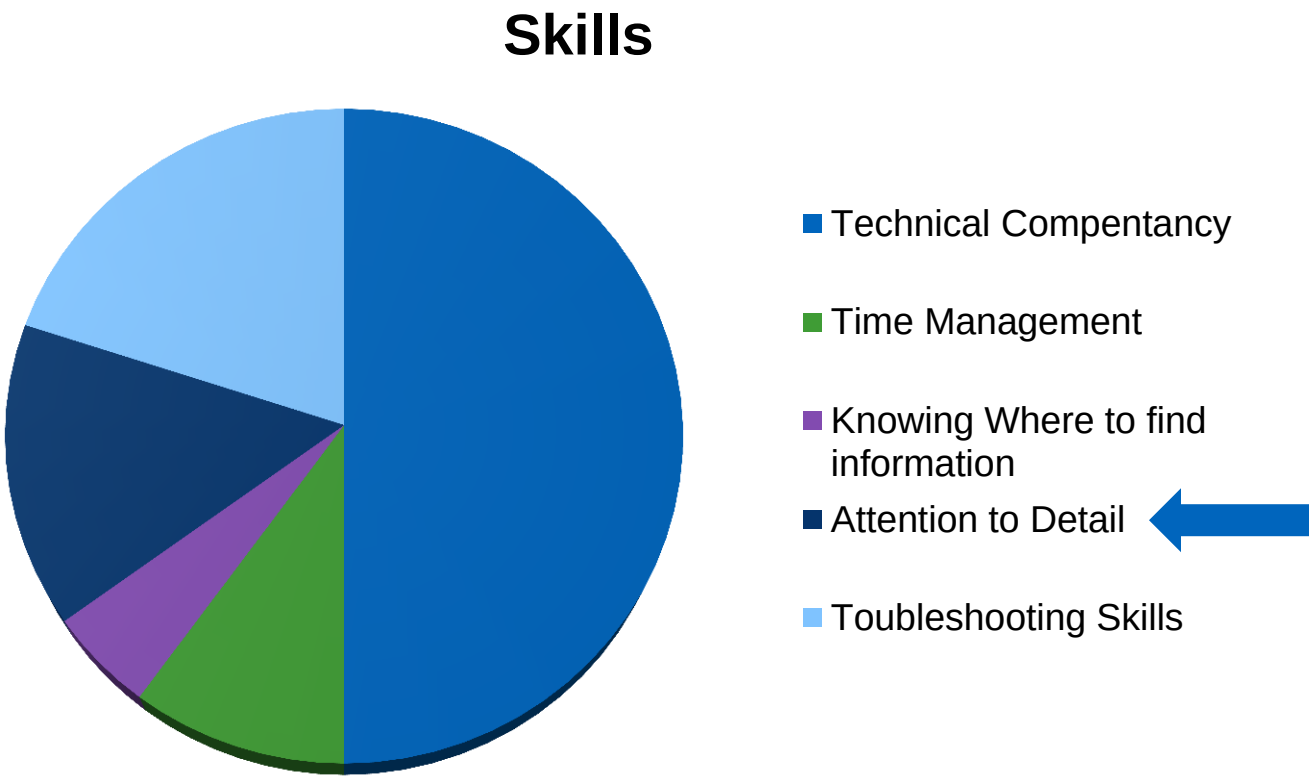
Pop Quiz

- Count the # of "F"s on this page

FINISHED FILES ARE OFTEN THE RESULT OF YEARS OF SCIENTIFIC STUDY COMBINED WITH THE EXPERIENCE OF YEARS...

How many did you count?

What does it take to pass the Lab Exam?



Don’t do it alone

- There are many groups, forums and study groups available.
  - 95% of successful CCIEs participate in a study group of some form.
  - On going groups available including Facebook, Learning @ Cisco, LinkedIn etc
- If you can’t team up locally, do it virtually
- Practice, practice and practice some again

The Big Day

- A week before your exam you should review Exam Outline and feel confident with each requirement
- Night Before – Close the books early and get your rest
- Breakfast is the most important meal of the day
- Dress comfortably. Leave your high heels at home.
- Start of Exam
  - Review the ENTIRE exam before starting – This investment will save you time later on
  - Take note of the Section and Individual question score value.
  - Test Everything you do
  - Set aside time at the end to review your work
- As you complete each task/requirement make notes. Comments such as “100% complete” or “Need to verify zoning distribution” will help you focus your efforts when you review.

What Happens if I Get Stuck???

- If you get into a question and hit a wall (not sure what to do), make a note, move on and come back to it.
- Lab Exams are composed of multiple questions and multiple tasks. Weigh the score value against the time invested. Sometimes its better to skip a question and focus on the rest.
- Some questions will affect others. Many lab scenarios are treated as a Data Centre solution – questions may have an impact on other outcome of another.

A Note on Lab Proctors

- Proctors are there to run the exam
- They are not there to help you on any technically related questions

- A Proctor will:
  - Clarify a Question
  - Deal with Hardware Issues Encountered

- A Proctor will not:
  - Solve or Troubleshoot Configuration Issues
  - Answer questions on how to configure devices (Confirming good/bad configuration)
  - Answer Questions regarding a choice of how to configure something

The Aftermath

- Once you finish your exam you should have a good idea of how you performed.
- Results will be available usually within 24hrs
- Congratulate yourself on your effort! - pass or fail.
- If you didn't score a passing mark – don't despair. Dust yourself off, review the sections you scored poorly on, and plan to focus on improving those areas.
- You can rebook after 6 weeks. This gives you adequate time to sharpen your skills in the poorly scored areas.
- Even some of the best TAC engineers require multiple attempts!

Available Resources

- Learning @ Cisco – Forum for asking questions, support and free online resources such as webinars and other virtual events
  https://learningnetwork.cisco.com/community/certifications/ccie_data_center
- Recommended Reading List
  https://learningnetwork.cisco.com/docs/DOC-13986
- Recommended Training
  https://learningnetwork.cisco.com/docs/DOC-13985
- Online Resources
  https://learningnetwork.cisco.com/docs/DOC-13987
- Other Courses
  http://www.cisco.com/web/learning/le31/ase/offerings/datacenter/index.html

Got a question after the session?

- Join the CCIE Data Centre Study Group on CLN
- https://learningnetwork.cisco.com/groups/ccie-data-center-study-group
  - Ask technical questions
  - Find study partner(s)

- Open a CertSupport case at http://www.cisco.com/go/certsupport

- Send me an email at munawaz@cisco.com

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SME= Subject Matter Expert




Q & A

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