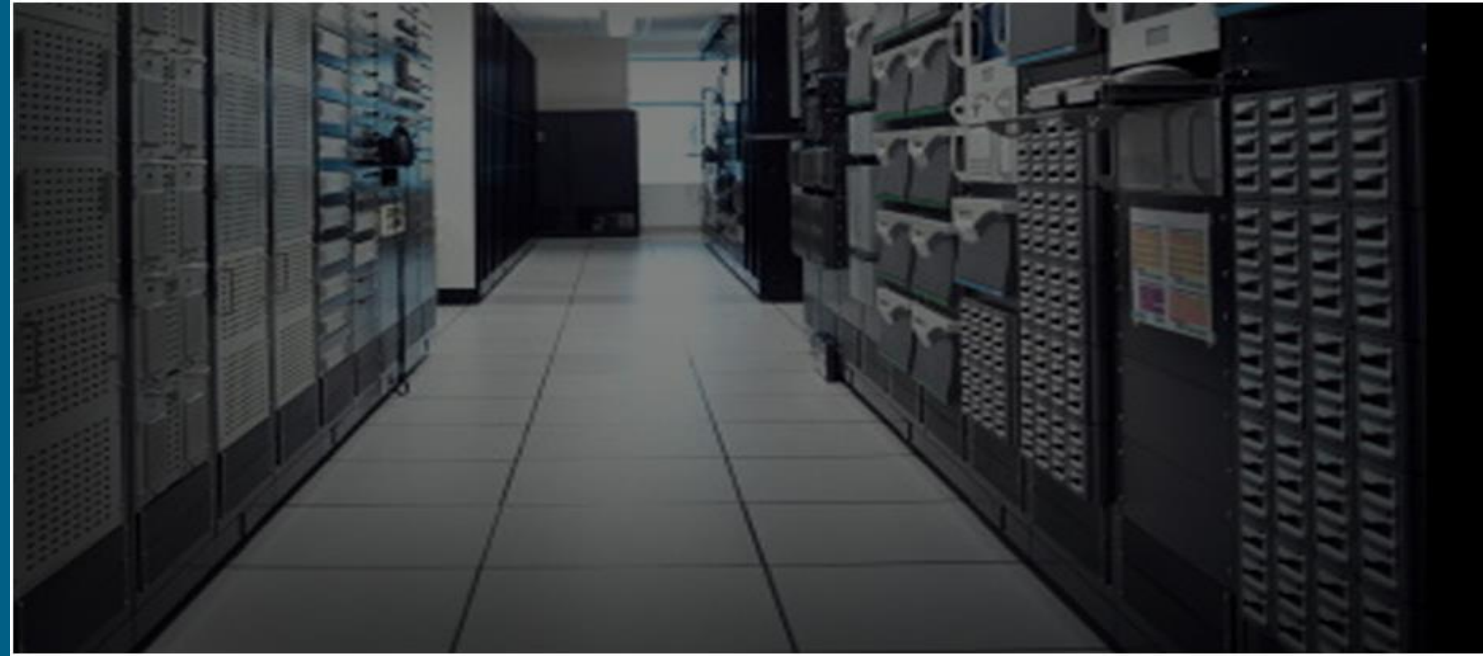
Welcome

Technical Services Virtual Boot Camp

Session 13

Technical Services India Team

NEXUS 7000



Introduction

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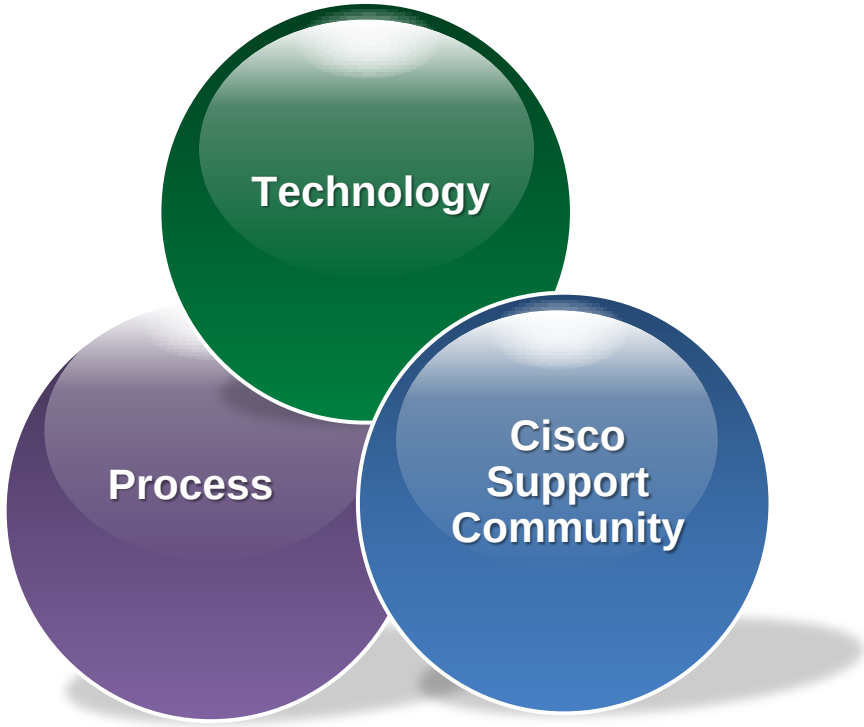
Technical Support Manager

Recap - Telepresence

Technology

- Product Portfolio - TC codec series
- Camera details
- Cables & Connectors
- How to capture logs
- Troubleshooting
- Lab

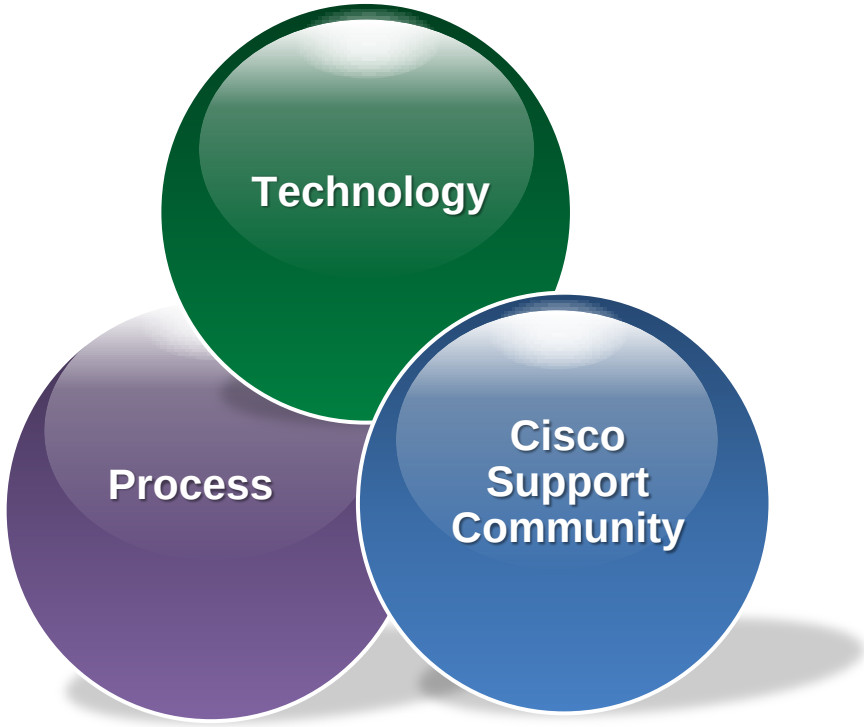


Q&A

Session 13 - Nexus

Technology

- Nexus Overview
- Software Architecture
- Hardware Architecture
- IOS vs NX-OS
- Nexus Release Train Info



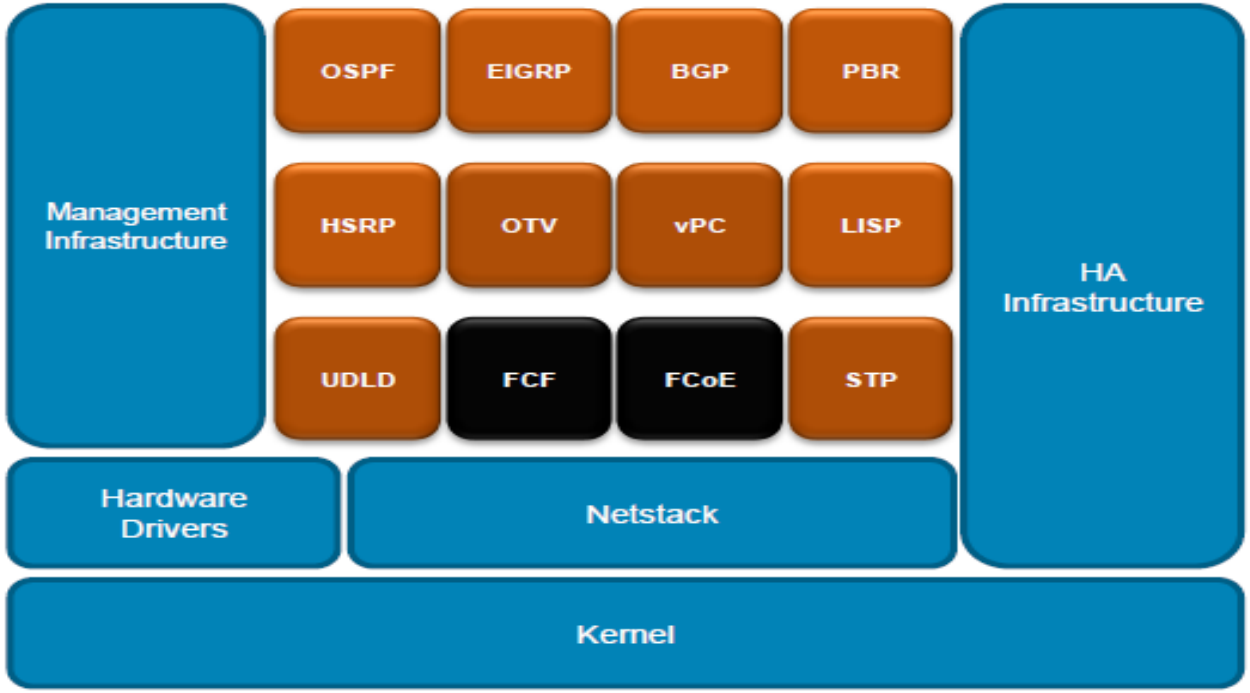
Q&A

Cisco NX-OS Highlights
Designed to Meet the Operational Needs of the Data Center

- **Feature Rich Operating System**
  Comprehensive L2 and L3 feature set
- **Modular, Multi-Threaded/Processor**
  Highly scalable unprecedented uptime
- **Intelligent IOS-Like CLI**
  Little or no retraining required
- **Zero Service Disruption**
  Maintenance ≠ Downtime
- **Virtualization Support**
  Industry first virtualized network OS, VM-FEX
- **Layer 2 and Layer 3 Multipathing**
  Resilient scalable Layer 2 and Layer 3 domains
- **Storage and Ethernet Convergence**
  FCoE, iSCSI, HPC
- **Advanced Management Infrastructure**
  XML and Web Services

NX-OS Feature/Service Granularity

- Highly granular implementations
- Each service is an individual memory protected process
  - Including multiple instances of particular service
- Effective fault isolation between services
- Individually Monitored & Managed



NX-OS: Infrastructure Services

- System Manager (sysMgr)
- MTS
- PSS
- Feature Manager
- Interface Manager ➔ EthPM / FCPM / PCM
- Platform Management ➔ Platform Manager, Xbar Manager, Module Manager
- Forwarding Plane ➔ Dist/Centralized forwarding, traffic replication, L3 Control Software

Interface Manager - EthPM

EthPM handles all following Interface Types:

- Physical Interfaces
- Port-Channel Interfaces
- Sub-Interfaces
- Loopback/Null Interfaces
- Management Interfaces
- Supervisor Inband Interfaces

Port Index Manager (PIXM)

- PIXM is the supervisor component that is responsible for the generation of port indices.
- EthPM interacts with PIXM to generate and release hardware indices for all physical ports in a module (during OIR).
- On receiving the indices, EthPM programs it in the PortASIC (via port client process)
- EthPM interacts with PIXM to perform CBL programming also.

MTS

- MTS used for inter-process communication – has built-in HA support
- MTS offers SAPs (Service Access Points) to allow services to exchange messages, which are opcode based.
- MTS is also a key component in the synchronization of state between active and standby services.
- New MTS node is created for every VDC (so that same SAP can be used) and specified in all MTS messages.

ELTM - Requirement

- EARL8 is designed to support features based on port only, vlan only and (port, vlan) pair.
- This increases the Logical Interface (LIF) count to 128K and above.
- Now we need a software process to program all LIF related tables in the EARL ASICs.
- The software process responsible for programming is ELTM !!

Debug/Crash info

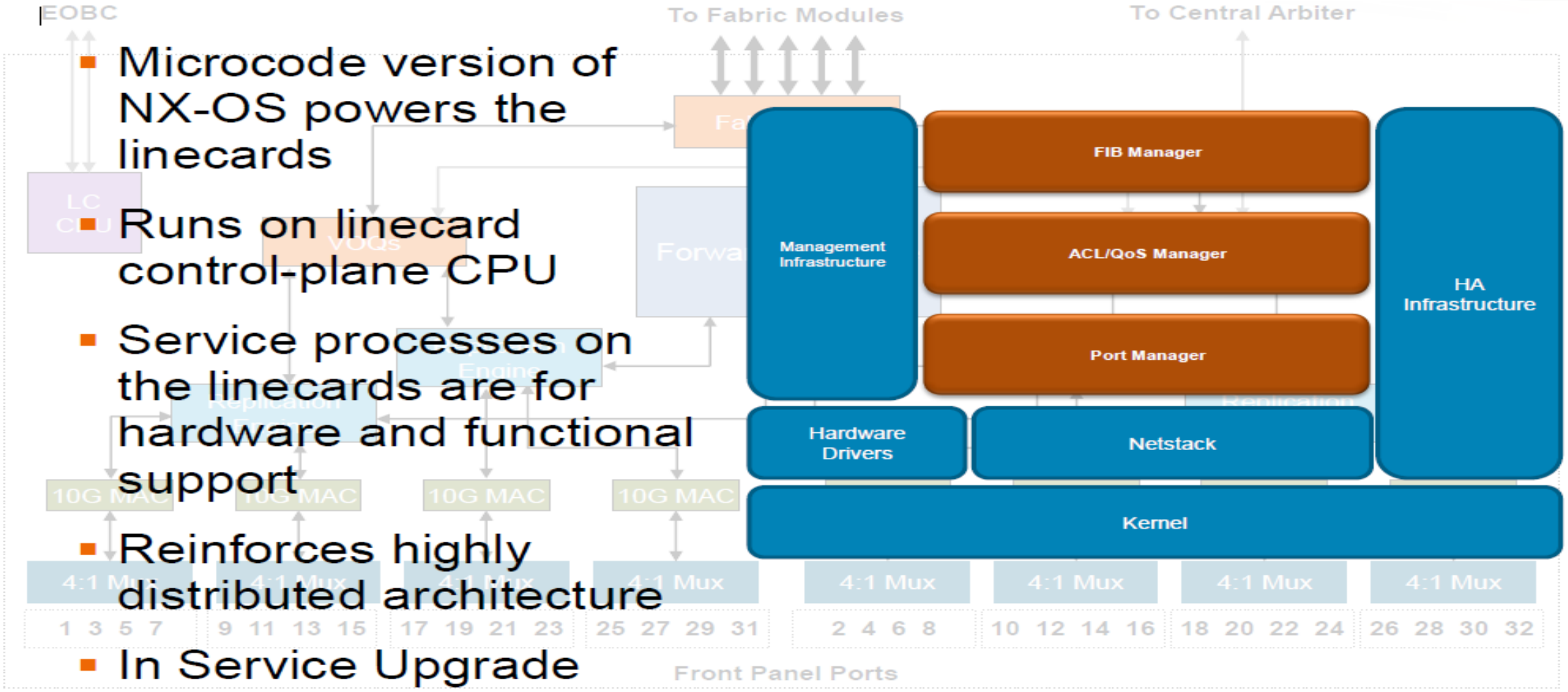
- show cores [vdc X] ➔ not persistent across reload
- show process log vdc-all ➔ persistent across reload

Files from:

- logflash:/core/
- logflash:/debug/
- logflash:/log/
- logflash:/generic/
- logflash:/eem_logs/

NX-OS runs on the Linecard

- Microcode version of NX-OS powers the linecards
- Runs on linecard control-plane CPU
- Service processes on the linecards are for hardware and functional support
- Reinforces highly distributed architecture
- In Service Upgrade capabilities

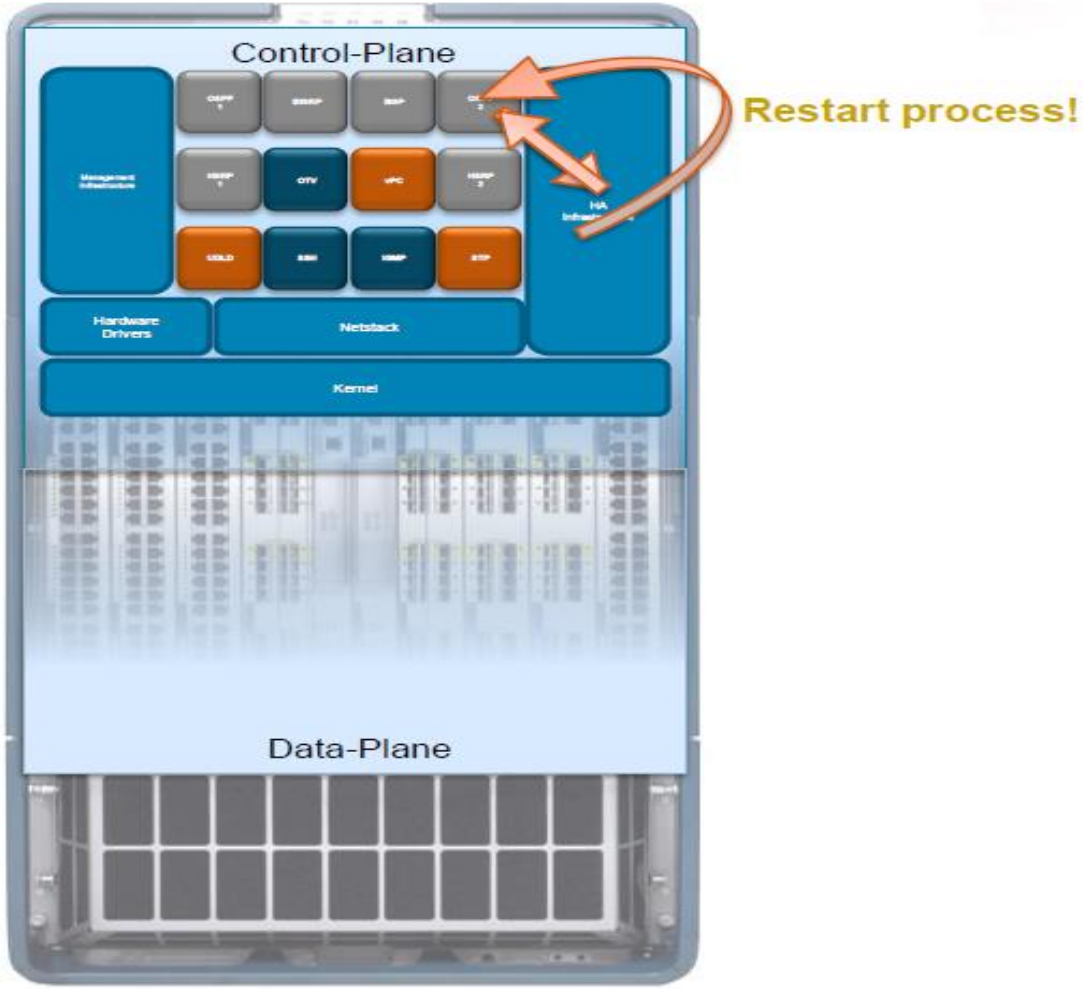


NX-OS Stateful Process Restart

- NX-OS services checkpoint their runtime state to the PSS for recovery in the event of a failure

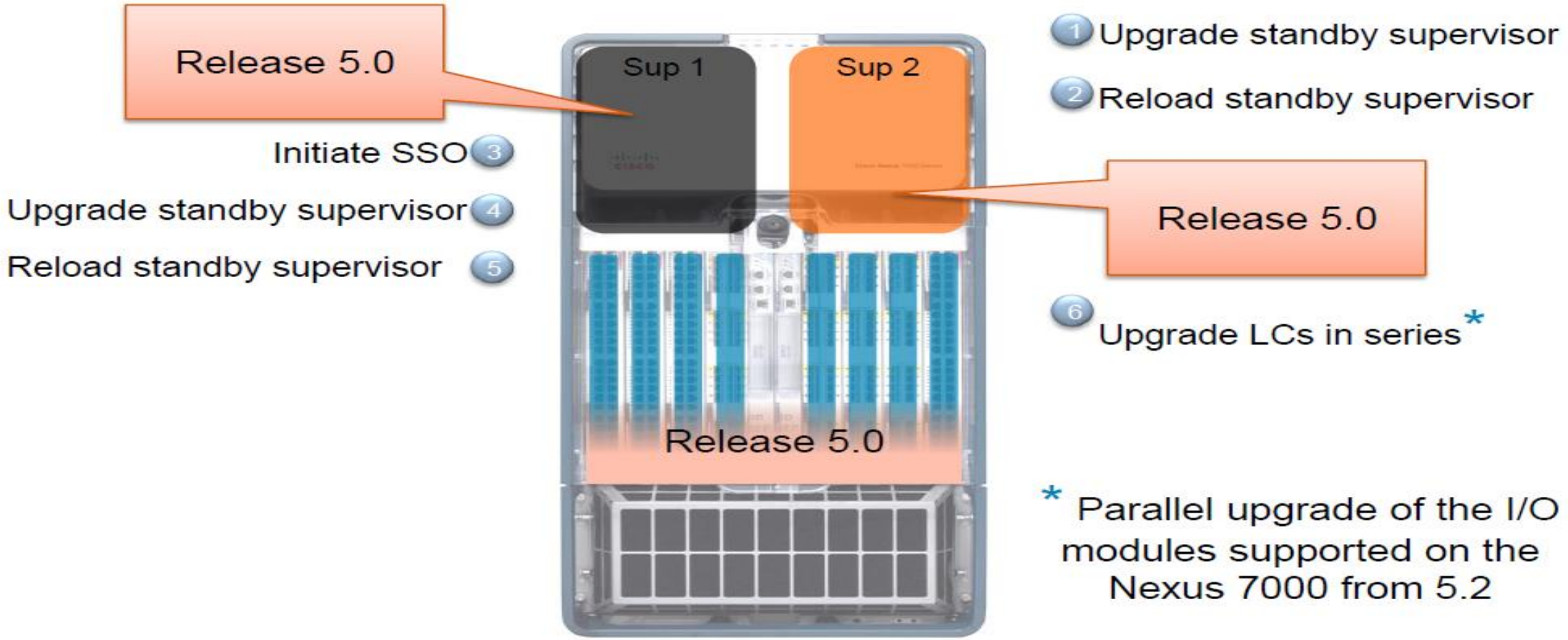
If a fault occurs in a process…

- HA manager determines best recovery action (restart process, switchover to redundant supervisor)
- Process restarts with no impact on data plane
- Total recovery time: ~10s ms
- State is recovered, operation resumes



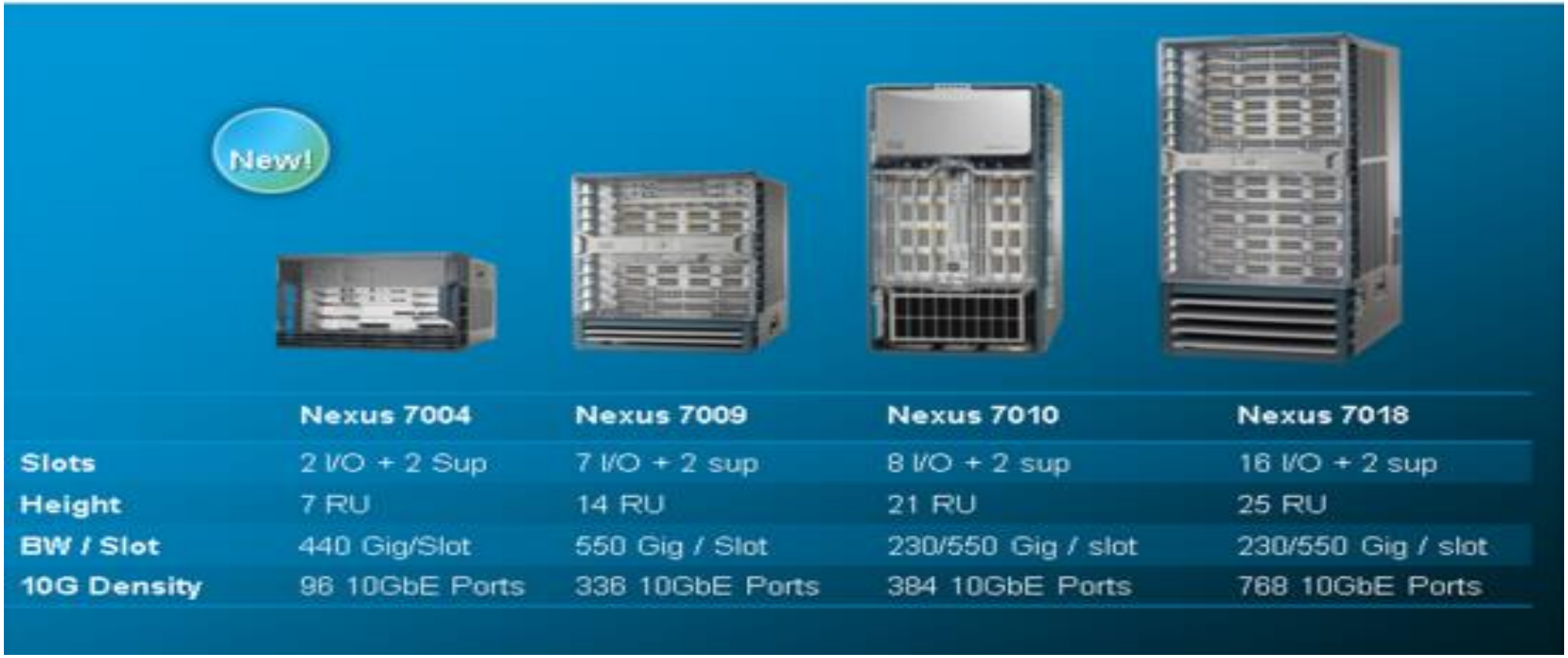
In-Service Software Upgrade

```
N7K# install all kickstart bootdisk:5.0-kickstart system bootdisk:5.0-system
N7K#
```



Nexus 7000 Series Switches

Nexus 7000 Series: Broad Range of Deployment Options

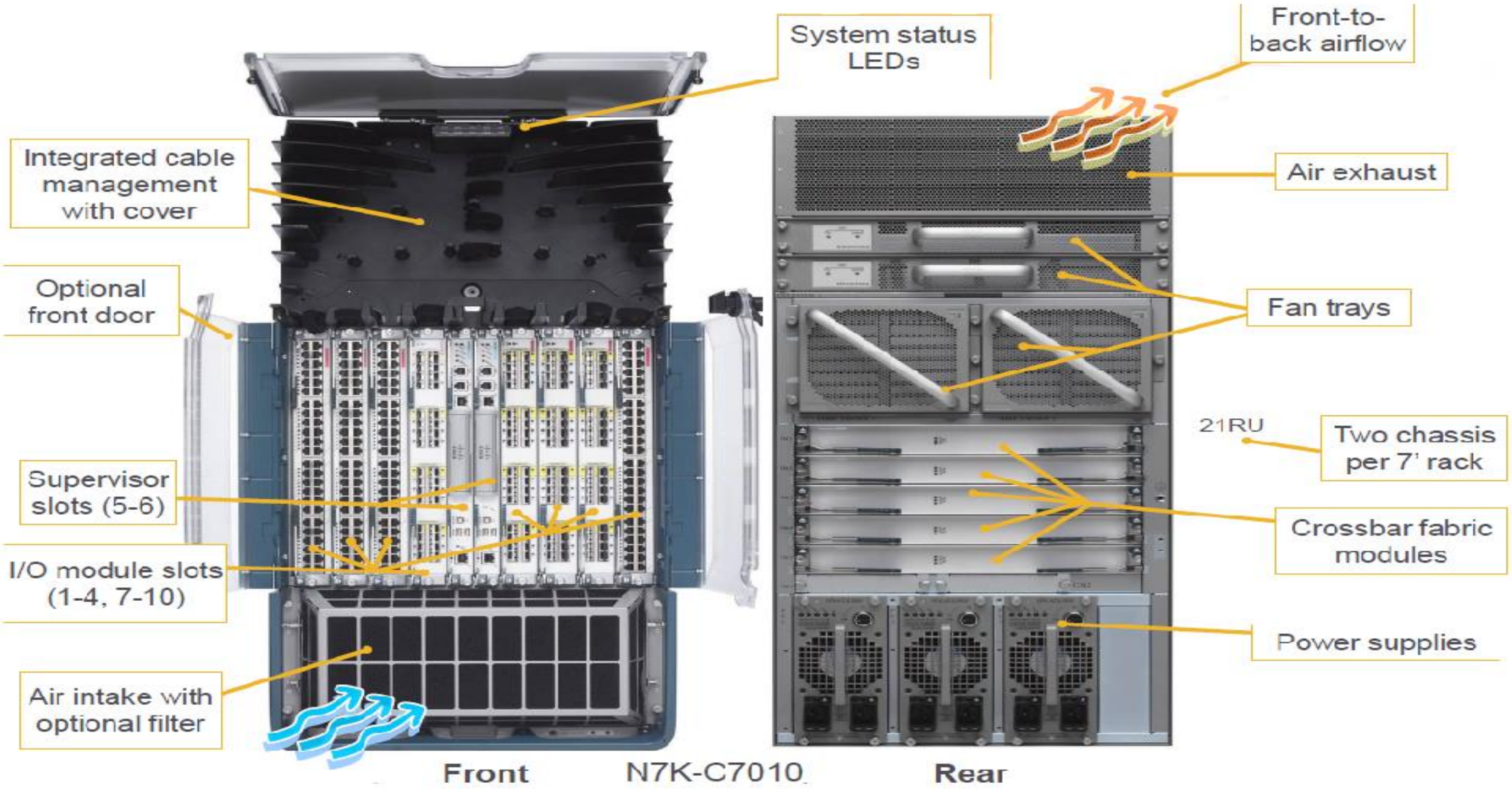


	Nexus 7004	Nexus 7009	Nexus 7010	Nexus 7018
Slots	2 I/O + 2 Sup	7 I/O + 2 sup	8 I/O + 2 sup	16 I/O + 2 sup
Height	7 RU	14 RU	21 RU	25 RU
BW / Slot	440 Gig/Slot	550 Gig / Slot	230/550 Gig / slot	230/550 Gig / slot
10G Density	96 10GbE Ports	336 10GbE Ports	384 10GbE Ports	768 10GbE Ports

Nexus 7010 Chassis

- **7010:** The 7010 chassis is a cutting edge core chassis designed for high bandwidth, low-latency, next-generation network topologies. Every attempt has been made to make this a future proof chassis for evolving technologies and physical layer exchange of data.
- 10-Slots: 1-4 and 7-10 are line card slots, 5-6 are supervisory slots
- Supports 256 10Gbps, and/or 384 1Gbps ports
- 1.2 Tb/s system bandwidth, future proof to 15+ Tb/s
- 80 Gbps, 60Mpps per slot
- Air flow is front to back, bottom to top
- Up to 5 Crossbar Fabric Modules
- Up to 3 power supplies

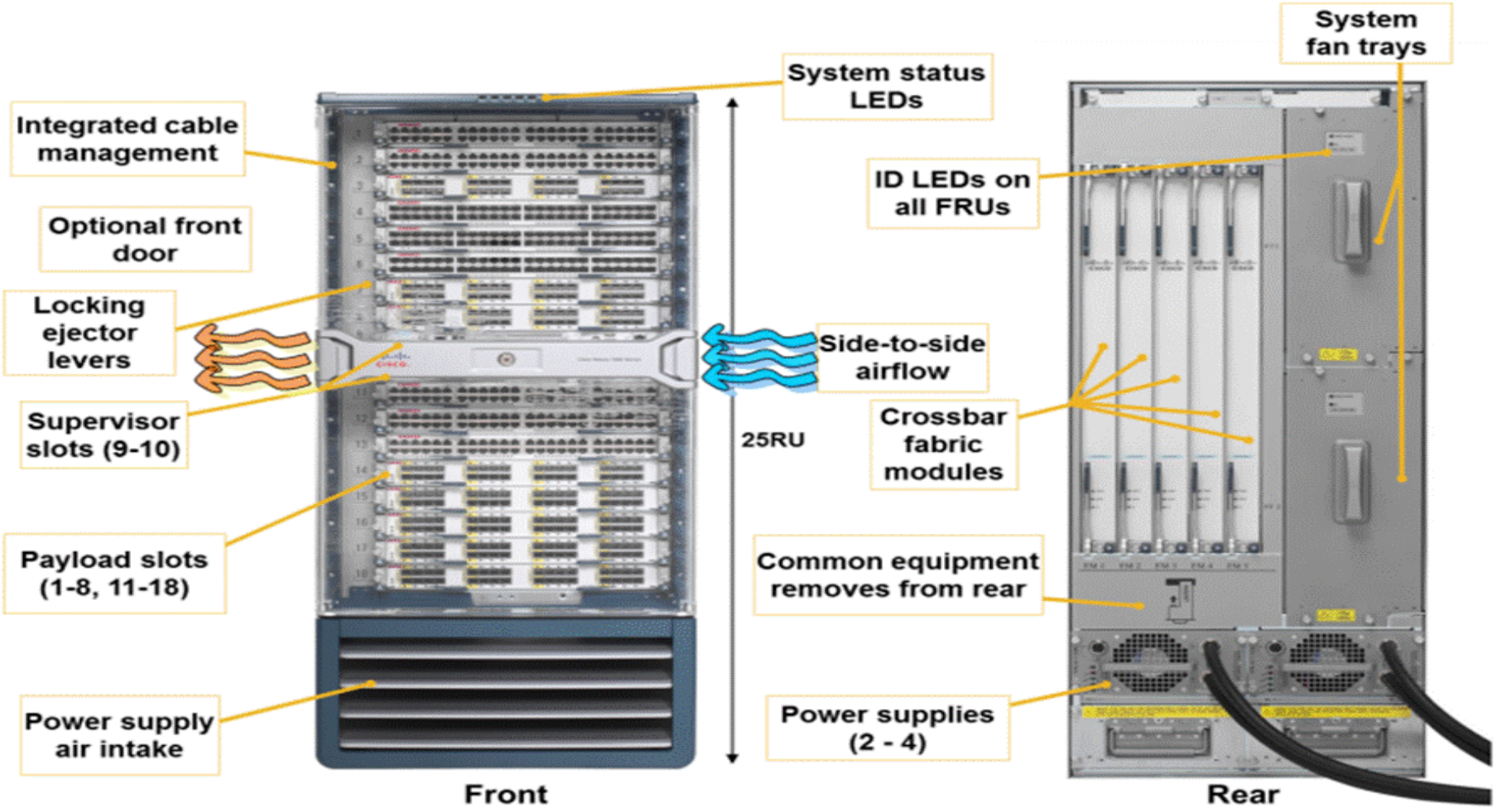
Nexus 7010 Chassis



Nexus 7018 Chassis

- The 7018 chassis is a larger version of the 7010. An additional 8 line cards are supported with an even larger crossbar fabric backplane. Like the 7010, this chassis is designed for high bandwidth, low-latency, next-generation network topologies. Every attempt has been made to make this a future proof chassis for evolving technologies and physical layer exchange of data.
- 18-Slots: 1-8 and 11-18 are line card slots, 9-10 are supervisory slots
- Supports 512 10Gbps, 768 1Gbps, and 128 non-blocking 10Gbps ports
- 7.8 Tb/s system bandwidth, future proof to 17.6Tb/s
- 256Gbps, 192Mpps per slot
- Air flow is side to side
- Up to 5 Crossbar Fabric Modules
- Up to 4 power supplies

Nexus 7018 Chassis



Nexus 7004/7700 Chassis

Key Features:
Inbuilt fabric
Only Sup2 Support

Key Features:
Cross Bow
Half-Width Sup

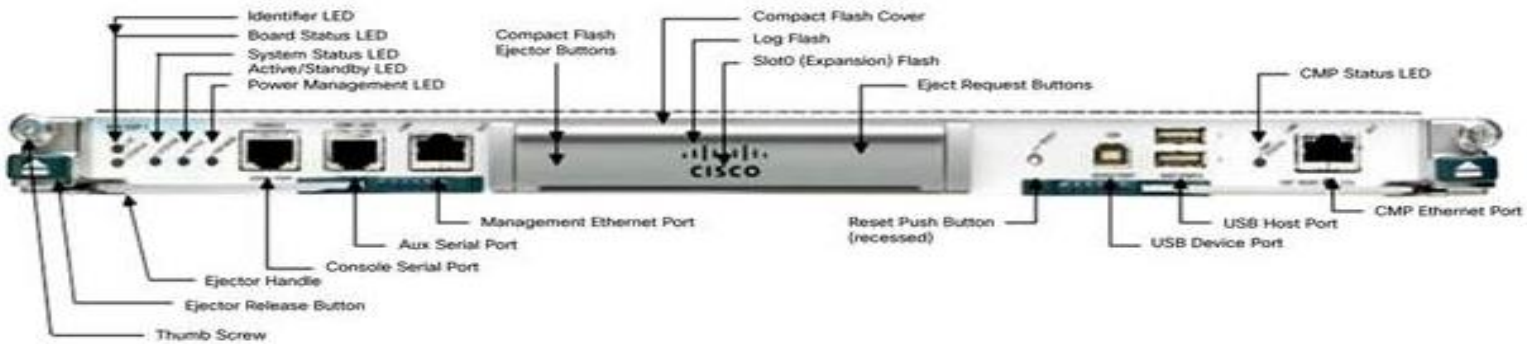
Nexus Supervisor Engine 1

- N7K-SUP1 (Supervisor Engine 1): This is the first generation supervisory card for the Nexus 7000 series. Cisco's recommendation is to run with two of these per chassis in an active/standby configuration.
- Dual-core 1.66Ghz Intel Xeon processors with 4GB DRAM
- 2MB NVRAM, 2GB internal bootdisk, 2 external compact flash slots 10/100/1000bps management port
- Console and Auxiliary serial ports
- USB file transfer port
- Connectivity Management Processor (CMP) with separate 10/100/1000 Ethernet access that will support 802.1ae LinkSec encryption in the future.
- Supervisory modules run in Active/Standby mode for continuous operation

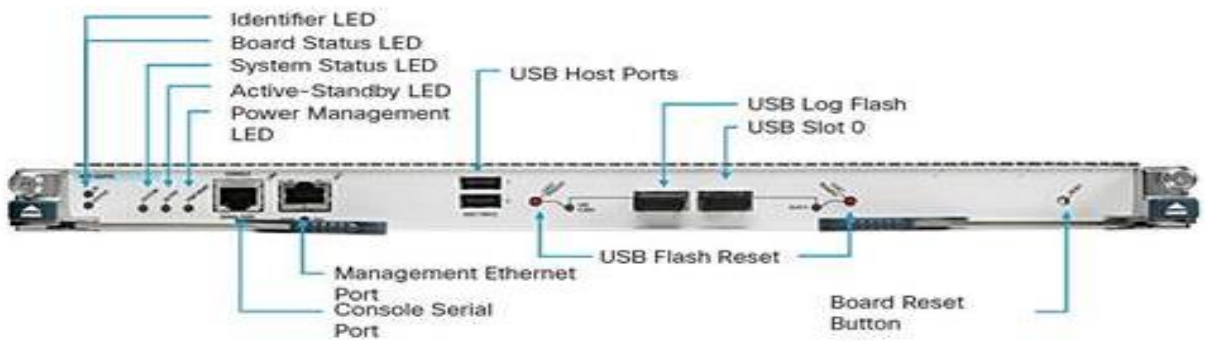
Nexus Supervisor Engine 2

Item	Sup2	Sup2E
Processor	Xeon	Xeon
Number of cores	Quad core	2 quad cores
Speed	2.13 GHz	2.13 GHz
Kernel	64-bit	64-bit
Cisco NX-OS version	Cisco NX-OS Software Release 6.1	Cisco NX-OS Software Release 6.1
Memory	12 GB (DDR3) NVRAM 2-MB battery backup	32 GB (DDR3) NVRAM 2-MB battery backup
Control and monitoring processor (CMP)	Not supported	Not supported
Flash memory	USB flash memory	USB flash memory
Removable storage	2 external USB memory slots: •Log (8 GB) •Expansion (2 GB)	2 external USB memory slots: •Log (8 GB) •Expansion (2 GB)
Power	Typical: 109W Maximum: 300W	Typical: 147W Maximum: 300W
Dimensions	•H x W x D: 1.18 x 15.35 x 21.85 in. (3.0 x 38.9 x 55.6 cm) •Weight 10.34 lb (4.7 kg)	•H x W x D: 1.18 x 15.35 x 21.85 in. (3.0 x 38.9 x 55.6 cm) •Weight 11.55 lb (5.25 kg)

Sup 1


Identifier LED
Board Status LED
System Status LED
Active/Standby LED
Power Management LED
Compact Flash Ejector Buttons
Compact Flash Cover
Log Flash
Slot0 (Expansion) Flash
Eject Request Buttons
CMP Status LED
Management Ethernet Port
Aux Serial Port
Console Serial Port
Ejector Handle
Ejector Release Button
Thumb Screw
Reset Push Button (recessed)
USB Device Port
USB Host Port
CMP Ethernet Port

Sup 2/2E


Identifier LED
Board Status LED
System Status LED
Active-Standby LED
Power Management LED
USB Host Ports
USB Log Flash
USB Slot 0
USB Flash Reset
Management Ethernet Port
Console Serial Port
Board Reset Button

Nexus 7000 I/O Module Families –M1 and F1

- M family – L2/L3/L4 with large forwarding tables and rich feature set

N7K-M132XP-12/
N7K-M132XP-12L

N7K-M108X2-12L

N7K-M148GT-11/N7K-M148GT-11L

N7K-M148GS-11/N7K-M148GS-11L

- F family – Low-cost, high performance, low latency, low power and streamlined feature set

N7K-F132XP-15

8-Port 10GE M1 I/O Module (N7K-M108X2-12L)

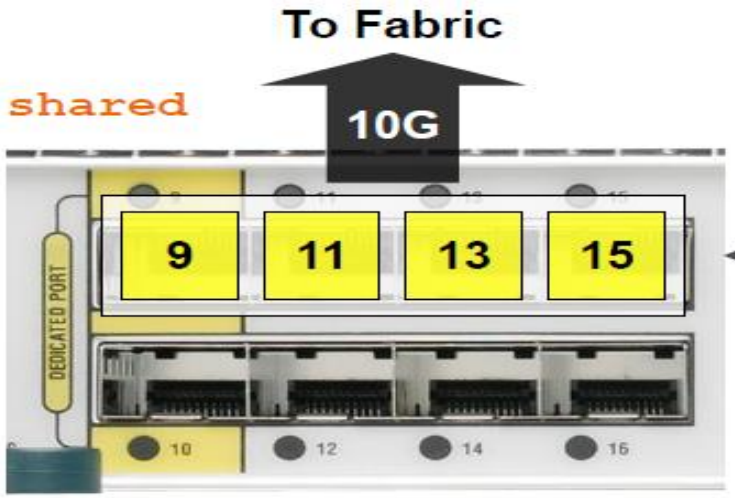
- Supported in NX-OS release 5.0(2a) and later
- 8-port 10G with X2 transceivers
- 80G full-duplex fabric connectivity
- Two integrated forwarding engines (120Mpps)Support for “XL” forwarding tables (licensed feature)
- Distributed L3 multicast replication
- 802.1AE LinkSec

32-Port 10GE M1 I/O Modules(N7K-M132XP-12/L)

- N7K-M132XP-12 –Supported in all releases
- N7K-M132XP-12L –Supported in NX-OS release 5.1(1) and later
- 32-port 10G with SFP+ transceivers
- 80G full-duplex fabric connectivity
- Integrated 60Mpps forwarding engineXL forwarding engine on “L” version
- Oversubscription option for higher density (up to 4:1)
- Supports Nexus 2000 (FEX) connections
- Distributed L3 multicast replication
- 802.1AE LinkSec

Shared vs. Dedicated Mode

`rate-mode shared`
(default)

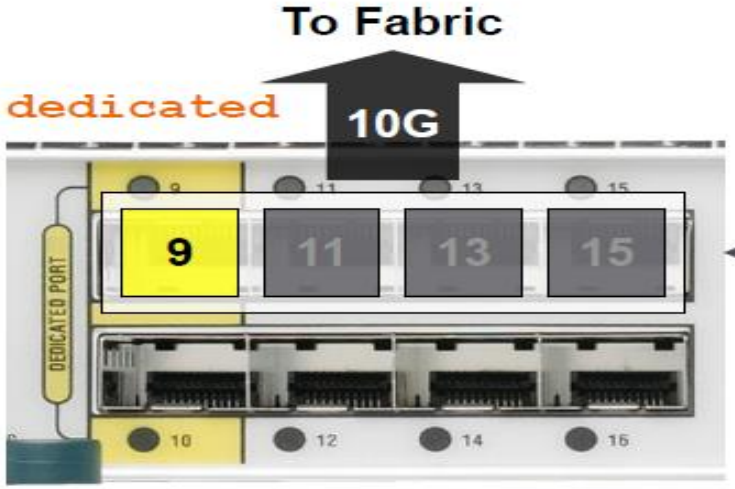


Shared mode

- Four interfaces in port group share 10G bandwidth

"Port group"– group of contiguous even or odd ports that share 10G of bandwidth (e.g., ports 1,3,5,7)

`rate-mode dedicated`



Dedicated mode

- First interface in port group gets 10G bandwidth
- Other three interfaces in port group disabled

48-Port 1G M1 I/O Modules

- Four 1G I/O module options:48 10/100/1000 RJ-45 ports (N7K-M148GT-11)48 1G SFP ports (N7K-M148GS-11)48 1G SFP ports with XL forwarding engine (N7K-M148GS-11L)48 10/100/1000 RJ-45 ports with XL forwarding engine (N7K-M148GT-11L)
- Integrated 60Mpps forwarding engine
- 46G full duplex fabric connectivityLine rate on 48-ports with some local switching
- Distributed L3 multicast replication
- 802.1AE LinkSec

N7K-M148GT-11
All releases

N7K-M148GS-11
Release 4.1(2) and later

N7K-M148GS-11L
Release 5.0(2a) and later

N7K-M148GT-11L
Release 5.1(1) and later

32-Port 1G/10GE F1 I/O Module (N7K-F132XP-15)

- Supported in NX-OS release 5.1(1) and later
- 32-port 1G/10G with SFP/SFP+ transceivers
- 230G full-duplex fabric connectivity (320G local switching)
- System-on-chip (SoC)†forwarding engine design16 independent SoC ASICs
- Layer 2 forwarding with L3/L4 services (ACL/QoS)
- Multi-protocol –Classic Ethernet, FabricPath, DCB, FCoE

F2 48-Port 1 and 10 Gb Module (N7K-F248XP-25/N7K-F248XT-25E)

Cisco NX-OS Software Release 6.0	Cisco NX-OS Software Release 6.1.2
48 ports of 1 and 10 Gigabit Ethernet (SFP or SFP+ pluggable optic modules)	48 ports of 1 and 10GBASE-T with RJ-45 cabling
720-mpps Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets	720-mpps Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets
16,384 per SoC, and up to 196,608 per module (depending on VLAN allocation)	16,384 per SoC, and up to 196,608 per module (depending on VLAN allocation)
550 Gbps in each direction (1.1 Tbps full duplex) distributed across up to five fabric modules	550 Gbps in each direction (1.1 Tbps full duplex) distributed across up to five fabric modules

F3-Series 6-Port 100 Gb

- Cisco NX-OS Software Release 6.2(8)
- 6 ports of 100 Gigabit Ethernet (Cisco CPAK)
- 900mpps of Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets
- High-density, low-latency, scalable data center architecture

7700 F3 Modules

7700 F3-Series 24-Port 40 Gigabit Ethernet Module(N77-F324FQ-25)

- Supported in all Cisco Nexus 7700 chassis
- 24 ports of 40 Gigabit Ethernet (QSFP+)
- 1.44 bpps of Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets

7700 F3-Series 48-Port Fiber 1 and 10 Gigabit Ethernet Module(N77-F348XP-23)

- Supported in all Cisco Nexus 7700 chassis
- 48 ports of 1 and 10 Gigabit Ethernet (SFP and SFP+)
- 720 mpps of Layer 2 and Layer 3 forwarding capacity for both IPv4 and IPv6 packets

M2-Series 6-Port 40 Gb Module(N7K-M206FQ-23L)

- Supported in all Cisco Nexus 7000 Series chassis
- Supported Fabric-1 or Fabric-2 fabric modules
- Supported SUP1, SUP2 or SUP2E Supervisor modules
- Cisco NX-OS Software Release 6.1 or later (minimum requirement)
- 6 ports of 40 Gigabit Ethernet (Quad Small Form-Factor Pluggable Plus [QSFP+] optics modules
- 120 Mpps Layer 2 and Layer 3 IPv4 unicast and 60 Mpps IPv6 unicast
- 550 Gbps in each direction (1.1 Tbps full duplex) distributed across up to five Fabric-2 modules
- 230 Gbps in each direction (460 Gbps full duplex) distributed across up to five Fabric-1 modules

M2-Series 24-Port 10 Gb Module(N7K-M224XP-23L)

- Supported in all Cisco Nexus 7000 Series chassis
- Supported Fabric-1 or Fabric-2 fabric modules
- Supported SUP1, SUP2 or SUP2E Supervisor modules
- Cisco NX-OS Software Release 6.1 or later (minimum requirement)
- 24 ports of 10 Gigabit Ethernet (Small Form-Factor Pluggable Plus [SFP+] optics modules)
- 550 Gbps in each direction (1.1 Tbps full duplex) distributed across up to five Fabric-2 modules
- 230 Gbps in each direction (460 Gbps full duplex) distributed across up to five Fabric-1 modules

I/O Module Design Principles

M I/O modules:

- Multi-chipset design
- Feature-rich
- Large forwarding tables and deep buffers in external memory

F I/O modules:

- Integrated SoC design
- Streamlined feature set
- On-chip forwarding tables and buffering (no external memory interfaces)

Crossbar Switch Fabric Module FAB-1

- Each fabric module provides 46Gbps per I/O module slotUp to 230Gbps per slot with 5 fabric modules
- Different I/O modules leverage different amount of fabric bandwidth 80G per slot with 10G M1 modules230G per slot with 10G F1 modules
- Access to fabric controlled using QoS-aware central arbitration with VOQ

Crossbar Switch Fabric Module FAB-2

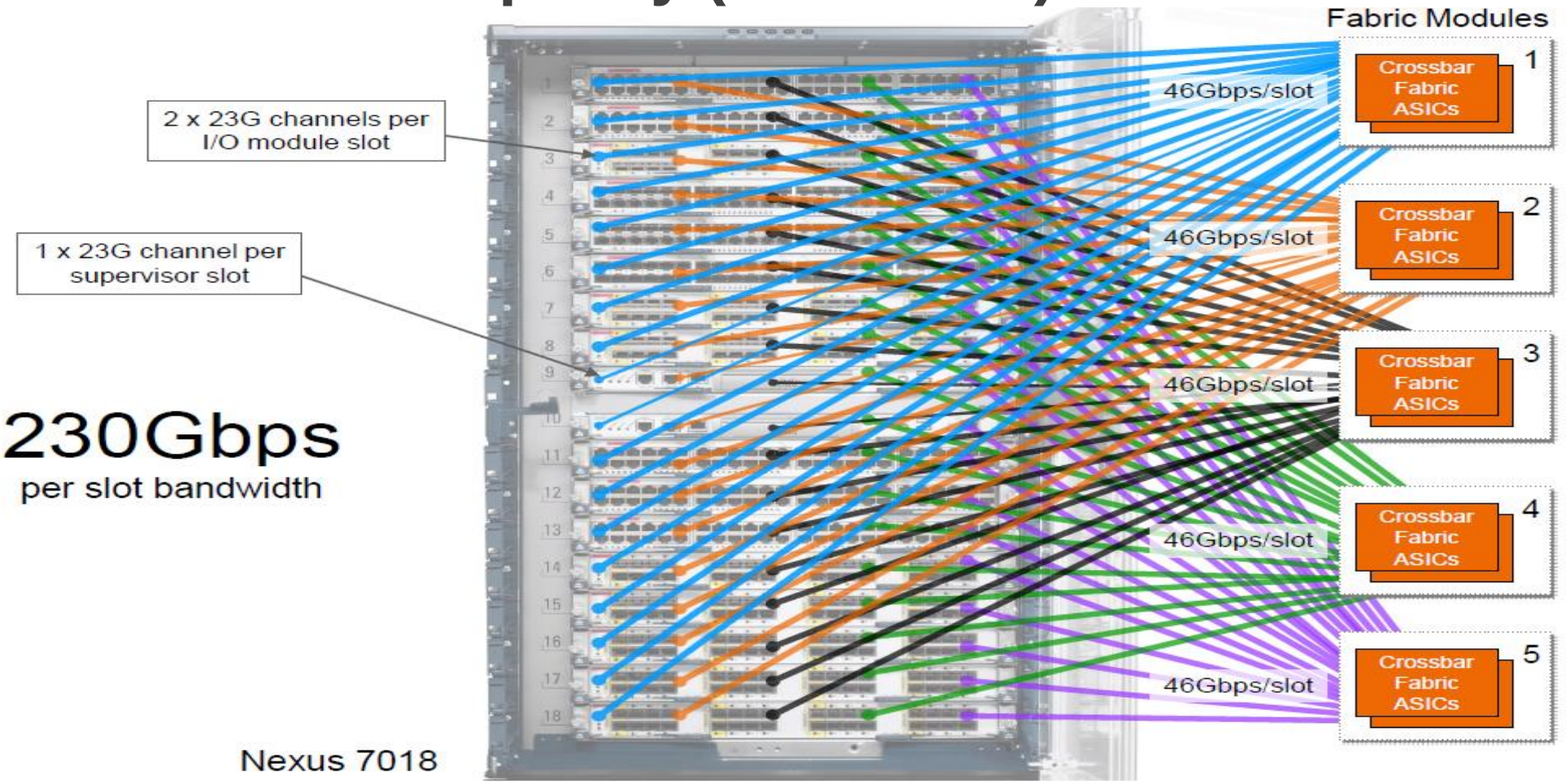
- 110 Gbps per slot per fabric
- Cisco NX-OS Software Release 5.2 (minimum requirement) on 7009 Chassis
- Cisco NX-OS Software Release 6.0 (minimum requirement) on 7010 and 7018 chassis

Figure 1. Nexus 7018 Fabric2 Module

Figure 2. Nexus 7010 Fabric2 Module

Figure 3. Nexus 7009 Fabric2 Module

Fabric Module Capacity (Ex: FAB-1)



FAB-2 is 550Gbps per slot bandwidth

M1 I/O Module Capacity

1G modules

- Require 1 fabric for full bandwidth
- Require 2 fabrics for N+1 redundancy

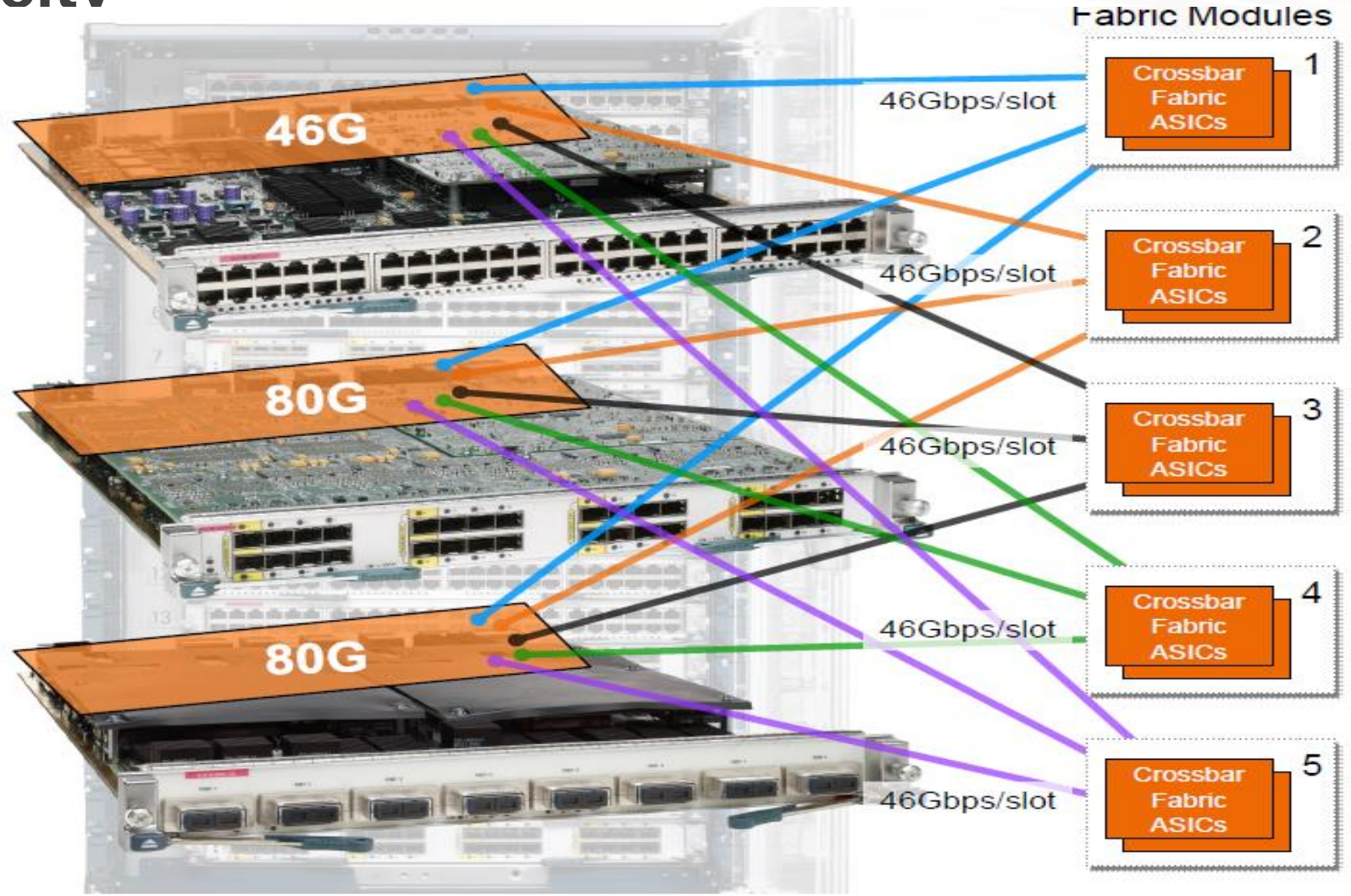
230Gbps

per slot bandwidth

- 4th and 5th fabric modules provide additional redundancy and future-proofing

10G modules

- Require 2 fabrics for full bandwidth
- Require 3 fabrics for N+1 redundancy



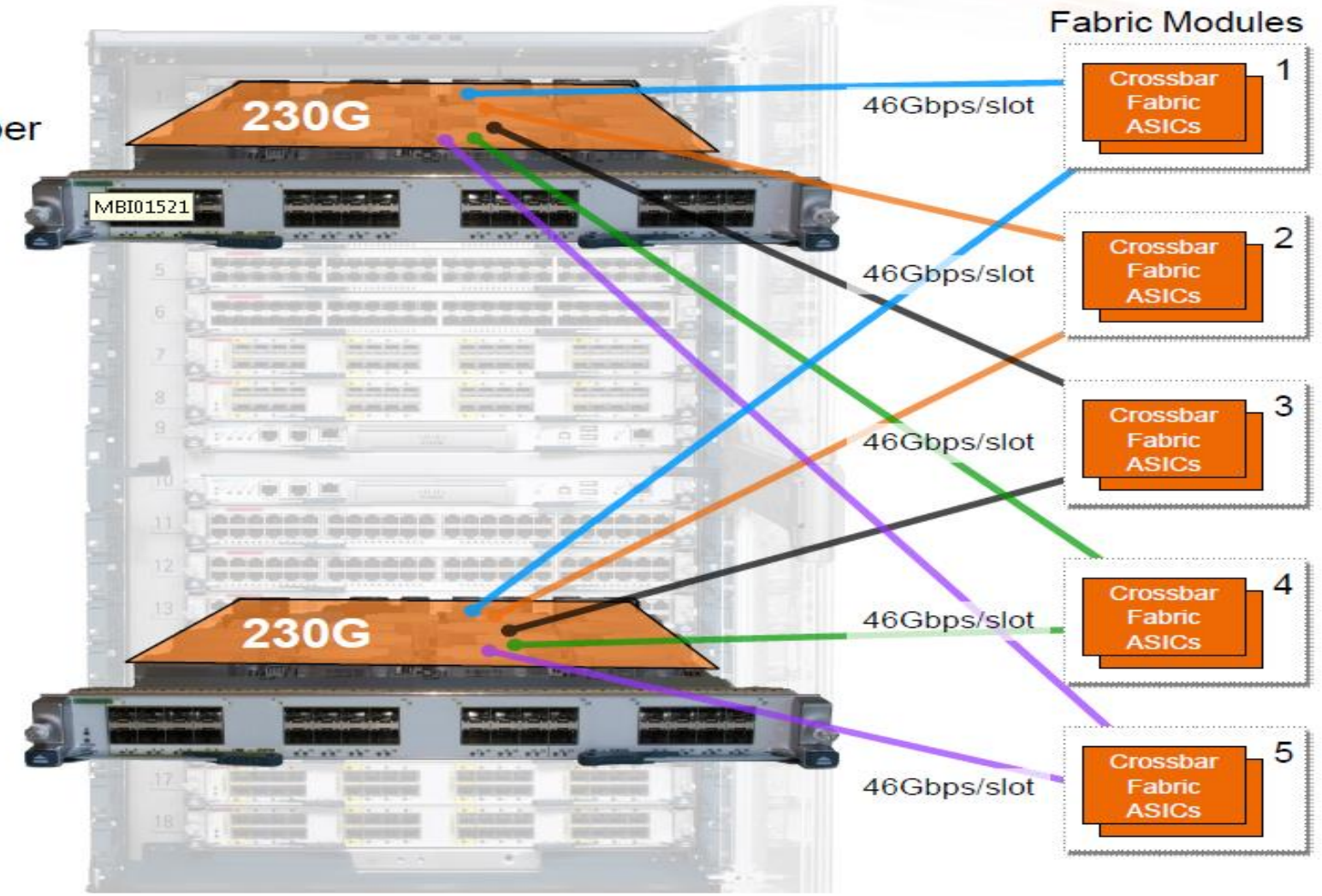
F1 I/O Module Capacity

F1 SFP+ module

- Operates with any number of fabrics
- Requires 5 fabrics for maximum bandwidth
- Redundancy model is graceful bandwidth derating

230Gbps

per slot bandwidth



Nexus 7000 Architecture Summary

Variety of front-panel interface and transceiver types with LinkSec, VOQ, and other advanced hardware features

I/O Modules

Future-proofed chassis designs with density and airflow options

Chassis

Control plane protocols, system and network management

Supervisor Engines

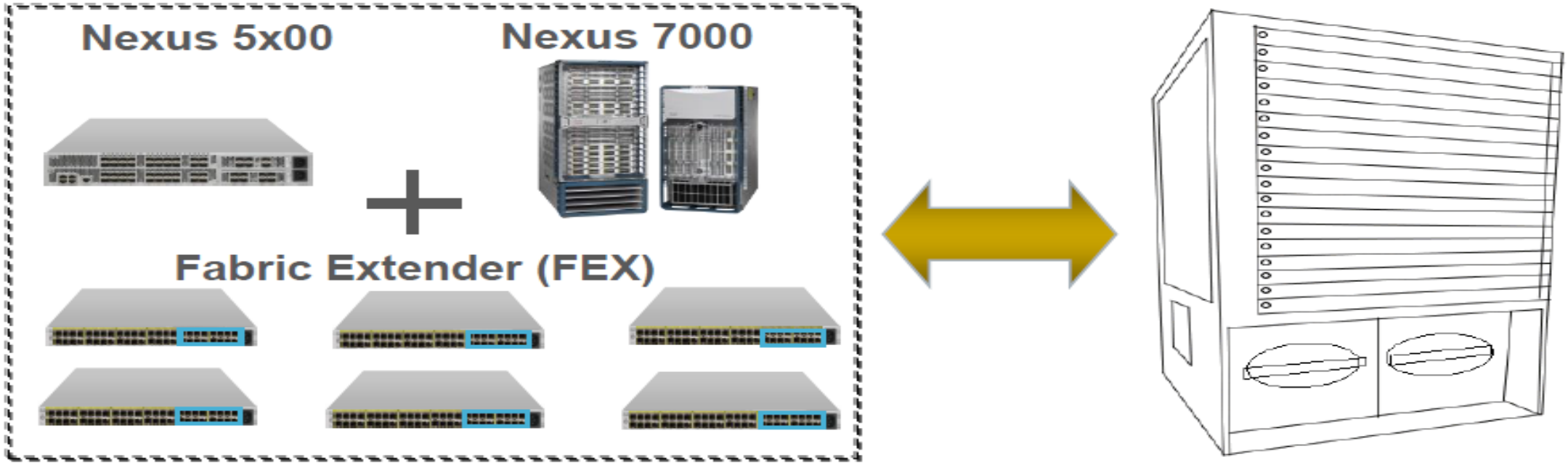
Fabrics

Forwarding Engines

Hardware services, including unicast/multicast, bridging/routing, ACL/QoS classification, and NetFlow statistics

Lossless-capable fabric with 230G/slot bandwidth to interconnect I/O modules and provide investment protection

FEX-Link: Extending the Fabric



- Nexus 7000/5x00 + FEX is like a “Virtual Chassis”
- Nexus 2000 FEX is a “Virtual Line Card” to its “parents”
- No Spanning Tree between the FEX and its “parent”
- No local switching on the FEX
- NX-OS Linecard code runs on the 2148/2248/2232

Nexus 2000 with Nexus 7000

- Combines benefits of Top of Rack (ToR) and End of Row (EoR) network architectures
- Reduces cable runs
- Reduce management points in the network
- Ensures feature consistency across hundreds or thousands of server ports

Important Cisco NX-OS and Cisco IOS Software Differences

- Direct EXEC mode
- By default, the admin user has network-admin rights that allow full read/write access. Additional users can be created with very granular rights to permit or deny specific CLI commands. (Roles network/vdc-admin/operator)
- The Cisco NX-OS has a Setup Utility that allows a user to specify the system defaults, perform basic configuration, and apply a pre-defined Control Plane Policing (CoPP) security policy.
- The Cisco NX-OS uses a feature based license model. An Enterprise Services, Advanced Services, Transport Services, Scalable Feature and Enhanced Layer 2 license is required depending on the features required. Additional licenses may be required in the future.
- The Cisco NX-OS has the ability to enable and disable features such as OSPF, BGP, etc… using the feature configuration command. Configuration and verification commands are not available until you enable the specific feature.
- Interfaces are labeled in the configuration as Ethernet. There aren’t any speed designations.
- The Cisco NX-OS has two preconfigured VRF instances by default (management, default).

Important Cisco NX-OS and Cisco IOS Software Differences

- SSHv2 server/client functionality is enabled by default. TELNET server functionality is disabled by default. (The TELNET client is enabled by default and cannot be disabled.)
- VTY and Auxiliary port configurations do not show up in the default configuration unless a parameter is modified (The Console port is included in the default configuration). The VTY port supports 32 simultaneous sessions and the timeout is disabled by default for all three port types
- The Console and VTY ports always prompt the user for a username/password pair for authentication before granting access to the CLI. The Cisco IOS applies the login command to the Console and VTY ports by default to enable password authentication (If the no login command is applied, a user can gain access without a password.).
- A user can execute show commands in configuration mode without using the do command as in Cisco IOS Software.
- When executing a show command, a user has several more options when using the pipe (|) option such as grep for parsing the output, perl for activating a script, and xml to format the output for network management applications.

http://docwiki.cisco.com/wiki/Cisco_Nexus_7000_NX-OS/IOS_Comparison_Tech_Notes

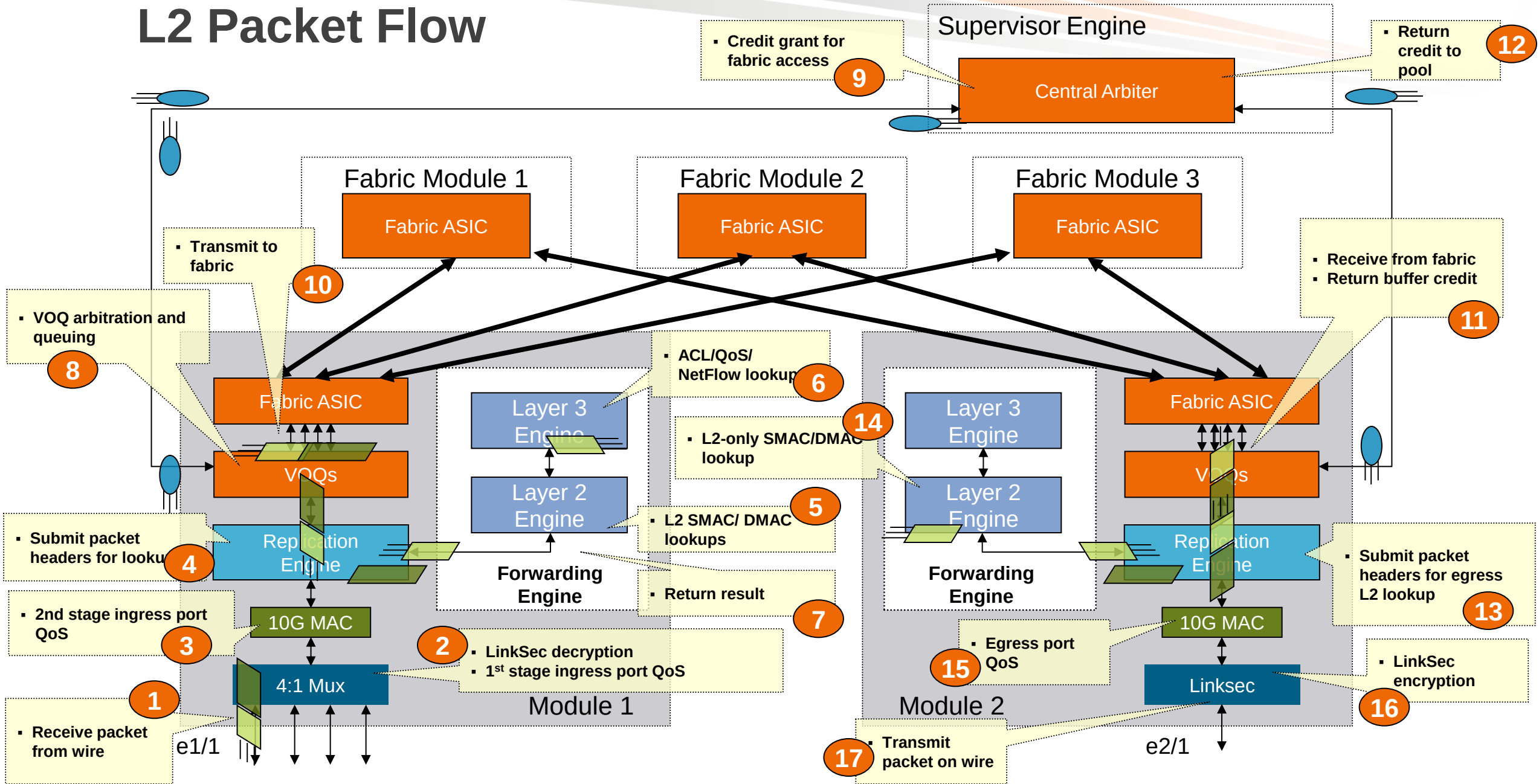
NX-OS Release Trains

- 4.2(1), 4.2(2), 4.2(2a), 4.2(3), 4.2(4), 4.2(6), 4.2(8)
- 5.0(2a), 5.0(3), 5.0(5)
- 5.1(1), 5.1(1a), 5.1(2), 5.1(3), 5.1(4), 5.1(5), 5.1(6)
- 5.2(1), 5.2(3)a, 5.2(4), 5.2(5), 5.2(7), 5.2(9)
- 6.0(1), 6.0(2), 6.0(3), 6.0(4)
- 6.1(1), 6.1(2), 6.1(3), 6.1(4), 6.1(4a), 6.1(5)
- 6.2.2, 6.2(2a), 6.2.6, 6.2.6a, 6.2.8

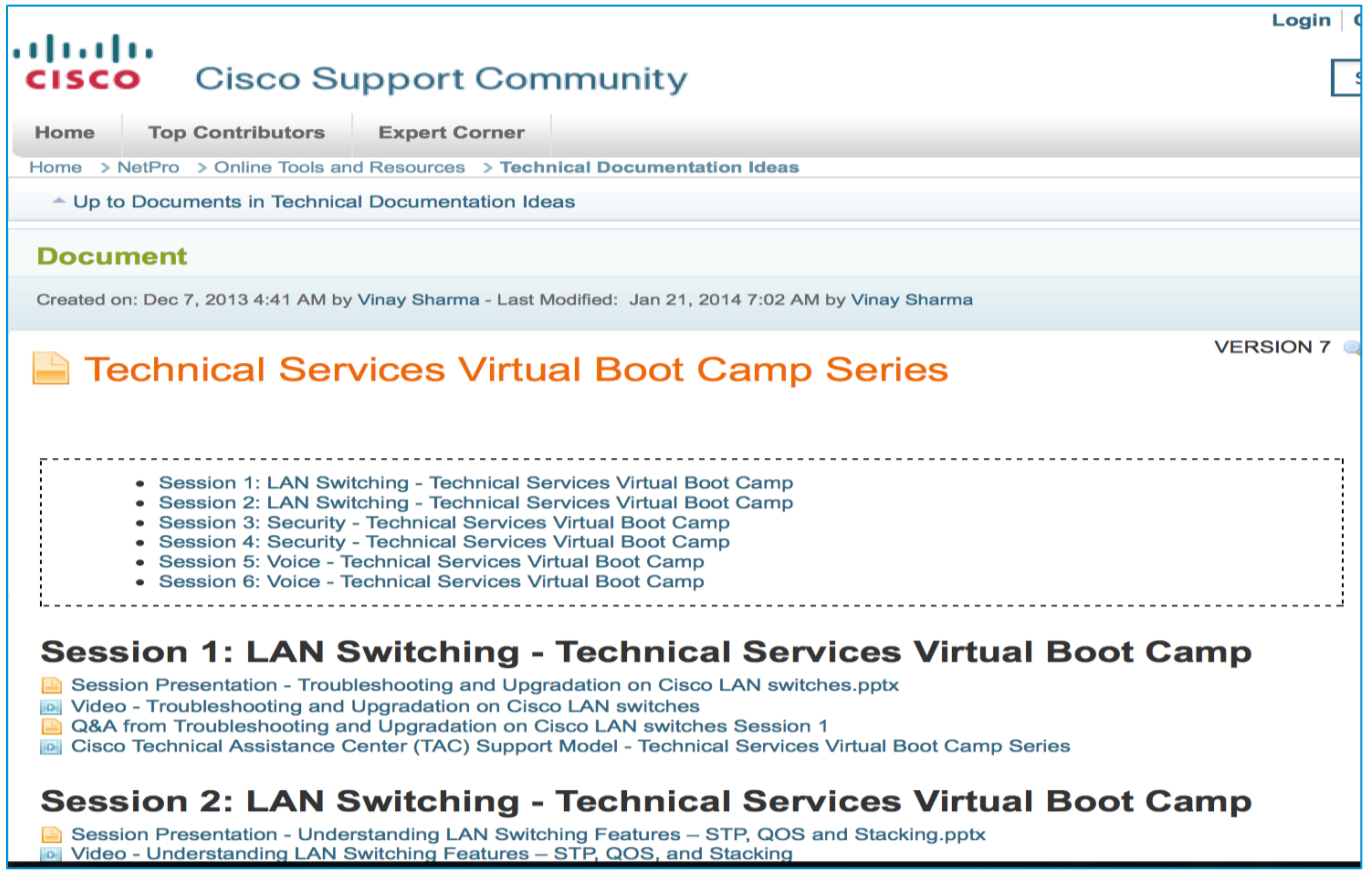
Also keep track of Nexus EPLD/CMP Images

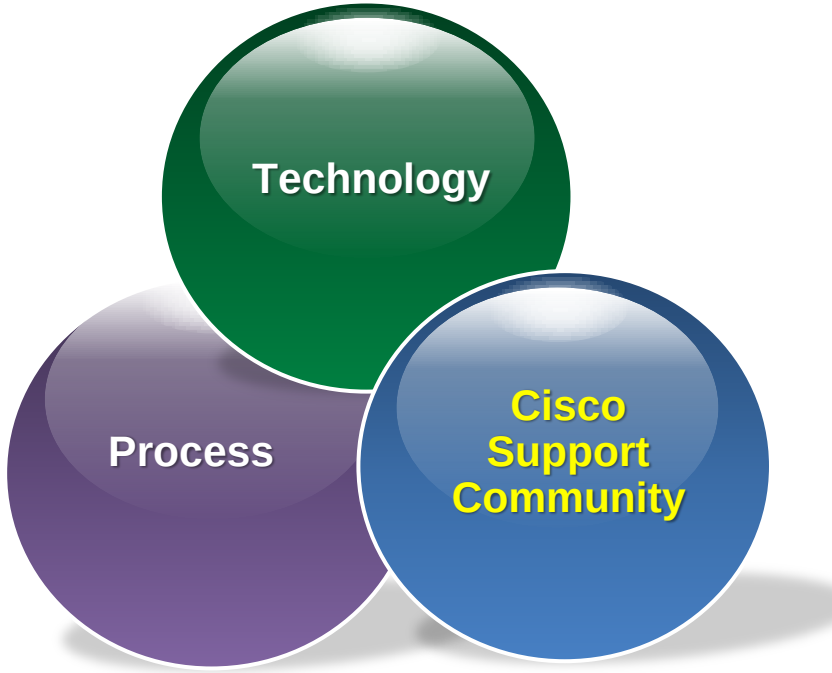
HDR = Packet Headers DATA = Packet Data CTRL = Internal Signaling

L2 Packet Flow



Course Material





https://supportforums.cisco.com/docs/DOC-37994 ...PPT

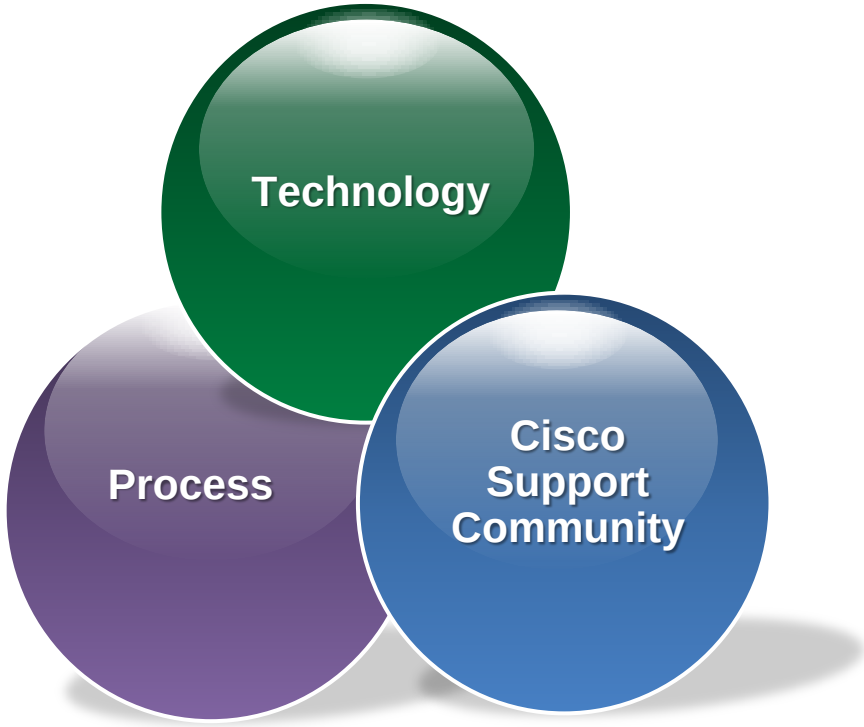
https://supportforums.cisco.com/videos/7517 ....Video

https://supportforums.cisco.com/docs/DOC-37851 ...Q&A

Technology

- VPC and VDC Concept
- Common issue noticed
- How to capture right set of logs
- Troubleshooting
- Live Demo

Q&A

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