



Unified Computing System (UCS) Overview

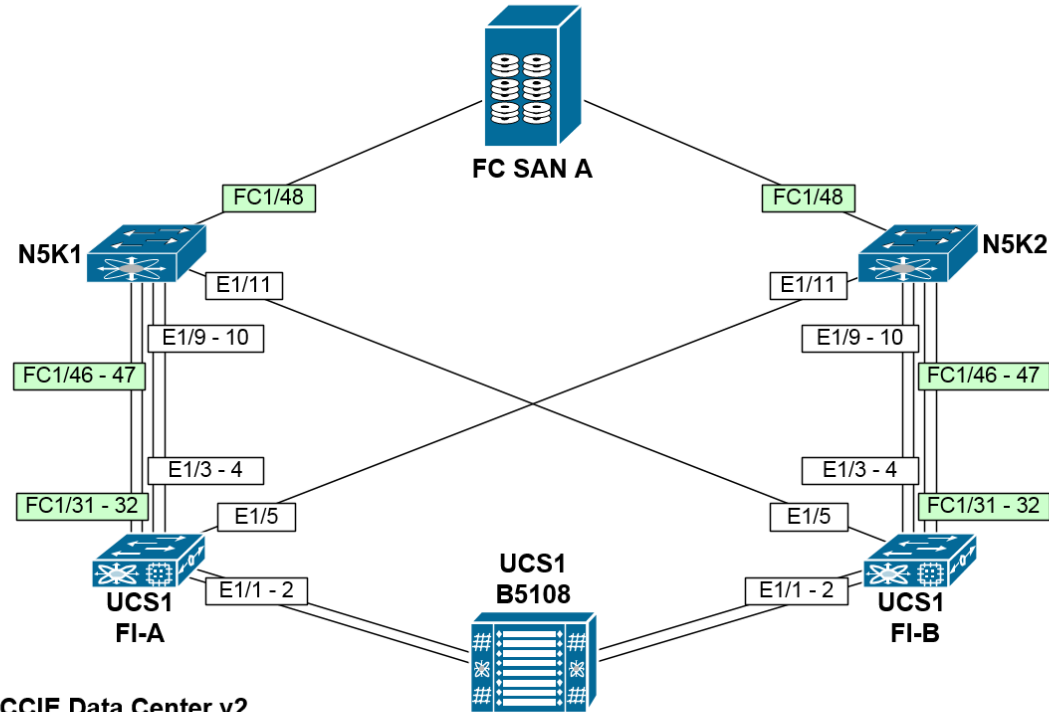


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Course Topic Flow

- ▷ UCS System Components Overview
- ▷ UCS Basic System Initialization
- ▷ Using the UCS Manager (UCSM)
- ▷ Using the UCS CLI
- ▷ UCS LAN Connectivity
- ▷ UCS SAN Connectivity
- ▷ UCS Pool, Policies, & Service Profiles

Hardware Topology – UCS B Series

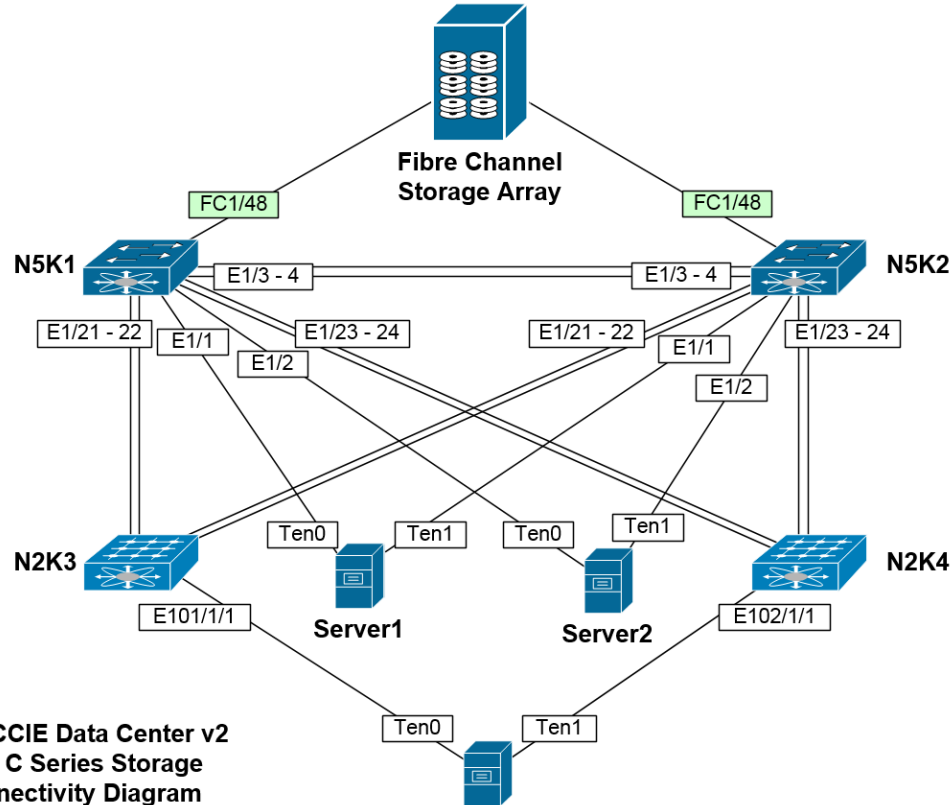


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UCS B Series Storage
Connectivity Diagram
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Hardware Topology – UCS C Series



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Recommended Resources

▷ Books

- [Cisco Unified Computing System \(UCS\) \(Data Center\): A Complete Reference Guide to the Cisco Data Center Virtualization Server Architecture](#)
- [Data Center Virtualization Fundamentals: Understanding Techniques and Designs for Highly Efficient Data Centers with Cisco Nexus, UCS, MDS, and Beyond](#)
- [NX-OS and Cisco Nexus Switching: Next-Generation Data Center Architectures](#)
- [Implementing Cisco UCS Solutions](#)

▷ Documentation

- [Unified Computing System Technology Design Guide](#)

▷ Cisco Live

- [BRKCOM-2003 - UCS Networking - Deep Dive](#)

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UCS Blade Server Components



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UCS High Level Components

▷ <http://www.cisco.com/go/ucs>

▷ UCS Blade Series is made up of five main components:

- Blade Chassis
- Blade Servers
- Blade Server I/O Adapters
- Blade Chassis I/O Modules
- Fabric Interconnects

UCS High Level Components

▷ Blade Chassis

- Physical enclosure for Servers
- Includes hot swappable power supplies and fans

▷ Blade Servers

- Physical Servers that include CPU, RAM, & Optional HDDs

▷ Adapters

- Network Interface Cards for Blade Servers
- AKA “mezzanine adapters”, “virtual interface cards” (VICs)

UCS High Level Components

▷ I/O Module

- AKA IOM, “Fabric Extender” (FEX)
- Physical module to connect backplane of chassis/servers to upstream Fabric Interconnects
- This is where the Chassis is physically wired to the network

▷ Fabric Interconnects

- AKA “UCS FI”
- Hosts the management, control, and data planes for Chassis and Servers
- Servers cannot operate without the FI(s)
- Deployed in pairs for redundancy

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UCS - OS Installation to Remote Storage



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UCS Remote Storage Variations

▷ UCS supports both Block and Object/File Storage

▷ Block Storage

- Fibre Channel
- Fibre Channel over Ethernet (FCoE)
- iSCSI

▷ Object/File Storage

- NFS
 - Linux Network File System
- CIFS
 - Microsoft Common Internet File System
 - SMB / SAMBA

UCS Virtual Media

- ▶ UCS supports “virtual” CD/DVD drives for installation media
 - KVM / UCSM mounts ISO as if it were a directly connected disk for B / C Server
 - E.g. Windows Server ISO installer
- ▶ ISOs can be manually mounted or centrally located
 - CIMC Mounted vMedia
 - E.g. CIFS/NFS share located on management segment
 - KVM mapped vMedia
 - Manually attached ISO through KVM console

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UCS LAN Connectivity



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UCS LAN Connectivity

▷ UCS Blade to IOM Pinning

- Controls how traffic leaves Blade Chassis up to Fabric Interconnects
- I.e. traffic on “server” ports of FI

▷ vNIC Pinning

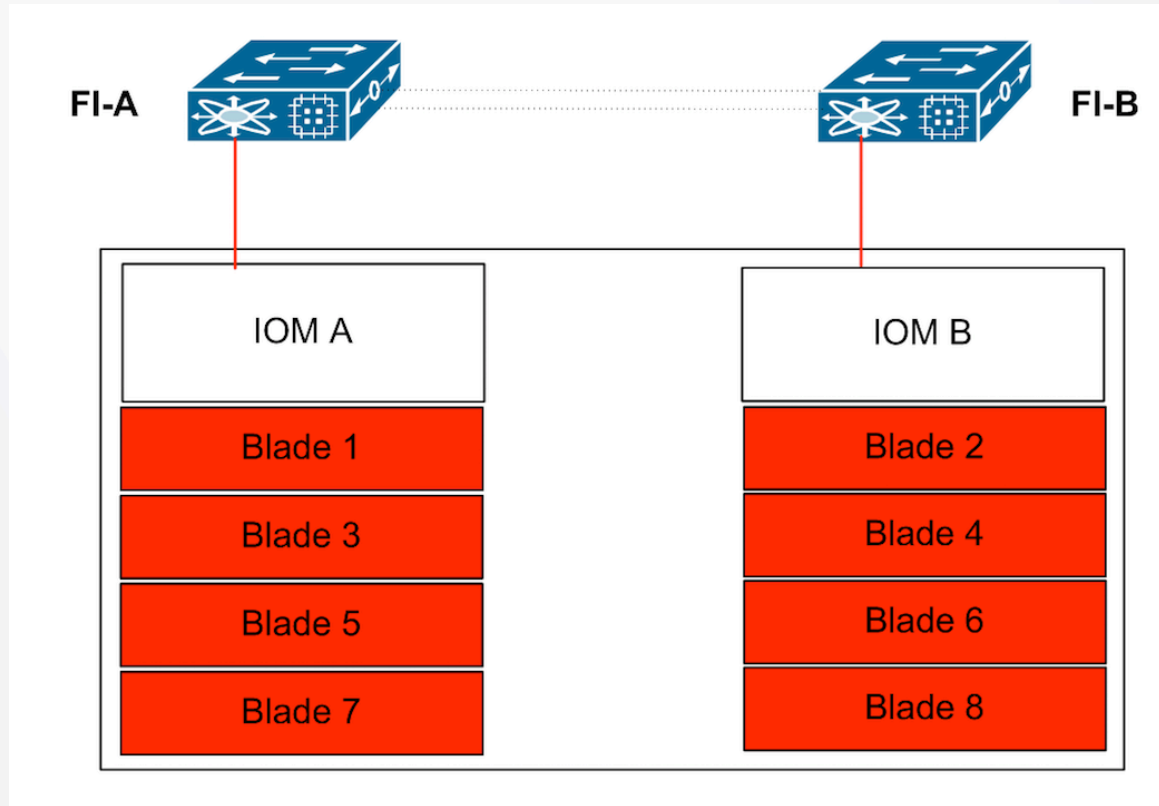
- Controls how traffic leaves Fabric Interconnect up to Northbound Switches
- I.e. traffic on “uplink” ports of FI

UCS FI Cluster Links

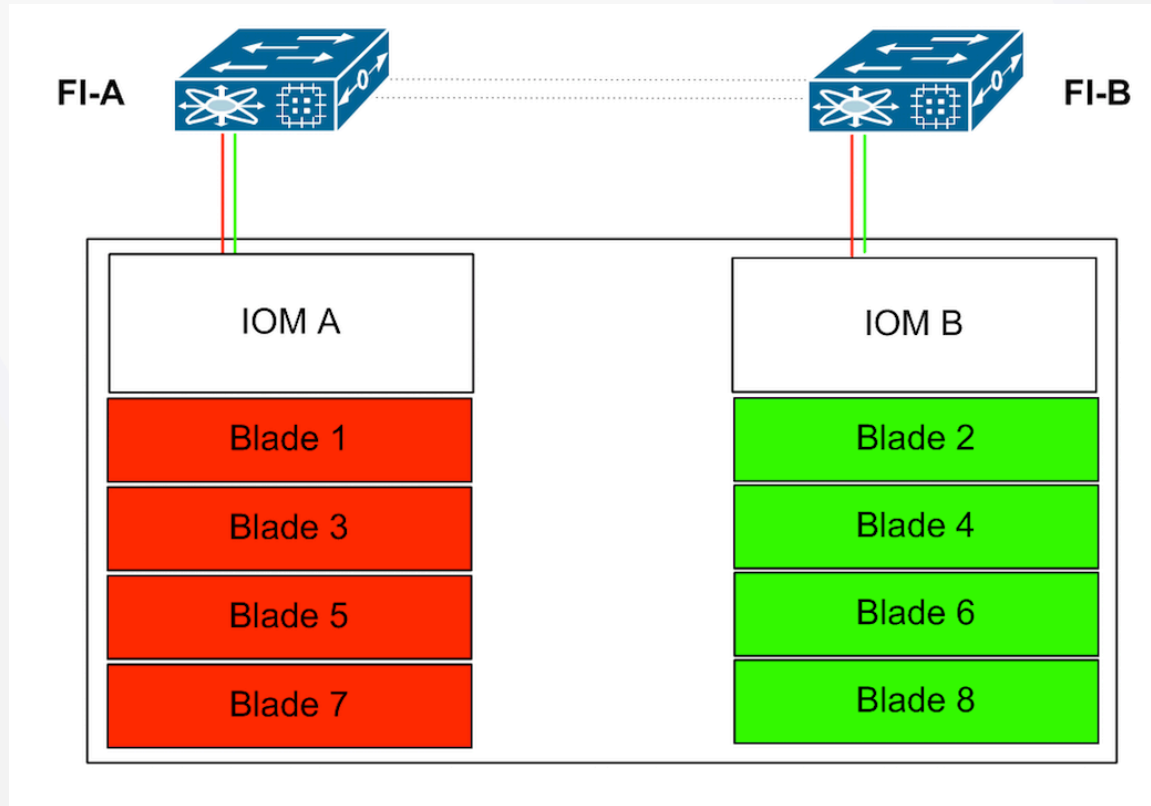
- ▷ Connects FI-A to FI-B over L1/L2 cable
 - Uses straight through Cat5 Cable
- ▷ Used to sync management plane
 - I.e. the config
 - Not used to sync the control & data planes



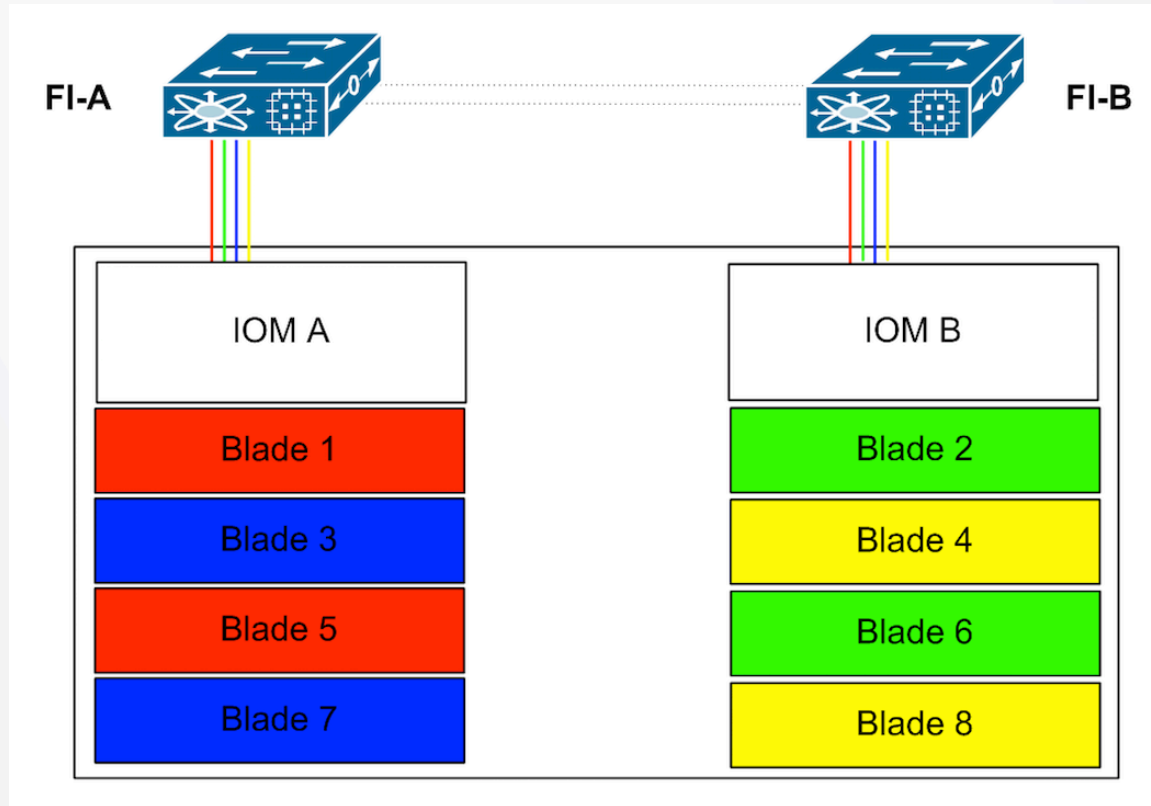
Blade to IOM Pinning – 1 link



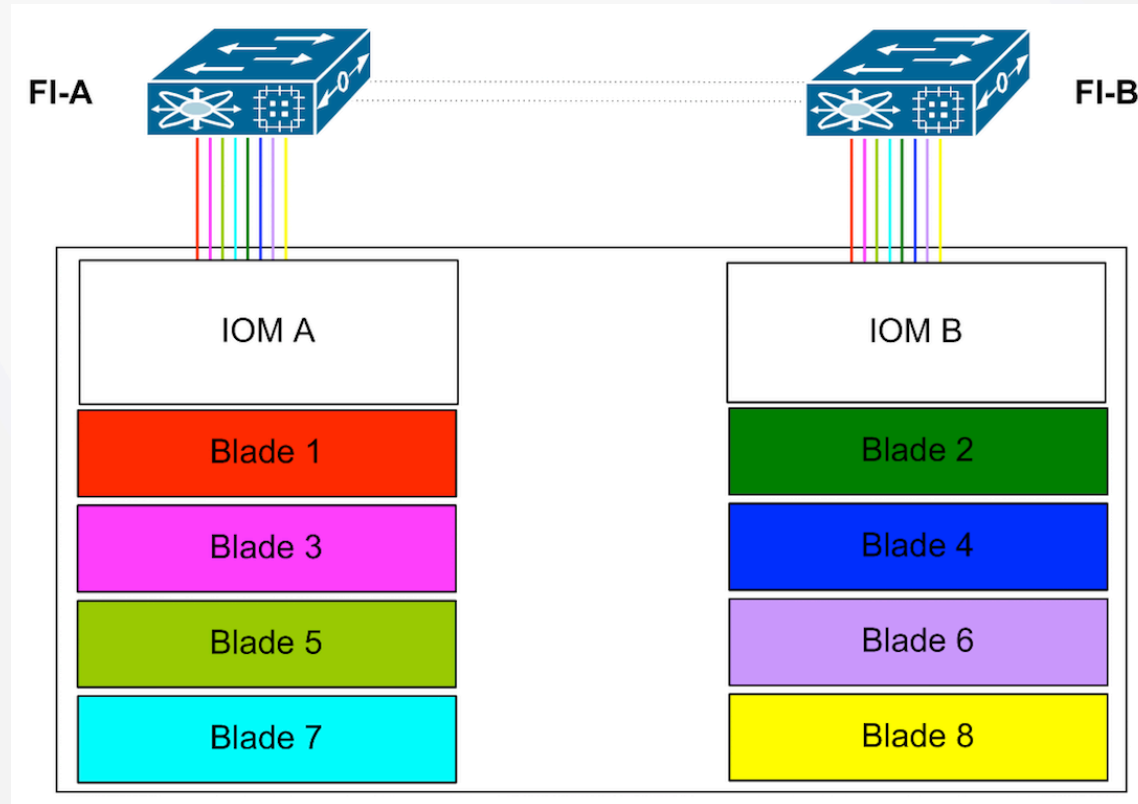
Blade to IOM Pinning – 2 links



Blade to IOM Pinning – 4 links

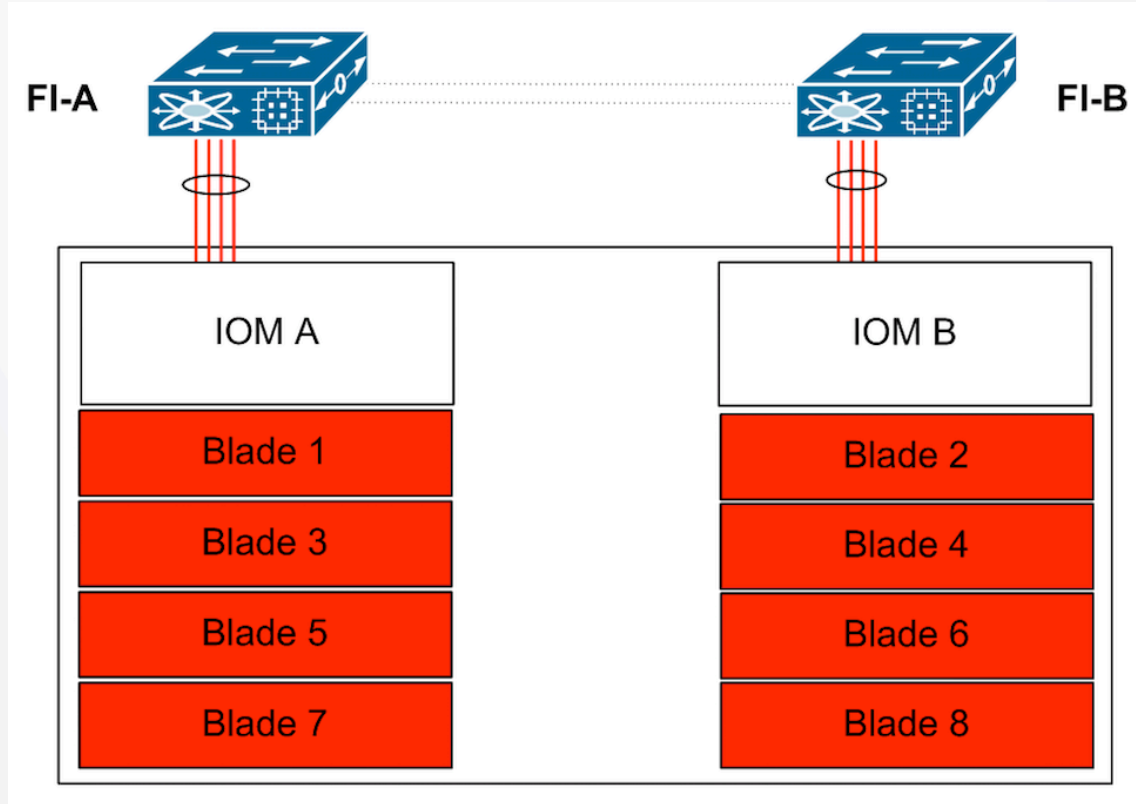


Blade to IOM Pinning – 8 links



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Blade to IOM Pinning – PC



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802.3ap and 10BASE-KR

▷ 802.3ap = Backplane Ethernet

- IEEE started task force in 2004
- Ratified standard in 2007
- Allows for 1 (single lane) and 10 GE (single and 4 lane) over printed circuit boards

▷ 10BASE-KR

- Operates over a single backplane lane
- Uses same physical layer coding as 10GBASE-LR/ER/SR
- This is the “KR” suffix that you will see in older mezzanine card part numbers

VN-Link vs VN-Tag

- ▶ VN-Link is an umbrella marketing term describing the goal of the functionality
 - i.e. To get traffic from one location to another via a virtual device that doesn't necessarily have direct physical connectivity
- ▶ VN-Tag is the actual act of populating the Ethernet header with a tag to denote what vEth/Eth port to send traffic to

VN-Tag

▷ Original study proposal

- <http://www.ieee802.org/1/files/public/docs2009/new-pelissier-vntag-seminar-0508.pdf>

▷ Became:

- 802.1Qbh

▷ Finally standardized as:

- 802.1br
- (to separate from 802.1Q working group)

LAN Connectivity

- ▶ No local switching on the IOM/FEX in chassis, local server switching on the FIs
- ▶ Fabric Interconnect Modes
 - End Host Mode (NIV) (default, recommended)
 - Presented to upstream switches as a host, not a switch
 - Ethernet Switching Mode
 - Really no use any longer
 - Used to need this for disjointed L2 networks, but now this is supported in EHM

LAN Connectivity – EHM

- ▶ No upstream MAC learning, only MAC learning is from southbound blades
- ▶ No STP
- ▶ Designated Broadcast/Multicast Uplink port
 - All other uplink interfaces that BC/MC heard → bit bucket
- ▶ RPF check
 - Is this coming in a uplink port but not one that a downstream blade is pinned to? Drop it!
- ▶ Deja-Vu check
 - Have I already seen this packet before? Drop it!
 - (also applies for BC/MC traffic)

LAN Connectivity – EHM

▷ Uplink pinning can be static or dynamic

- Static pinning is done by “LAN Pin Group”
- If dynamic, and pinned uplink fails, auto failover to another dynamic uplink port on same FI, then to static uplink on FI, then to other FI (if VIC supported and configured)
- If static, we will failover to static pin group on other FI
- Because of pinning, can use all 10GE uplinks, even if not using port channeling

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UCS Disjoint Layer 2 LAN Connectivity



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UCS Disjoint Layer 2

▷ What is Disjoint Layer 2?

- FI connects to multiple northbound switches via trunks
- Not all trunk links carry the same VLANs
- Result can be a traffic black hole

▷ How does UCS determine pinning for RPF check?

- **show pinning [border-interfaces | server-interfaces]**

▷ How does UCS determine the Broadcast Receiver port?

- **show platform software enm internal info vlandb [x] | all**
- shortcut – “which | include vlandb” from UCS NX-OS CLI

UCS Disjoint Layer 2 Solutions

- ▷ Option 1 – Fix the Disjoint Network Upstream
 - All switches trunk all VLANs to each other
- ▷ Option 2 – Edit Trunking Allowed List
 - VLAN manager or VLAN groups on UCS
- ▷ Option 3 – Provision Multiple vNICs to the OS
 - Pinning decision happens per vNIC, not per VLAN
- ▷ Option 4 – Enable Ethernet Switching Mode on FI
 - Disables pinning and uses normal RSTP for forwarding

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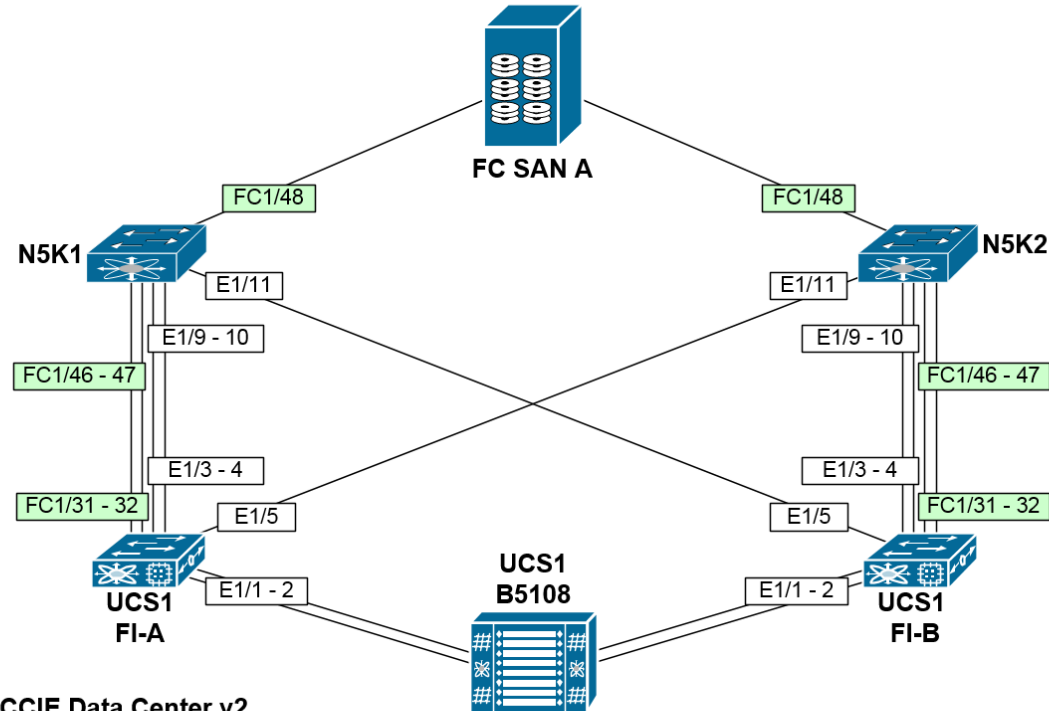


UCS LAN Connectivity Ethernet Port Channels



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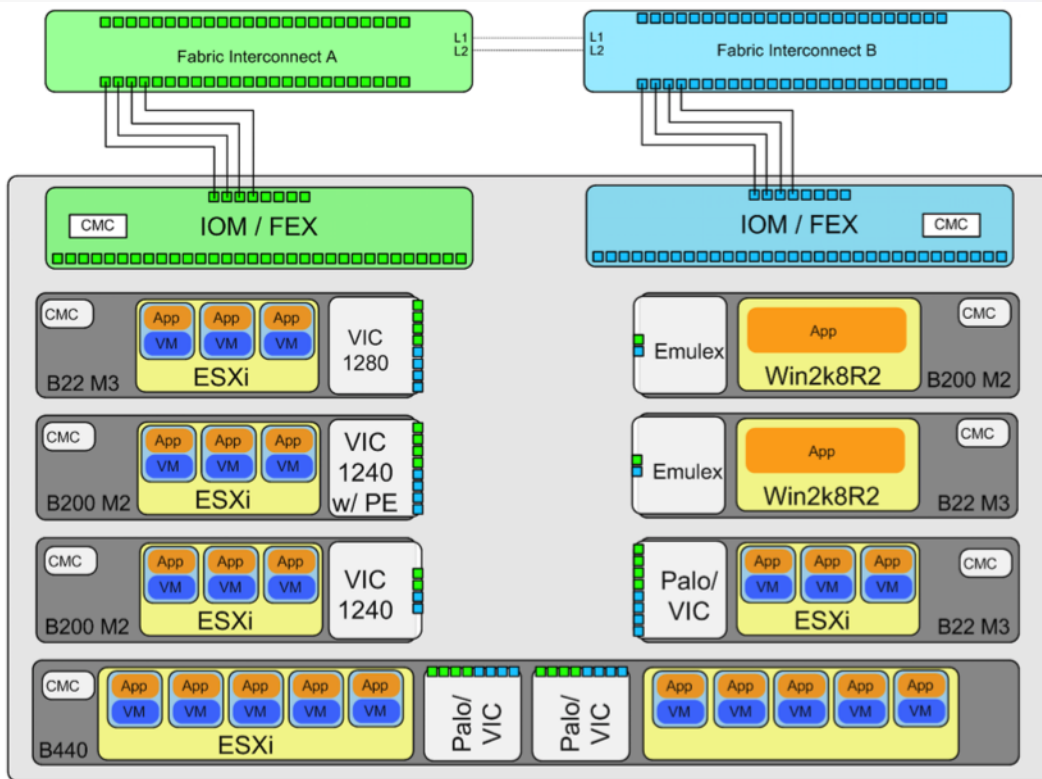


UCS LAN Connectivity Fabric Failover



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Logical View – FIs, IOMs, & Blades



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UCS LAN Connectivity vNIC Templates



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CCIE DCv2 Advanced Technologies Series



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In Today's Class

▷ Service Profile Templates

- Initial vs. updating, creating, disconnecting & reconnecting templates

▷ UCS Pools

- MAC, NWWN, PWWN, XWWN, iSCSI, MGMT, etc.

▷ Orgs, Locales, & RBAC

▷ Inband Management

▷ Backup & Restore

▷ Firmware Management

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UCS Service Profile Templates



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UCS Service Profile Templates

▷ Two types of templates

- Initial
- Updating

▷ Initial Templates

- Initially copies objects from parent template to child Service Profile instance
- Changes to parent template do not affect child instance

▷ Updating Templates

- Child Service Profile instance is connected to parent template
- Changes in parent template are pushed to child instances
 - E.g. new vNICs added, VLANs updated, etc.
- Child instance cannot be edited without disconnecting from parent template

Creating Service Profile Templates

▶ Two ways to create a Service Profile template

- Servers > Service Profile Templates > Create Service Profile Template
 - Creates a new template
- Servers > Service Profiles > Create Template from Service Profile
 - Creates template based off existing Service Profile

▶ Creating Template from Service Profile inheritance caveats

- Pools of Objects referenced in child Service Profile inherited by parent Template
- Manually defined child objects inherited as ***derived*** by parent template
 - E.g. vNIC with statically assigned MAC address in child becomes derived in parent
- Objects whose value cannot be derived will cause association failure when new child instance is spawned from parent template
 - E.g. VIC adapters do not have burnt-in MAC addresses, cannot be derived

Disconnecting Child from Parent Object

- ▶ Objects of instance spawned from Updating Template can't be edited
 - E.g. vHBA options of child cannot differ from parent Updating Template
- ▶ Child object must be disconnected from parent to edit directly
 - Applies to both vNIC/vHBA Template and Service Profile Template instances
- ▶ Disconnected child objects no longer subject to changes in parent
 - E.g. Add new VLANs to vNIC of Updating Template, changes do not get pushed down to disconnected child object

Reconnecting Child to Parent Object

- ▶ vNIC, vHBA, or Service Profile Template instance can be re-bound to parent object after being disconnected
 - ▶ E.g. Servers > Service Profiles > *instance* > Bind to a Template
- ▶ **Changes of child object are reverted if they conflict with parent template**
 - E.g. new vNICs previously added to child SP instance are deleted when reconnected to parent template if they don't match

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UCS Server Pools & Qualification Policies



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UCS Server Pools

- ▶ Server Pools used to automate association of Service Profile to Blade or Rack Mount Server
 - E.g. find me any 4 available blades and associate 4 instances of Template X to them
- ▶ Server Pools can have conditionally assign servers per Qualification Policy
 - E.g. find me 4 available blades with at least 128GB RAM and associate 4 instances of Template X to them

UCS Server Qualification Policies

- ▶ Qualification Policy defines the required attributes of a server
 - CPU type, speed, cores, etc.
 - Memory type, speed, quantity, etc.
 - Adapter type
 - Disk policy
- ▶ Qualification policy is referenced from Server Pool Policy
 - Server Pool Policy binds Qualification Policy to Server Pool
 - Result is Server Pool is populated with server that meet Qualification
 - Server Pool is then assigned to Service Profile or Template

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UCS Address Pools



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UCS Address Pools

▷ Address Pools used to automate assignment of variables such as...

- UUID (CPU ID)
- vNIC MAC Addresses
- vHBA Node World Wide Names (NWWN/WWNN)
- vHBA Port World Wide Names (PWWN/WWPN)
- vHBA Node/Port World Wide Names (WWxN)
- iSCSI Qualified Name (IQN)
- iSCSI Initiator IP Addresses
- Management IP Addresses

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UCS Policies



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UCS Policies

▷ UCS Policies define behavior of Service Profiles, such as:

- What BIOS options are enabled/disabled?
 - E.g. Hyperthreading, VT-x/VT-d, etc.
- What disk configuration does the server run?
 - RAID 0/1/5/6/10, etc.
- What is the boot order?
 - CD/DVD, FC SAN, iSCSI SAN, Local Disk, etc.
- What firmware package is the server running?
- Do I power the server off if there is a brownout?

UCS Policy Types

- ▷ Policies are generally in three categories
 - Server Policies
 - LAN Policies
 - SAN Policies

UCS Server Policies

▷ Adapter

- Input & Output Queue Depth, TCP Offload Engine (TOE), etc.

▷ BIOS

- Quiet Boot, Resume on Power Loss, Front Panel Lockout, Chipset

▷ Boot Policy

- Local or Remote Disk Targets

▷ Host Firmware Package

- Drivers for adapters, CIMC, BIOS, etc.

▷ IPMI Access

- Who can login to Integrated Platform Management Interface (IPMI) over LAN

▷ KVM

- Is vMedia encrypted?

▷ Local Disk Config

- No disks, any disks, RAID config, FlexFlash, etc.

UCS Server Policies

▷ Maintenance

- Does the system ask before making a change and rebooting the server?
- **User Ack is disabled by default!**

▷ Memory

- Allows marking DIMMs as bad

▷ Power Control

- 1 highest priority cap, 10 lowest. Power off lower priority servers first in event of power issues.

▷ Scrub

- Delete the disk/BIOS config when disassociating

▷ Serial over LAN

- Enable console access over LAN

UCS Server Policies

▷ Server Pool

- Dynamically assign servers based on Qualification Policy

▷ Threshold

- Monitor SNMP MIBs and trap/alarm on specified thresholds

▷ iSCSI Auth

- Username/password for iSCSI target to initiator authentication

▷ vMedia

- Remote CIFS/NFS/HTTP file share for hosting OS installer ISOs

▷ vNIC/vHBA Placement

- PCIe order of cards

UCS LAN Policies

- ▷ Flow Control
- ▷ LACP
- ▷ LAN Connectivity
- ▷ Link Protocol
- ▷ Multicast
- ▷ Network Control
- ▷ QoS
- ▷ Threshold

UCS SAN Policies

- ▷ FC Adapter
- ▷ LACP
- ▷ SAN Connectivity
- ▷ Storage Connection
- ▷ Threshold

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UCS Administration



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In This Section

- ▷ Firmware Management
- ▷ Backup & Restore
- ▷ Orgs, Locales, & RBAC
- ▷ Inband Management

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UCS Firmware Management



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UCS Firmware Management

- ▶ Firmware for all UCS components is managed from UCS Manager
 - Equipment > Equipment > Firmware Management
 - I.e. Fabric Interconnects, I/O Modules, CMC, Blade & Rack Mount CIMC, BIOS, Network Adapters, and Storage Controllers, etc.
- ▶ Firmware Bundles have multiple components
 - Infrastructure Bundle (A Bundle)
 - Fabric interconnects, IO Modules, and UCS Manager (UCSM)
 - B-Series Bundle
 - Blade Servers Adapters, BIOS, CIMC, etc.
 - C-Series Bundle
 - Rack Servers Adapters, BIOS, CIMC, etc.

UCS Firmware Versions

- ▶ Infrastructure & Server components can run different versions
 - Fabric Interconnects & UCSM must run version greater than or equal to blades & rack mounts firmware
- ▶ Not all combinations of versions and hardware components are supported
 - E.g. older adapters and blades not supported in version 3.x
- ▶ See release notes for more information
 - [Release Notes for Cisco UCS Manager, Release 3.1](#)

Active vs. Backup Firmware

- ▶ Some components hold two versions of firmware
 - CIMC, I/O module, BIOS, CIMC, & Adapters
- ▶ Backup slot used to upgrade to new firmware
- ▶ Startup Version chooses which of the two firmware versions to run at next reboot
 - If Startup Version boot fails, backup version is booted
- ▶ Fabric Interconnect and UCSM only have active firmware
 - Additional versions can be stored in flash on FIs

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UCS Backup & Restore



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UCS Inband Management



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UCS Orgs, Locales, & RBAC



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