



You make **possible**



Catalyst 9200 and 9300

Switching Architecture

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BRKARC-2101

Cisco *live!*

October 28 - 31, 2019 · Cancun

#CiscoLiveLA



Agenda

- Introduction
- Catalyst 9300 Architecture
- Catalyst 9200 Architecture
- IOS-XE and Software Innovations
- Wrap-up

Level Setting

- Scope is Catalyst 9200 and 9300
- This will be recorded – review again later if needed
- Learn more about Catalyst 9400, 9500 and 9600 tomorrow



BRKARC-2105
Thu @ 11:15

Cisco Webex Teams

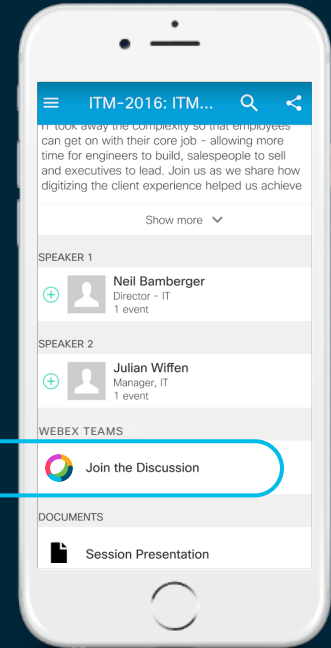
Questions?

Use Cisco Webex Teams to chat with the speaker after the session

How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install Webex Teams or go directly to the team space
- 4 Enter messages/questions in the team space

Webex Teams will be moderated by the speaker until November 1st , 2019.



cs.co/ciscolivebot#BRKARC-2101

Introduction



You make networking **possible**

Trends in Enterprise

7.5B
Things

Enterprise IoT



Infrastructure convergence
vulnerable endpoints

3.64
Devices
per person



Changing workforce
and apps hyper-
connected

Mobility

100K
Devices

Cloud

AWS
Windows 10

Devices per Admin
Agility
consumption
models

Security

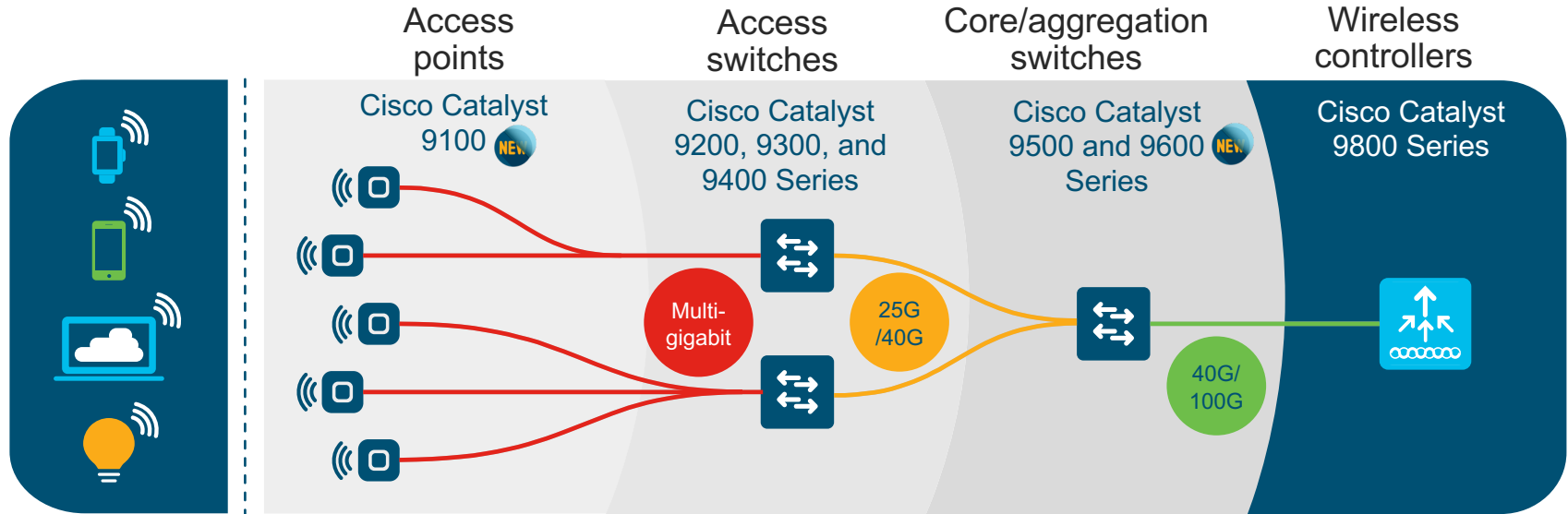


Average cost of a
data breach

\$3.5M

New Technologies Require New Speeds

Best of breed end-to-end network with Cisco Catalyst portfolio



← Scalability, reliability, and security across the network →

Built from the ground up for intent-based networking



Automation

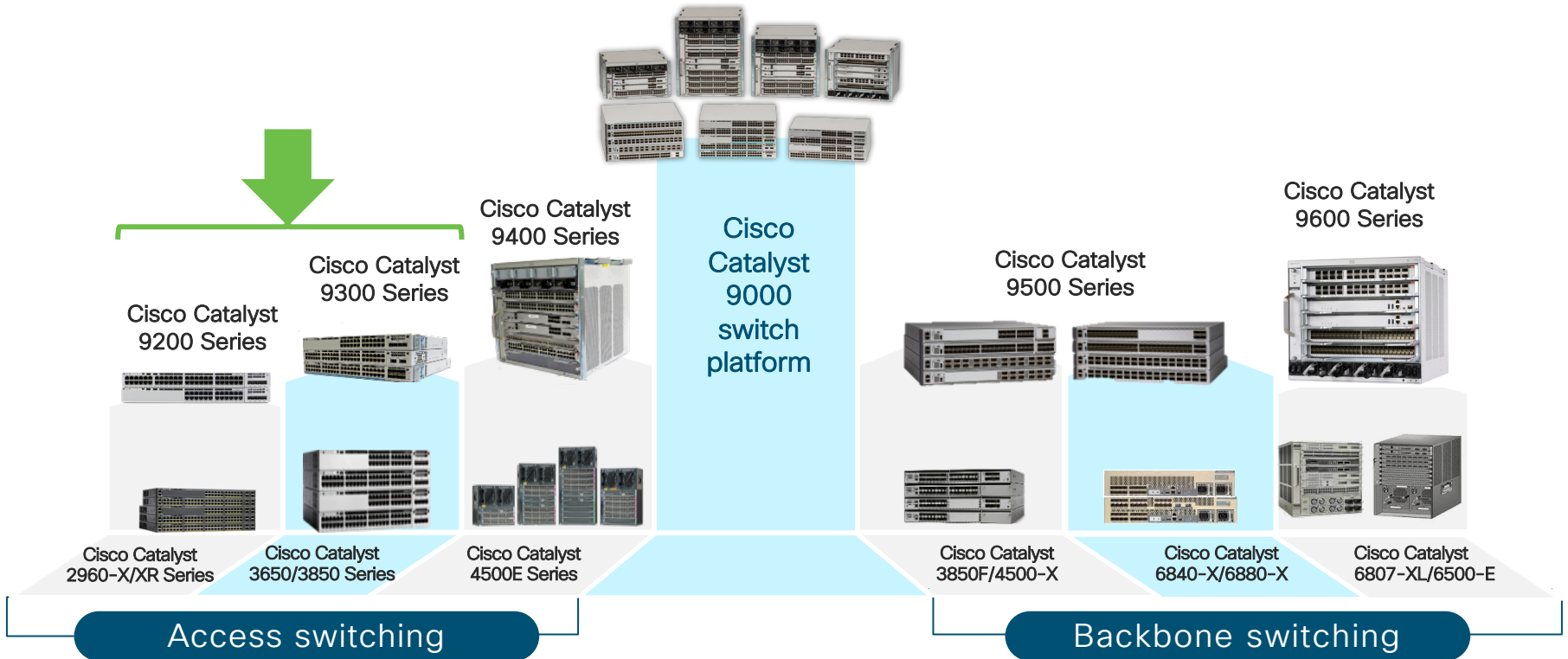


Security



Analytics

Cisco Catalyst 9000 portfolio

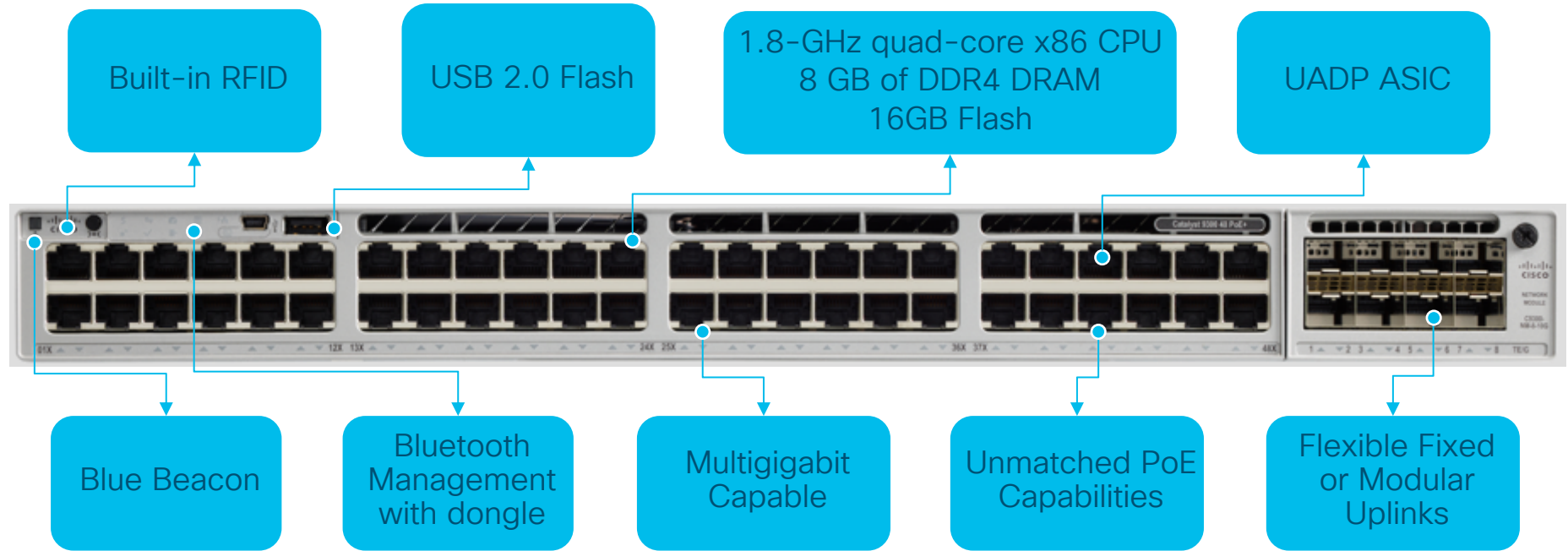


Catalyst 9300

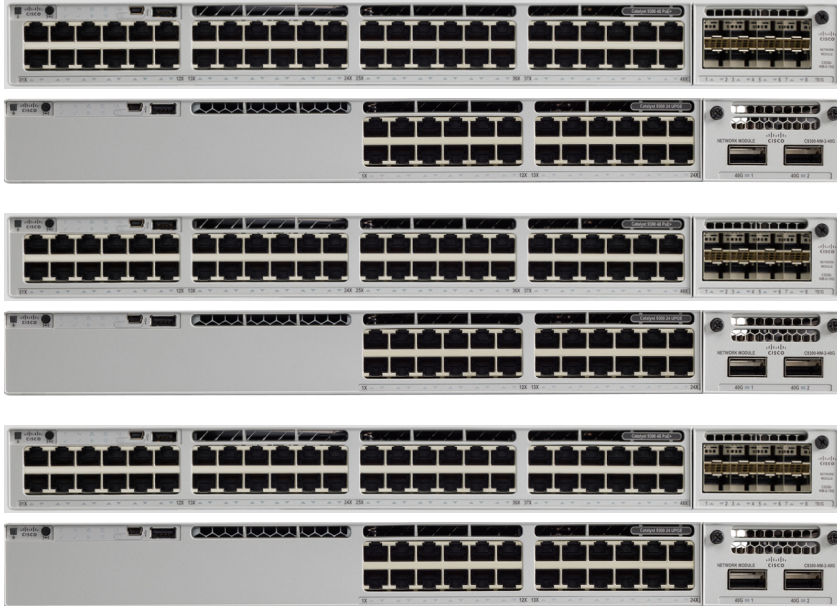


You make networking **possible**

Cisco Catalyst 9300 Front View



Cisco Catalyst 9300 – 1G Models Overview



UPOE 60W
on all ports

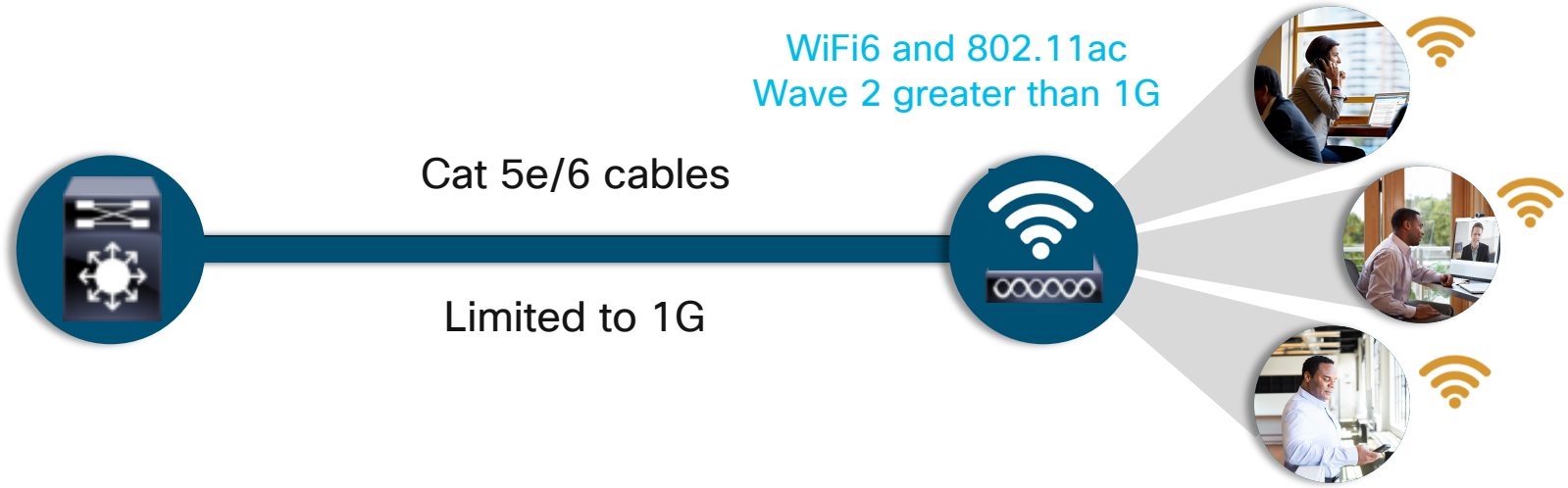
StackWise-480

POE+ 30W
on all ports

StackPower

Data-only
on all ports

Gigabit bottleneck

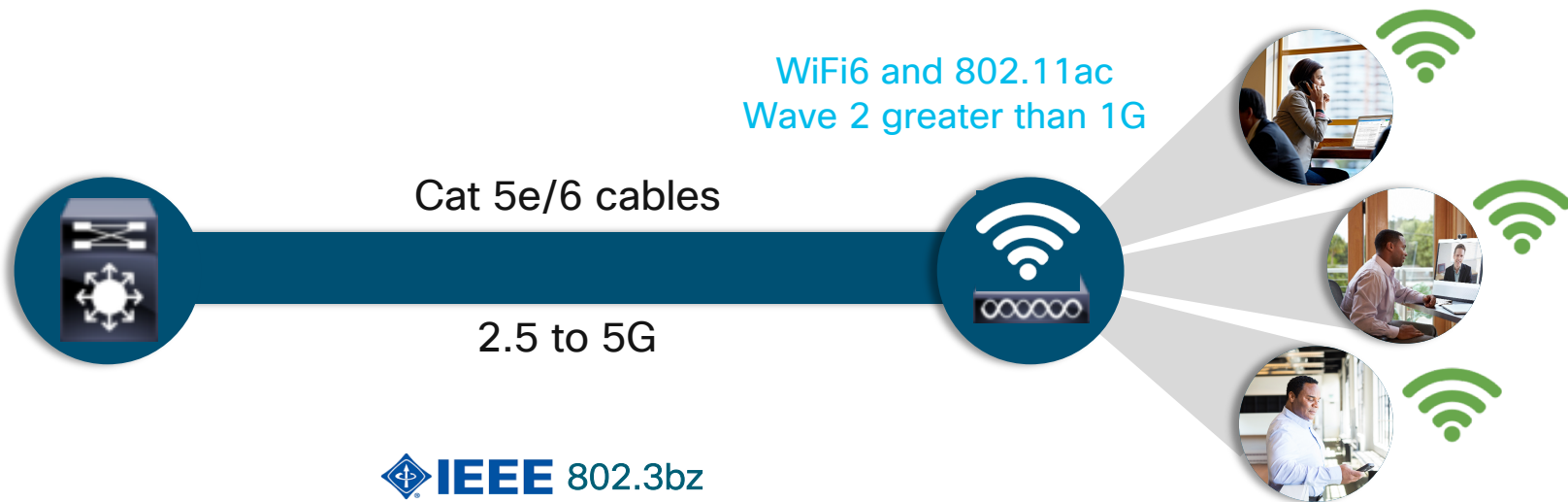


Existing infrastructure is insufficient to handle WiFi6 and 802.11ac Wave 2 growth beyond 1 Gbps

Gigabit Ethernet has been around since 1999 and has now become the bottleneck

Market needs an innovative technology to support greater than 1 Gbps over existing cables

The Solution: Multigigabit



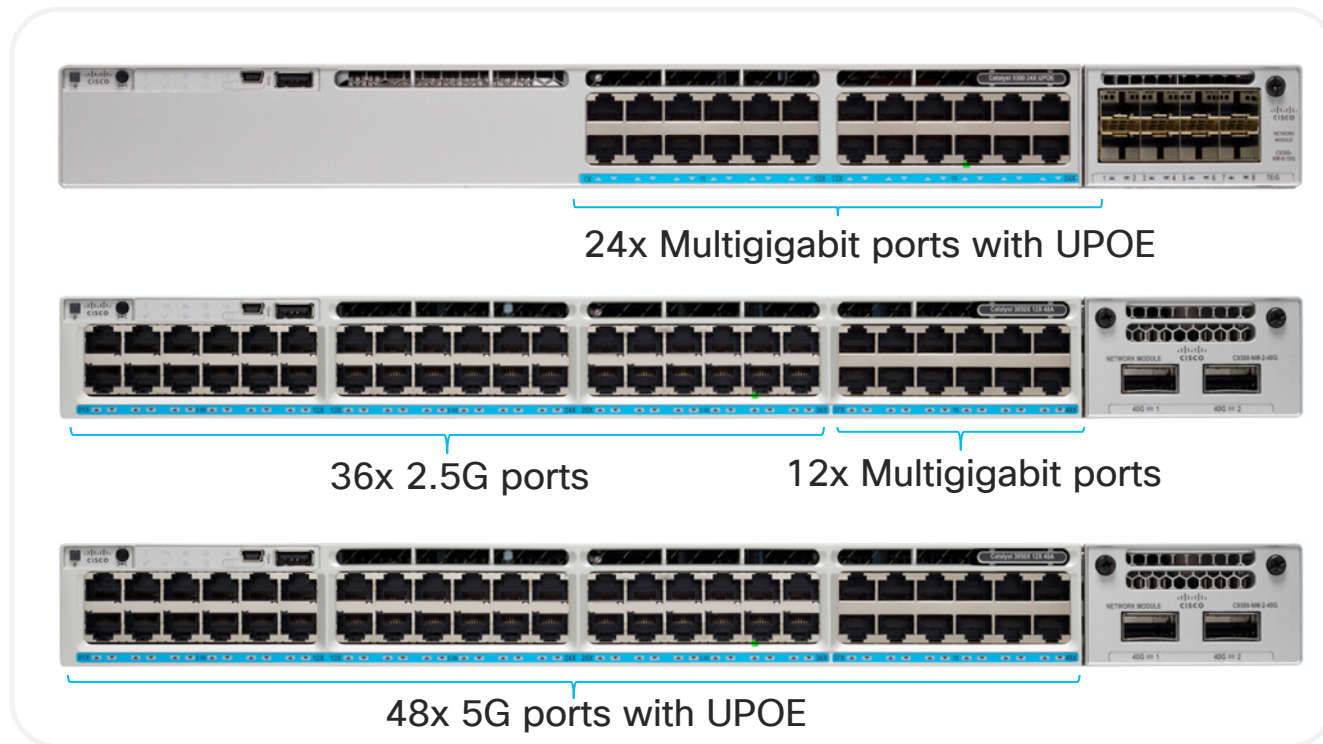
No need to replace cabling infrastructure

Enables 2.5 and 5 Gbps up to 100m

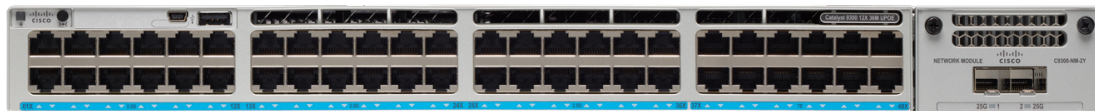
Supports all PoE standards up to 60W

Cisco Catalyst 9300 Multigigabit Models

Highest 2.5G and Multigigabit density in the industry



Modular Uplink Options on Cisco Catalyst 9300



4x 1 Gbps
SFP



8x 10 Gbps
SFP/SFP+



2x 40 Gbps
QSFP



4x Multigigabit
Copper



2x 1/10/25 Gbps
SFP/SFP+

Modular Uplink options on all C9300 Models

Cisco Catalyst 9300 Power Supplies & Stacking

Power Supplies



350WAC

715WAC

1100WAC

750WDC

Platinum Rated

Stacking



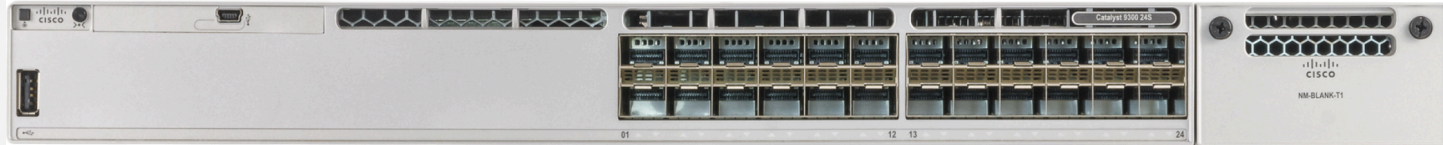
0.5, 1 and 3 meters



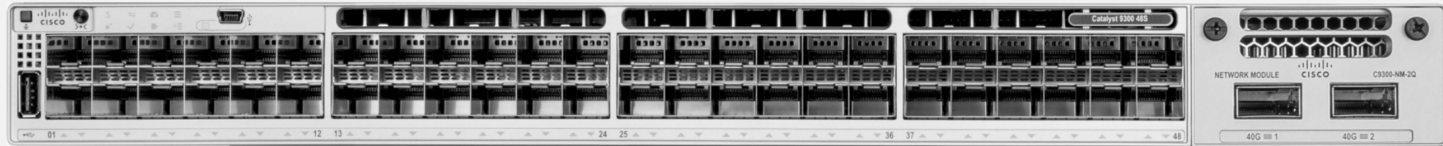
Cisco Catalyst 9300-S 1G Fiber Models

Expanding to FTTD and 1G Fiber Aggregation Applications

24 ports 1G fiber



48 ports 1G fiber



Stackable with all C9300 Models

Supports same scale and features of C9300



Cisco Catalyst 9300-B Series

Fixed access optimized for Media Distribution and IP Storage Networks

48 ports 1G with UPOE



24 ports Full Multigigabit with UPOE



24 ports 1G with UPOE



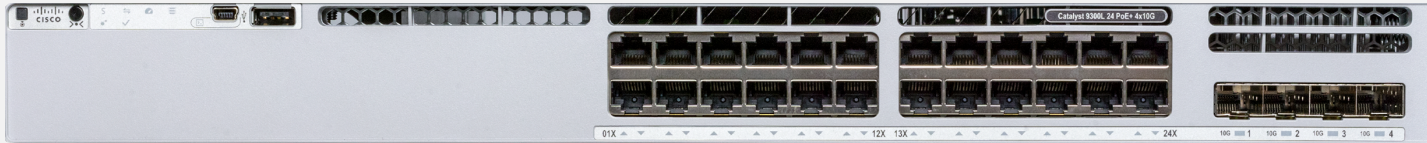
Expanded Packet Buffers

Increased Network Scale

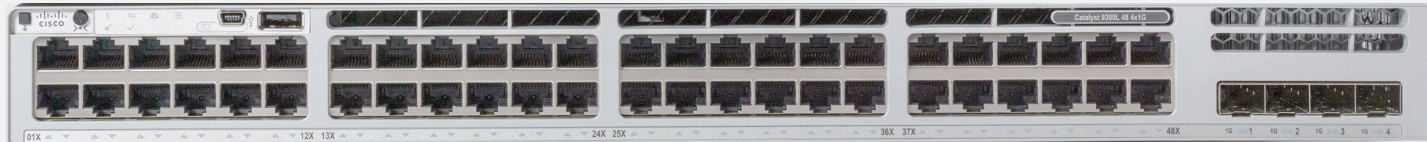
Cisco Catalyst 9300L Fixed Uplink Models

New

24 Port Data/PoE Model



48 Port Data/PoE Model



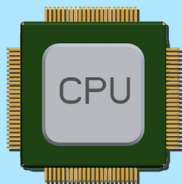
4x 1G or 4x 10G
fixed uplinks

Stackable with all C9300L Models

Supports same software features of C9300

Inside the Catalyst 9300

Hosting Containers
3rd party Apps



X86 CPU

Programmable Pipeline
Flexible Tables



UADP

Model-driven APIs
Streaming Telemetry



Open and
Extensible Cisco IOS XE

Cisco Innovations

Lookup tables

Forwarding resources

	Cisco Catalyst 9300/9300L	Cisco Catalyst 9300-B
MAC addresses	32,000	64,000
Host/Direct routes	24,000	48,000
IGMP groups	8000	16,000
LPM/Indirect routes	8000	64,000
Multicast routes	8000	16,000
SGTs	8000	8000

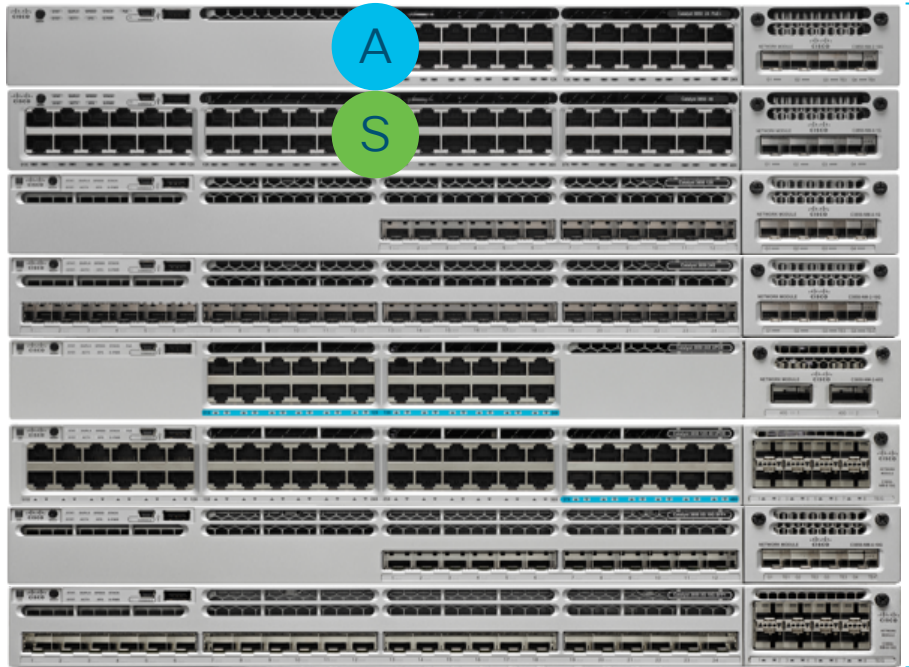
Feature resources

	Cisco Catalyst 9300/9300L	Cisco Catalyst 9300-B
Security ACL entries	5000	18,000
<ul style="list-style-type: none">• PACL• VACL• RACL		
QoS ACL entries	5000	18,000

NetFlow

NetFlow entries: 64,000 / 128,000 per UADP 2.0 / 2.0 XL ASIC

High Availability - StackWise



Centralized Control Plane

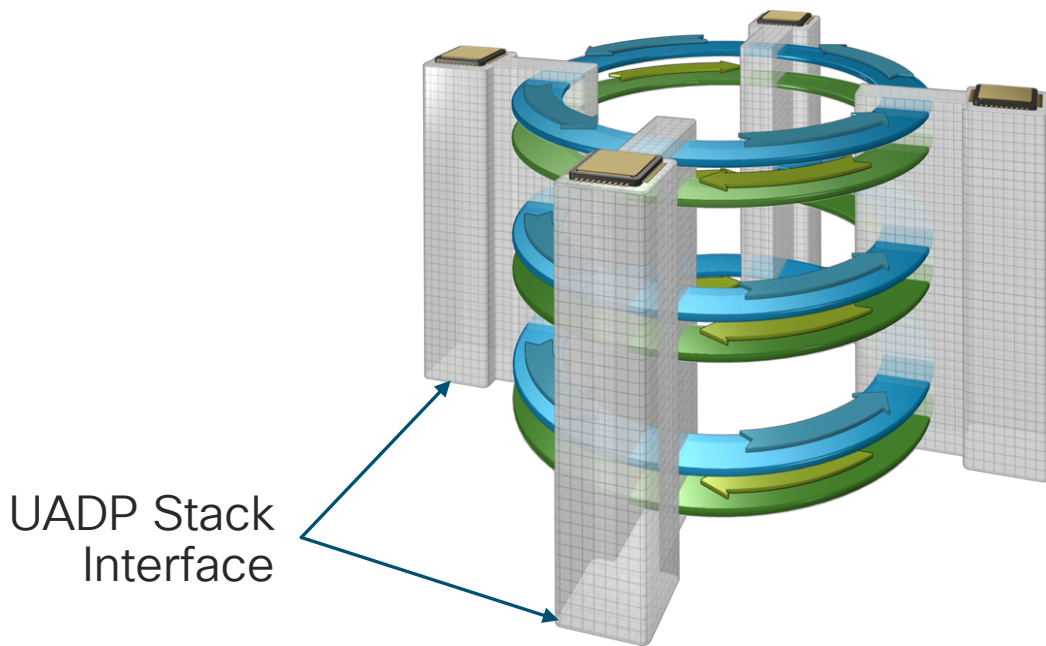
Distributed Data Plane

1+1 Stateful Redundancy

Stateful Switchover SSO/NSF

Up to 8 switches

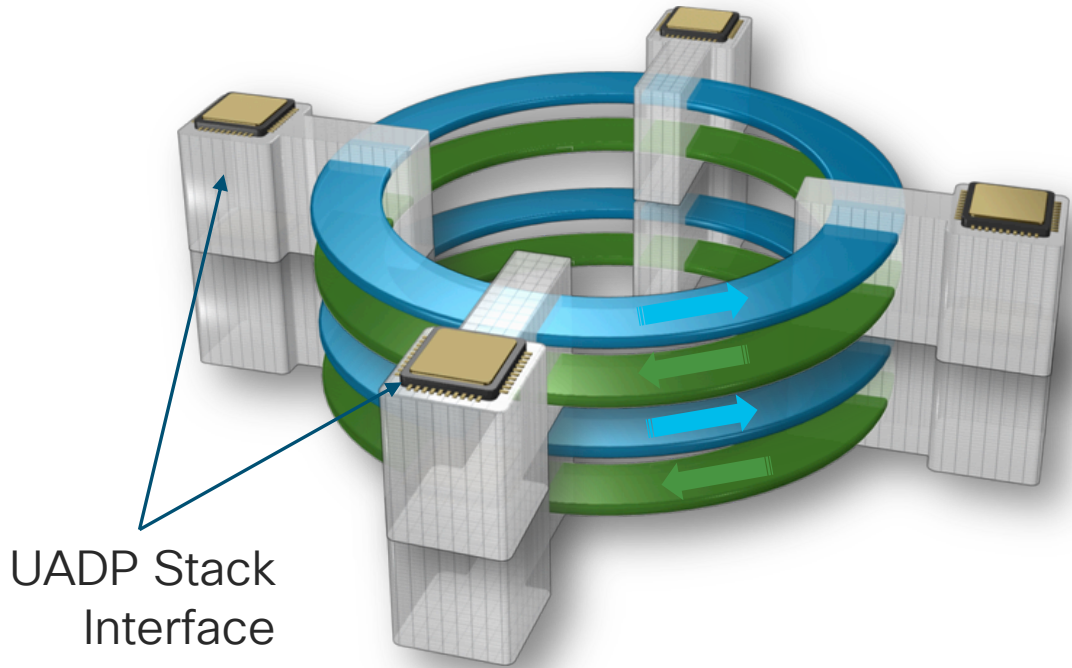
The Stack Ring – StackWise-480 on C9300



- 6 rings in total
- 3 rings go east
- 3 rings go west
- Each ring is 40 Gbps
- 240 Gbps unidirectional
- Spatial reuse = 480 Gbps

Assuming 4x 24-port Cisco Catalyst 9300 Series modular uplink models

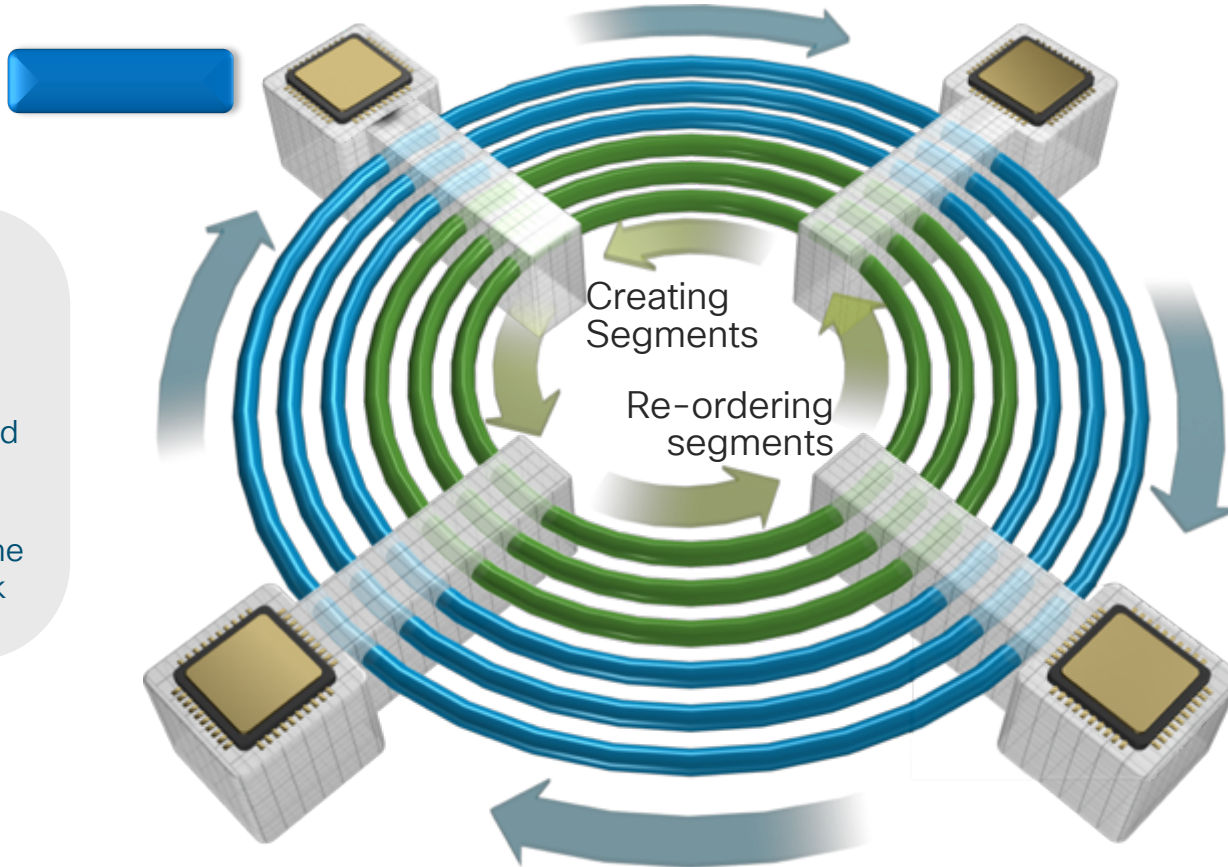
The Stack Ring – StackWise-320 on C9300L



- 4 rings in total
- 2 rings go east
- 2 rings go west
- Each ring is 40 Gbps
- 160 Gbps bidirectional
- Spatial reuse = 320 Gbps

Assuming 4x 24-port Cisco Catalyst 9300 Series fixed uplink models

Unicast Packet Path

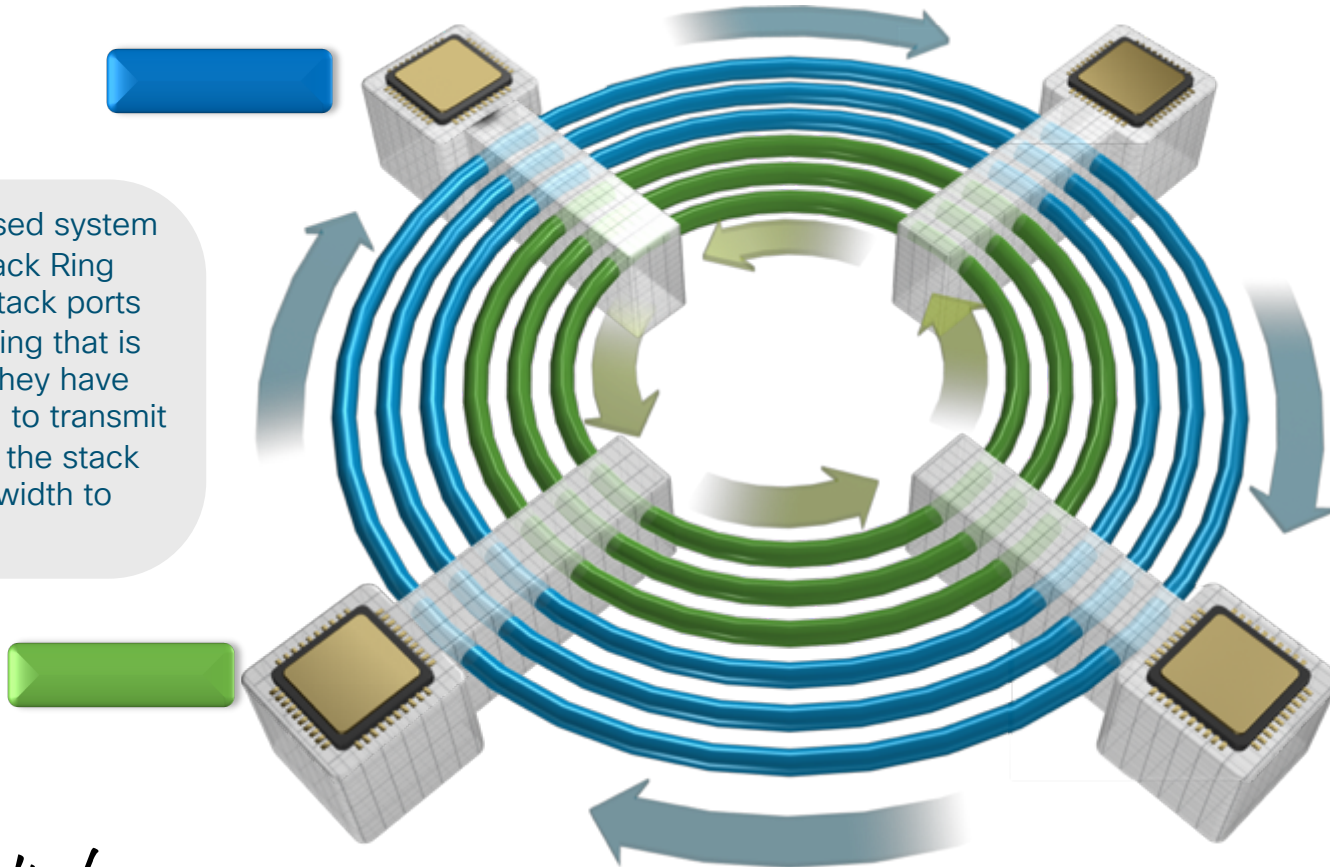


- Packet segmented into 256 bytes
- Packet travels half the ring for unicast traffic
- Segments reordered at destination stack port
- Destination strips the packet off the stack ring

Assuming
4 x 24-port
9300 Switches

Stack Ring Spatial Reuse

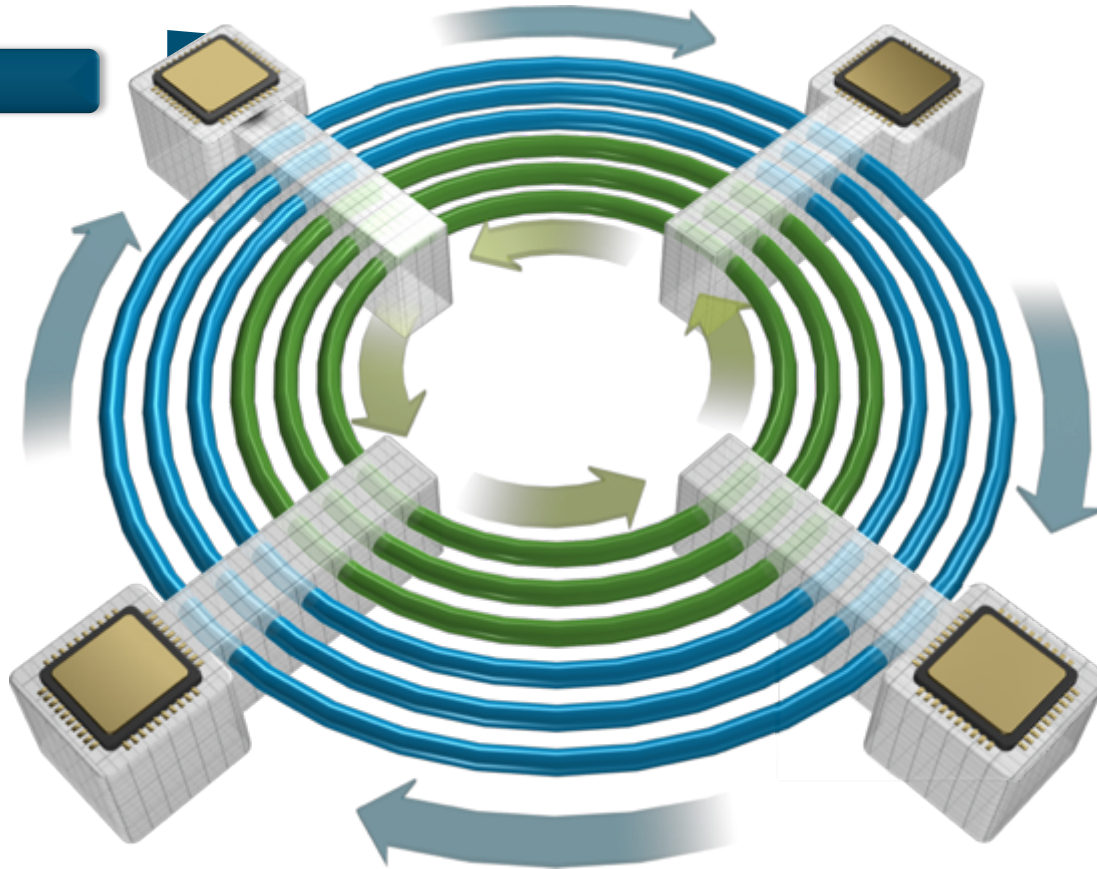
- Credit based system on the Stack Ring
- Multiple stack ports grab the ring that is free and they have credits on to transmit
- Increases the stack ring bandwidth to 480Gbps



Assuming
4 x 24-port
9300 Switches

Multicast Packet Path on the Stack Ring

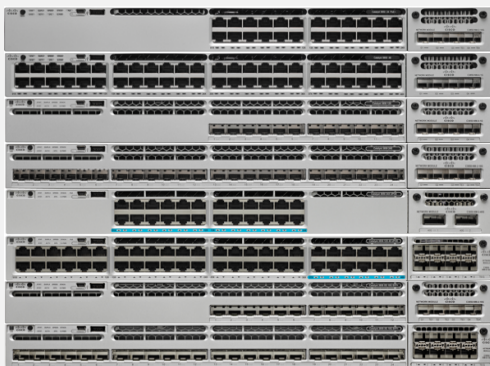
- One copy of the source packet is placed on the rings
- Interested Stack Ports grab the segments when they see them
- Packet segments travel the whole ring back to source
- The source strips these segments off the ring (Source Stripping)
- Results in efficient replication of multicast traffic for multiple Stack Port receivers



Assuming
4 x 24-port
9300 Switches

Cisco Catalyst 9300 Stacking Support

Modular Uplink
C9300



8 switches

Fixed Uplink
C9300L



8 switches

Stacking supported among
C9300 models

Stacking supported among
C9300L models

Mixed stacking is not supported between C9300 and C9300L

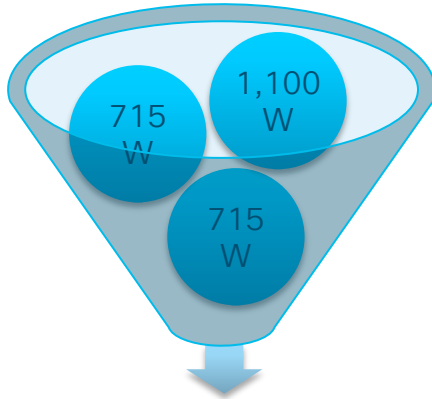
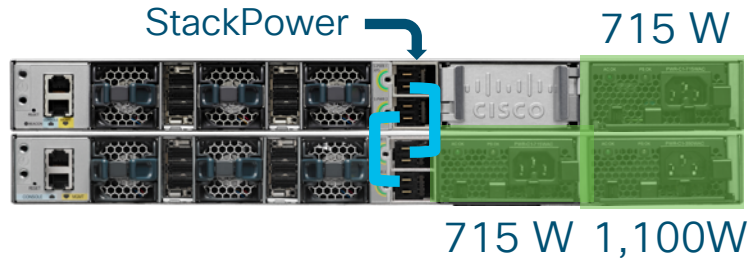
Cisco StackPower Overview

“Zero-footprint” Redundant Power System (RPS) Deployment



- Provides RPS functionality with zero RPS footprint
- Pay-as-you-grow architecture – similar to the data stack
- 1+N redundancy with inline power
- Up to 4 switches in a StackPower ring
- Multiple StackPower possible within one data stack
- Up to 8 switches in a star topology with an expandable power system (XPS)
- Not available on C9300L

How StackPower Works?



Total Input Power 2,530W

- Pools Power from All PS
- All Switches in StackPower share the available Power in Pool
- Each Switch is given their Minimum Power Budget

Power Redundancy Options

StackPower



eXpansable Power System (XPS)

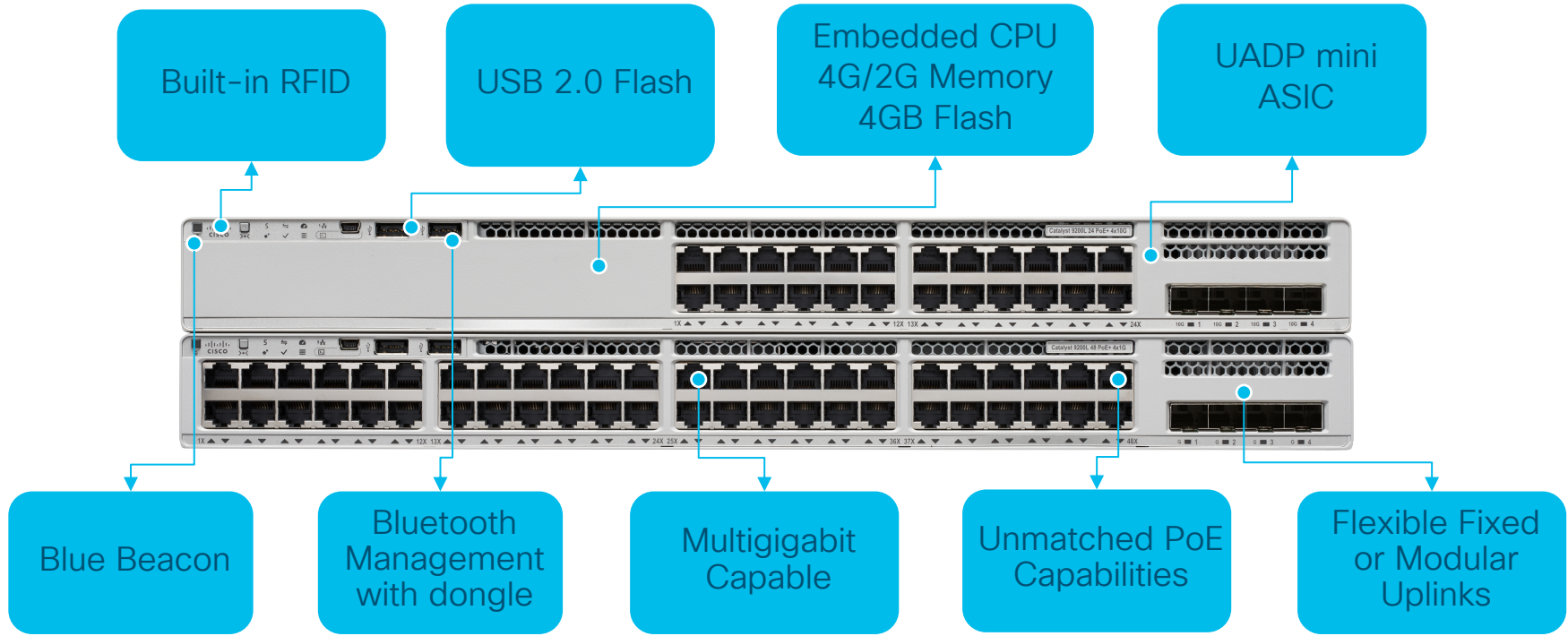


Catalyst 9200



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Cisco Catalyst 9200 Front View



Catalyst 9200 1G Models

9200 (Modular Uplinks and Fans)

Data



24x 1G Ports

48x 1G Ports

POE+



24x 1G Ports

48x 1G Ports

4x 1G and 4x 10G Uplinks

9200L (Fixed Uplinks and Fans)

Data



24x 1G Ports

48x 1G Ports

POE+



24x 1G Ports

48x 1G Ports

4x 1G and 4x 10G Uplinks


Modular Power Supplies available on all models

Catalyst 9200 Multigigabit Models




9200L (Fixed Uplinks and Fans)

POE+




16x 1G Ports
8x mGig Ports
4x 10G Uplinks

POE+




36x 1G Ports
12x mGig Ports
4x 10G Uplinks

POE+



16x 1G Ports
8x mGig Ports
2x 25G Uplinks

POE+



40x 1G Ports
8x mGig Ports
2x 25G Uplinks

All Models Support Full PoE+

Catalyst 9200 Modular Uplink Options



- 4x 1G
- SFP Transceivers



- 4x 10G
- SFP/SFP+ Transceivers

Supported on Catalyst 9200 Series modular models

All modular uplink modules are Field Replaceable Units

Resilient Power Supplies

Silver Rated (80% efficiency)



125WAC

Supported only on 1G Data models

Platinum Rated (90% efficiency)



600WAC

Supported only on 24
Port POE+ models



1000WAC

Supported only on 48
Port POE+ models

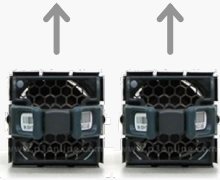
Load sharing (1+1) mode supported for PoE+ models

Power Supplies are Field Replaceable Units and Hot Swappable

Redundant Power Supply must be identical

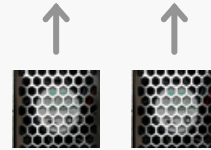
Resilient Fan Modules

Catalyst 9200 Modular Models



FRU Fan Modules

Catalyst 9200L Fixed Models



Fixed Fan Modules

Switch can operate on a single fan at ambient temperature (up to 45° C)

Inside the Catalyst 9200

Programmable Pipeline
Flexible Tables



UADP mini

Model-driven APIs
Streaming Telemetry



Open and
Extensible Cisco IOS XE

Cisco Innovations

Lookup tables

Forwarding Resources

	9200	9200L
MAC	32,000	16,000
Host Route	10,000	8,000
IGMP Groups	1,000	1,000
Indirect Route	4,000	3,000
Multicast Route	1,000	1,000
SGT	2,000	2,000

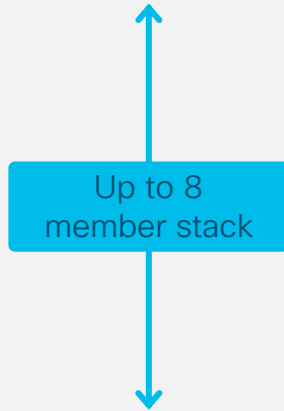
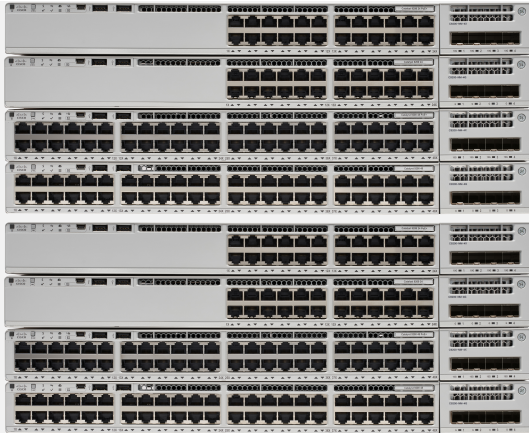
Feature Resources

	9200	9200L
Security ACL	1,000	1,000
• PACL		
• VACL		
• RACL		
QoS ACL	1,000	1,000
Netflow ACEs	128	128

Netflow

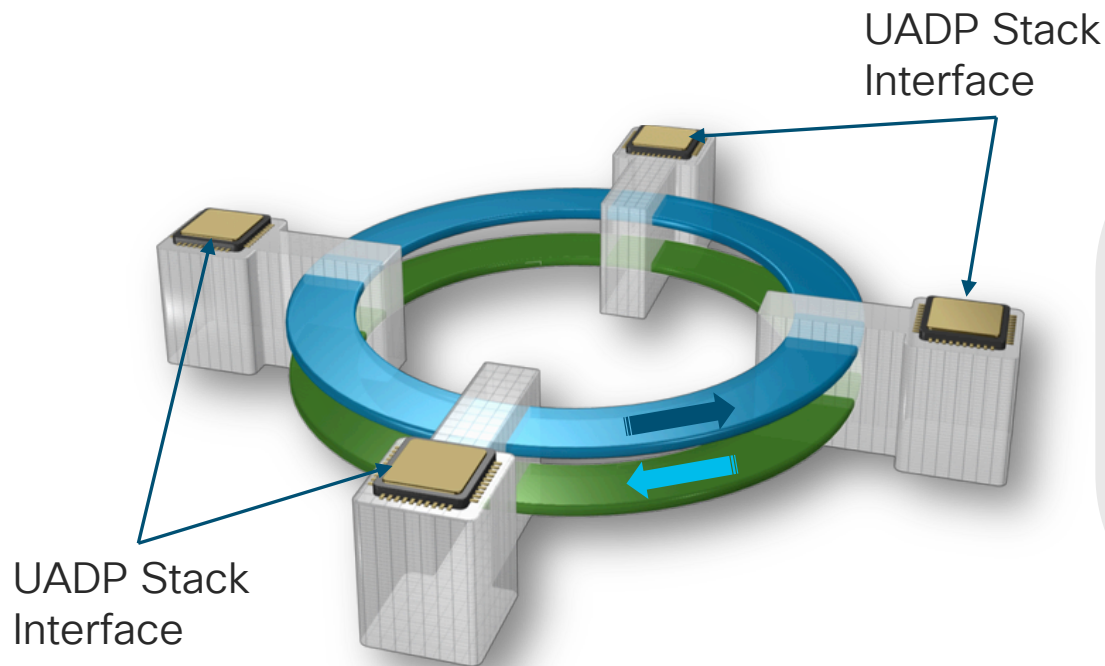
Netflow Entries: 16,000 per ASIC

StackWise-160/80 with SSO



- StackWise-160 supported on all modular Catalyst 9200 models
- StackWise-80 supported on all fixed Catalyst 9200L models

The Stack Ring – StackWise-160/80

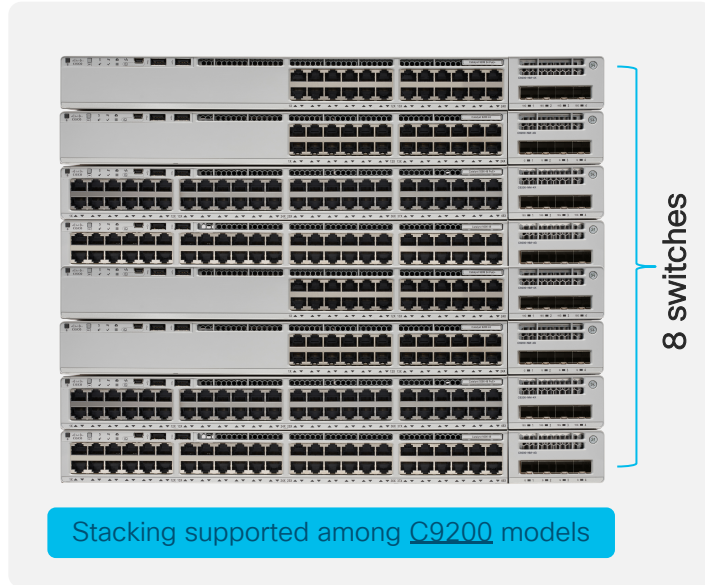


- 2 rings in total
- 1 ring goes east
- 1 ring goes west
- Each ring is 40/20 Gbps
- 80/40 Gbps bi-direction
- Spatial Reuse=160/80 Gbps

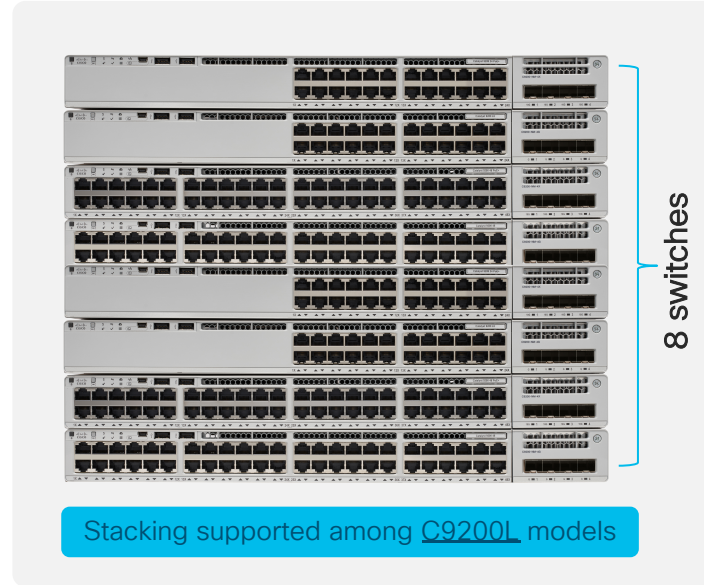
Assuming 4 x 24-port Catalyst 9200 Series switches

Cisco Catalyst 9200 Stacking Support

C9200 (Modular Uplink)



C9200L (Fixed Uplink)



Ordered Separately

Stacking Kit



Stack Adapters



Stacking Cable

Mixed stacking is not supported between C9200 and C9200L models

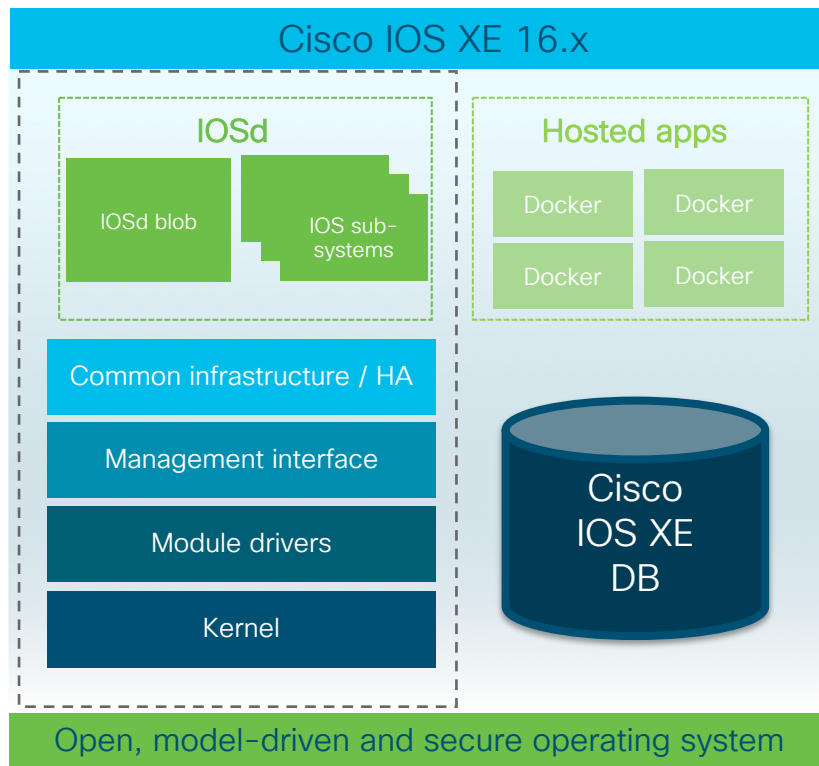
Same Cisco IOS XE and license required on all members

IOS-XE and Software Innovations

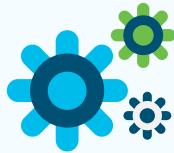


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Cisco IOS XE Architecture



Cisco IOS XE



Single Release

Feature Consistency and Velocity

Run Any Feature Anywhere (RAFA)



Simplicity

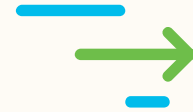
Simplified Lifecycle Management

Object-based models
Programmable interfaces



Operational Efficiency

Faster Troubleshooting
Modularized Upgrades
Patch Updates

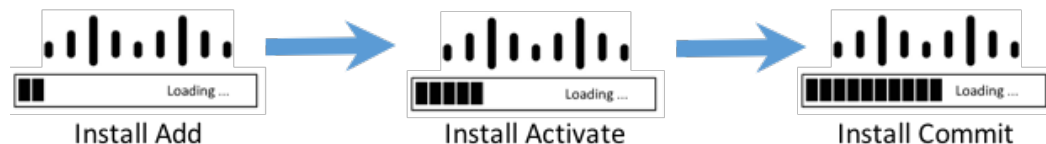


Platform Security

Trustworthy Solutions
Integrity Verification
Secure Boot

IOS XE Software Patchability

9300/9200



SMU is an emergency point fix positioned for expedited delivery to a customer in case of a network down or revenue affecting scenario.

Cold Patching

Install of a SMU will require a system reload in the first release. It is traffic impacting.

Hot Patching

Install of a SMU does not require a reload.

Day 0 Security – Trustworthy Solutions

9300/9200



Physical security practices + Security technology innovations + Logical security processes

PnP SUDI support

Image signing

Hardware authenticity



Secure boot

Integrity verification

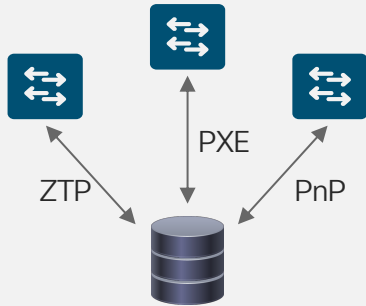
Runtime defenses

Cisco trustworthy solutions use industry best practices to help ensure full development lifecycle integrity and end-to-end security

Programmability and Automation

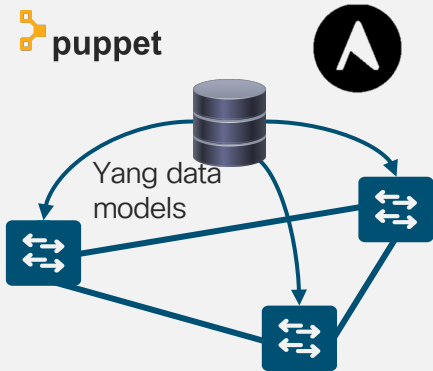
9300/9200

Day 0 Device onboarding



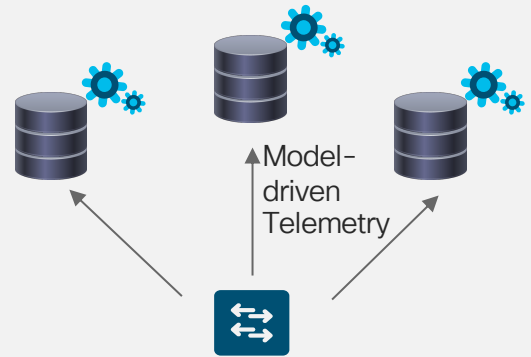
Automatic device bring-up using industry-standard interface

Day 1 Model-driven configuration



3rd party tool support for configuration and provisioning

Day N Monitoring, analytics

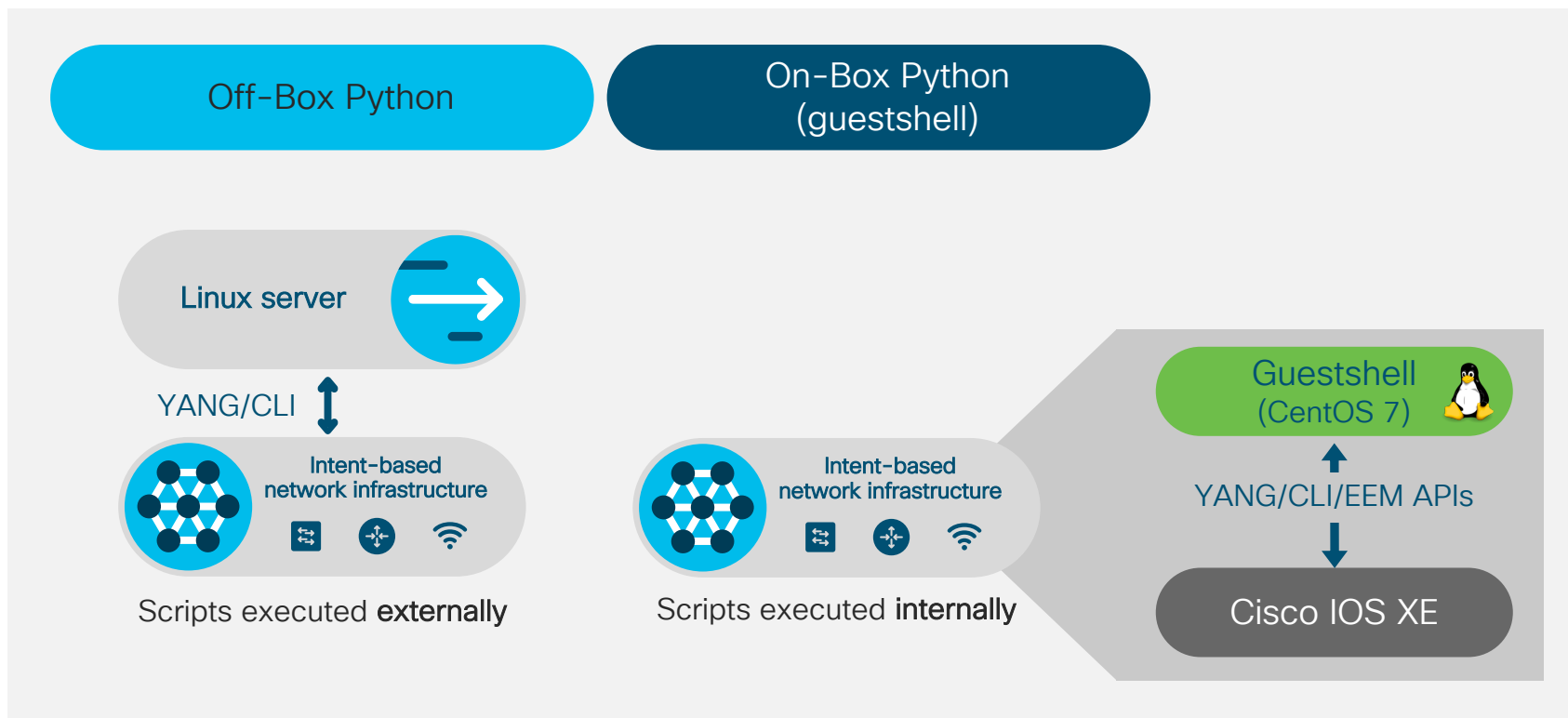


Model-driven telemetry for monitoring and analytics

Plug in to operational in minutes

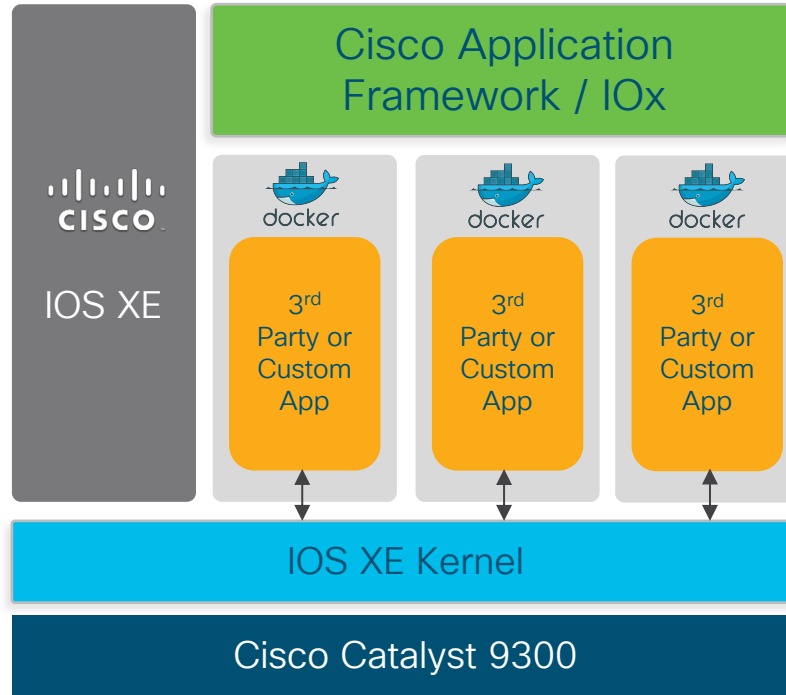
Using Python with Cisco IOS XE devices

9300/9200



Application Hosting

9300



Application Ecosystem

9300

Catalyst 9000 Switching



tshark



ISC DHCP Server



iPerf

Nagios



- Cisco will not provide any support to third-party apps and open source apps unless specifically called out
- Such apps, however, will be validated for compatibility on Cisco Catalyst 9000 switches
- DevNet ecosystem will indicate the partners who have worked on Cisco Catalyst 9000 switches

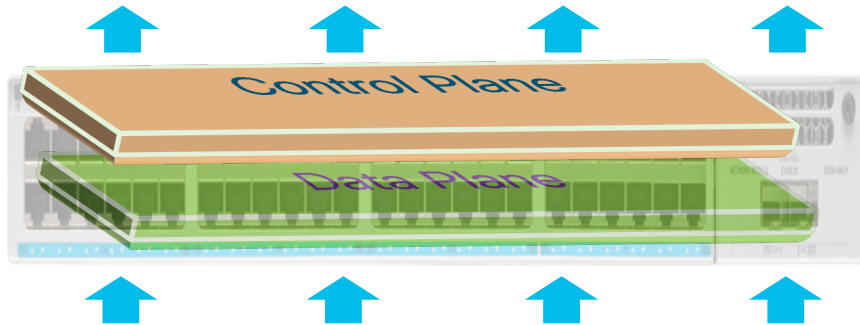
Enhanced Fast Software Upgrade

9300

Regular Upgrade Vs Enhanced Fast Software Upgrade Process



```
#install add file image activate commit
```

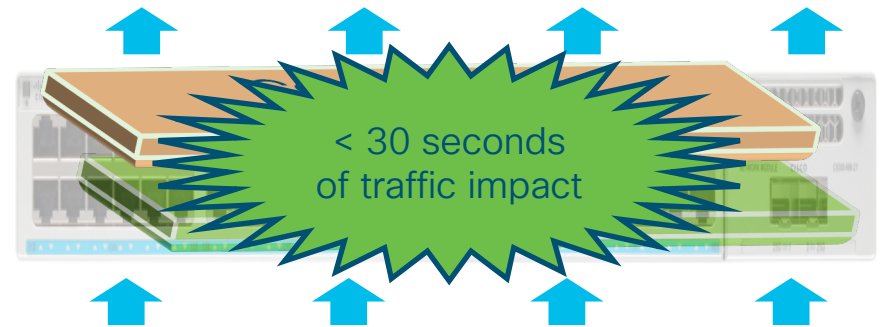


Traffic is impacted throughout the upgrade cycle



Enhanced Fast Software Upgrade

```
#install add file image activate reloadfast commit
```



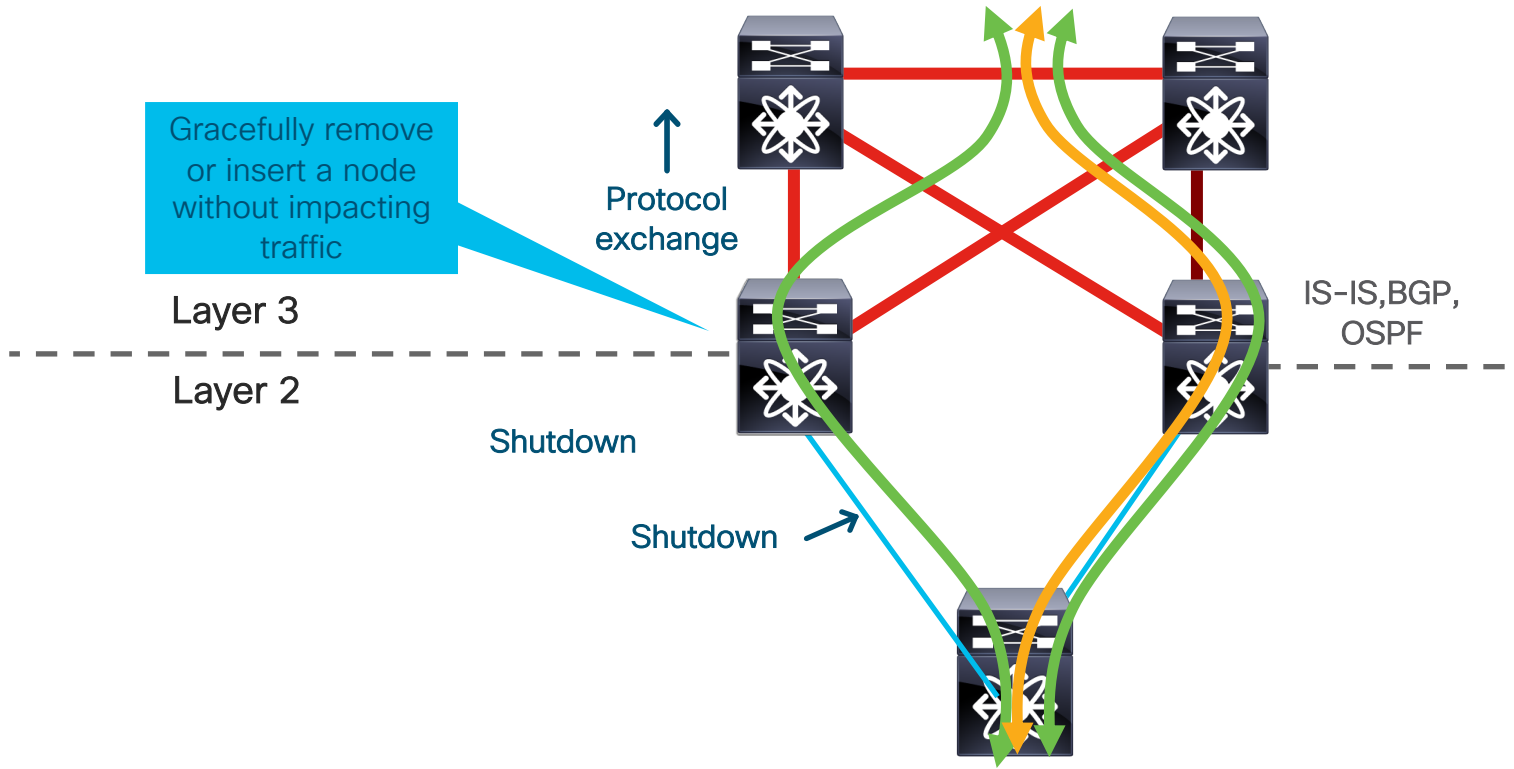
Graceful Insertion and Removal (GIR)

9300

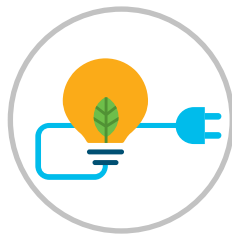
Hardware replacement

Software upgrades

Configuration changes



PoE Innovations



9300/9200

2-event classification

- Fast power negotiation without LLDP
- Physical layer negotiation < 1s

Perpetual PoE

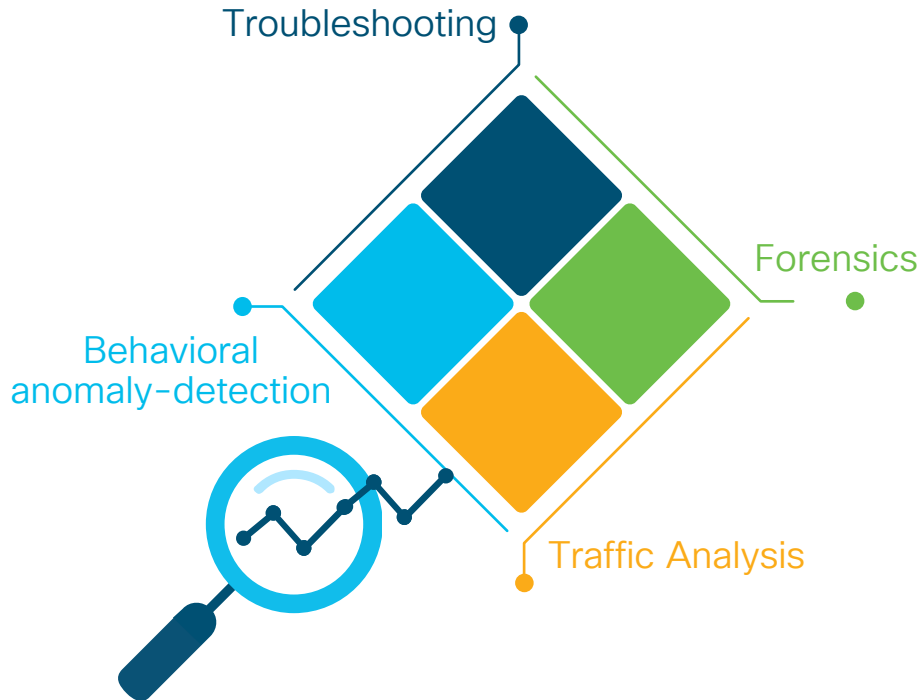
- Uninterrupted PoE power during control plane reboot

Fast PoE

- Bypasses IOS control plane boot
- Restores power to PD within 30 sec of power resumption

Full Flexible Netflow

9300/9200



Multiple monitors per interface



Configuration

- Traffic type support
- IPv4
- IPv6
- Datalink



Interface type

- Switchport
- Non-switchport (routed port)
- VLAN configure
- Port-channel member interface

Ingress and egress Flexible Netflow supported on all ports, VLANs

Application Visibility and Control

9300/9200

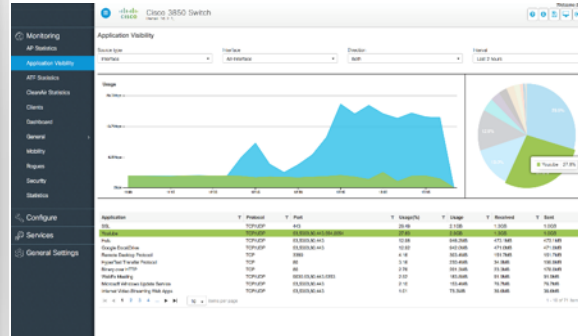
Granular Detection, Advanced Monitoring & Business Logic Based Policies

Know Your Applications



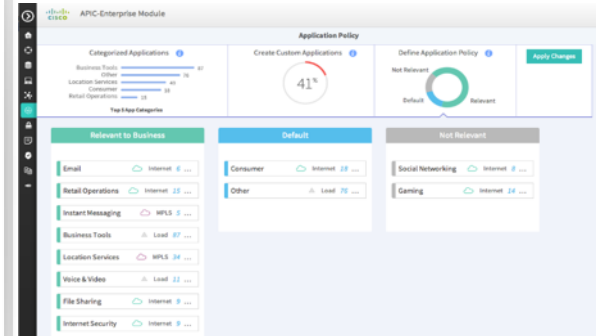
Granular App Detection
Encrypted Application

Monitor Your Applications



Fault Isolation, Troubleshooting
Performance Assessment

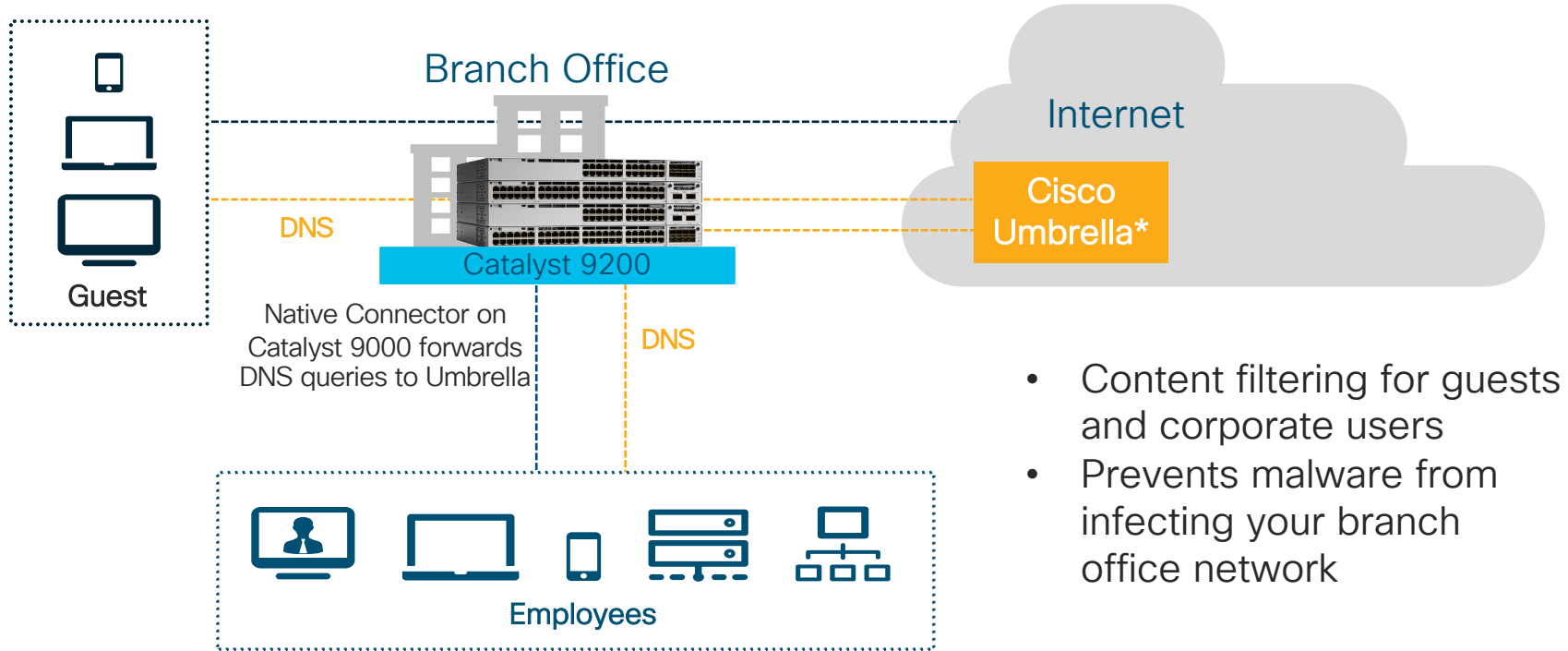
Control Your Applications



Prioritized Applications,
Bandwidth Management

Cisco Umbrella Native Connector Integration

New



*Requires a Cisco Umbrella license

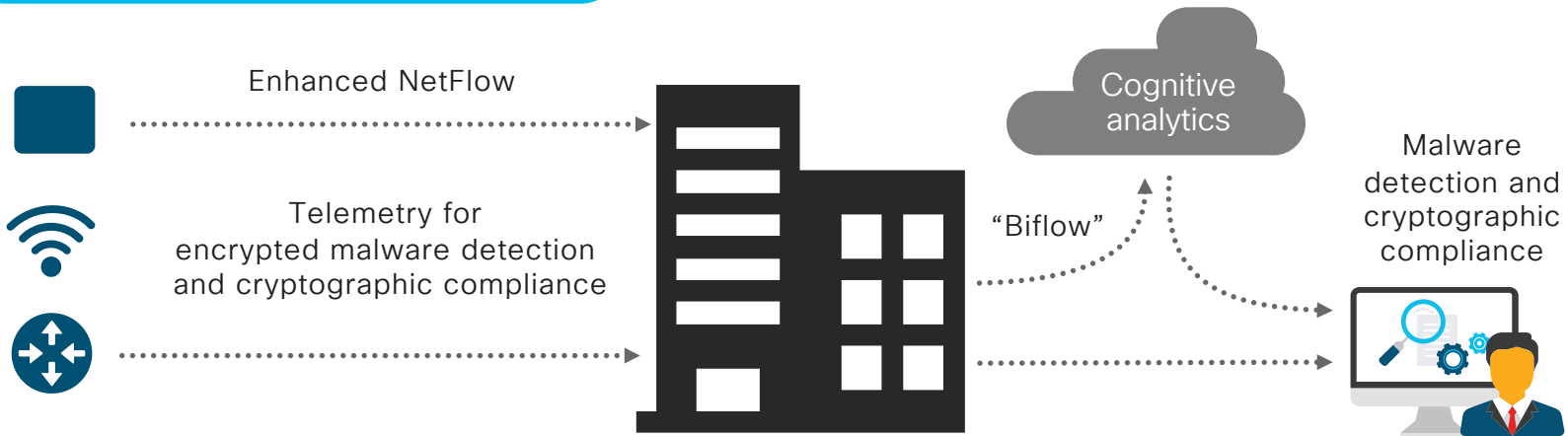
Encrypted Traffic Analytics (ETA)

9300

Finding malicious activity in encrypted traffic

Cisco Catalyst 9300 Series

Cisco Stealthwatch



Leveraged network

Faster investigation

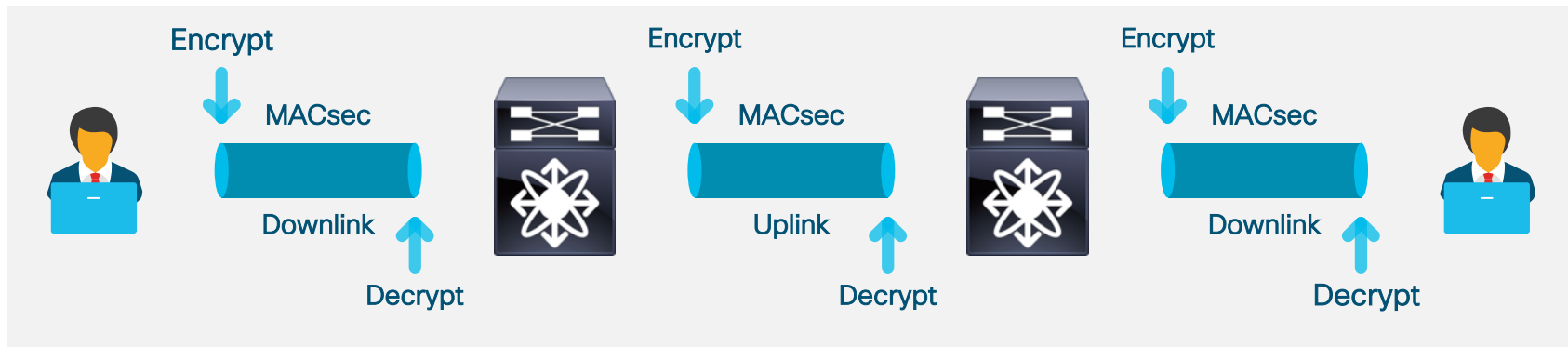
Higher precision

Stronger protection

MACsec Link Encryption

9300/9200

Hop-by-hop encryption via 802.1ae

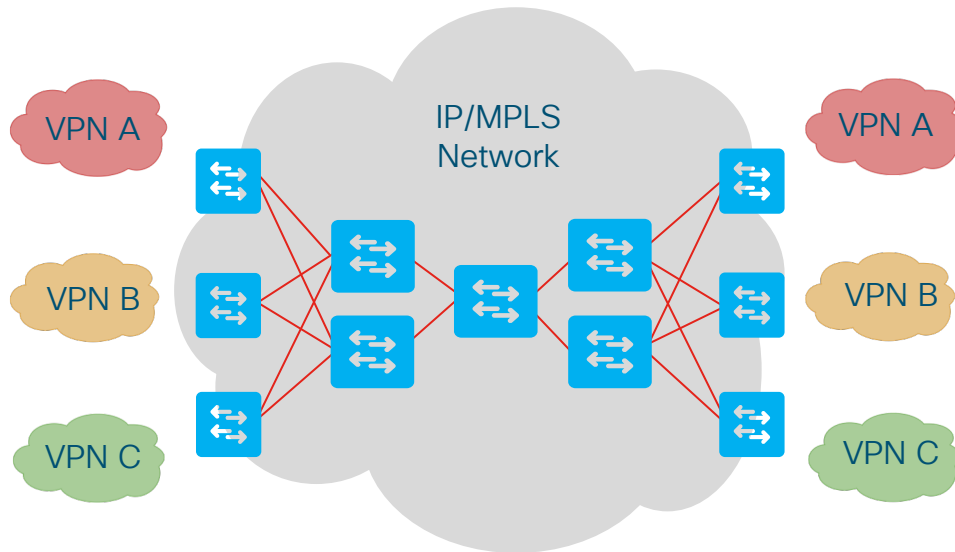


- Packets are encrypted on egress, decrypted on ingress
- Offers line-rate encryption (performed at hardware level)
- Transparent to all upper-layer protocols
- Supports switch-to-switch and switch-to-host MACsec
- Manual or 802.1X modes supported

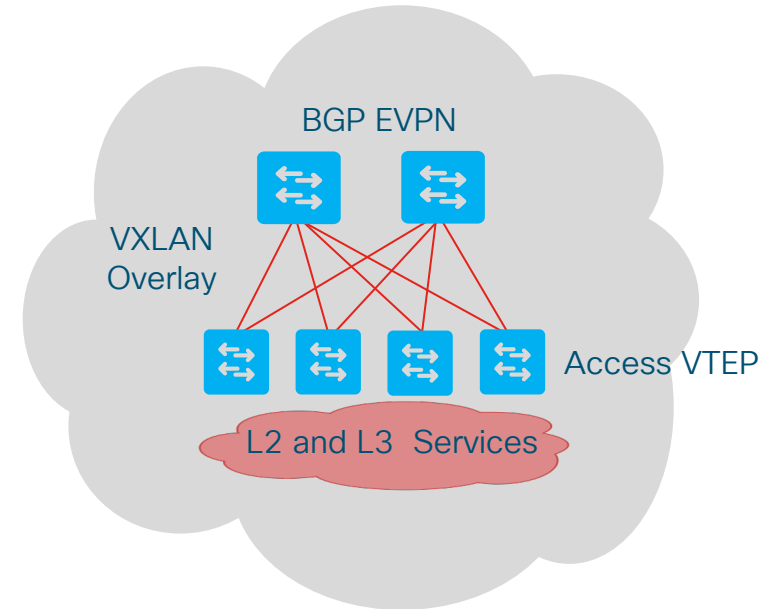
MPLS and VXLAN Alternatives

9300

MPLS VPN



VXLAN with BGP EVPN



Do It Yourself (DIY)

Cisco Software-Defined Access

9300/9200

Cisco DNA Center



Segmentation



Automation

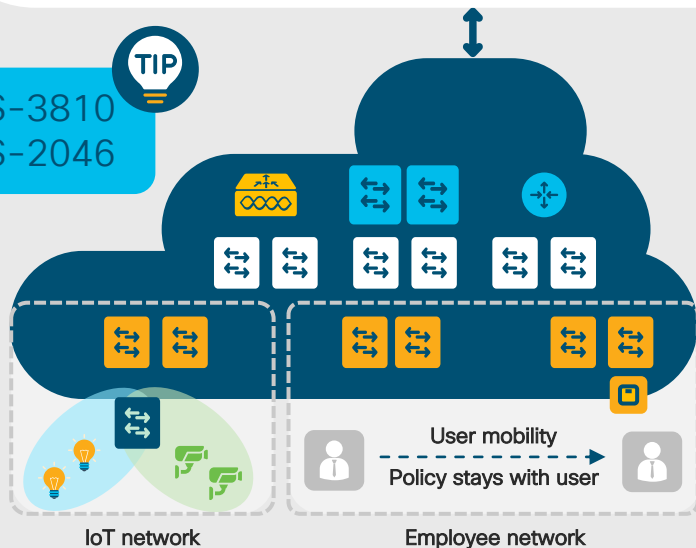


Assurance



TIP

BRKCRS-3810
BRKCRS-2046



Identity-based policy and segmentation

Security policy definition decoupled from VLAN and IP address



Automated network fabric

Single fabric for wired and wireless with workflow-based automation



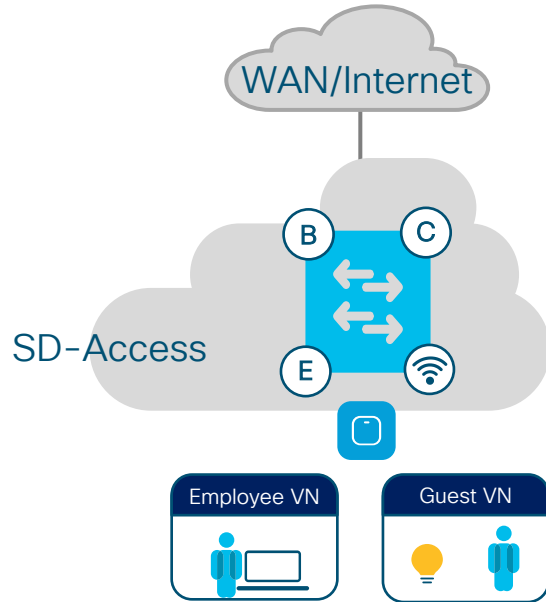
Insights and telemetry

Analytics and insights into user and application behavior

SD-Access Deployment for Branches

9300

Fabric-in-a-Box and Embedded Wireless

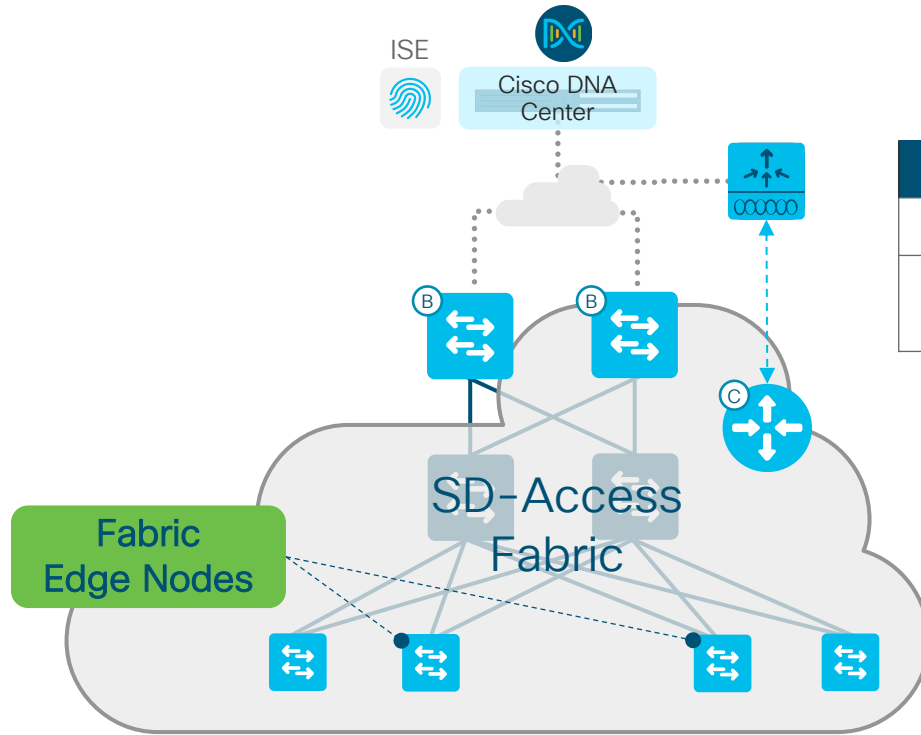


- All SD-Access Fabric Functions in a Single Box or Stack
- Embedded Wireless eliminates need for dedicated appliance

BRKCRS-3810
BRKCRS-2046

TIP

Catalyst 9200 in SD-Access



Scale	9200	9200L
Virtual Networks	4	1
SD-Access Wireless (attached APs)	Yes	No

Wrap-Up



You make networking **possible**

Access Positioning

For a Resilient Campus and Secure branch



Catalyst 9300L Series



Catalyst 9300 Series



Catalyst 9200 Series

Limited scale
Entry Point for Intent-based
Networking/SD-Access



Full SDA, Fabric-in-a-Box, Embedded WLC



ETA, MACSec-256



On-box App Hosting



HA, Hot Patching, StackPower, UPOE

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Related sessions



Thank you





You make **possible**