



*TOMORROW
starts here.*

Cisco *live!*



NX-OS, IOS, IOS-XR, Unique and Similar at the Same Time

BRKCRT-2001

Joseph J Rinehart, MBA, CCIE #14256

Senior Education Specialist, Cisco Systems

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Agenda

- Introduction
- IOS Origins
- Cisco OS Architectures
- IOS & NX-OS: Comparison/Contrast
- IOS & IOS-XR: Comparison/Contrast
- Conclusion/Q&A



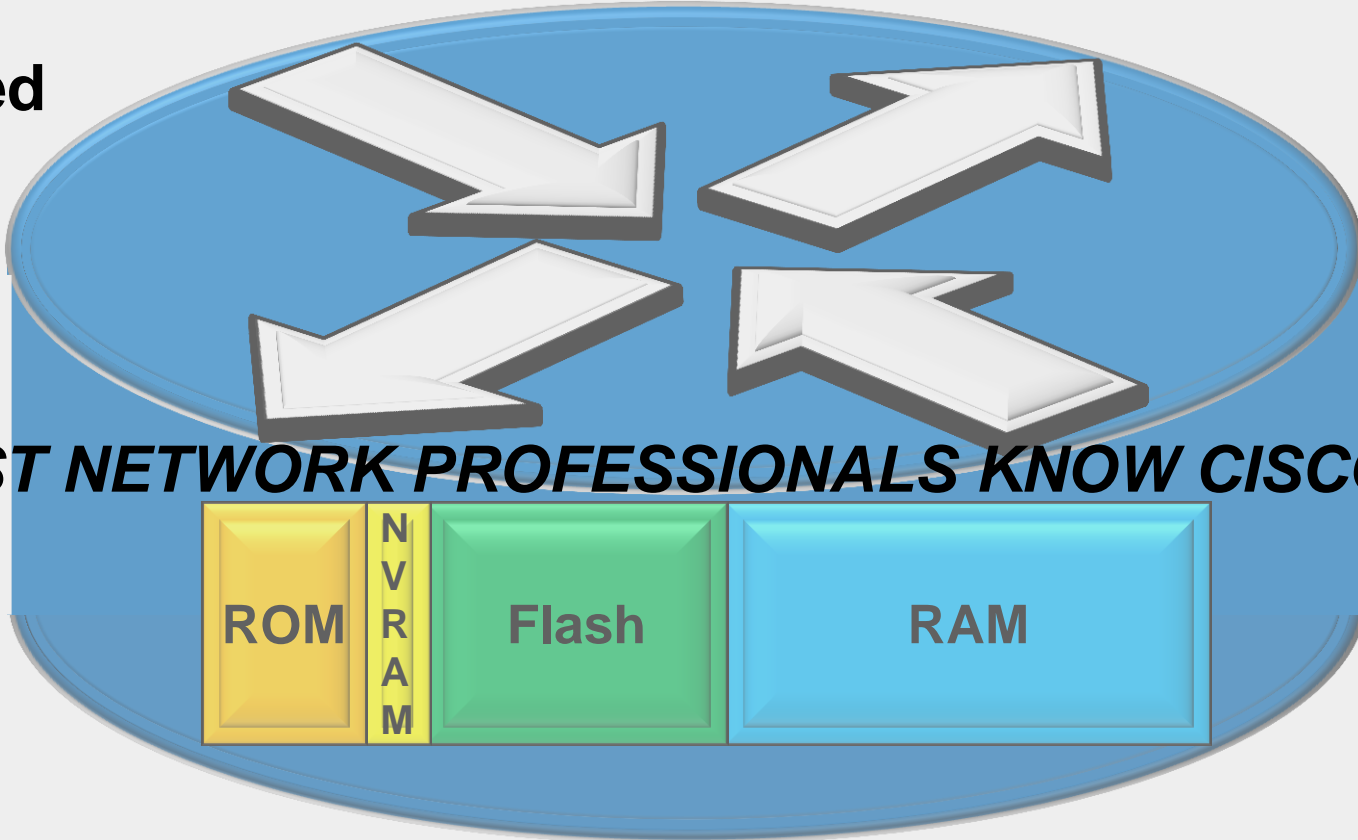
Introduction

In the Beginning...was IOS

**Released
Circa
1984**

**Over 2M
Certified
People**

MOST NETWORK PROFESSIONALS KNOW CISCO IOS



Discontinued/Obsolete Cisco OS's



FastHub OS



C1900 OS



CSS11501 OS



Catalyst OS

Centralized OS Development

**One PI Development
Team for all
Platforms:**

IOS & IOS-XE

NX-OS

IOS-XR

**Specific Focus
Areas:**

Behavioral Consistency

Operational Consistency

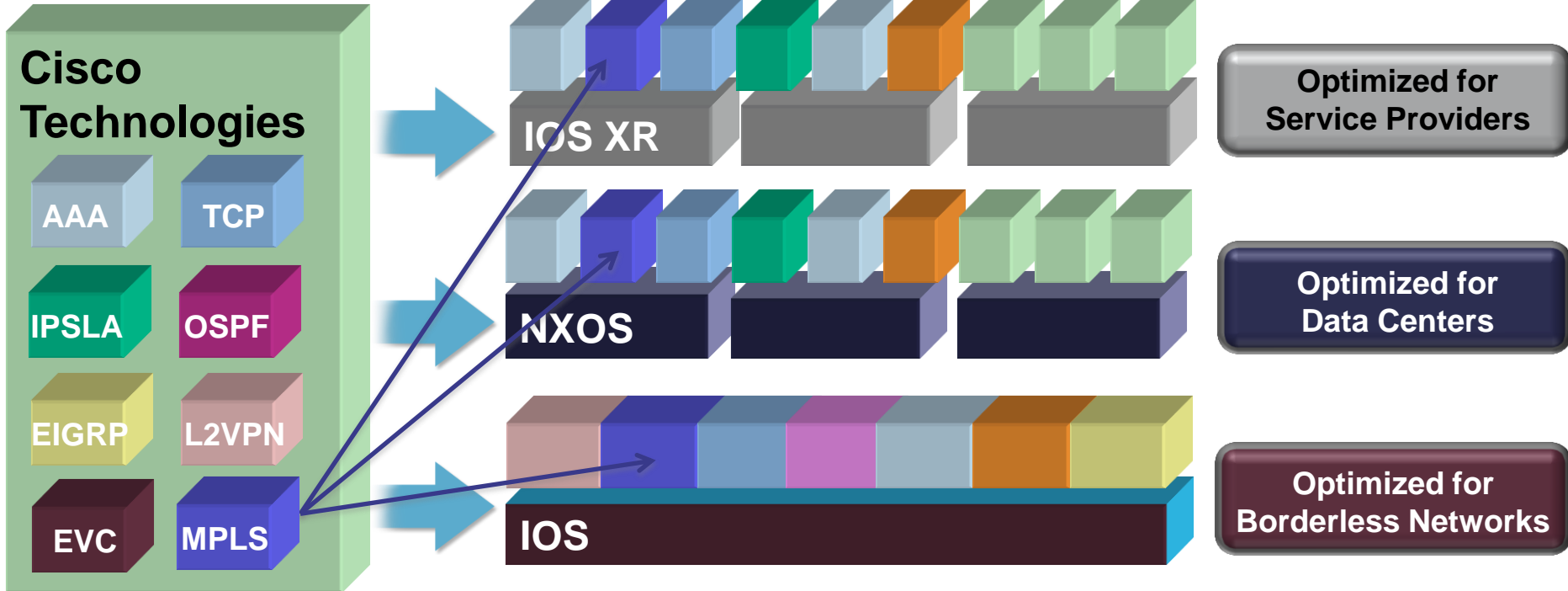
**Release Timing and
Lifecycle**

**Programmability,
Integration, Investment
Protection**

Cisco IOS Family

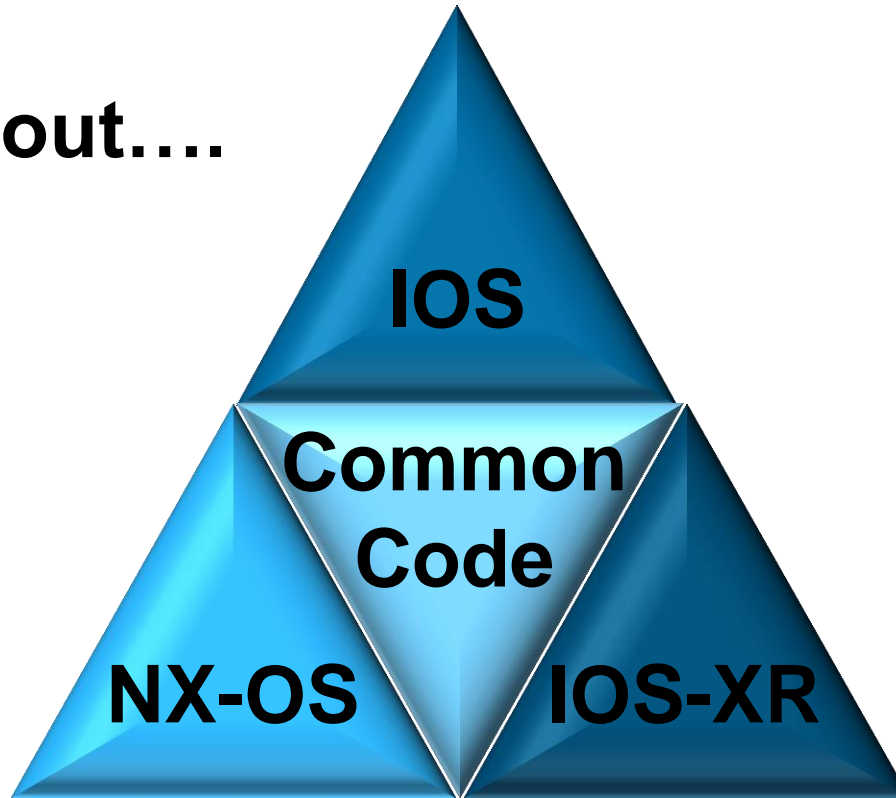


Cisco IOS Family



Cisco IOS Family

What about....



...IOS XE?

Cisco live!

A dramatic space scene featuring the Earth's horizon and a bright sun with lens flares. The Earth's surface is visible in the lower half, showing clouds and landmasses. The sun is in the upper left, creating a bright starburst effect with long, thin rays extending across the dark sky. The overall color palette is dominated by deep blues and blacks, with the bright white and yellow of the sun providing a strong contrast.

**IOS-XE is the
FUTURE of IOS**



IOS Origins

IOS Trivia Questions

The original software program that became Cisco IOS was written by:

**Leonard
Bosack**

**Kirk
Lougheed**

**William
Yeager**

**Greg
Satz**

IOS Trivia Questions

**IOS itself was created in what
Assembler?**

C

Java

Linux

Unix

IOS Trivia Questions

Why did IOS jump from version 12.4 to 15.0? What happened to 13 & 14?

**Trademark
Issues**

**Unlucky
Numbers**

**Testing
Versions**

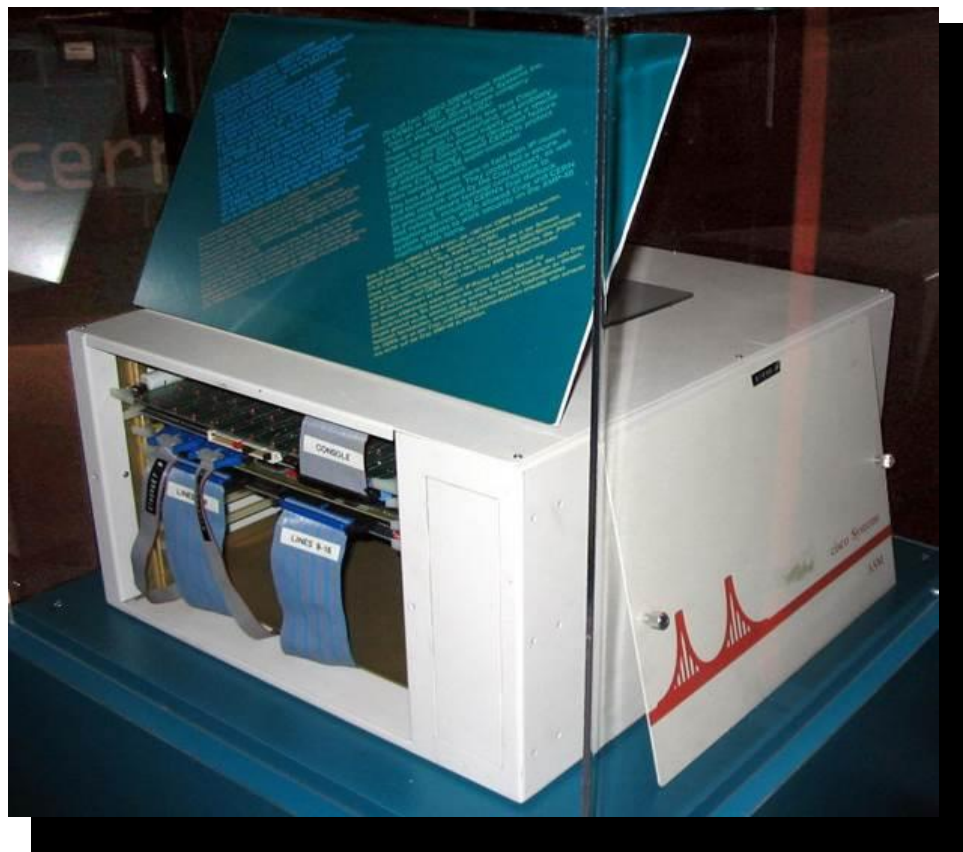
**Failed
Software**

Early Versions of Cisco Hardware



Early Prototype at Rutgers University

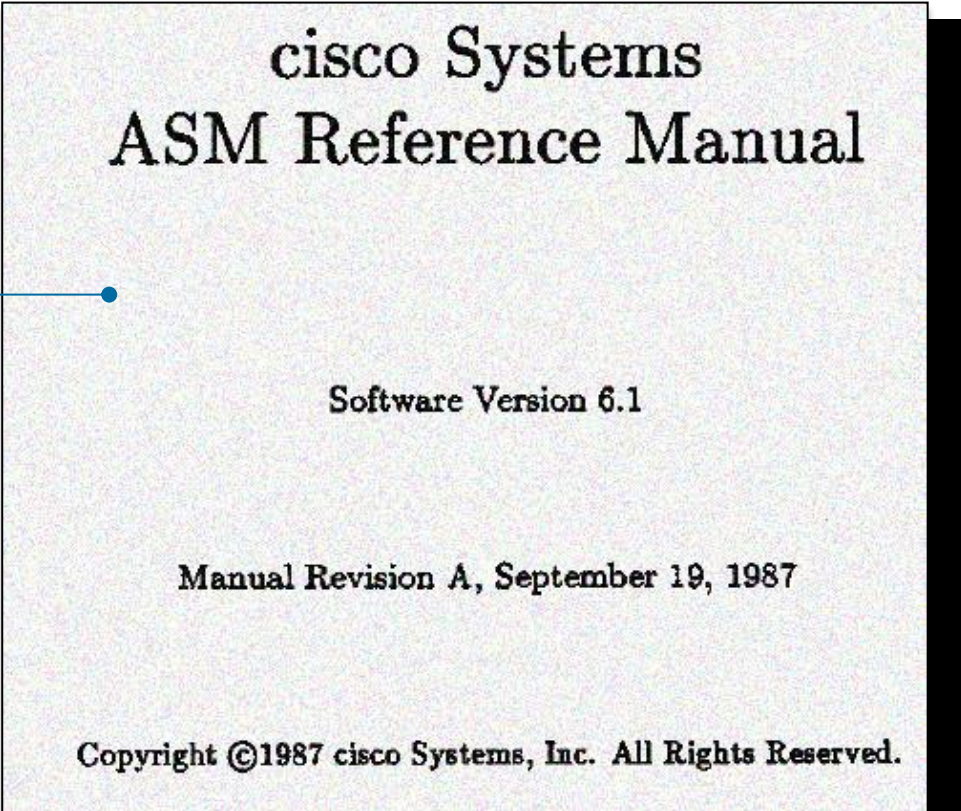
Early Versions of “Cisco OS” (forerunner to IOS)



Early Versions of “Cisco OS” (forerunner to IOS)

System Software Manual

One of the earliest
officially available
examples of hardware
and software



cisco Systems
ASM Reference Manual

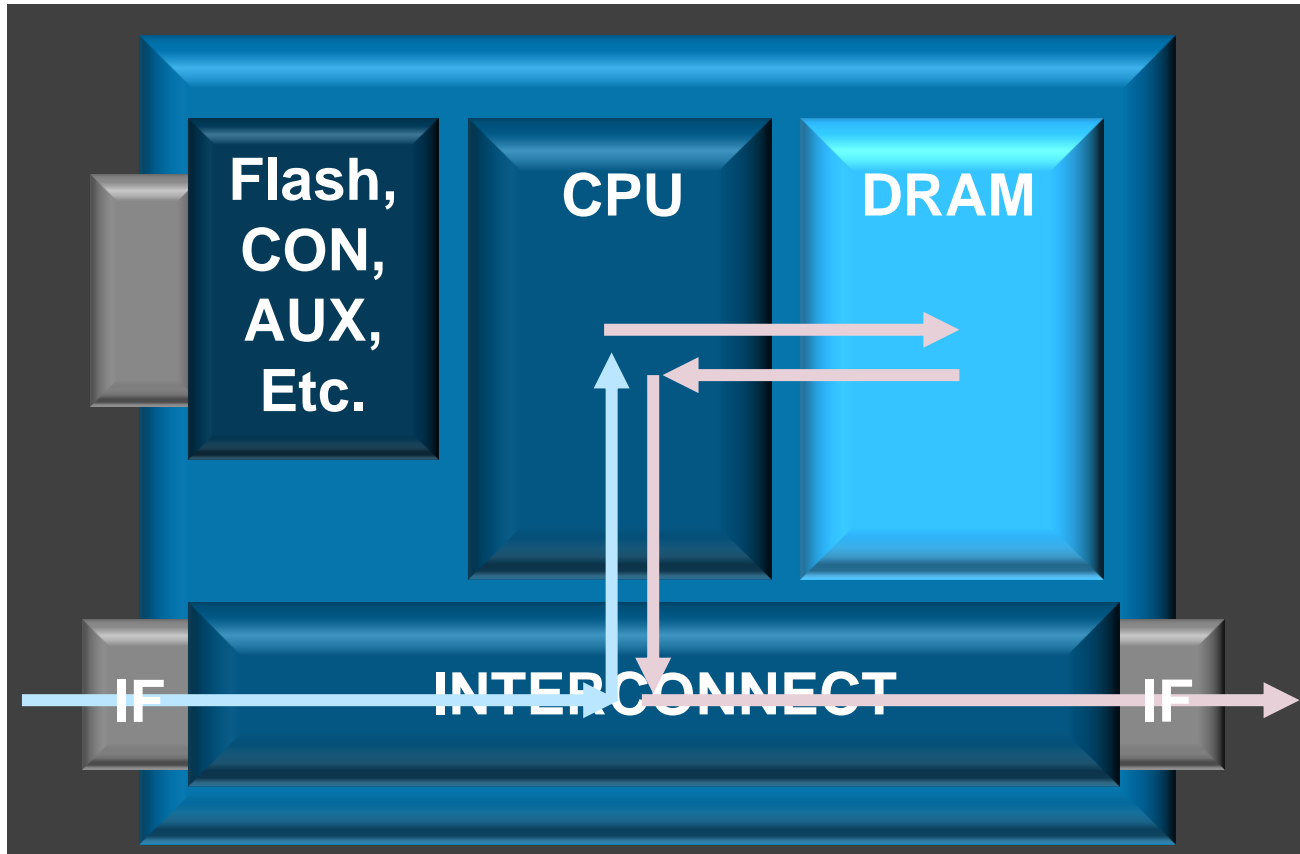
Software Version 6.1

Manual Revision A, September 19, 1987

Copyright ©1987 cisco Systems, Inc. All Rights Reserved.

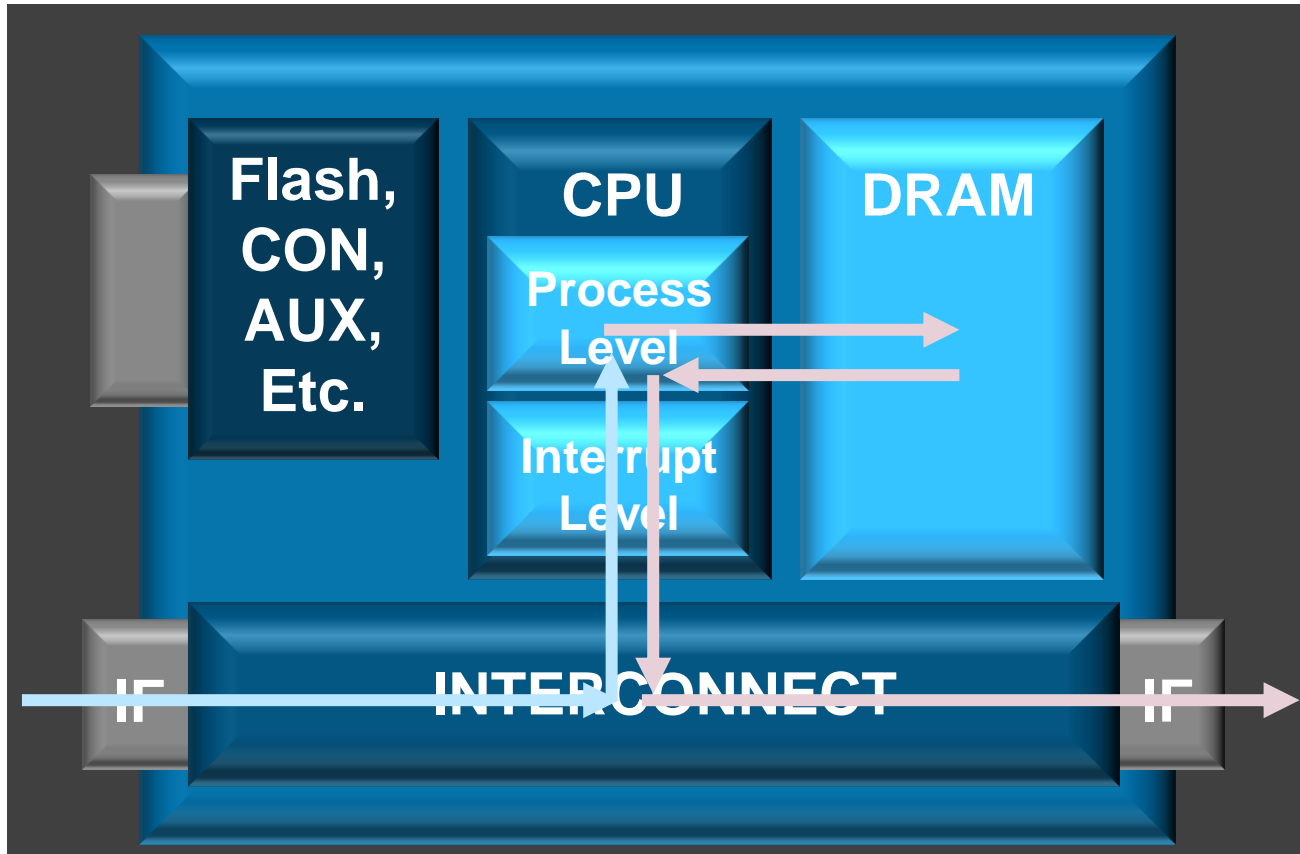
Cisco Router Architecture

Early Software-Based Devices



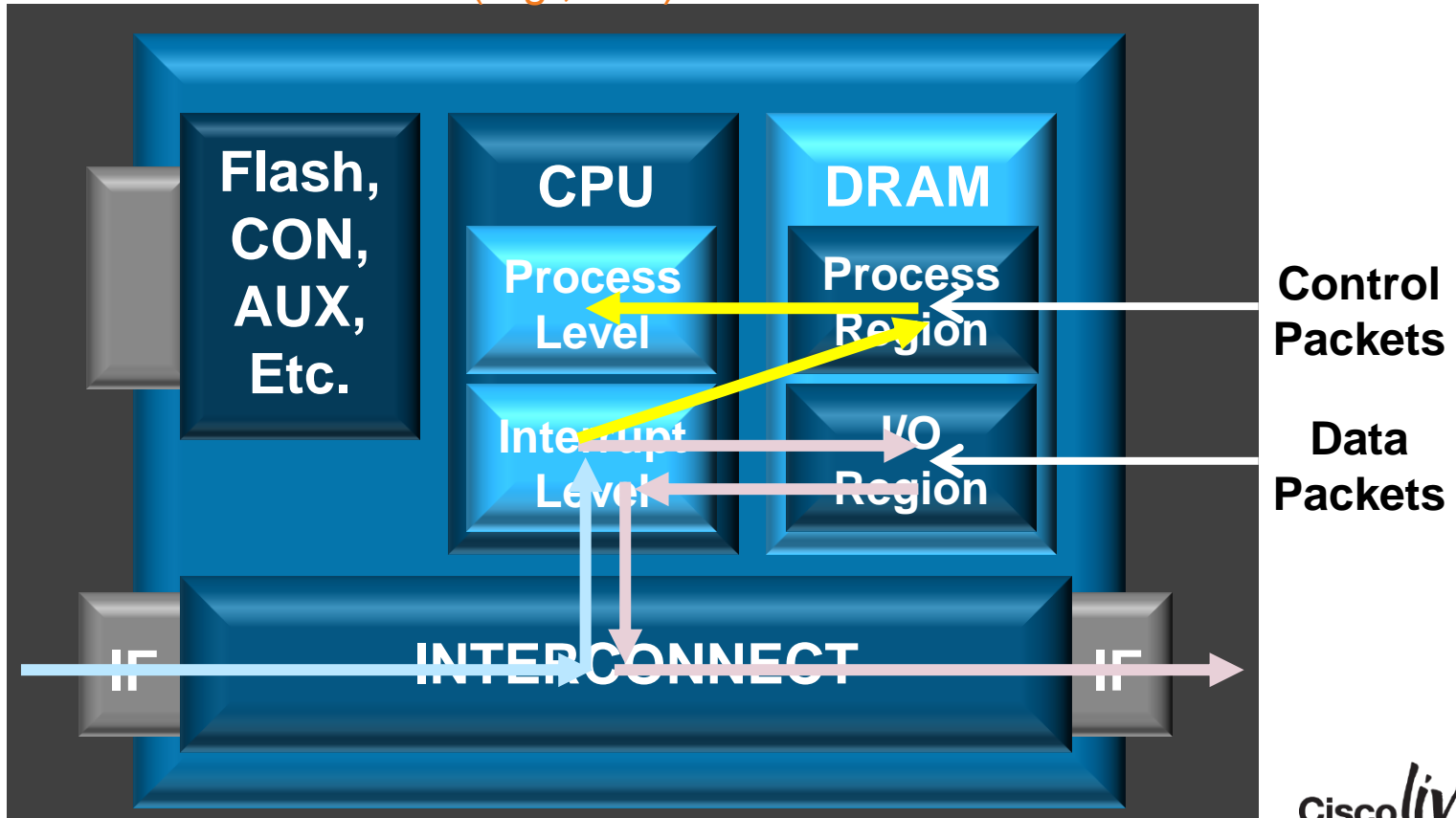
Cisco Router Architecture

Process Switched Devices



Cisco Router Architecture

Software Based Modern Routers (e.g., ISR)



Cisco IOS Facts

Early IOS Versions Had NO CLI

IOS 9.2 Introduced Line Editing Features

Originally Only Used on Routing Products

Introduced on Catalyst Switches in 11.2(8) SA

Version Numbering Based on TOPS20 OS

Cisco IOS Facts

Terry Slattery

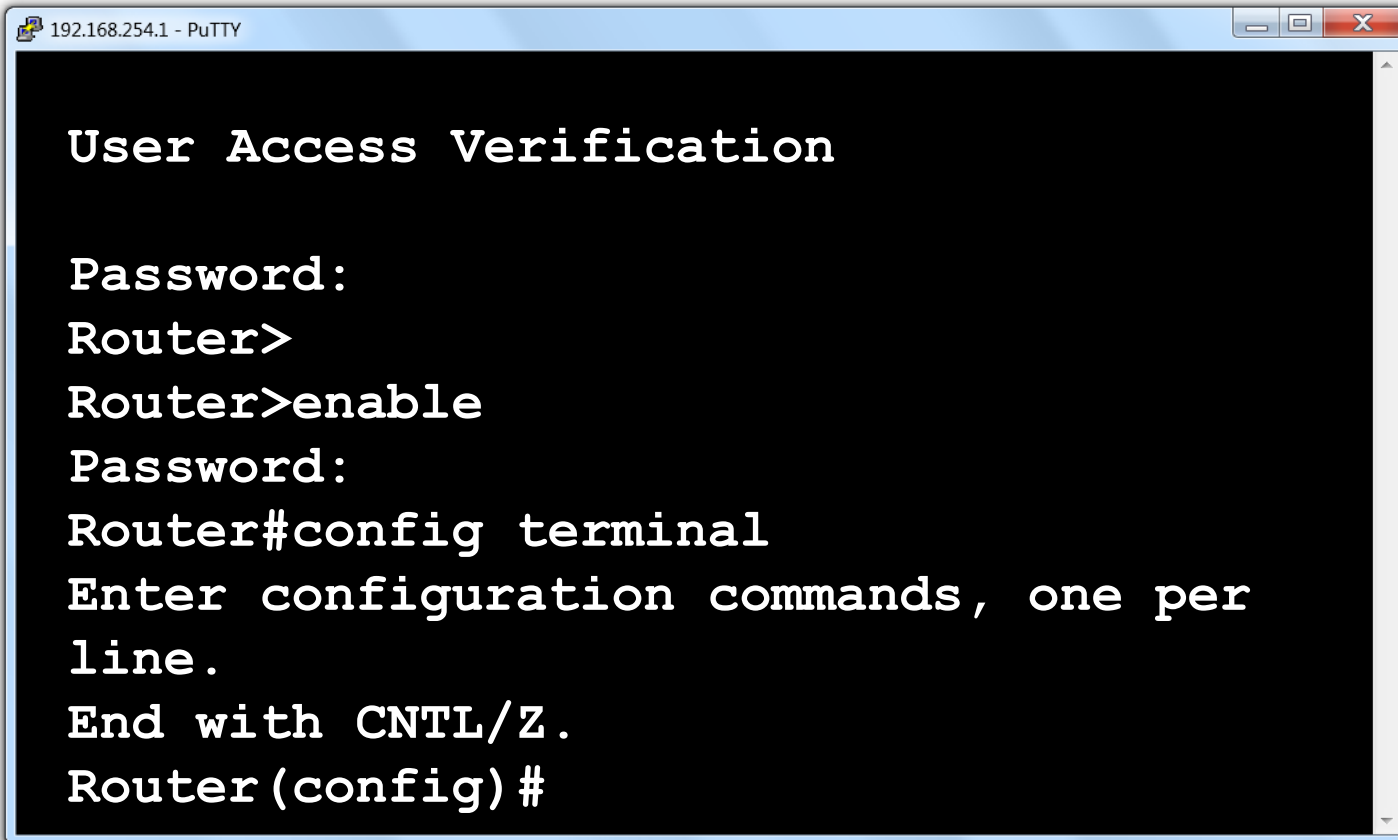


**Created IOS CLI
Improvements**

**Early IOS
IOS 9.2 Intro
Originally Or
Introduced on
Version Num**

**NO CLI
ng Features
ng Products
s in 11.2(8) SA
TOPS20 OS**

The IOS CLI



```
192.168.254.1 - PuTTY

User Access Verification

Password:
Router>
Router>enable
Password:
Router#config terminal
Enter configuration commands, one per
line.
End with CNTL/Z.
Router(config)#
```


A nighttime photograph of a city street. In the foreground, there are long, curved light trails from cars, primarily in shades of yellow and orange. In the middle ground, a pedestrian bridge with a glass railing spans across the street. The background features several modern buildings with lit windows and some flags on poles. The overall scene is illuminated by city lights, creating a vibrant urban atmosphere.

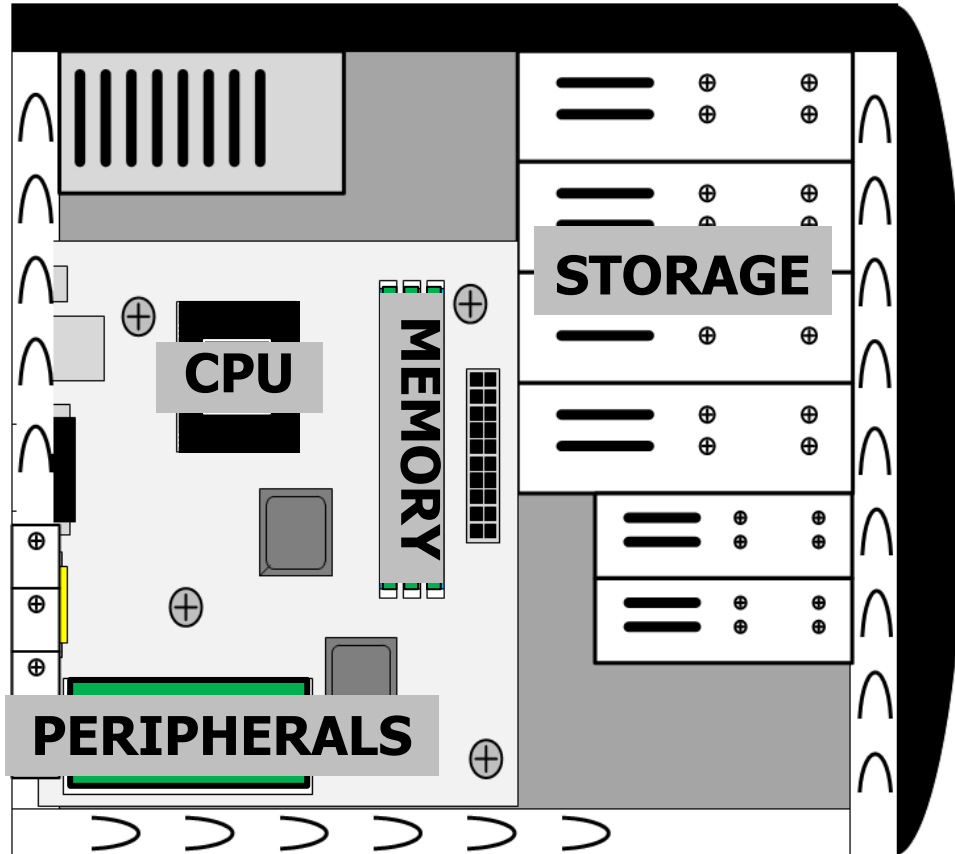
Cisco OS Architectures

OS Fundamentals: Computer Architecture

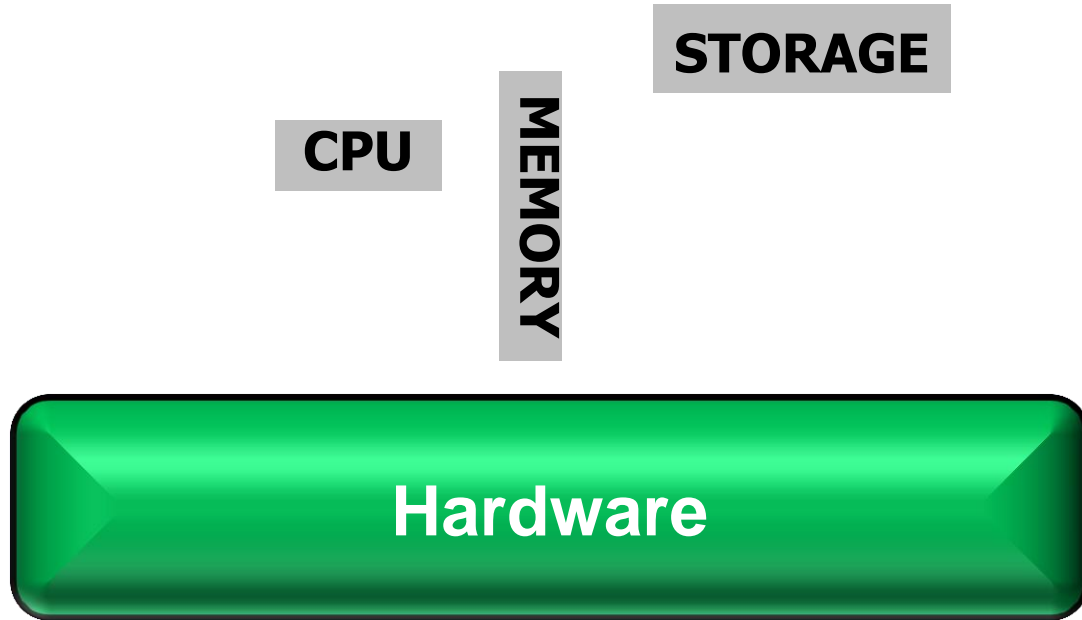


**Core
Components**

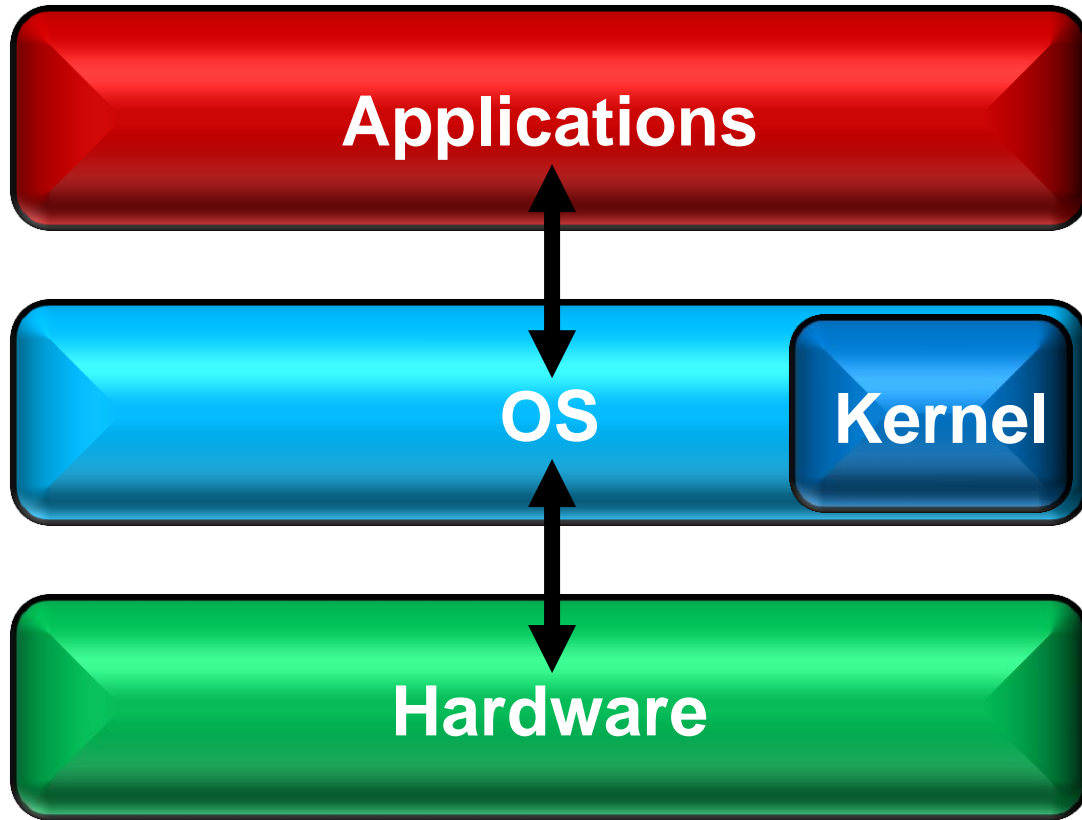
OS Fundamentals: Computer Architecture



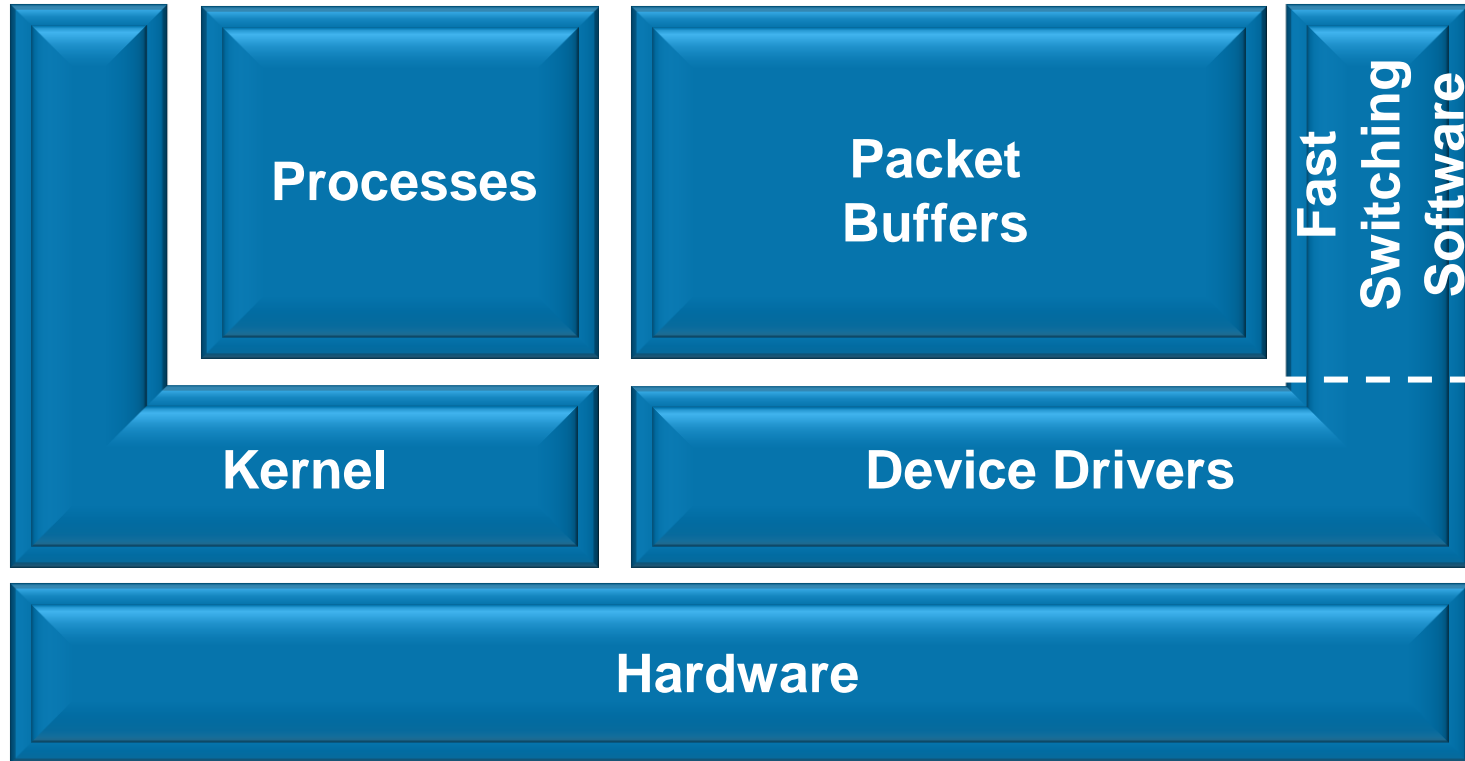
OS Fundamentals: OS Architecture



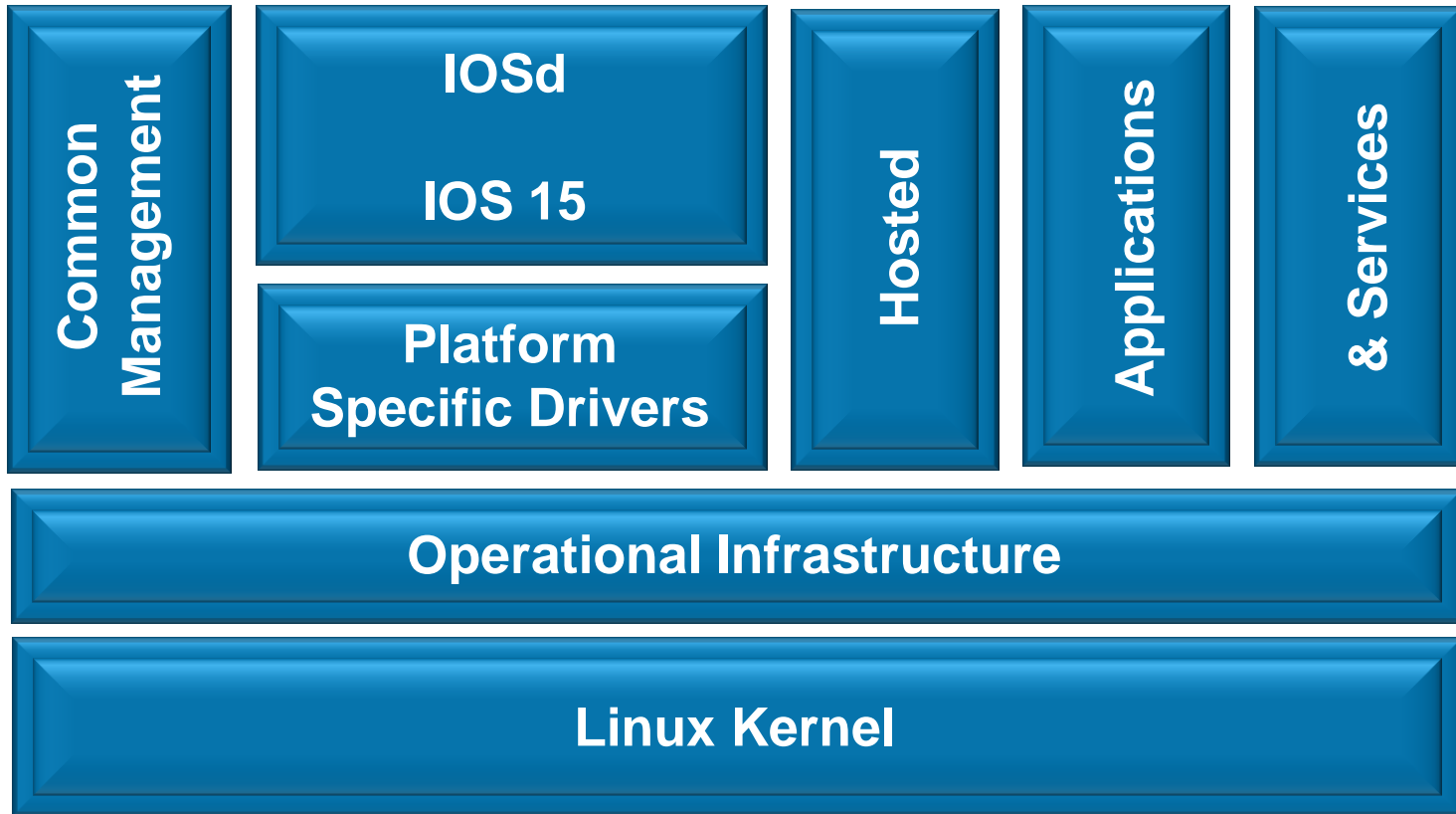
OS Fundamentals: OS Architecture



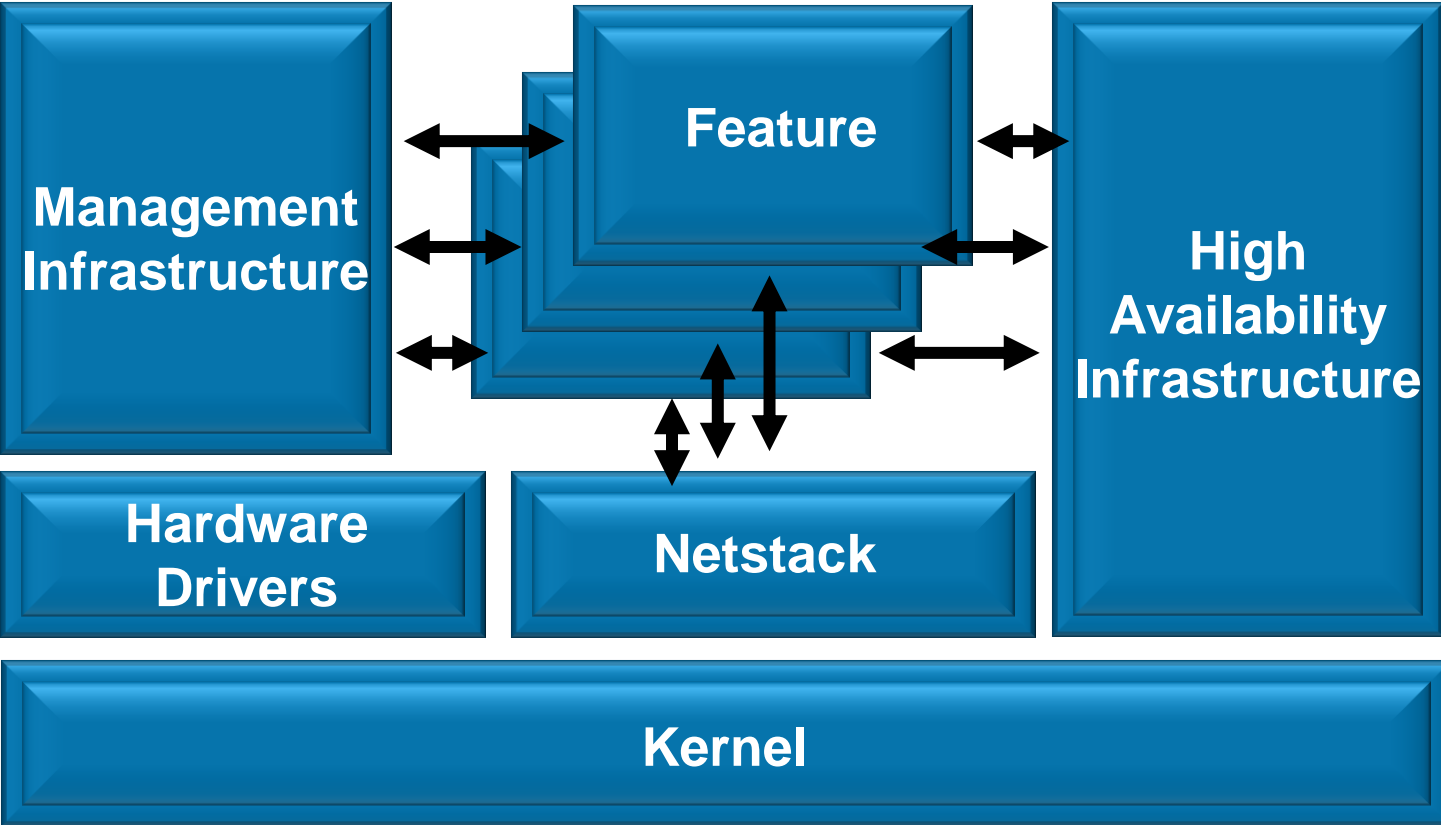
Original IOS Architecture



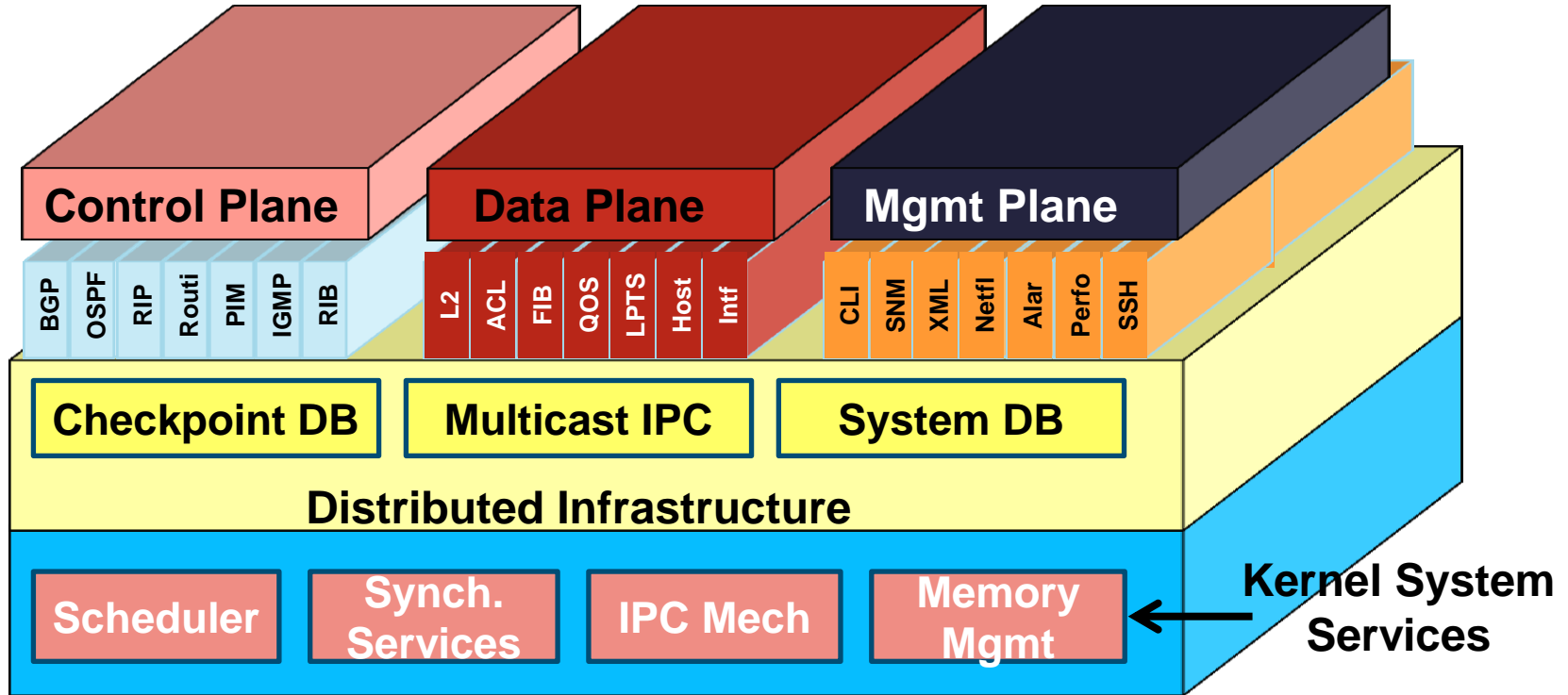
IOS-XE Architecture



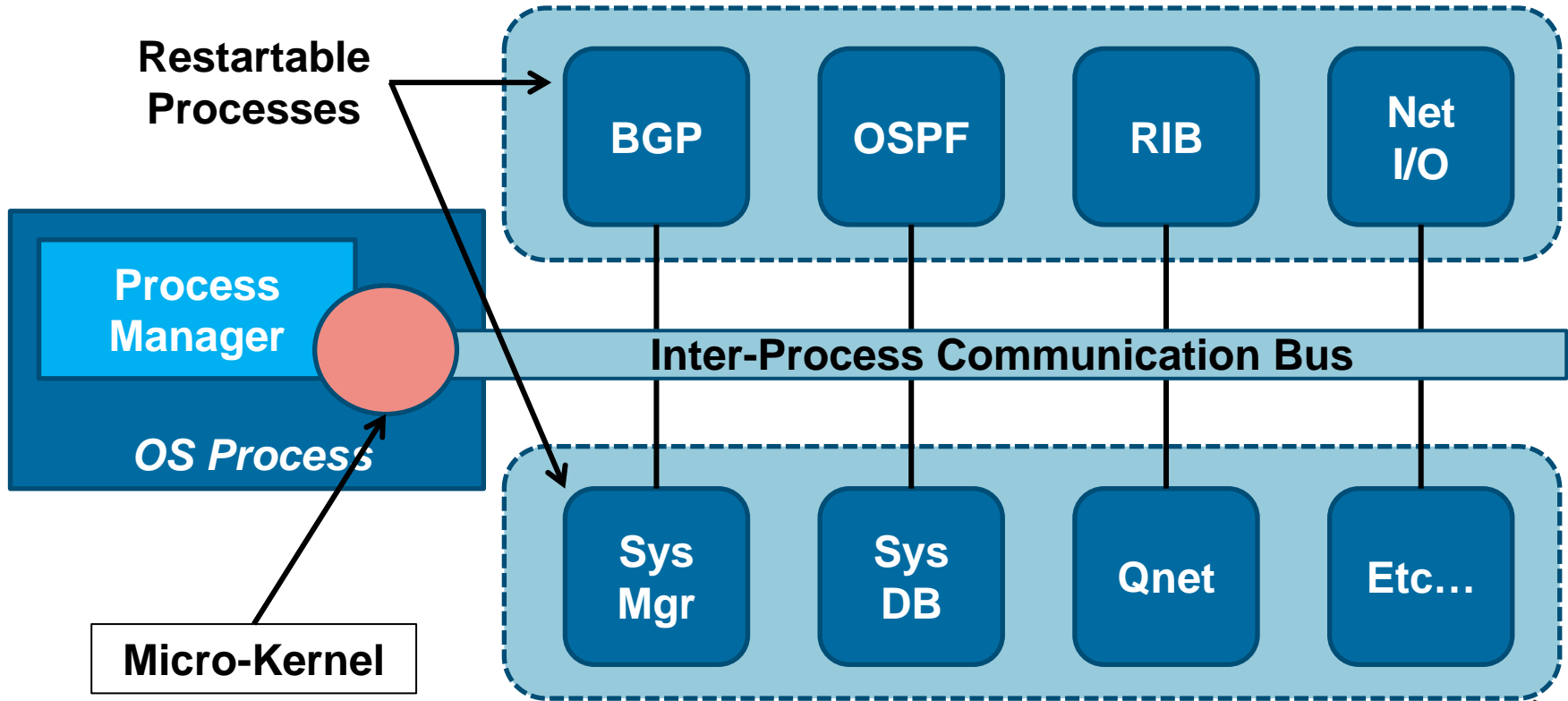
NX-OS Architecture



IOS-XR Architecture



IOS-XR Architecture (2)



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A nighttime photograph of a city street. In the foreground, there are long, curved light trails from cars, primarily in shades of yellow and orange. In the middle ground, a pedestrian bridge with a glass railing spans across the street. The background features several modern buildings with lit windows and some flags on poles. The overall scene is illuminated by city lights, creating a vibrant urban atmosphere.

IOS & NX-OS: Comparison/Contrast

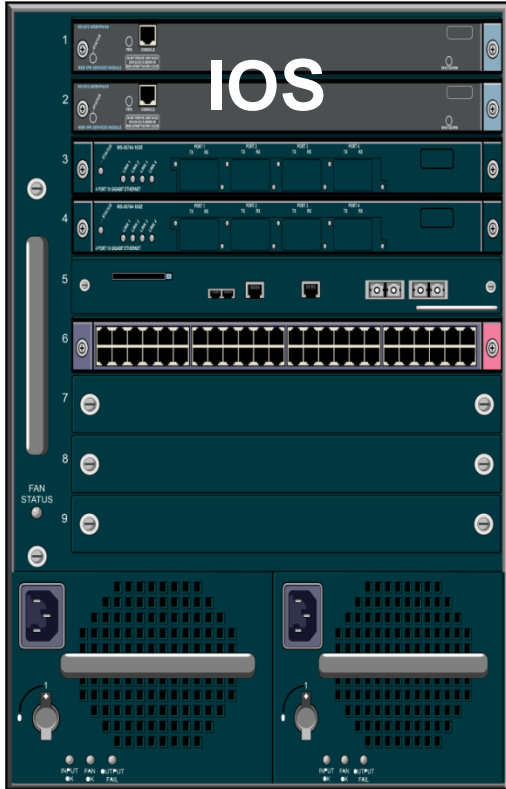
IOS/NX-OS Similarities



The Relationship of IOS and NX-OS...

...Can be likened to that of **brothers**

IOS/NX-OS Similarities



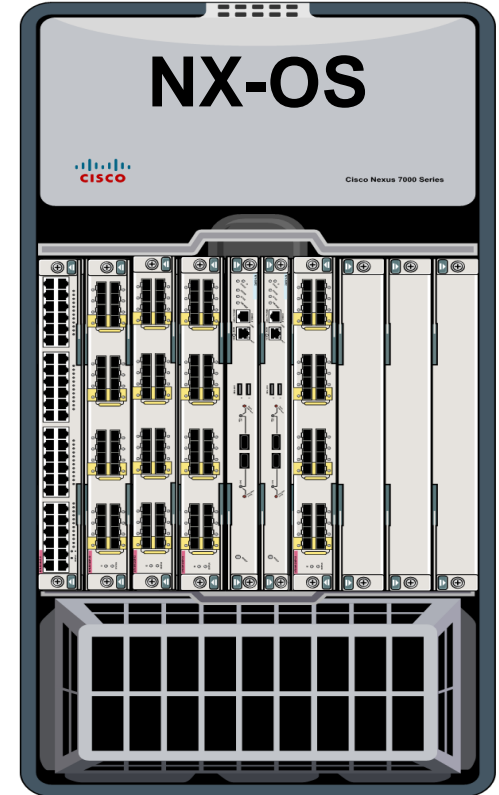
Hostname & Prompts

CLI Format/EXEC Modes

CLI Shortcuts

Startup/Running Config

Many Config/Show Commands



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IOS/NX-OS Similarities

```
192.168.254.222 - PuTTY
*****
* IOSv - Cisco Systems Confidential
*
* This software is provided as is without
* development and testing purposes only u
* Early Field Trial agreement. Under no
* be used for production purposes or depl
* environment.
*
* By using the software, you agree to abi
* of the Cisco Early Field Trial Agreemen
* conditions of the Cisco End User Licens
* http://www.cisco.com/go/eula
*
* Unauthorized use or distribution of thi
* Prohibited.
*****
Router>en
Router#conf t
Enter configuration commands, one per line
Router(config)#int g0/1
Router(config-if)#
```

Hostname & Prompt

CLI Format/EXEC Mode

CLI Shortcuts

Startup/Running Conf

any Config/Show Comm

```
192.168.254.222 - PuTTY
The use of NX-OS/Titanium Software and Do
limited to Cisco's internal use.
Any use or disclosure, in whole or in par
Software or Documentation to any third pa
expressly prohibited except as otherwise.
The copyrights to certain works contained
third parties and are used and distribute
of this software may be covered under the
GNU Lesser General Public License. A copy
available at
http://www.gnu.org/licenses/gpl.html and
http://www.gnu.org/licenses/lgpl.html
*****
* Titanium is strictly limited to Cisco'
* demonstration and NX/OS education. An
* in part, of the Titanium Software or D
* for any purposes is expressly prohibit
* authorized by Cisco in writing.
*****
switch# conf t
Enter configuration commands, one per lin
switch(config)# int e2/2
switch(config-if)#
```

IOS/NX-OS Similarities

```
192.168.254.222 - PuTTY
Router#show startup-config
Using 5030 out of 262144 bytes
!
! Last configuration change at 16:13:13 U
!
version 15.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
!
!
```

Hostname & Prompts

CLI Format/EXEC Mode

CLI Shortcuts

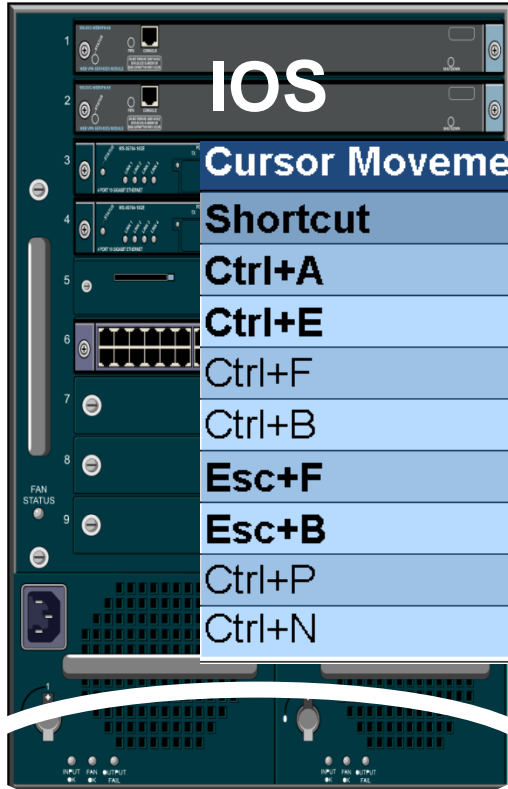
Startup/Running Config

any Config/Show Commands

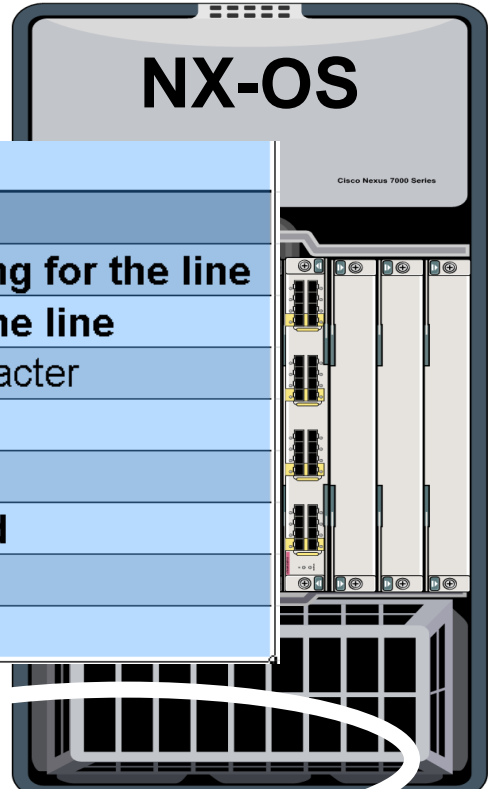
```
192.168.254.222 - PuTTY
switch# sh startup-config
!Command: show startup-config
!Time: Sat Mar 22 06:27:30 2014
!Startup config saved at: Sat Mar 22 06:2
version 7.0(1)
vdc switch id 1
limit-resource module-type m1 m1x1 m2x1
allocate interface Ethernet2/1-48
allocate interface Ethernet3/1-48
allocate interface Ethernet4/1-48
limit-resource vlan minimum 16 maximum
limit-resource vrf minimum 2 maximum 40
limit-resource port-channel minimum 0 m
limit-resource u4route-mem minimum 96 m
limit-resource u6route-mem minimum 24 m
limit-resource m4route-mem minimum 58 m
limit-resource m6route-mem minimum 8 ma
username admin password 5 $1$0507w209$jA0
no password strength-check
ip domain-lookup
vlan dot1q tag native
system default switchport
```



IOS/NX-OS Similarities



Hostname & Prompts



Cursor Movement Shortcuts

Shortcut	Description
Ctrl+A	Move cursor to the beginning for the line
Ctrl+E	Move cursor to the end of the line
Ctrl+F	Move cursor forward one character
Ctrl+B	Move cursor backward
Esc+F	Moves forward one word
Esc+B	Moves backwards one word
Ctrl+P	Previous command
Ctrl+N	Next command

Many Config/Show Commands

IOS/NX-OS Similarities

```
192.168.254.222 - PuTTY
Router#show startup-config
Using 5030 out of 262144 bytes
!
! Last configuration change at 16:13:13 U
!
version 15.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
!
no aaa new-model
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
!
!
```

Hostname & Prompts

CLI Format/EXEC Mode

CLI Shortcuts

Startup/Running Config

any Config/Show Commands

```
192.168.254.222 - PuTTY
switch# sh startup-config
!Command: show startup-config
!Time: Sat Mar 22 06:27:30 2014
!Startup config saved at: Sat Mar 22 06:2
version 7.0(1)
vdc switch id 1
limit-resource module-type m1 m1x1 m2x1
allocate interface Ethernet2/1-48
allocate interface Ethernet3/1-48
allocate interface Ethernet4/1-48
limit-resource vlan minimum 16 maximum
limit-resource vrf minimum 2 maximum 40
limit-resource port-channel minimum 0 m
limit-resource u4route-mem minimum 96 m
limit-resource u6route-mem minimum 24 m
limit-resource m4route-mem minimum 58 m
limit-resource m6route-mem minimum 8 ma
username admin password 5 $1$0507w209$jA0
no password strength-check
ip domain-lookup
vlan dot1q tag native
system default switchport
```

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IOS/NX-OS Similarities

```
192.168.254.222 - PuTTY
Router#sh running-config
Building configuration...

Current configuration : 5030 bytes
!
! Last configuration change at 16:13:13 UTC Mon Mar 22 2014
!
version 15.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
```

Hostname & Prompts

CLI Format/EXEC Mode

CLI Shortcuts

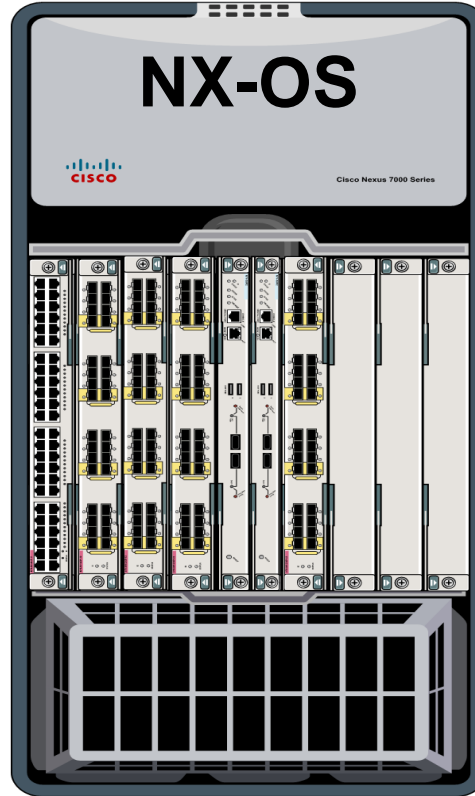
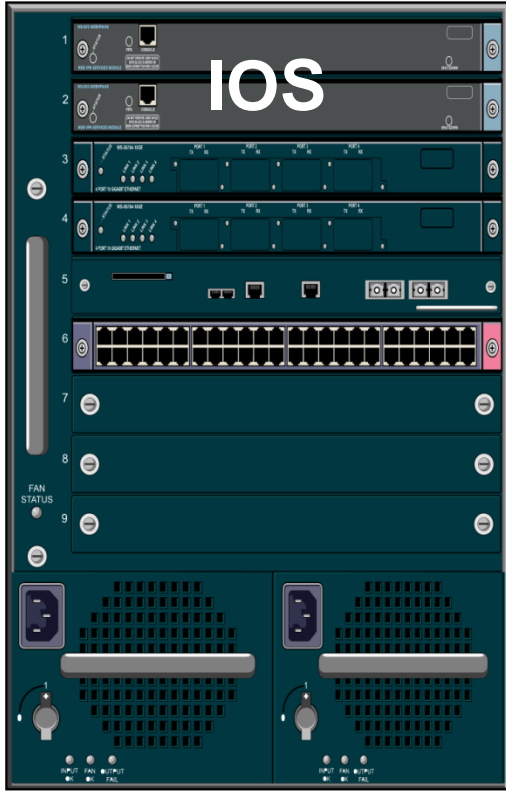
Startup/Running Config

any Config/Show Commands

```
192.168.254.222 - PuTTY
!Command: show running-config
!Time: Sat Mar 22 06:29:16 2014

version 7.0(1)
vdc switch id 1
  limit-resource module-type m1 m1x1 m2x1
  allocate interface Ethernet2/1-48
  allocate interface Ethernet3/1-48
  allocate interface Ethernet4/1-48
  limit-resource vlan minimum 16 maximum
  limit-resource vrf minimum 2 maximum 40
  limit-resource port-channel minimum 0 m
  limit-resource u4route-mem minimum 96 m
  limit-resource u6route-mem minimum 24 m
  limit-resource m4route-mem minimum 58 m
  limit-resource m6route-mem minimum 8 ma
username admin password 5 $1$0507w209$jAC
no password strength-check
ip domain-lookup
vlan dot1q tag native
system default switchport
no logging event trunk-status enable
--More--
```

IOS/NX-OS Feature Parity

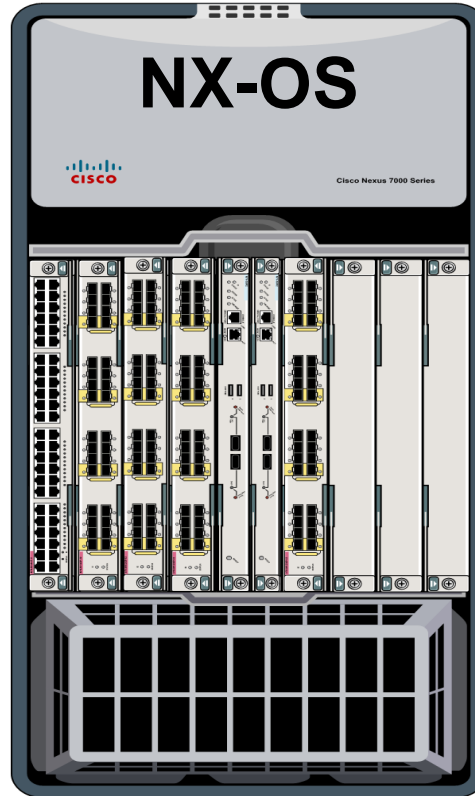
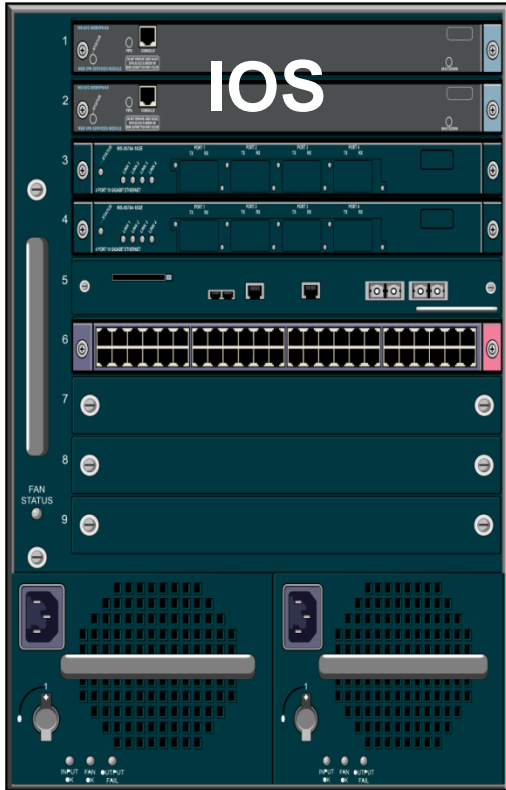


IP Routing

- IPv4/IPv6
- Static
- RIP
- OSPF
- EIGRP
- ISIS
- BGP
- PBR
- Route Maps

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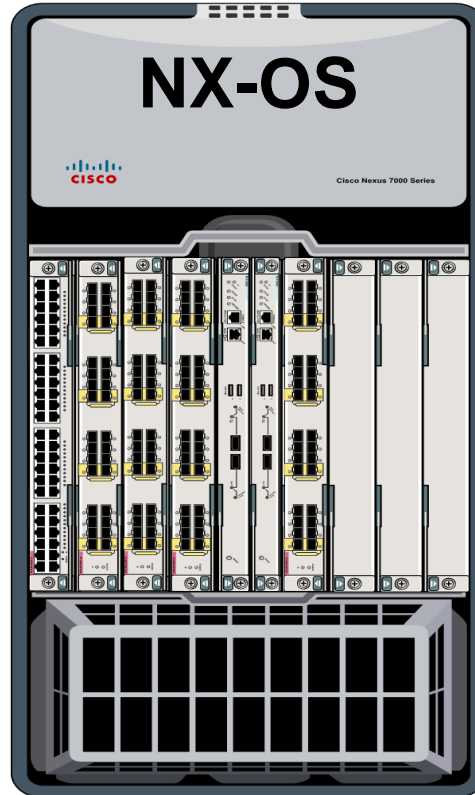
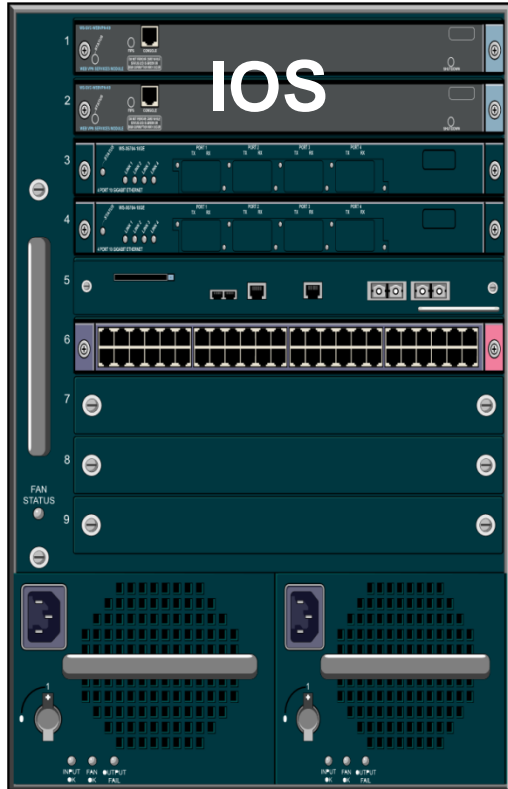
IOS/NX-OS Feature Parity



Multicast

- IGMP
- PIM
- MSDP
- IGMP Snooping
- SSM

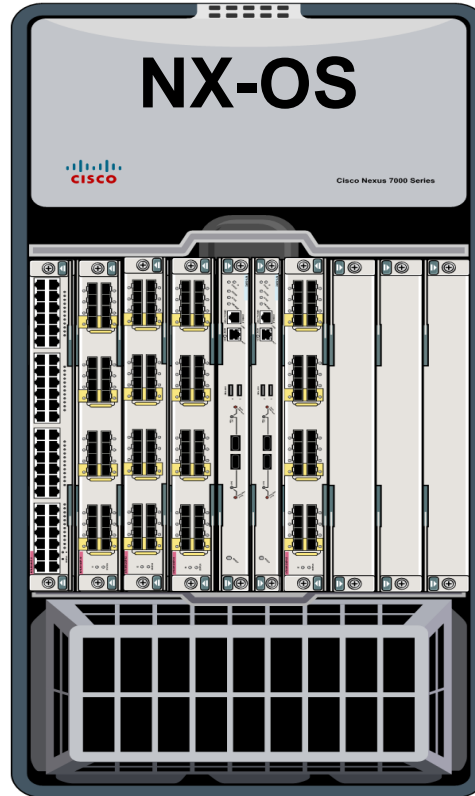
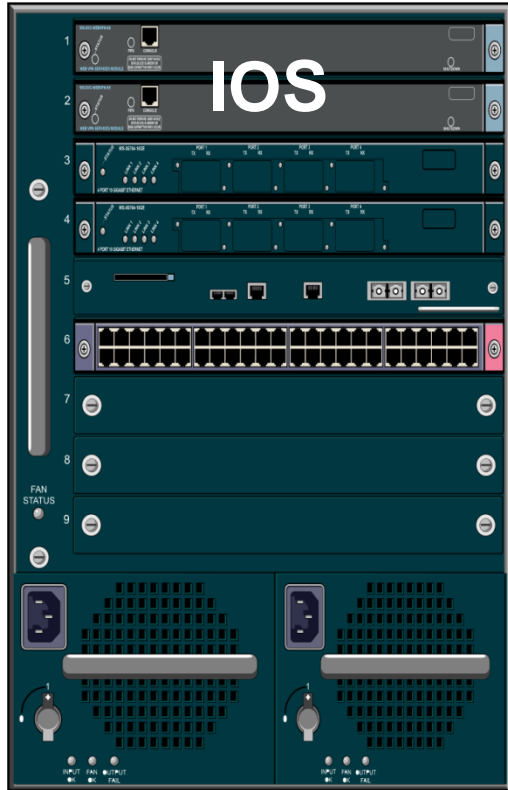
IOS/NX-OS Feature Parity



High Availability

- HSRP
- VRRP
- GLBP

IOS/NX-OS Feature Parity

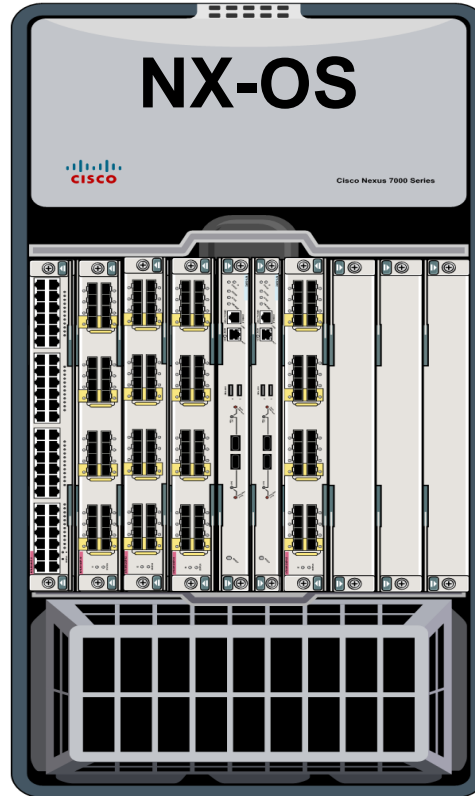
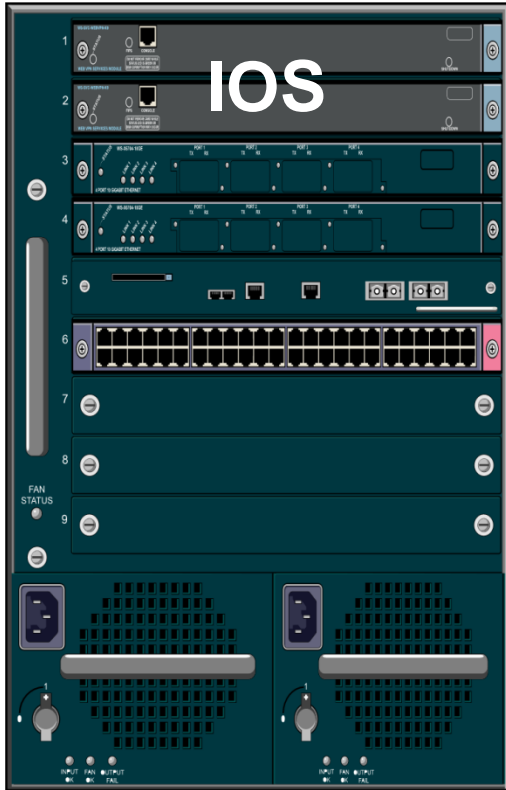


Security

- (R)ACLs
- MAC ACLs
- PACLs
- Port Security
- DHCP Snooping
- DAI
- PVLAN
- MPLS
- 802.1X/AAA

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IOS/NX-OS Feature Parity

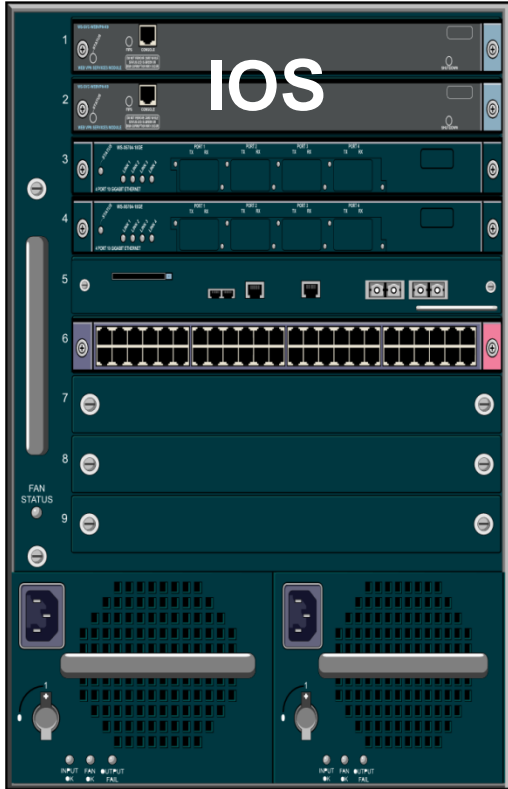


Other Features

- CDP
- LLDP
- Netflow
- VTP
- SNMP
- Port-Channels
- 802.1Q Trunks
- NTP
- Many More!

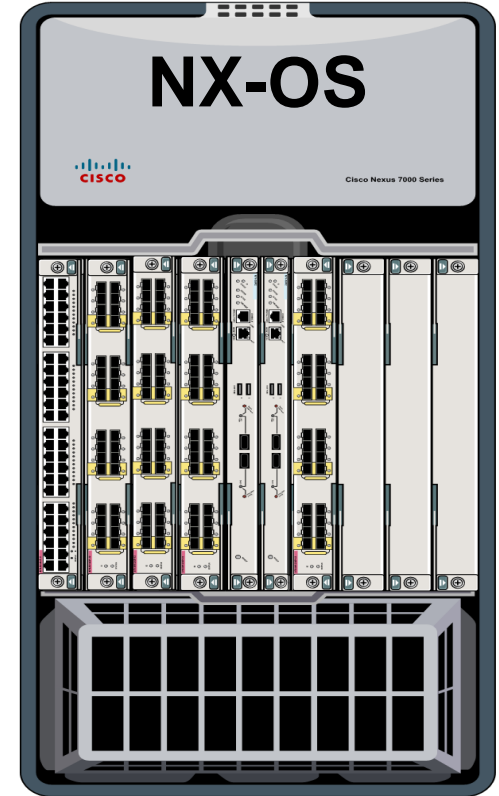
Cisco *live!*

IOS/NX-OS Differences



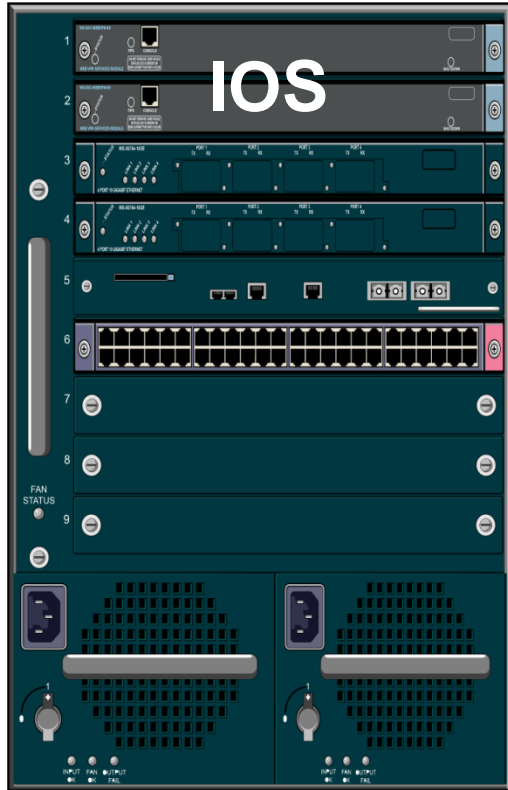
System Access

- Admin User
- Setup Utility
- SSH enabled
- Default Prompt & Mode
- License installs
- RBAC



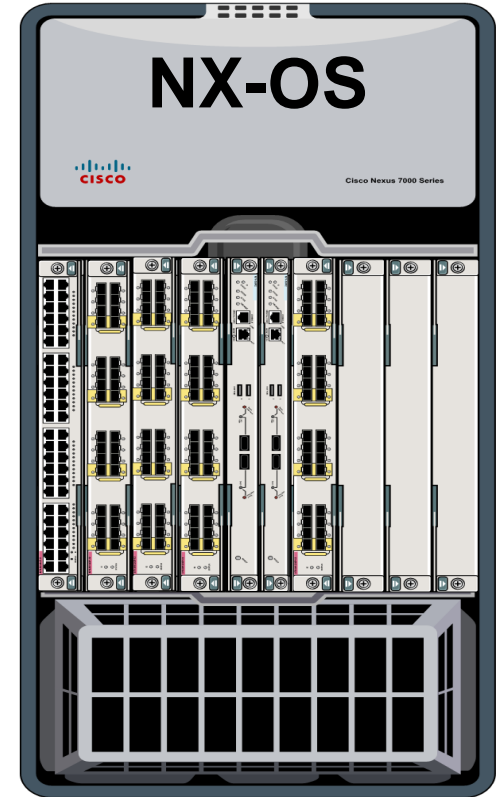
Cisco *live!*

IOS/NX-OS Differences



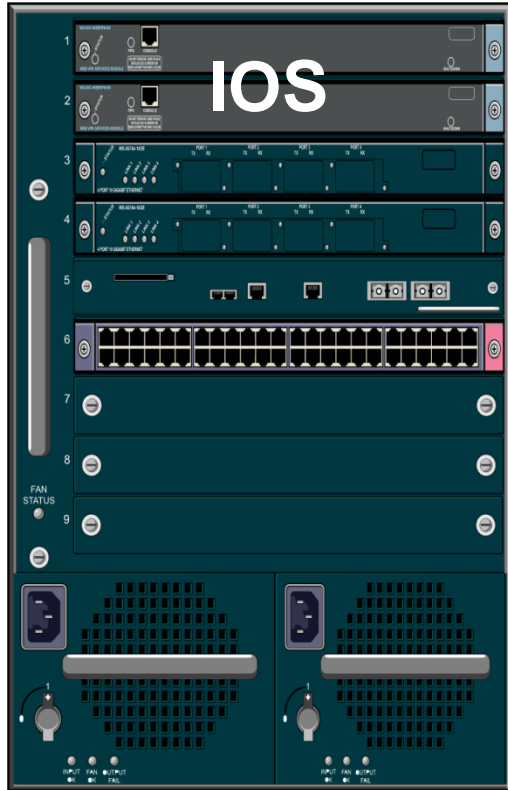
System Operation

- Two OS images
- No **write mem!**
- VDCs
- Explicit Feature Enablement
- Configuration Rollback
- Different defaults
- No **do** command



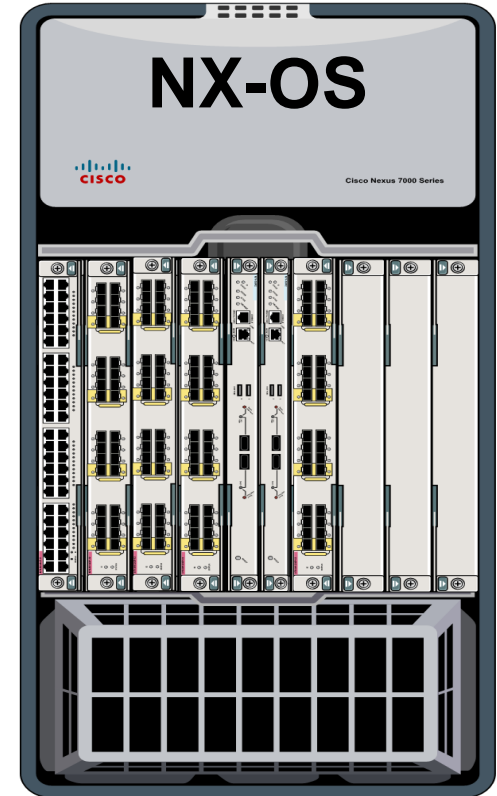
Cisco *live!*

IOS/NX-OS Differences



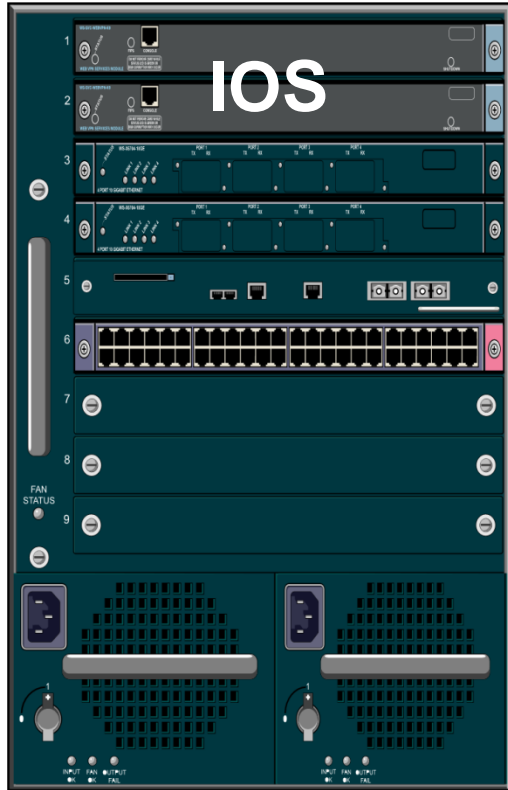
Interfaces

- Ethernet (no speed reference)
- No traditional WAN interfaces
- OOB Management
- Port profiles
- No PoE support
- FC Interfaces
- FEX-Link



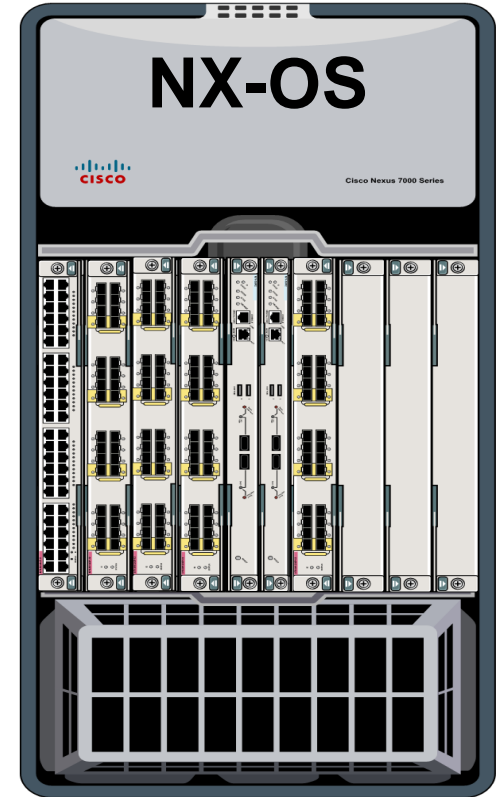
Cisco *live!*

IOS/NX-OS Differences



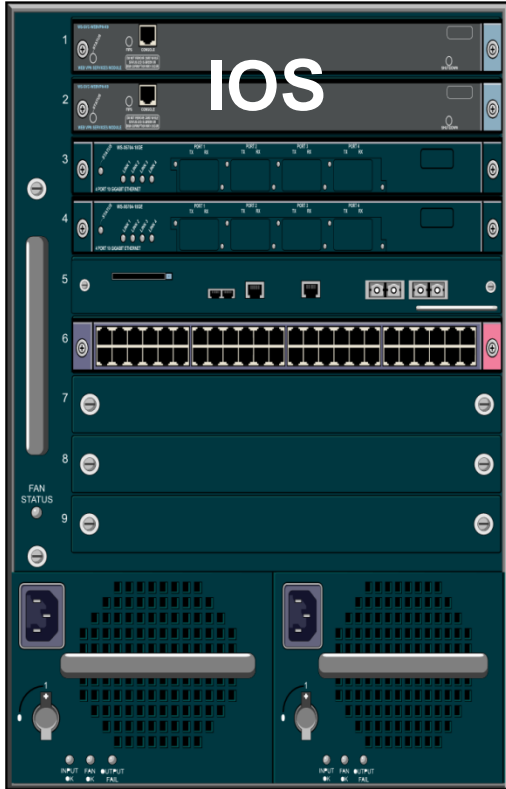
IP Routing

- **Redistribution behavior**
- **No network commands**
- **Syntax differences**
- **Other varied differences**

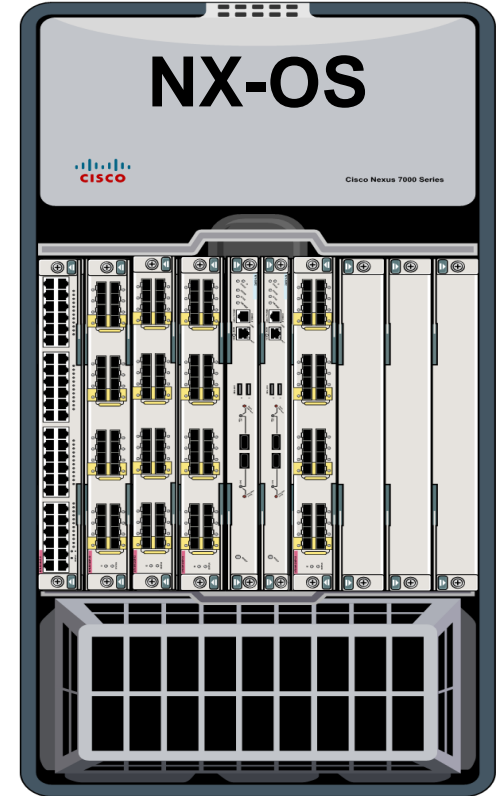


Cisco *live!*

IOS/NX-OS Differences



- **No voice support**
- **No NAT**
- **Many data-center only features**
- **No service modules**
- **Additional variations (see handouts)**



Cisco *live!*

A long-exposure photograph of a city street at night. The image shows light trails from cars and streetlights, creating a sense of motion. The scene includes a sidewalk, a fence, and buildings in the background.

IOS vs. NX-OS CLI DEMO

IOS/NX-OS Lab Demo

```
virl@virl: ~  
*  
* I  
* S  
* C  
*****  
*****  
* Titanium is strictly limited to Cisco's internal use for evalua  
* /  
* demonstration and NX/OS education. Any use or disclosure, in w  
or *  
* in part, of the Titanium Software or Documentation to any third  
* ty *  
* for any purposes is expressly prohibited except as otherwise  
*  
* authorized by Cisco in writing.  
*  
**  
**  
*****  
*****  
R1-  
R3-NXOS#  
R3-NXOS# █
```



IOS & IOS-XR: Comparison/Contrast

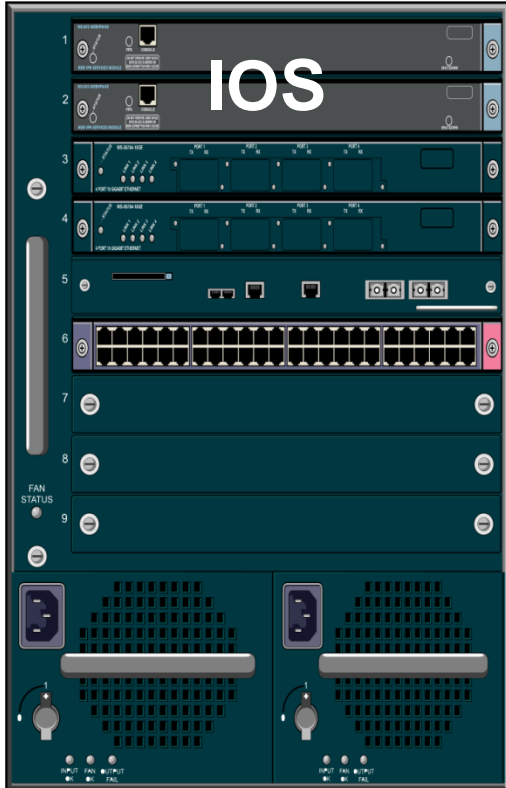
IOS/IOS-XR Similarities

The Relationship of IOS and IOS-XR...



...Can be likened to that of **cousins**

IOS/IOS-XR Similarities



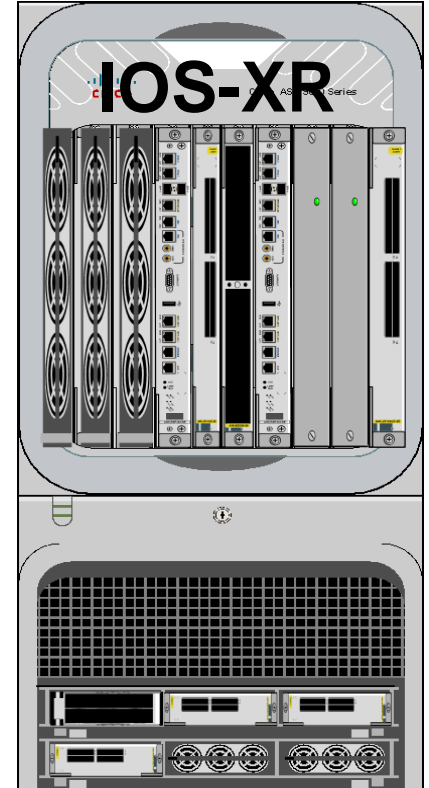
CLI Format/EXEC Modes

Naming

CLI Prompts/Shortcuts

Running Config

Some Config/Show Commands



IOS/IOS-XR Similarities

CLI Format/EXEC Mo

Naming

CLI Prompts/Shortc

Running Config

me Config/Show Com

```
vir1@vir1: ~
d
*
* conditions of the Cisco End User
*
* http://www.cisco.com/go/eula
*
*
* Unauthorized use or distribution
*
* Prohibited.
*
*****
*****
R1-IOS#
R1-IOS#conf t
Enter configuration commands, one
R1-IOS(config)#router rip
R1-IOS(config-router)#
```

```
vir1@vir1: ~
Software, and (b) you may return
orth
in the Agreement.

Please login with any configured

User Access Verification

Username: cisco
Password:

RP/0/0/CPU0:R2-XR#conf t
Wed Mar 26 13:53:41.170 UTC
RP/0/0/CPU0:R2-XR(config)#router
RP/0/0/CPU0:R2-XR(config-rip)#
```



IOS/IOS-XR Similarities

```
vir1@vir1: ~
* Prohibited.
*****
R1-IOS#sh ip int brief
Interface                               IP-Address
GigabitEthernet0/0                      172.16.1.52
GigabitEthernet0/1                      172.16.12.1
GigabitEthernet0/2                      172.16.21.1
GigabitEthernet0/3                      172.16.13.1
GigabitEthernet0/4                      172.16.31.1
Loopback0                               10.1.1.1
Loopback1                               192.168.1.1
R1-IOS#
```

CLI Format/EXEC Mode

Naming

CLI Prompts/Shortcuts

Running Config

Line Config/Show Commands

```
vir1@vir1: ~
User Access Verification

Username: cisco
Password:

RP/0/0/CPU0:R2-XR#sh ip int brief
Wed Mar 26 18:19:24.598 UTC

Interface                               IP-Address
Loopback0                               10.2.2.2
Loopback2                               192.168.2.2
GigabitEthernet0/0/CPU0/0              172.16.1.52
GigabitEthernet0/0/0/0                 172.16.12.1
GigabitEthernet0/0/0/1                 172.16.21.1
GigabitEthernet0/0/0/2                 172.16.23.1
GigabitEthernet0/0/0/3                 172.16.32.1
RP/0/0/CPU0:R2-XR#
```



IOS/IOS-XR Similarities

```
vir1@vir1: ~  
R1-IOS#show run  
Building configuration...  
  
Current configuration : 5810 bytes  
!  
! Last configuration change at 12:00:00  
!  
version 15.4  
service timestamps debug datetime msec  
service timestamps log datetime msec  
no service password-encryption  
!  
hostname R1-IOS  
!  
boot-start-marker  
boot-end-marker  
!  
!
```

CLI Format/EXEC Mode

Naming

CLI Prompts/Shortcut

Running Config

Running Config/Show Command

```
vir1@vir1: ~  
RP/0/0/CPU0:R2-XR#show running-configuration  
Wed Mar 26 13:27:56.736 UTC  
Building configuration...  
!! IOS XR Configuration 5.1.1.120  
!! Last configuration change at Wed Mar 26 13:27:56.736 UTC  
!  
hostname R2-XR  
domain name cisco.com  
cdp  
line console  
  exec-timeout 0 0  
!  
interface Loopback0  
  ipv4 address 10.2.2.2 255.255.255.255  
!  
interface Loopback2  
  description Simulated LAN  
  ipv4 address 192.168.2.2 255.255.255.255
```



IOS/IOS-XR Similarities

```
vir1@vir1: ~  
R1-IOS#show ip route  
Codes: L - local, C - connected, S - static  
D - EIGRP, EX - EIGRP external, O - OSPF  
N1 - OSPF NSSA external type 1, N2 - OSPF  
E1 - OSPF external type 1, E2 - OSPF  
i - IS-IS, su - IS-IS summary, L1 - IS-IS  
ia - IS-IS inter area, * - candidate default  
o - ODR, P - periodic downloaded static route  
a - application route  
+ - replicated route, % - next hop unreachable  
Gateway of last resort is 172.16.1.1 to network 0.0.0.0  
  
S* 0.0.0.0/0 [254/0] via 172.16.1.1  
10.0.0.0/8 is variably subnetted, 4 subnets, 8 prefixes  
C 10.1.1.1/32 is directly connected, 2 interfaces  
D 10.2.2.0/24 [90/2841] via 172.16.1.1, 2 interfaces  
[90/2841] via 172.16.1.1, 2 interfaces
```

CLI Format/EXEC Mode

Naming

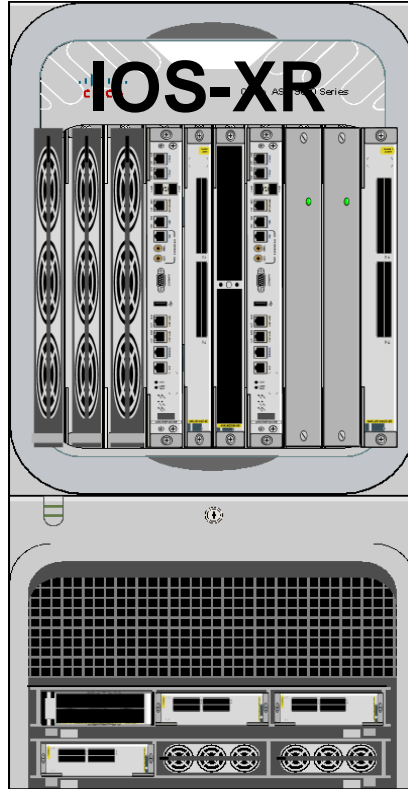
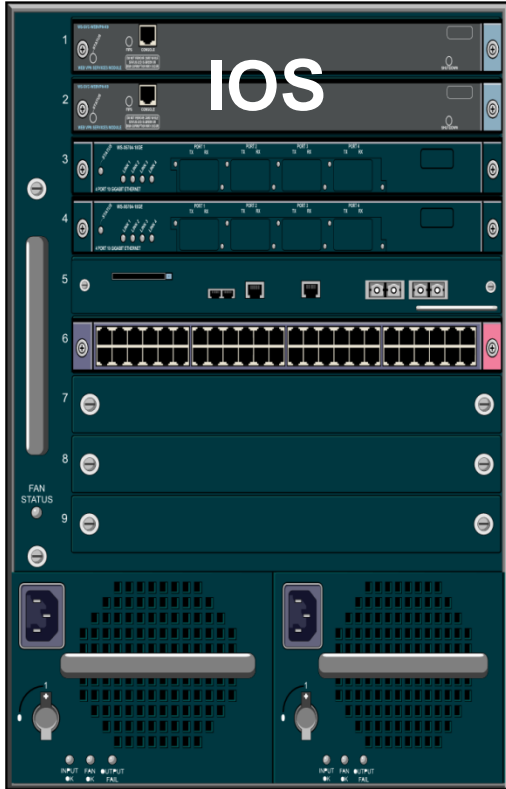
CLI Prompts/Shortcuts

Running Config

Line Config/Show Commands

```
vir1@vir1: ~  
RP/0/0/CPU0:R2-XR#show route ipv4  
Wed Mar 26 14:11:18.908 UTC  
  
Codes: C - connected, S - static, R - RIP  
D - EIGRP, EX - EIGRP external, O - OSPF  
N1 - OSPF NSSA external type 1, N2 - OSPF  
E1 - OSPF external type 1, E2 - OSPF  
i - ISIS, L1 - IS-IS level-1, L2 - IS-IS  
ia - IS-IS inter area, su - IS-IS summary  
U - per-user static route, o - ODR  
A - access/subscriber, a - Application  
Gateway of last resort is not set  
  
D 10.1.1.1/32 [90/2570240] via 172.16.1.1, 2 interfaces  
[90/2570240] via 172.16.1.1, 2 interfaces  
C 10.2.2.0/24 is directly connected, 2 interfaces  
L 10.2.2.2/32 is directly connected, 2 interfaces
```

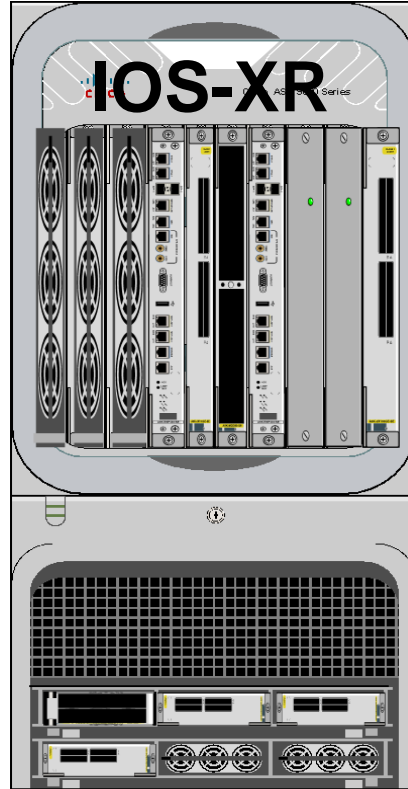
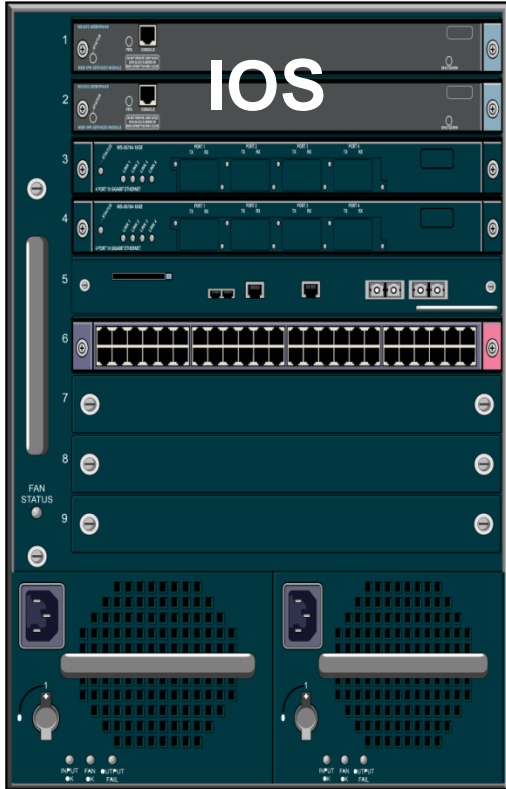
IOS/IOS-XR Feature Parity



IP Routing

- IPv4/IPv6
- Static
- RIP
- OSPF
- EIGRP
- ISIS
- VRF Support

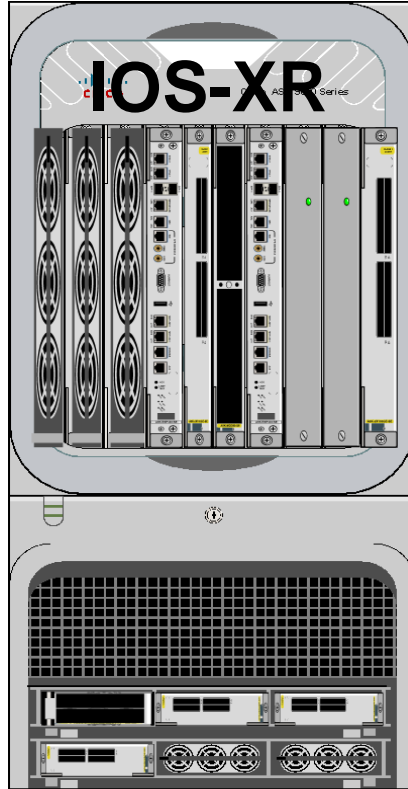
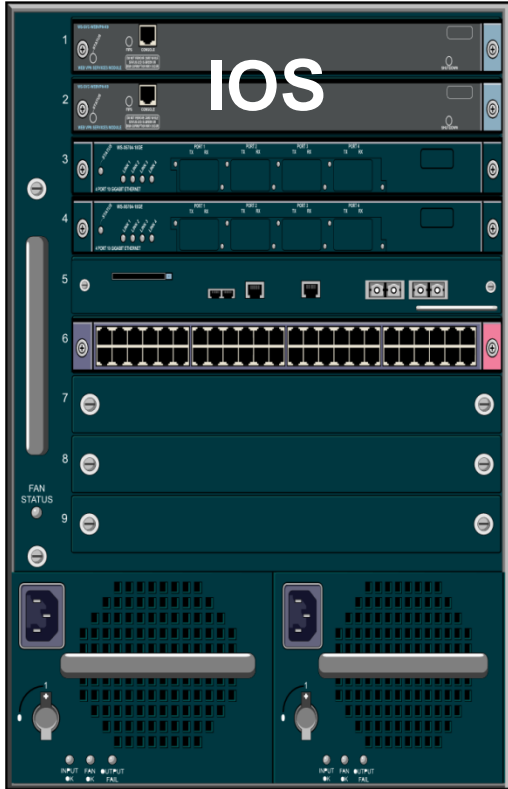
IOS/IOS-XR Feature Parity



Multicast

- IPv6/IPv6
- IGMP
- PIM
- MSDP
- SSM
- Auto-RP

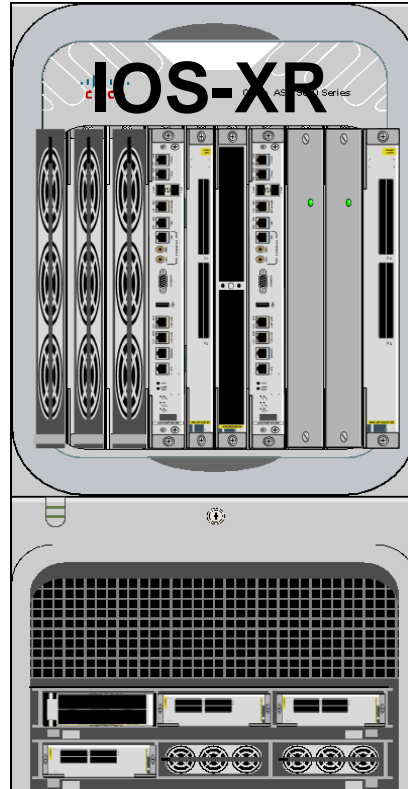
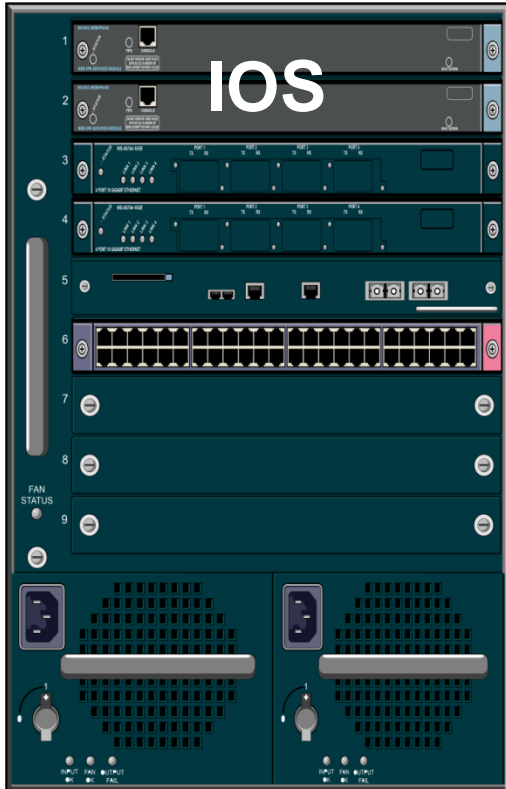
IOS/IOS-XR Feature Parity



High Availability

- HSRP
- VRRP
- Multiple Route Processors

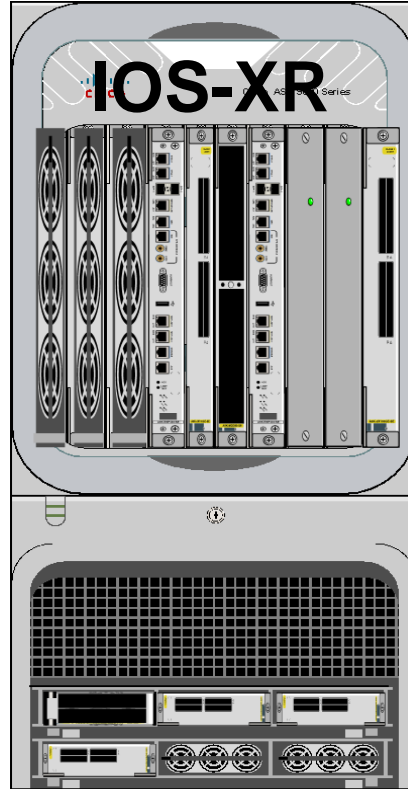
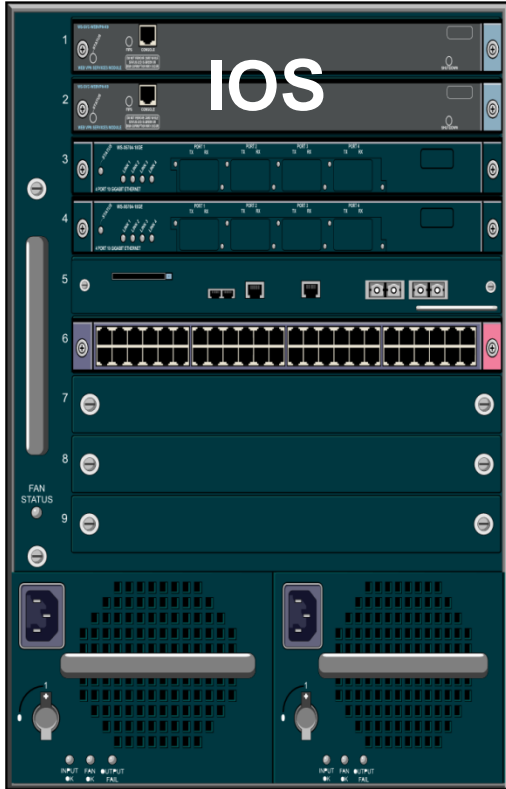
IOS/IOS-XR Feature Parity



Security

- AAA (RADIUS & TACACS+)
- ACLs
- uRPF
- MPP
- MPLS/VPN
- IPsec VPN
- DAI

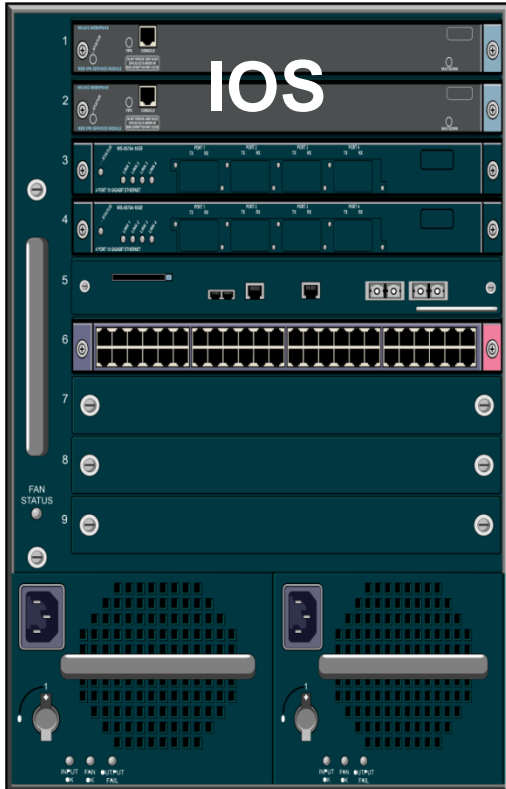
IOS/IOS-XR Feature Parity



Other Features

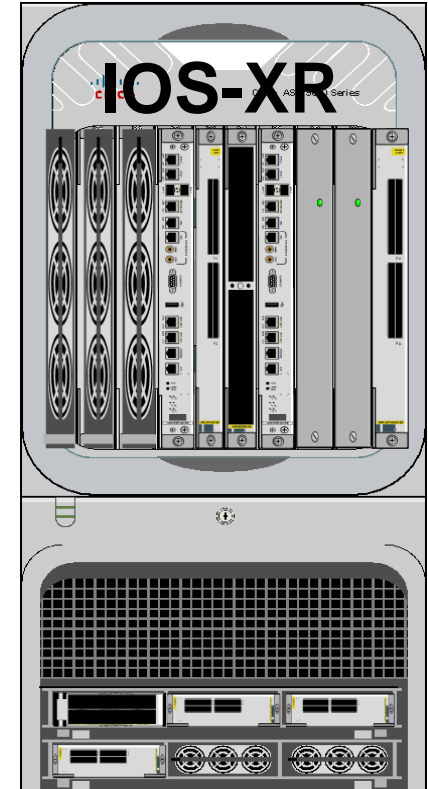
- CDP
- LLDP
- VTP
- SNMP
- 802.1Q VLANs
- NTP
- IP-SLA
- QoS (CBWFQ)
- IRB

IOS/IOS-XR Differences

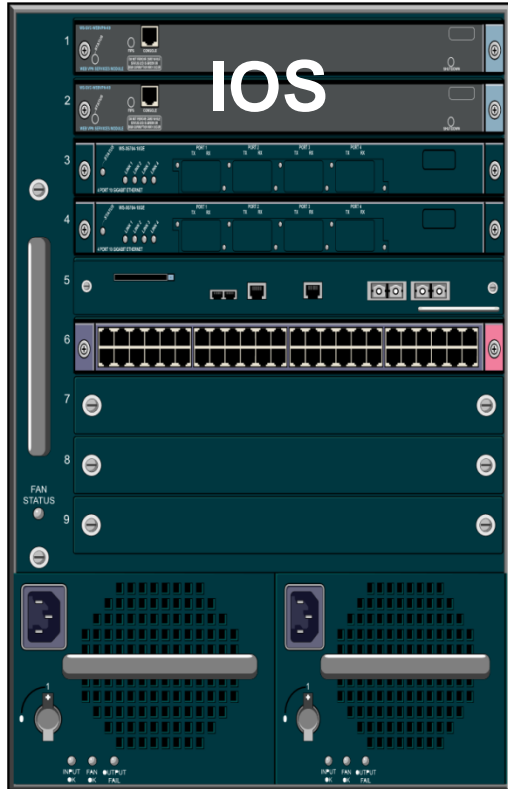


System Access

- User login
- Default Prompt & Mode
- Hostname
- Line configs
- Admin mode
- License installs
- RBAC

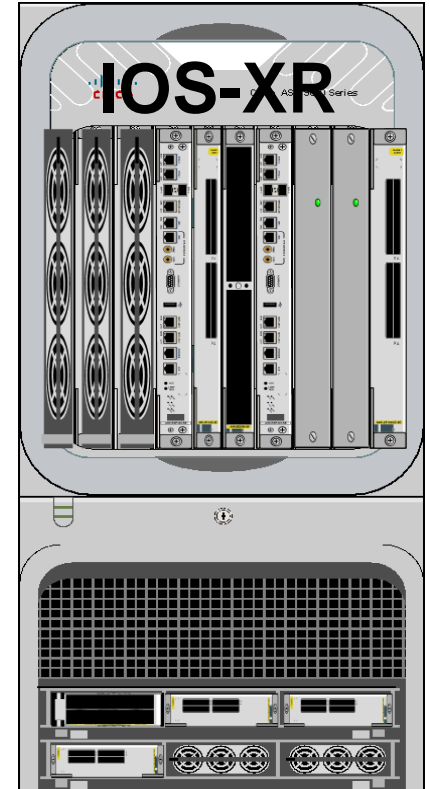


IOS/IOS-XR Differences



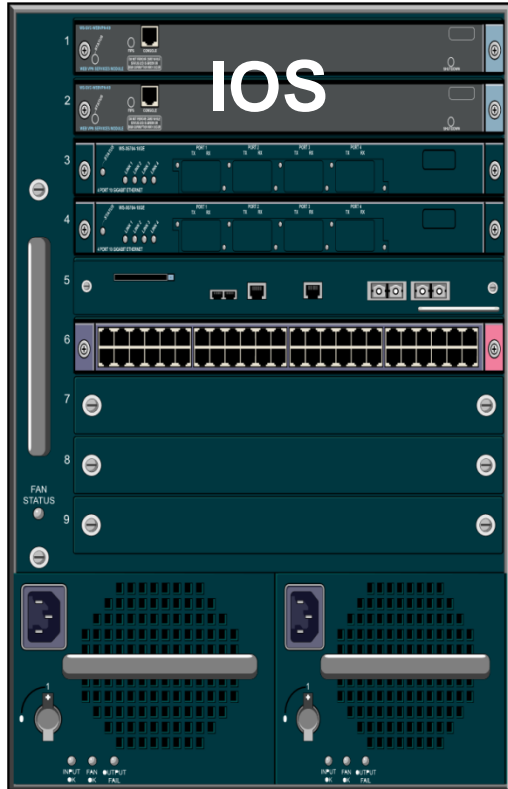
System Operation

- PIE images
- SDRs
- Two-stage config
- No **write mem!**
- Configuration Rollback
- Management interface
- Boot options



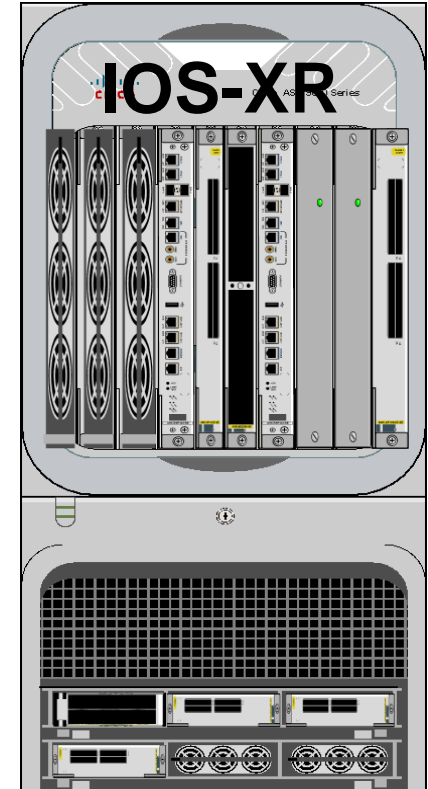
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IOS/IOS-XR Differences

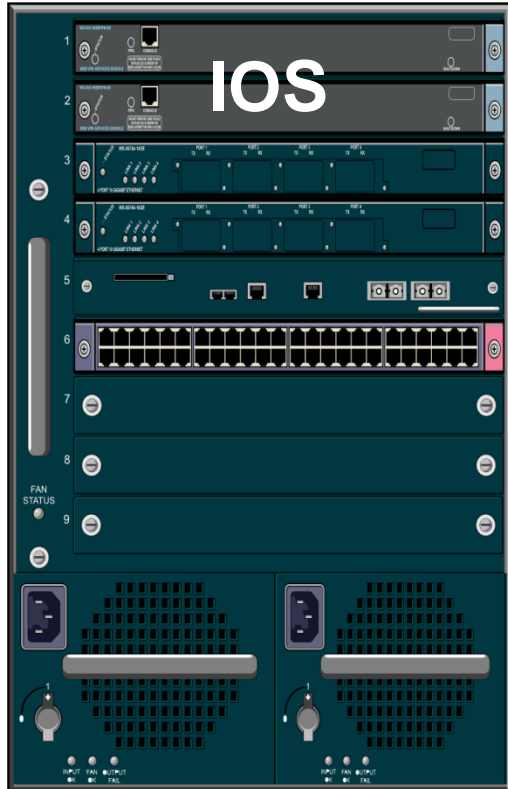


Interfaces

- DWDM/Optical
- Carrier Ethernet
- SIP/SPA*
- Packet over SONET
- 100 GB Ethernet
- No PoE support
- No voice ports
- Link bundling

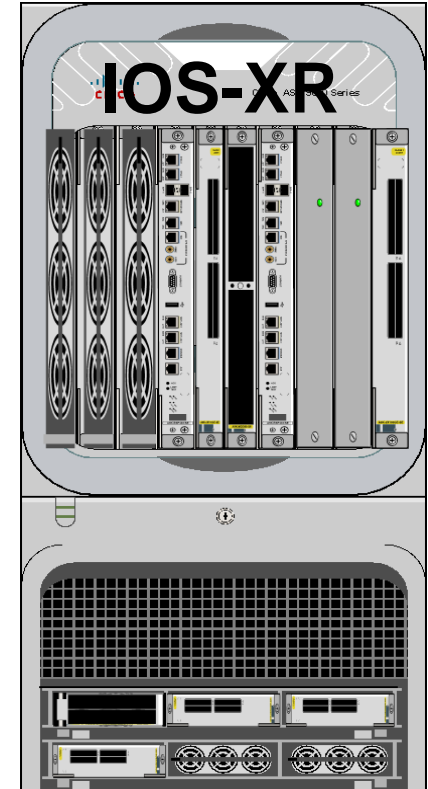


IOS/IOS-XR Differences



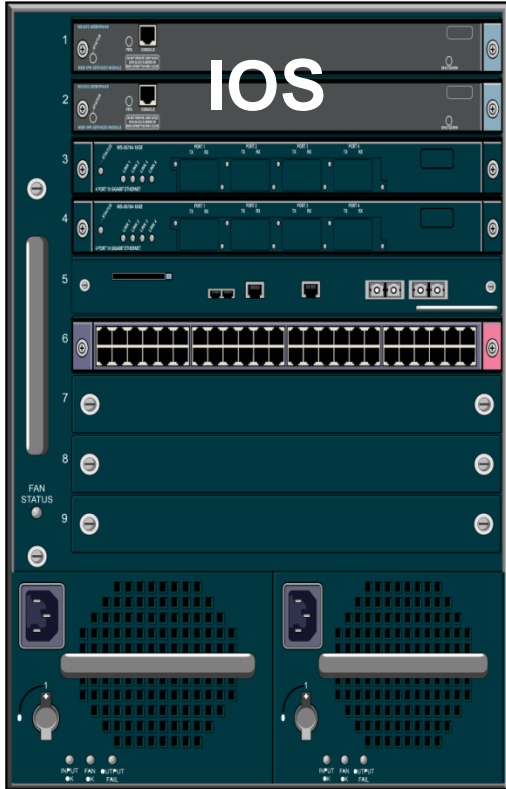
IP Routing

- **Must specify IPv4/IPv6 address**
- **Address-family**
- **Route Policy**
- **Language (RPL)**
- **No network statements**
- **Unique router config commands**

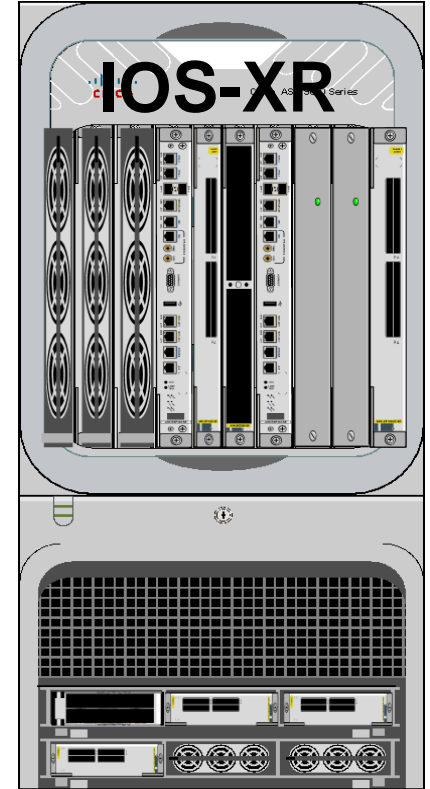


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IOS/IOS-XR Differences



- **No voice support**
- **Carrier grade NAT**
- **Many carrier only features**
- **LPTS**
- **SFTP support**
- **CLI Utilities**
- **Numerous others**



A long-exposure photograph of a city street at night. The image shows light trails from cars and streetlights, creating a sense of motion. The scene includes a road with a fence, trees, and a building with illuminated windows and an overpass structure. The overall color palette is dominated by blues, yellows, and oranges from the artificial lighting.

IOS vs. IOS-XR CLI DEMO

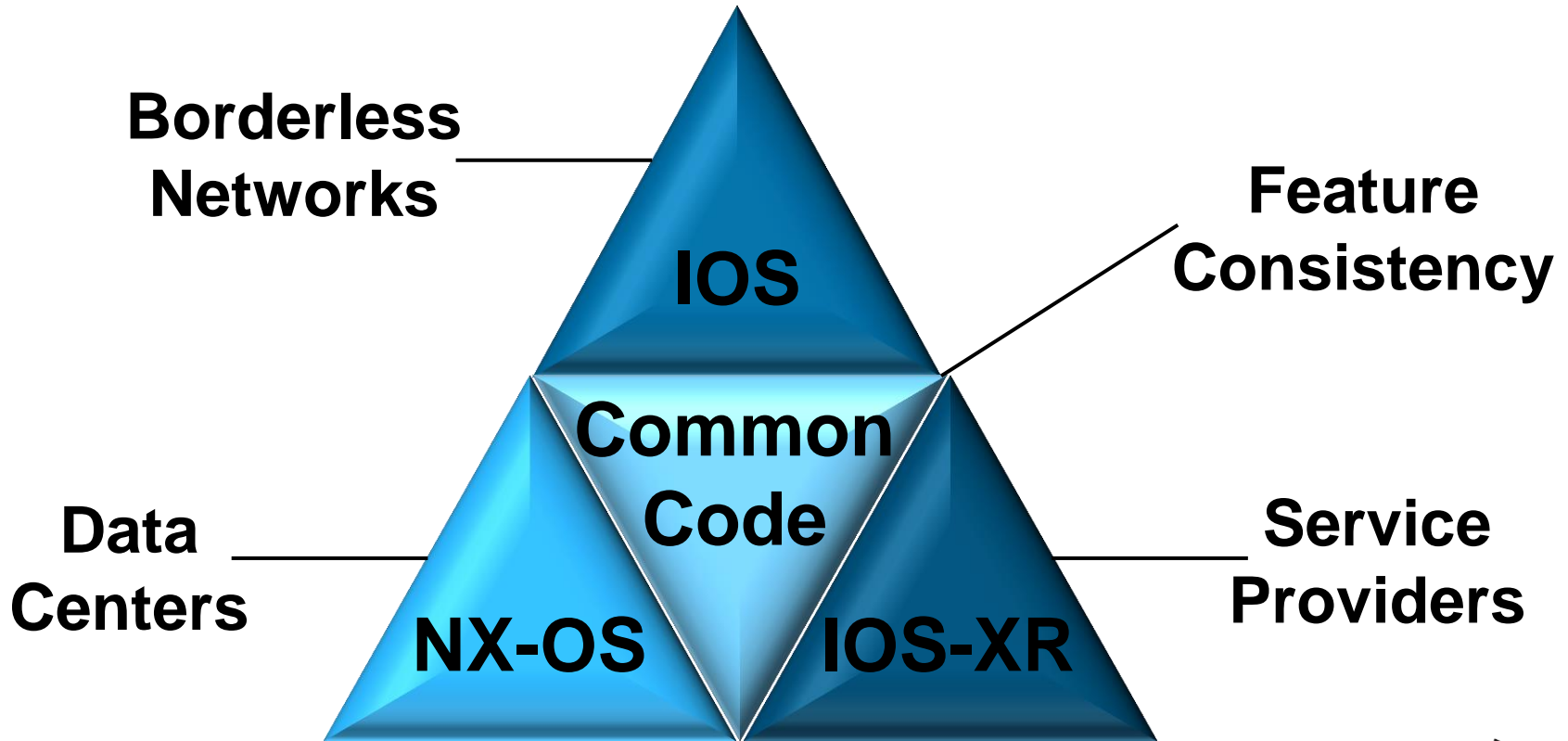
IOS/IOS-XR Lab Demo

```
virtl@virtl: ~  
* virtl@virtl: ~  
* S  
* C  
* C  
up  
* I  
* U  
* U  
* R1-  
evpn           Configure E-VPN commands  
exception      Coredump configuration commands  
exclude        Negate a command or set its defaults  
exclude-group  Exclude apply-group configuration fro  
exit           Exit from configure mode  
explicit-path  Explicit-path config commands  
extcommunity-set Define an extended community set  
forward-protocol Controls forwarding of physical and d  
IP broadc  
asts  
RP/0/0/CPU0:R2-XR(config)#ev  
event evpn  
RP/0/0/CPU0:R2-XR(config)#en?  
**  
**  
end  
RP/0/0/CPU0:R2-XR(config)#  
RP/0/0/CPU0:R2-XR#  
RP/0/0/CPU0:R2-XR#
```

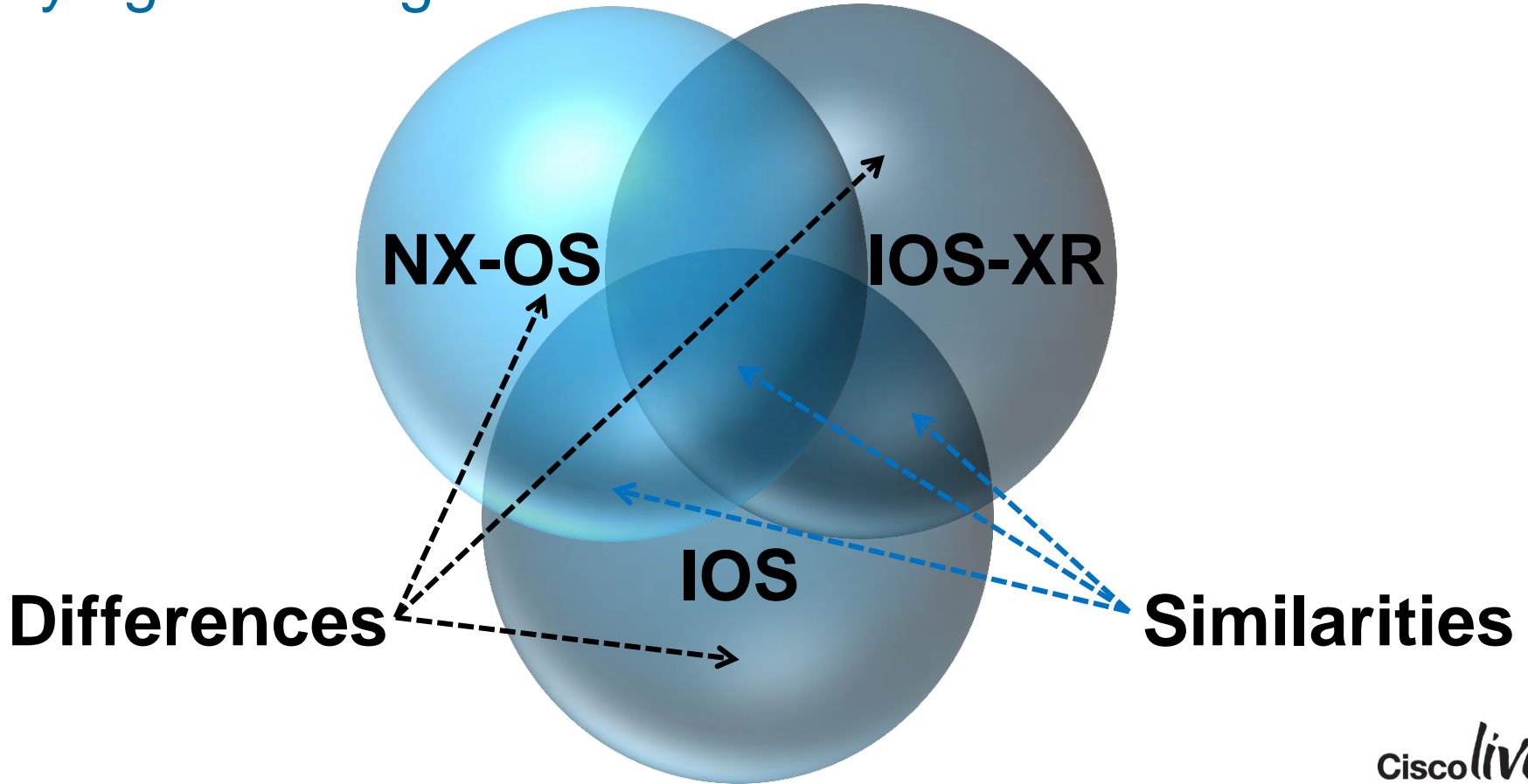
A long-exposure photograph of a city street at night. The foreground is dominated by vibrant, multi-colored light trails from moving vehicles, creating a sense of motion and energy. In the background, a modern pedestrian bridge with blue lighting spans across the street. Tall buildings with illuminated windows and storefronts line the street, and traffic lights are visible in the distance. The overall scene is a dynamic and colorful urban nightscape.

Conclusion/Q&A

Tying It All Together



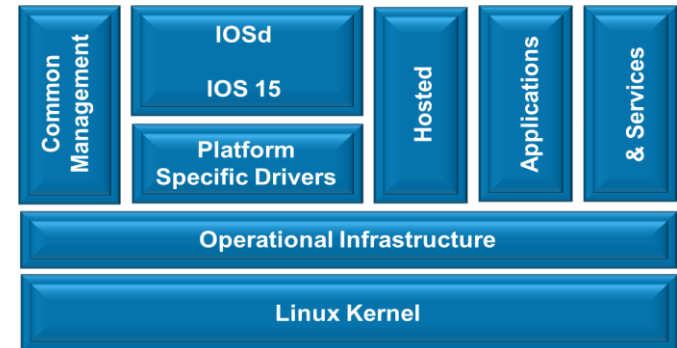
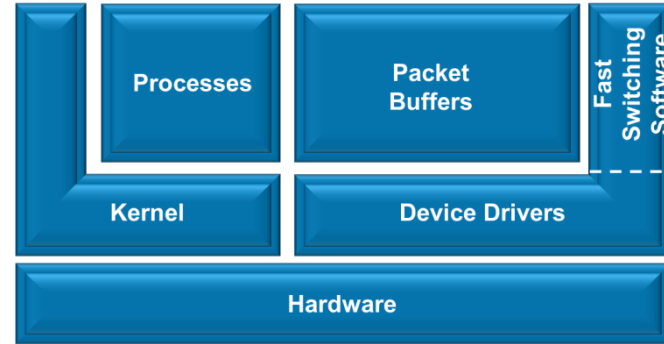
Tying It All Together



Things to Remember

About IOS/IOS-XE

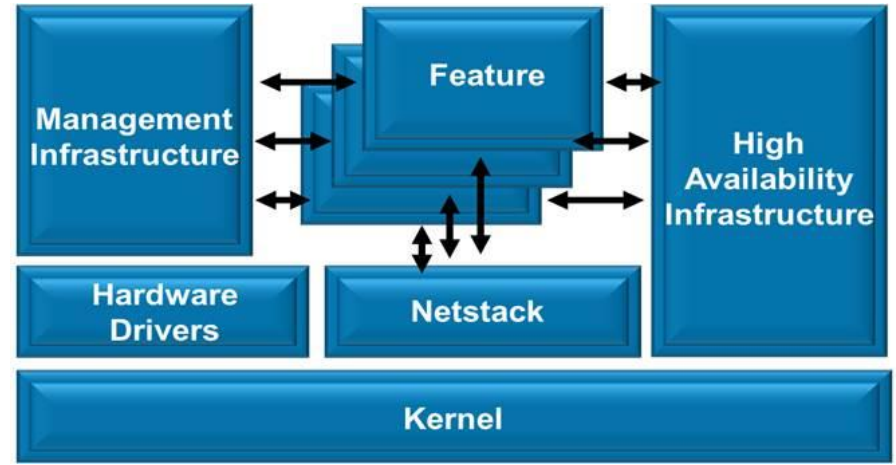
- **User experience (CLI/UI) virtually identical**
- **Very different architectures**
- **IOS daemon running in Linux**
- **IOS traditionally monolithic, XE is highly modular**
- **Platforms supporting XE are increasing in number**



Things to Remember

About NX-OS

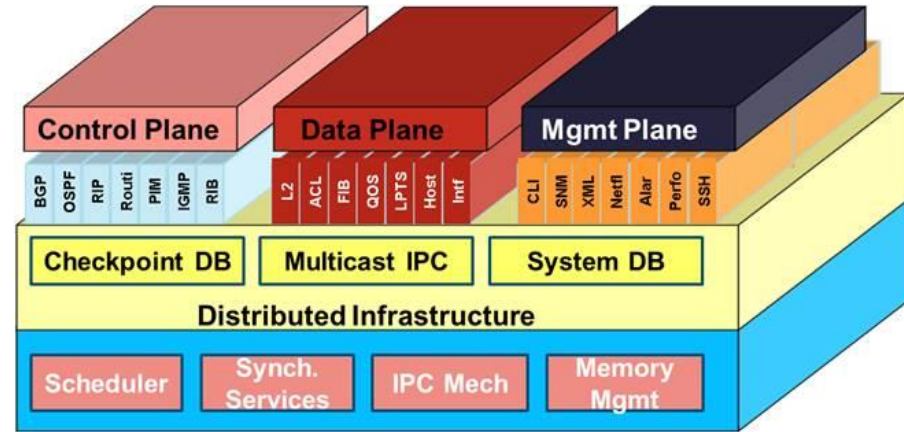
- **Explicit feature enablement**
- **Same running/startup config setup as IOS**
- **No interface speed references (ethernet)**
- **CIDR addressing format**
- **No **Do** command needed for exec commands in config**
- **No **wr mem** command (must create alias)**



Things to Remember

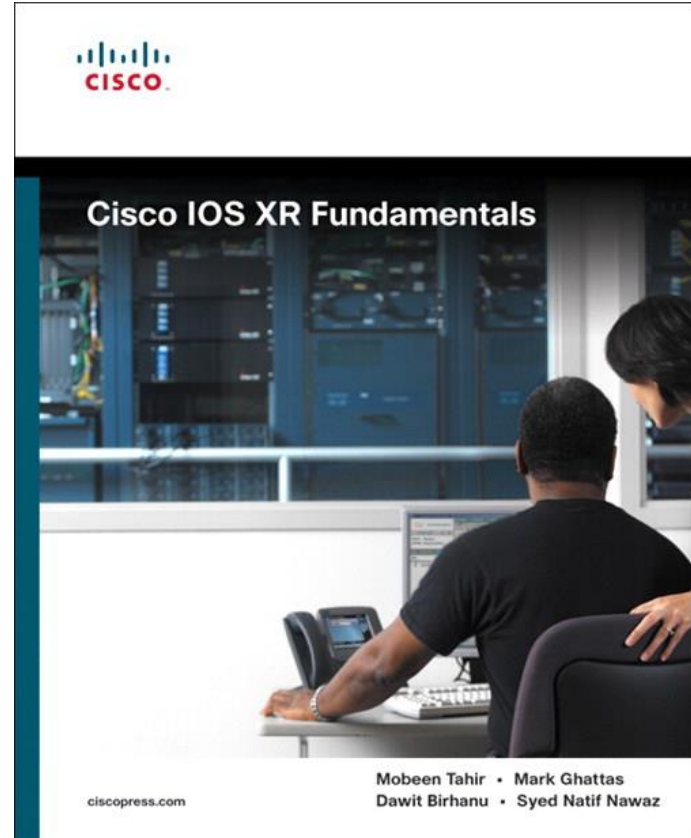
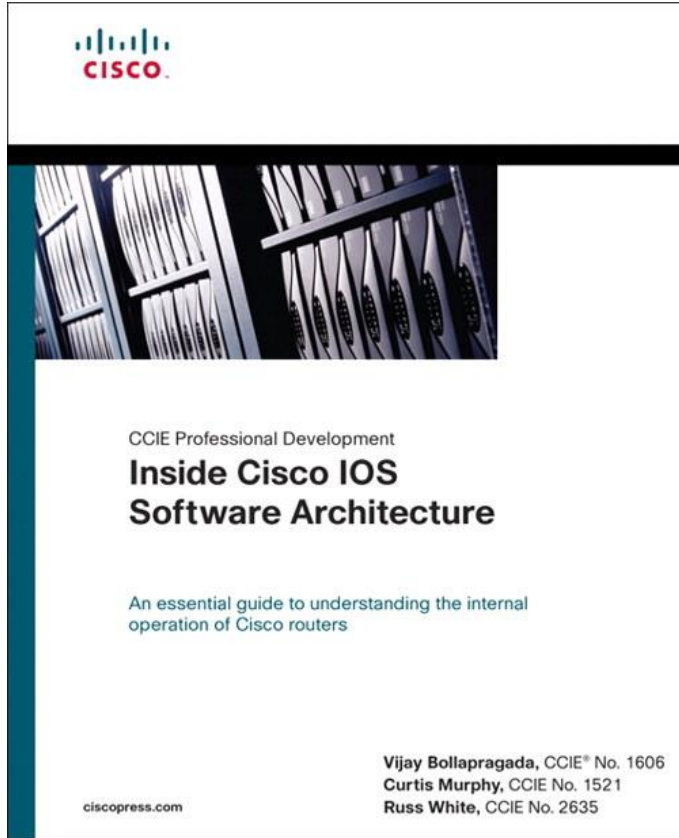
About IOS-XR

- **Two-stage config commit**
- **CIDR addressing format**
- **Secure Domain Router**
- **Admin CLI mode**
- **Vastly different CLI syntax**
- **Route Policy Language (RPL)**
- **System access and prompts**
- **Software installation and updates (e.g., PIE)**
- **Configuration rollback**

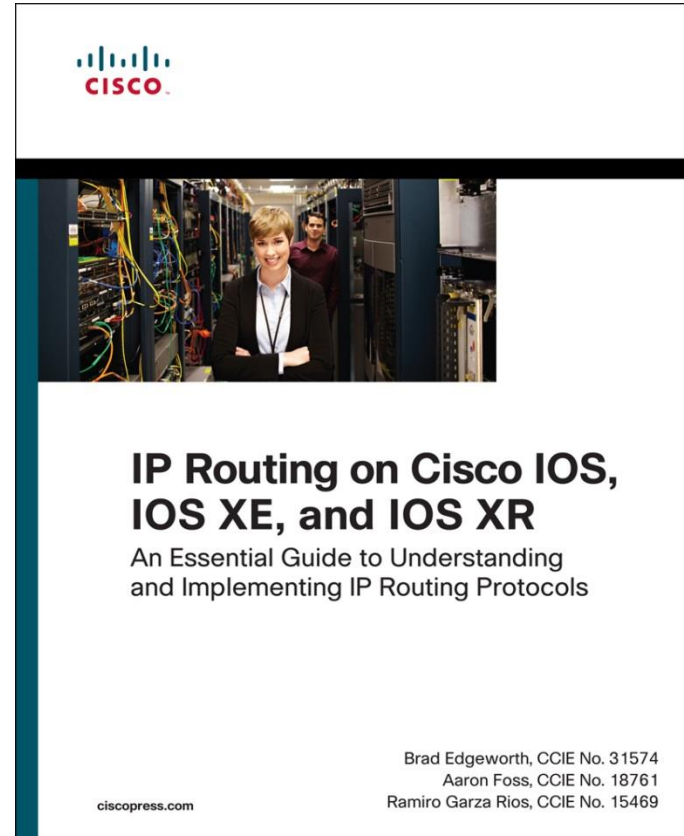
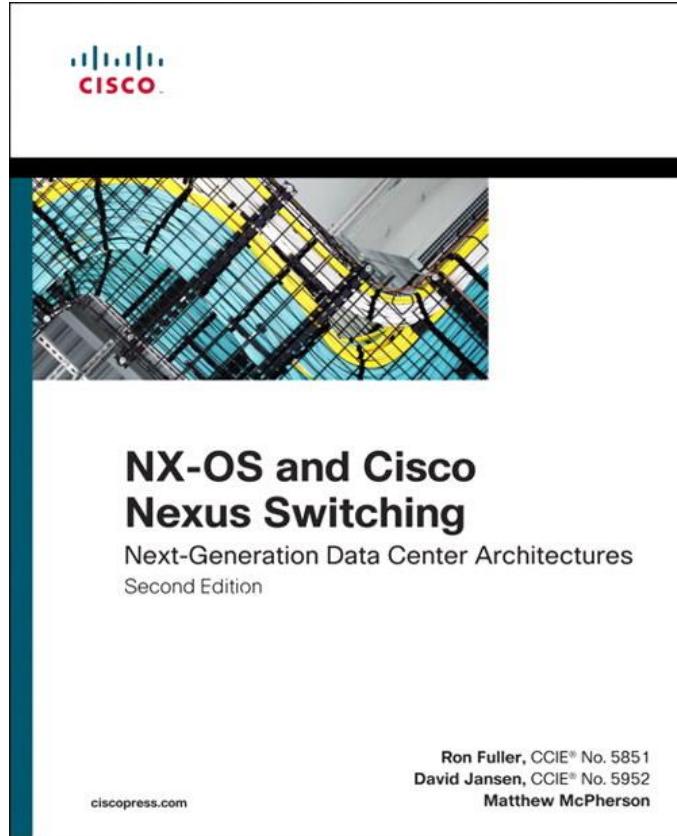


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Additional Resources





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Thank you.

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