Технический обзор линейки коммутаторов Catalyst 9000 для построения классической LAN сети

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Март 2021

План презентации

- Линейка Cisco Catalyst 9000
- Catalyst 9200
- Catalyst 9300
- Catalyst 9400

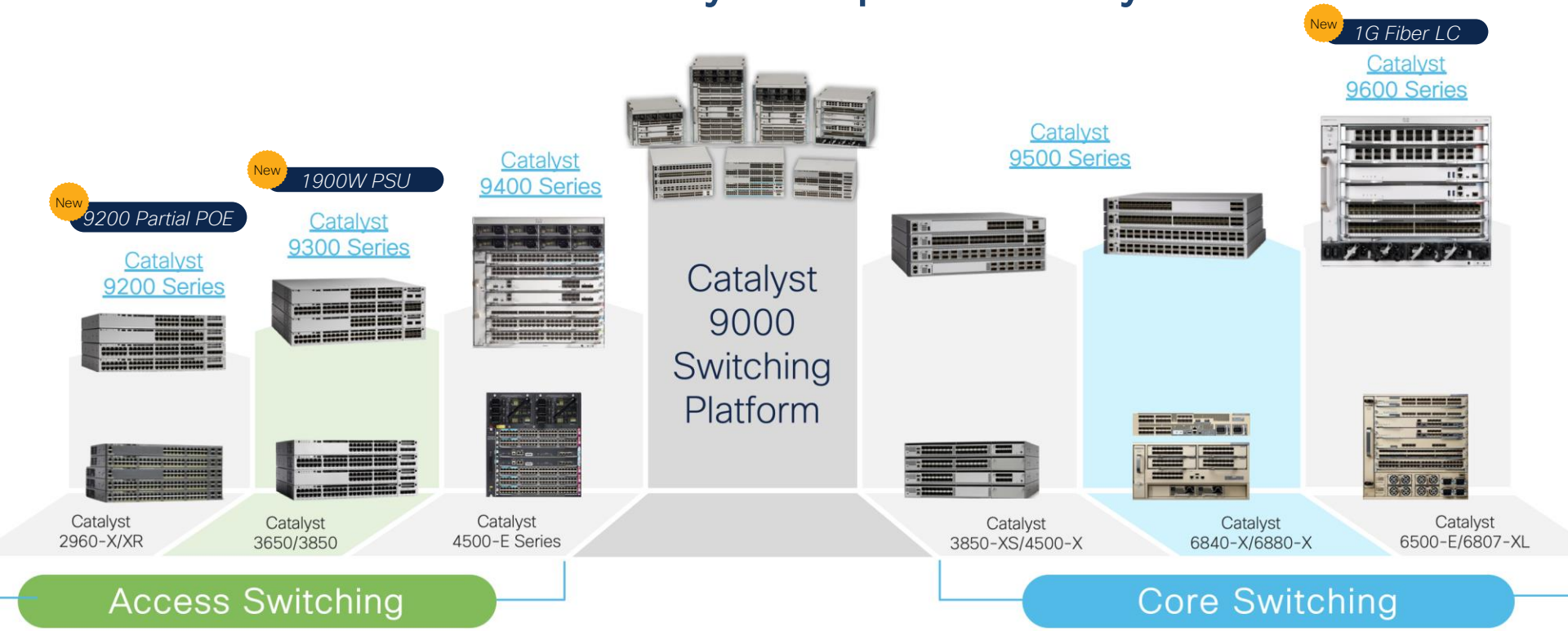
-=Перерыв=-

- Catalyst 9500
- Catalyst 9600
- Лицензирование
- Smart Licensing Using Policy или как просто купить и начать эксплуатировать коммутатор



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Новое поколение коммутаторов Catalyst 9K



Предыдущая линейка коммутаторов постепенно снимается с продаж

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Окончание продаж предыдущего поколения коммутаторов

EOS Plans	Продукты	Рекомендованная замена
EOS Announcement 31/10/19 EOS Date 30/10/20	Catalyst 3850 (excl. Fiber SKUs) Catalyst 4500E (excl. SUP9E) Catalyst 4500X Series Catalyst 6880 and 6840 Series Catalyst 6500* (6/9/13 slots Chassis/Sup2T) Catalyst 2960C	Catalyst 9300 Catalyst 9400 Catalyst 9500 Catalyst 9600 Catalyst 2960CX/3560CX
EOS Announcement 31/10/20 EOS Date 31/10/21	Catalyst 2960X/XR (excl. PSQ Fanless) Catalyst 2960L/P Catalyst 3650 (excl. 3650 Mini) Catalyst 4500E – SUP9E	Catalyst 9200/L Catalyst 1000 Catalyst 9300L Catalyst 9400

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Тренды в индустрии и Catalyst 9000

Capture Industry Transitions

Wi-Fi 6 drives
- Faster Speed – 3x data rat
- Lower Latency
- Higher Capacity

Speed Transition
- 1G → mGig (Access)
- 10/25/40G → 100/400G[1] (Core)

90W UPOE+
- Expanded smart building ecosystem
- PoE (IEEE 802.3af/at/bt*) supported across C9K Access



C9600 C9300



C9400

C9K holds **83%** Modular POE Market Share

Key Modular Differentiation

Mission Critical HA
- Platform, OS, Architecture resiliency

Max Investment Protection
- 15-20 Year Lifecycle

Unmatched Flexibility
- Flexible templates, table sizes

[1]Future
[2]Applicable only to C9400

*802.3bt supported on 9300 and 940

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Catalyst 9000
Общее в архитектуре

Что общего?

pininfarina
ITALIAN DESIGN AND ENGINEERING



Контейнеры,
но не Docker ☺



BMW Gran Lusso Coupe



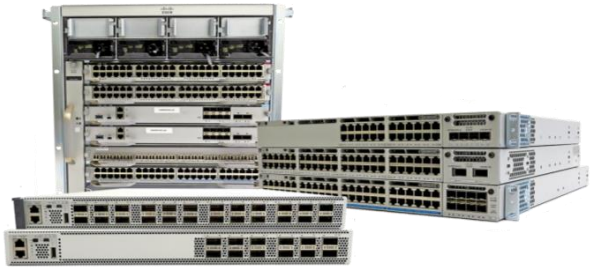
Ferrari F12berlinetta



Chevrolet Lacetti



E-Voluzione



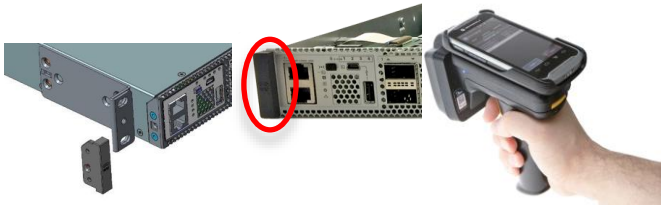
Cisco Catalyst 9000



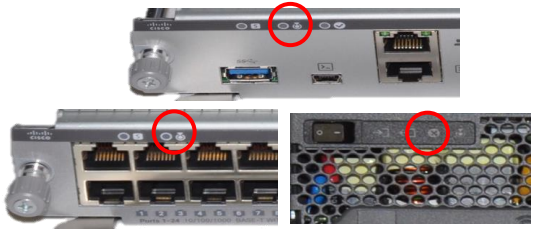
Reflex Vela

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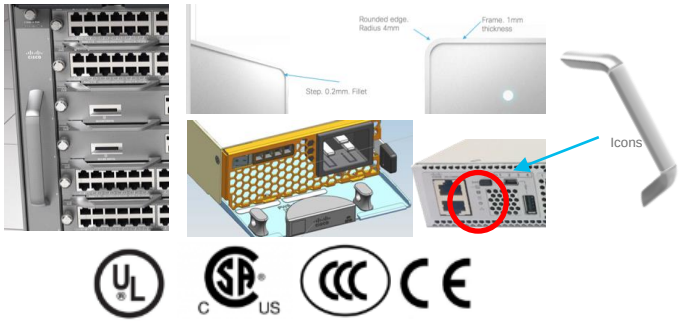
Индустриальный дизайн и лёгкость в обслуживании



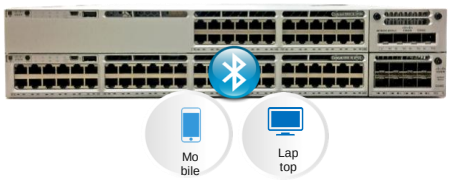
Новые возможности инвентаризации со встроенным RFID



Легкость обслуживания с Blue Beacons на каждом компоненте



Эргономичный индустриальный дизайн



Безопасный доступ к консоли по Bluetooth

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Ключевые компоненты семейства Catalyst 9000



Programmable x86 Multi-Core CPU

Application Hosting
Secure Containers



Open & Extensible IOS-XE®

Model-Driven APIs
Modular Patching

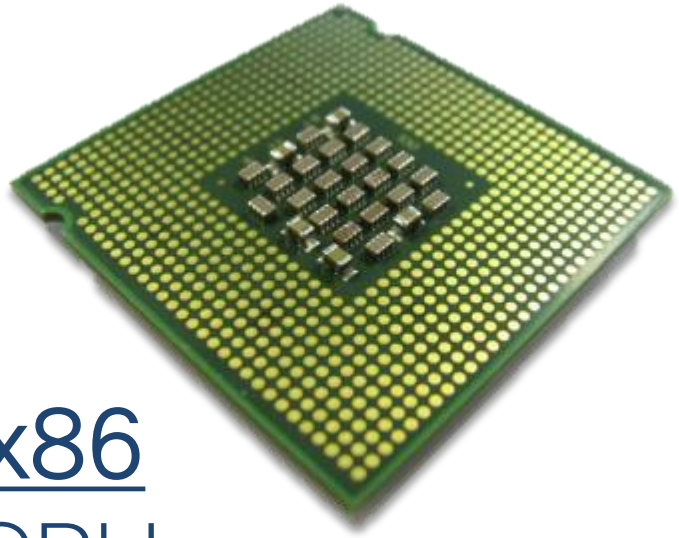


Unified Access Data Plane ASIC 2.0 & 3.0

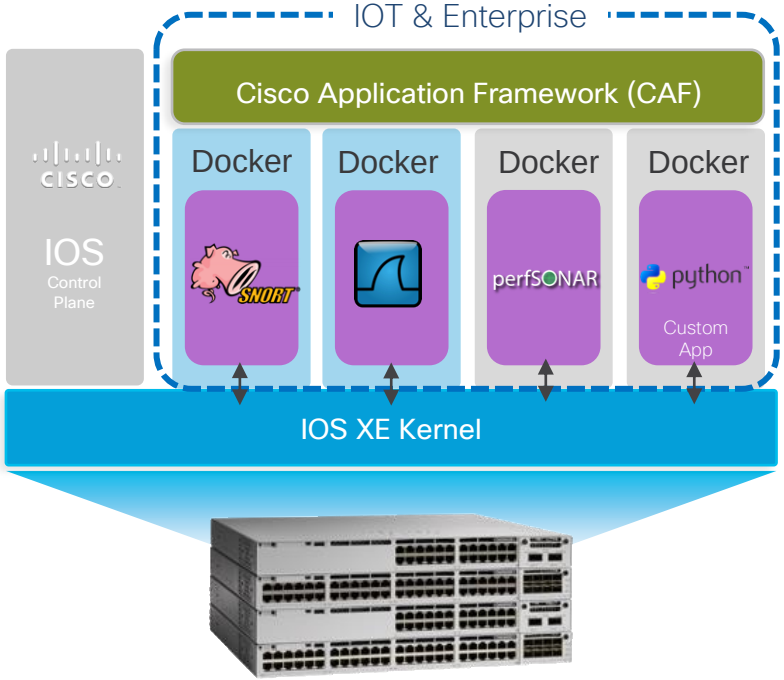
Programmable Pipeline
Flexible Tables

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Многоядерный CPU (x86) – с возможностями App Hosting



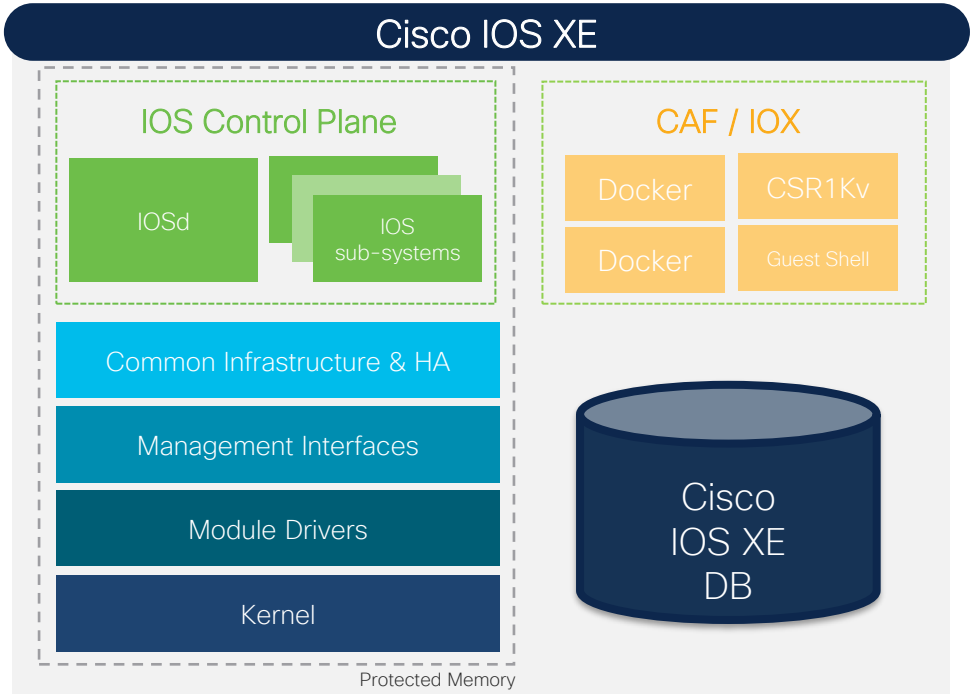
x86
CPU



x86 CPU enables hosting NFV devices, Containers and 3rd-party Apps

* Cisco Catalyst 9200 Series uses an embedded ARMv8 CPU

Cisco IOS XE – Modern Operating System



Cisco IOS subsystems

Resiliency and High Availability

Cisco IOS XE database

Programmability and Open models

IOX / Docker containers

Cisco and 3rd-party App hosting

Open, Model Driven & Secure Operating System

Cisco IOS XE Lite

Специально разработано для Cisco Catalyst 9200 Series Switches

Optimized for Cisco Catalyst 9200 Series Switches



Consistent

- Same code base of Cisco IOS XE

Light

- Optimized for lower memory on Cisco Catalyst 9200 Switches
- Image size reduced by 50%

Optimized

- Unused libraries removed
- IOSd optimizations
- Bash optimizations

Modern

- Model-driven programmability
- Streaming telemetry
- Network monitoring

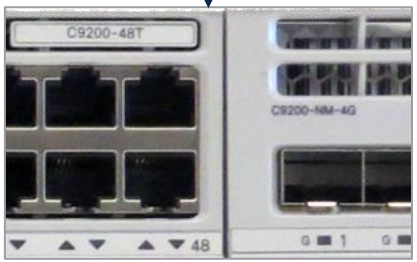
Highly available

- Modularized feature block
- Status recovery
- Failure isolation

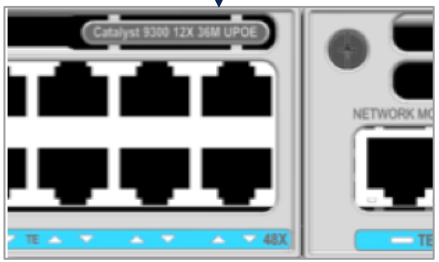
Same image for all Cisco Catalyst 9200 Switches

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Cisco IOS XE 17.x



Cisco Catalyst 9200 Series



Cisco Catalyst 9300 Series



Cisco Catalyst 9400 Series



Cisco Catalyst 9500 Series

Cisco IOS XE Lite binary image

Cisco IOS XE binary image

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UADP ASIC – основа инноваций Cisco



UADP 1.0/1.1
1.6/3.2 Billion Transistors
65/36 nm



UADP 2.0
~7 Billion Transistors
28 nm



UADP 2.0XL
~7 Billion Transistors
28 nm



UADP 3.0
~20 Billion Transistors
16 nm

Integrated CPU
Quad Core 1.4
GHz



UADP 2.0 Mini
3.2 Billion Transistors



Catalyst
3850/3650

2013г



Catalyst
9300



Catalyst
9400 &
Catalyst
9500



Catalyst 9500
High
Performance



Catalyst
9200

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Cisco Catalyst 9200 Series



Catalyst 9200 – два исполнения



Catalyst 9200 Series

Общее:

- Заменяемые отказоустойчивые блоки питания
- Опция стекирования
- Отказоустойчивые вентиляторы



9200

Модульные Uplinks & Fans
4x1G, 4x10G, 2x25G, 2x40G
Stackwise 160G (опция)



9200L

Фиксированные Uplinks & Fans
4x1G, 4x10G, 2x25G
Stackwise 80G (опция)

Выше производительность и масштабируемость



*Штатная работа с одним исправным вентилятором при 45 ° С окружающей среды. Нет необходимости в RMA

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Cisco Catalyst 9200 Series
Data & PoE SKUs

Cisco Catalyst 9200 Series switching SKUs

9200 Data/PoE+ (modular uplinks and fans)

Data



24 ports

48 ports

PoE+



24 ports

48 ports

4x 1G and 4x 10G uplinks

9200L Data/PoE+ (fixed uplinks and fans)

Data



24 ports

48 ports

PoE+



24 ports

48 ports

4x 1G and 4x 10G uplinks

Modular power supplies available on all SKUs

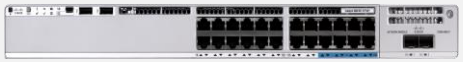
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Cisco Catalyst 9200 Series
Multigigabit models

Cisco Catalyst 9200 Series switching SKUs

Cisco Catalyst 9200 with Modular Uplinks

PoE+



4x 10G Uplinks
2x 25G Uplinks
2x 40G Uplinks

16x 1G and 8x Multigigabit Ports

PoE+



4x 10G Uplinks
2x 25G Uplinks
2x 40G Uplinks

40x 1G and 8x Multigigabit Ports

Cisco Catalyst 9200L with fixed uplinks

PoE+



2x 25G Uplinks

16x 1G and 8x Multigigabit Ports



4x 10G Uplinks

16x 1G and 8x Multigigabit Ports

PoE+



2x 25G Uplinks

40x 1G and 8x Multigigabit Ports



4x 10G Uplinks

36x 1G and 12x Multigigabit Ports

All models support Full PoE+

Modular power supplies available on all SKUs

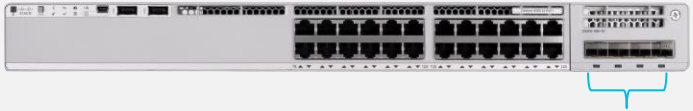
Cisco Catalyst 9200 Series

Модели с увеличенным числом VRF (Virtual Networks)

Cisco Catalyst 9200 Series для SD-Access Fabric Edge

Cisco Catalyst 9200-24PB

24x 10M/100M/1G Downlink Ports



4 x 1/10G SFP/SFP+ Uplink Module

Cisco Catalyst 9200-48PB

48x 10M/100M/1G Downlink Ports



4 x 1/10G SFP/SFP+ Uplink Module

All models support Full PoE+

32 VN/VRF у этих моделей 31 пользовательский VRF и 1 Default
4 VN/VRF у остальных моделей 9200
1 VRF/VN у моделей 9200L

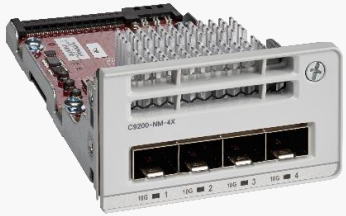
Cisco Catalyst 9200 Series

Modular uplink options



C9200-NM-4G

- 4x 1G
- SFP transceivers
- Supported on all modular SKUs



C9200-NM-4X

- 4x 10G
- SFP and SFP+ transceivers
- Supported on all modular SKUs



C9200-NM-2Y

- 2x 25G
- SFP and SFP+ transceivers
- 1/10/25G Speed support
- Supported on all **9200 mGig SKUs only**



C9200-NM-2Q

- 2x 40G
- QSFP transceivers
- Supported on all **9200 mGig SKUs only**

All modular uplink modules are field-replaceable units

Modular uplinks supported on Cisco Catalyst 9200 Series modular SKUs

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Resilient power supplies

Silver rated (80% efficiency)



125W AC

Supported only on 1G data SKUs

Platinum rated (90% efficiency)



600W AC

Supported only on
24-port PoE+ SKUs



1000W AC

Supported only on
48-port PoE+ SKUs

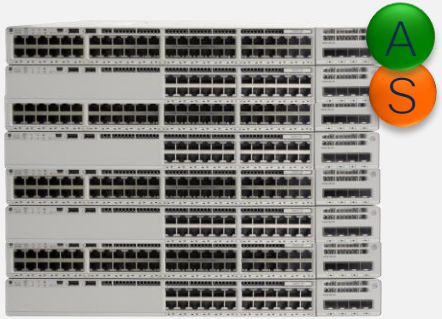
Load sharing (1+1) mode supported for PoE+ SKUs

Power supplies are field-replaceable units

!!!Второй блок питания должен быть идентичным!!! – особенность C9200

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StackWise-160/80 теперь с SSO



До 8 коммутаторов в стеке



- **Все** модели 9200 поддерживают стекирование
- StackWise-160 на всех Catalyst 9200 SKUs
- StackWise-80 на всех Catalyst 9200**L** SKUs
- Catalyst 9200 и 9200L (и предыдущие модели 2960X) имеют разный RAM и скорости стекирования и не могут находится в одном стеке
- Требуется одинаковый Cisco IOS XE и уровень лицензии
- Модели 32VN и 4VN не могут находиться в одном стеке

Stacking Kit →

Опционально





Stack Adapters Stacking Cable

Варианты кабеля стекированияя:
50cm, 1m, 3m

*Смешанные стеки на StackWise-160 и на StackWise-80 не поддерживаются

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StackWise с SSO/NSF
Stateful switchover/Non-Stop Forwarding



Hardware Redundancy

Возможность объединения в стек нескольких коммутаторов

Stackwise-160 and Stackwise-80

Используются механизмы SSO для обеспечения высокой доступности стека

How?

Активный коммутатор создает и обновляет всю информацию по коммутации и маршрутизации и постоянно синхронизирует ее с standby коммутатором.

Stateful Switchover

В случае выхода из строя активного коммутатора, Standby берёт на себя его роль и стек продолжает работать

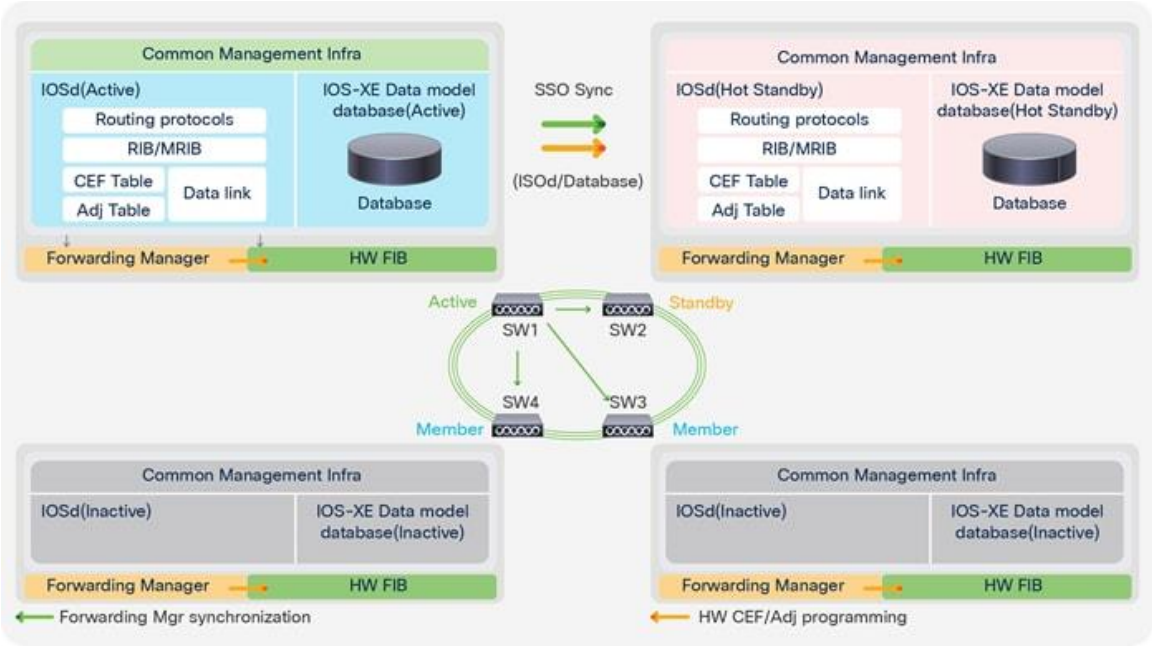
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Работа стека Stackwise

- Централизованный Control Plane
- Распределённый и расширяемый Data Plane

- Требование в единой версии IOS XE для всех коммутаторов стека
- `9300-STACK(config)#software auto-upgrade enable`

Auto Upgrade



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Stackwise и механизмы SSO и NSF

- SSO настраивается по-умолчанию. Дополнительных настроек не требуется. Можно только проверить

```
9200-STACK#sh redundancy states
        my state = 13 -ACTIVE
        peer state = 8  -STANDBY HOT
          Mode = Duplex
          Unit = Primary
        Unit ID = 1

        Redundancy Mode (Operational) = sso
        Redundancy Mode (Configured) = sso
        Redundancy State = sso
```

- NSF работает совместно с SSO

- NSF расширяет возможности CEF позволяя трафику использовать последнюю информацию в FIB пока избранный ACTIVE коммутатор в стеке изучает маршруты.

- Для включения возможности Graceful restart протоколов маршрутизации, поддерживающих NSF нужно явно включить эту функцию.

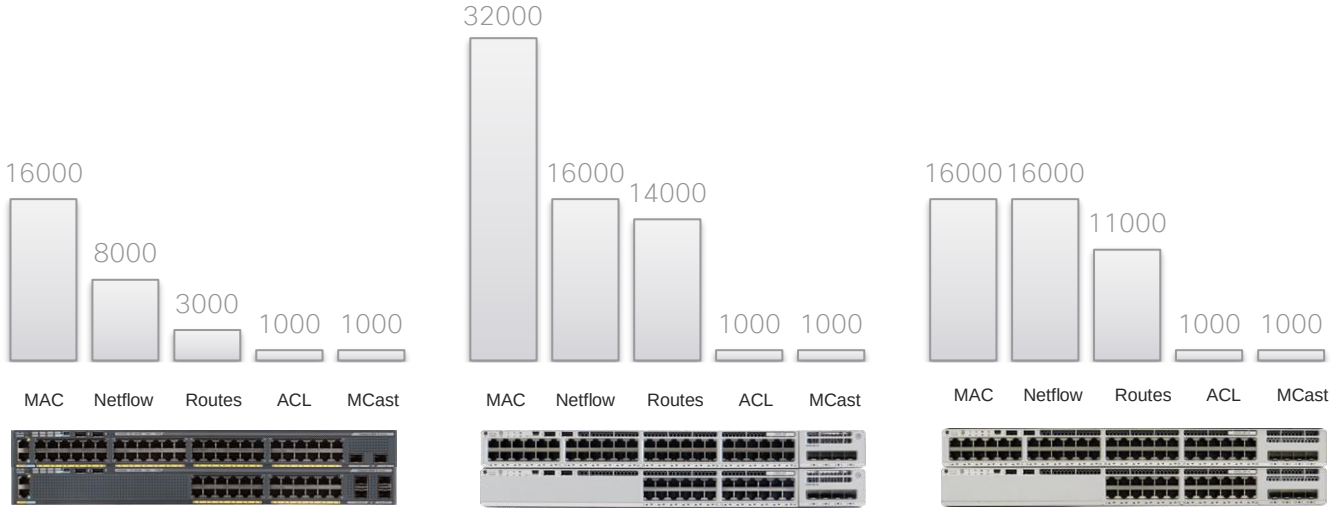
```
9300-STACK(config)#router eigrp 100
9300-STACK(config-router)#nsf

9300-STACK#sh ip protocols
*** IP Routing is NSF aware ***

Routing Protocol is “eigrp 100”
```

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Сравнение Catalyst 9200 и 2960X



Catalyst 2960-X | Catalyst 9200 | Catalyst 9200L

Catalyst 9200 обладает достаточной масштабируемостью для небольших компаний / удалённых офисов

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	Feature	9200	9200L	2960XR	2960X
Foundational Hardware	Programmable ASIC	✓	✓	✗	✗
	CPU	Embedded Quad-Core @1.4Ghz	Embedded Quad-Core @1.4Ghz	Dual Core @600MHz	Dual Core @600MHz
	Flash	4GB	4GB	256MB	128MB
	Memory	4GB DDR3	2GB DDR3	512MB	512MB
	mGiG downlinks	✓	✓	✗	✗
Uplinks	FRU Uplinks	✓	✗	✓	✗
	4X10G SPF+ Uplinks	✓	✓	✗	✗
	25G Uplinks	✓	✓	✗	✗
	40G Uplinks	✓	✗	✗	✗
Power & Fan	Full PoE+	✓	✓	✗	✗
	FRU PS	✓	✓	✓	✗
	Platinum Rated PS*	✓	✓	✗	✗
	FRU Fans	✓	✗	✗	✗
Stacking	High Bandwidth Stacking	160Gbps	80Gbps	80Gbps	80Gbps
	Stacking SSO	✓	✓	✗	✗
Servicea bility	RFID	✓	✓	✗	✗
	Blue Beacon	✓	✓	✗	✗

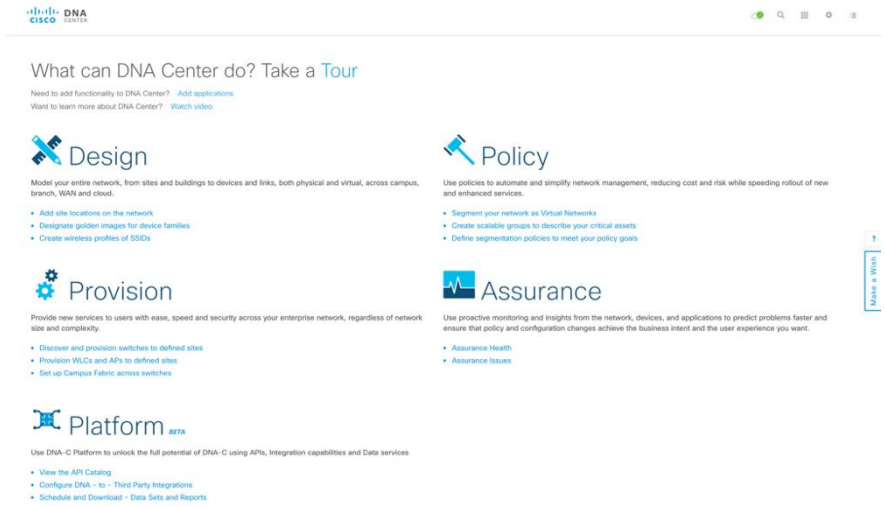
s reserved.

	Feature	9200	9200L	2960XR	2960X
Modern OS	Model Driven Programmability	✓	✓	✗	✗
	Streaming telemetry	✓	✓	✗	✗
	Patching	✓	✓	✗	✗
Advanced Routing	VRF Support	✓	✓	✗	✗
	ISIS	✓	✓	✗	✗
	EIGRP	✓	✓	EIGRP Stub only	EIGRP Stub only
	OSPF	✓	✓	✓	✓
Fabric	SDA Fabric Edge	✓	✓	✗	✗
Security	MACsec-128	✓	✓	✗	✗
	Trustworthy System	✓	✓	Limited Support	Limited Support
	SGT	✓	✓	✗	✗
Visibility	Full Flexible Netflow	✓	✓	Ingress Only	Ingress Only
QoS	QoS Model	MQC	MQC	MLS	MLS
	Hierarchical QoS	✓	✓	✗	✗

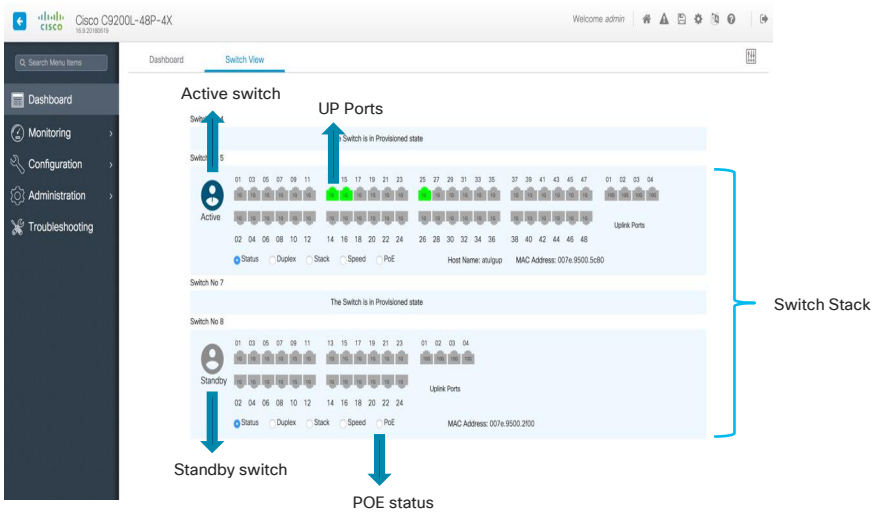
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Возможности по управлению коммутаторами Cat9000

Возможности по управлению Catalyst 9000



DNAC



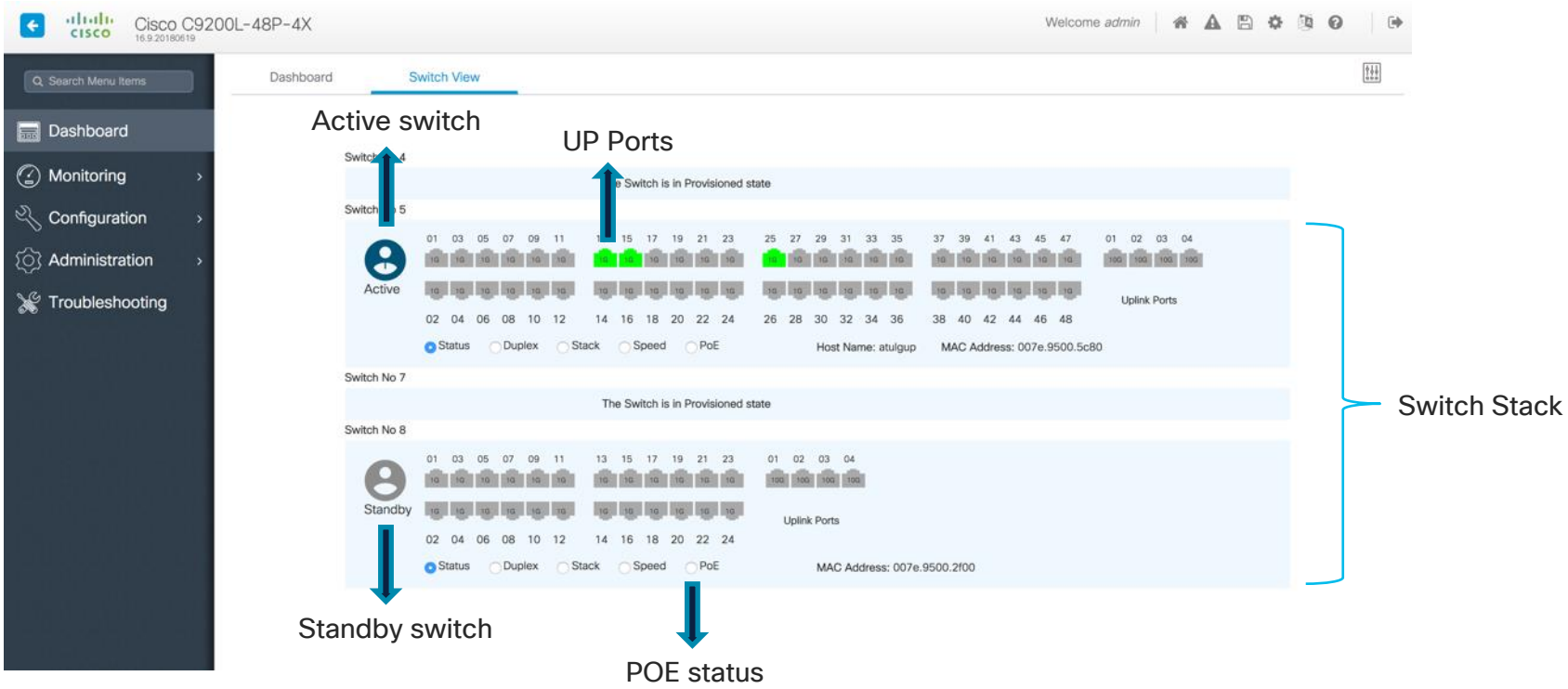
WebUI



CLI

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Обновленный WebUI



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PoE innovations

Инновации Cisco для надёжной PoE инфраструктуры

2-event classification

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

Perpetual PoE

- Uninterrupted PoE power during control plane reboot

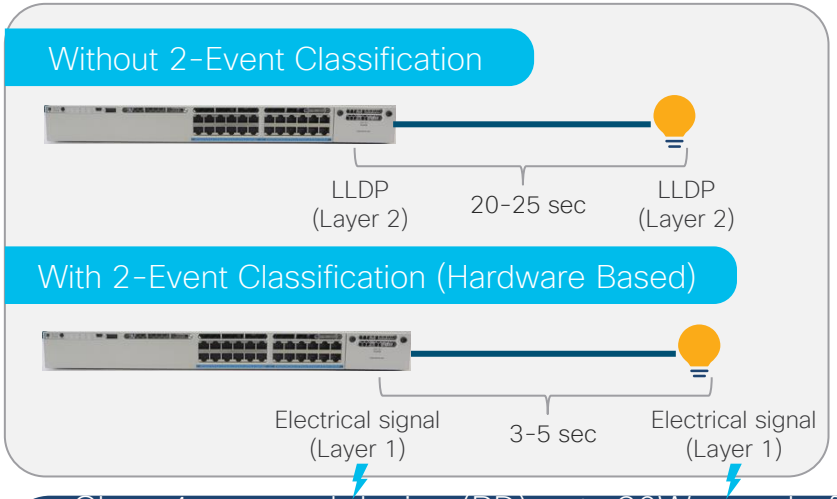
Fast PoE

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



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2-Event classification



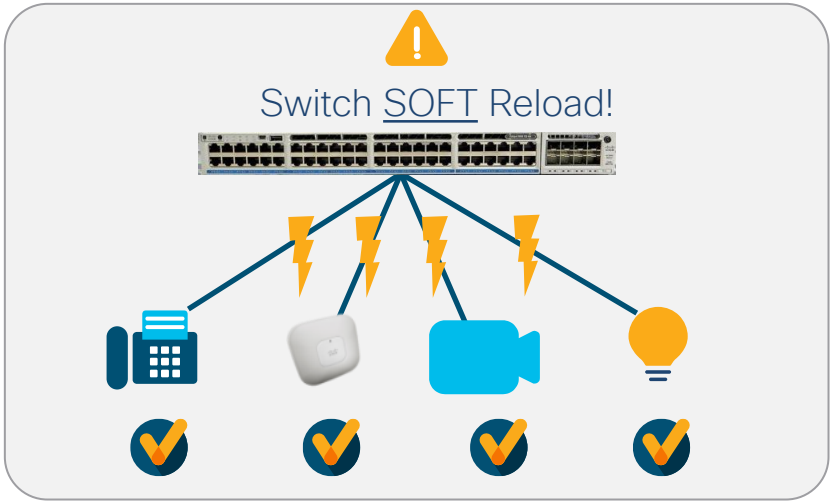

```
Switch> enable
Switch# configure terminal
Switch(config)# interface
gigabitethernet2/0/1
Switch(config-if)#
power inline port 2-event
Switch(config-if)# end
```

- Class 4 powered device (PD) gets 30W even before the link comes up, otherwise 15.4W
- Type-2 (power sourcing equipment)PSE sends classification voltage (2nd Handshake) pulse to Class 4 PD (PoE+, 12.96-25.5 W) confirming it is a high power capable PSE
- 30W of power is allocated for PD (PD draws up to 25.5W)
- Both PSE and PD need to support 2-Event
- No waiting for CDP/LLDP exchange for PoE+ power levels

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Perpetual PoE

PoE устройства получают питание даже во время перезагрузки!

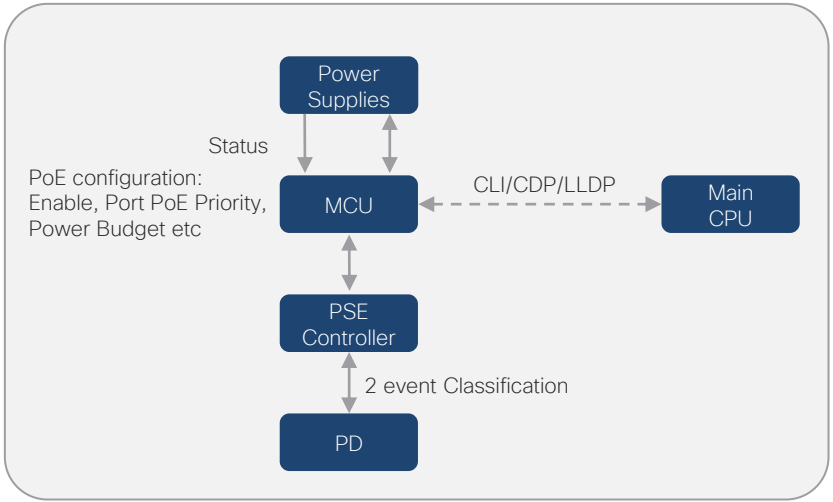



```
Switch> enable
Switch# configure terminal
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)#
power inline port perpetual-poe-ha
Switch(config-if)# end
```

- PoE devices continue to get Last Negotiated Power
- Applicable to “Soft” Reload – image upgrade, software crash, manual reboot
- Supported with Stacking deployments
- Not applicable during power outage to switch
- Not applicable when switch is in hibernation mode

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Fast PoE




```
Switch> enable
Switch# configure terminal
Switch(config)# interface gigabitethernet2/0/1
Switch(config-if)#power inline port perpetual-poe-ha
Switch(config-if)#power inline port poe-ha
Switch(config-if)# end
```

- Restores power to powered device (PD) in less than 30 seconds post restoration of power
- Works even before IOS comes up
- Allocates last power (stored in NVRAM) drawn from PDs
- Works in Stacking deployments

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Full flexible netflow

Сравнение Catalyst 9200 Series и Catalyst 2960X/XR Series

Catalyst 9200 Series switches



- Both ingress and egress
- 16K Flows/ASIC
- Match on Layer2 VLAN header as well

Catalyst 2960X/XR Series switches



- Only ingress
- 8K Flow/ASIC
- No match on Layer2 VLAN Header

Layer 2, IPv4 and IPv6 capable

4 banks in ASIC, 2 ingress, 2 egress
Ipv4 flows: 8k per direction
Layer 2 and Ipv6 flows: 4k per direction

Ingress and Egress FnF supported on all ports, VLANs

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QoS

Ключевые отличия– Catalyst 9200 Series vs Catalyst 2960X/XR Series

Catalyst 9200 Series switches



- MQC
- Trust by Default
- 8 Queues per Port
- 6 MB Buffer per ASIC
- HQoS – 2 Level Hierarchical Policy

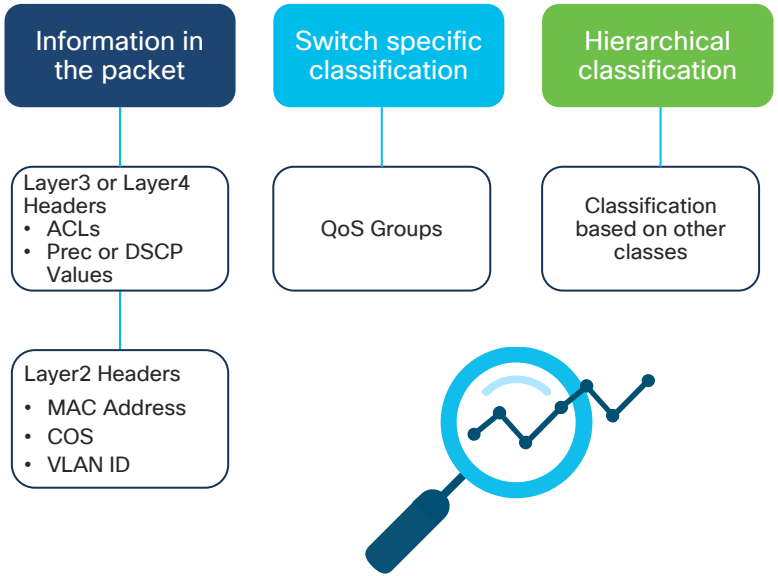
Catalyst 2960X/XR Series switches



- MLS QoS
- Untrust by Default
- 4 Queues per Port
- 4 MB Buffer per ASIC
- No HQoS

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Packet classification



A class-map can be defined as a logical OR only, i.e. “match-any” “match-all” is also supported on Catalyst 9000 switches (default)

```
switch(config-cmap)# class-map match-any VOICE
switch(config-cmap)#match ?
  access-group    Access group
  any             Any packets
  class-map       Class map
  cos             IEEE 802.1Q/ISL class of service/user priority values
  dscp            Match DSCP in IPv4 and IPv6 packets
  group-object    Match object-group
  ip              IP specific values
  mpls            Multi Protocol Label Switching specific values
  non-client-nrt  Match non-client NRT
  precedence      Match Precedence in IPv4 and IPv6 packets
  protocol        Protocol
  qos-group       Qos-group
  vlan            VLANs to match
  wlan            802.11-specific values
```

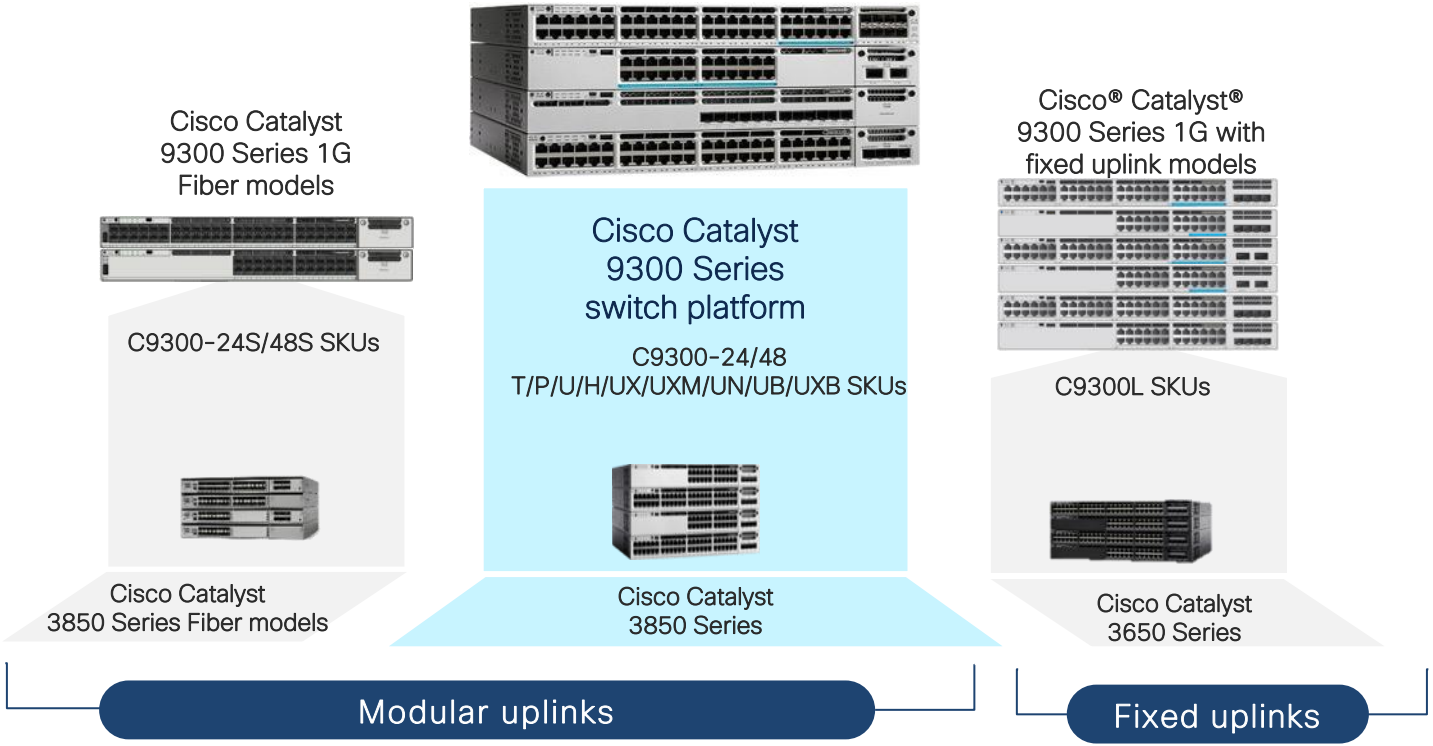
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Catalyst 9300 Series



Cisco Catalyst 9300 Series

Platform transitions



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Catalyst 9300 – два исполнения



Catalyst 9300 Series

Общее:

- Заменяемые отказоустойчивые блоки питания и вентиляторы



9300

Модульные Uplinks
4x1G, **8**x10G, **2x25G**, 2x40G
Stackwise 480G, **Stackpower**,
802.3bt Type 4 UPOE+ (**90W**)



9300L

Фиксированные Uplinks
4x1G, 4x10G, 2x40G
Stackwise 320G **(опция)**
UPOE, 802.3bt Type 3 (60W)

Выше производительность и масштабируемость



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Cisco Catalyst 9300 Series Switches

Новое поколение коммутаторов фиксированной конфигурации

Flexible uplinks (C9300 SKUs)

Copper – 24/48 Ports



Data-Only

POE+ – 30W

UPOE – 60W

Fiber 1G SFP – 24/48 Ports



Data-Only

Fixed uplinks (C9300L SKUs)

Copper – 24/48 Ports



Data or POE+

C9300L Optional Stack kit



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Catalyst 9300 Series 1G SFP Fiber

Для решений FTTD и 1G оптической агрегации

C9300-48S: 48-port 1G SFP Switch



C9300-24S: 24-port 1G SFP Switch



- 24 and 48 port SFP SKUs
- Transition Catalyst 3850 1G SFP to Catalyst 9300 1G SFP
- Wire-speed, non-blocking performance
- Seamlessly integrates with Cisco Catalyst 9300 Series copper
  - Supports same optics
  - Common stacking – StackWise-480
  - Common power stacking – StackPower
  - Common uplink modules
  - Common power supplies, fans, cables

Modular fans

Modular uplinks

Higher-efficiency AC and DC power supplies

Platinum rated





8x 10G



2x 40G



4x Multigigabit



4x 1G



2x 25G



315W AC



715W AC/DC



1100W AC



1900W AC

Fiber to the desktop

1G fiber aggregation

Collapsed access

Cisco Catalyst 9300 – IEEE 802.3bt Compliance

Представляем 90W UPOE+ модели для инновационных IoT устройств

C9300-48H: 48-port 1G UPOE+ Switch



C9300-24H: 24-port 1G UPOE+ Switch



- 24 and 48 port UPOE+ SKUs
- Supports 90W on all ports, Backward compatible will previous POE standards
- Wire-speed, non-blocking performance
- Seamlessly integrates with Cisco Catalyst 9300 Series copper

C9300-**24H** все 24 порта могут отдавать одновременно 90W

C9300-**48H**: 32 порта одновременно могут отдавать 90W

- Common uplink modules
- Common power supplies, fans, cables

Modular fans

Modular uplinks

Higher-efficiency AC and DC power supplies

Platinum rated





8x 10G



2x 40G



4x Multigigabit



4x 1G



2x 25G



315W AC



715W AC/DC



1100W AC



1900W AC

StackWise-480

StackPower

Catalyst 9300 увеличенной масштабируемости

Доступ, оптимизированный для передачи аудио/видео трафика и IP Storage

AVID CERTIFIED

2x Buffers

More Packet Buffers

2-4x Scale

Increased Network Scale



C9300-48UB: 48 Port 1G switch with UPOE



C9300-24UXB: 24 Port Multigigabit switch with UPOE



C9300-24UB: 24 Port 1G switch with UPOE

Catalyst 9300 Leadership
UADP 2.0 XL
Cisco IOS® XE Software
x86 CPU and containers
Cisco SD-Access
Encrypted Traffic Analytics (ETA)
AES-256/MACsec-256
Trustworthy systems
Cisco StackWise-480
IEEE1588 and AVB*
NBAR2
Perpetual/Fast PoE
Model-driven programmability
Patching/GIR
Streaming telemetry

Modular fans

Modular uplinks

Higher-efficiency AC and DC power supplies

New Platinum rated





8x 10G



2x 40G



4x Multigigabit



4x 1G



2x 25G



315W AC



715W AC/DC



1100W AC



1900W AC

StackWise-480

Stackpower

История PoE инноваций Cisco

Cisco invented PoE

1999

15.4W



IP Phone

IEEE 802.3af

2003

15.4W

Cisco invented PoE+

2004

30W



AP

IEEE 802.3at

2009

30W

Cisco invented Cisco UPOE

2011

60W



POE Displays

Network Powered Light



Badge Readers

IEEE 802.3bt

2018

60W, 90W



PTZ UHD Cameras



Large Video Displays

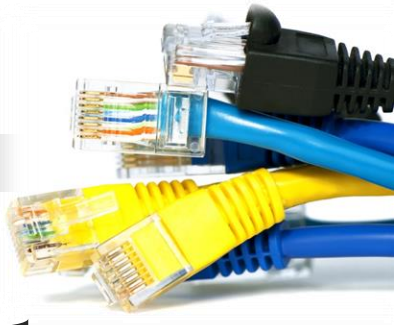


USB-C dongles



Network Powered Light arrays

Digital Building Components

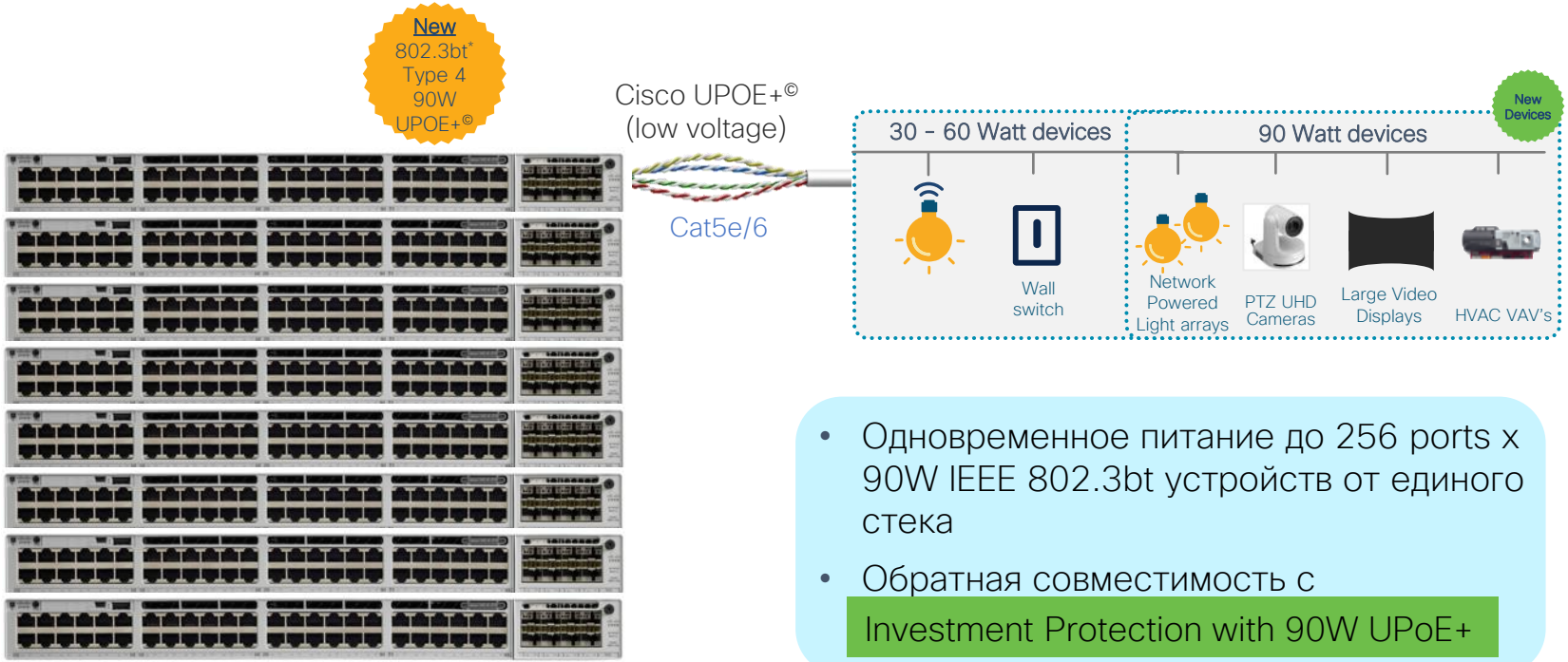


PoE Leadership coupled with Innovations

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Catalyst 9300 90W UPOE+ Models

Самое высокое число UPOE+ в одном стеке в индустрии



- Одновременное питание до 256 ports x 90W IEEE 802.3bt устройств от единого стека
- Обратная совместимость с

Investment Protection with 90W UPoE+

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90W PoE открывает новые возможности по построению сетей



Orderable now

Cisco Catalyst 9400 1G UPOE+ 90W line card (C9400-LC-48H)

Растущая экосистема решений


USB-C dongle


Touchscreen PCs


PoE displays


UPOE powered compact switches

Hill-Rom

Nurse call systems


CBRS private LTE


UHD IP cameras


Network-powered light


HVAC VAVs



molex


Badge readers

Panasonic

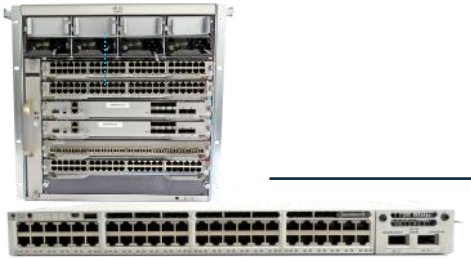
SIEMENS

igor


Environmental sensor hubs


Biometric door locks


People-counting sensors



IEEE 802.3bt-compliant platforms
Cisco Catalyst 9400 and 9300 Series*



Cisco Compact Switch

PoE+ passthrough

PoE+



01 Daisy-chaining
(for cable cost savings)

Single-pair PoE



02 Single-pair PoE
(for replacing RSxx for BMS)

USB-C power + data

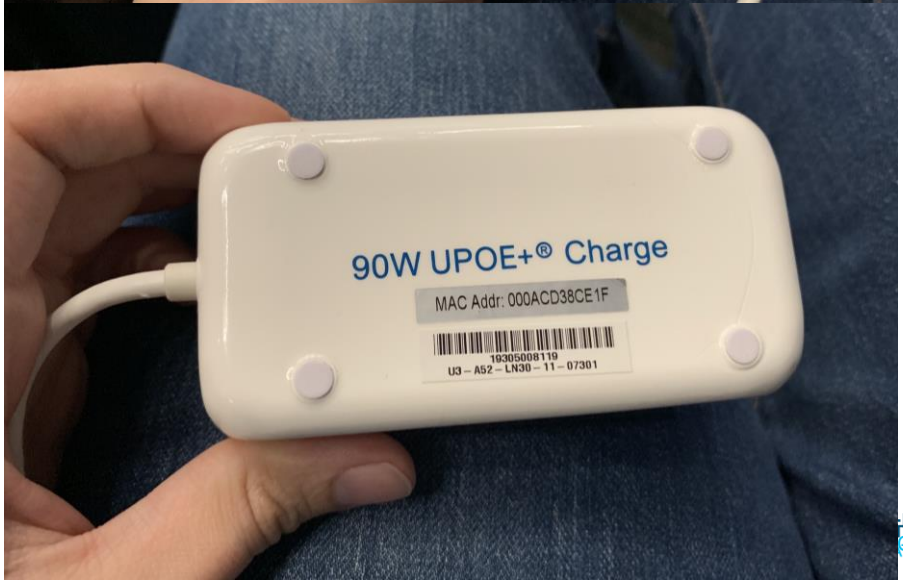


03 USB-C power
(laptop/phone charging + data)

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Panasonic
4K
UPoE+ 90 Watts
Linecard


cisco
Cisco Catalyst 9000


90W UPOE+® Charge
MAC Addr: 000ACD38CE1F
19305008119
U3 – A52 – LN30 – 11 – 07301

Cisco Catalyst 9300 MultiGigabit Switches



24x 100M/1G/2.5G/5G/10G ports



36x 2.5G ports

12x MultiGigabit ports



48x 5G ports

Highest 2.5G, 5G and MultiGigabit density in the Industry



4x 1G/2.5G/5G/10G copper uplink module

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Новые коммутаторы Multigigabit в семействе 9300L

NEW

48 UPOE Ports



2x40G Uplinks



4x10G Uplinks

36x 1G Ports
12x mGig Ports

mGig – 100M/1G/2.5G/5G/10G

24 UPOE Ports



2x40G Uplinks



4x10G Uplinks

16x 1G Ports
8x mGig Ports

Stackable with 9300L Models

Cisco Catalyst 9300 Series
Опции Uplink портов

Cisco Catalyst 9300 Series modular uplink models





4x Multigigabit copper

C9300-NM-4M



4x 1G SFP

C9300-NM-4G



8x 10G SFP, SFP+

C9300-NM-8X



2x 1G, 10G, 25G SFP, SFP+

C9300-NM-2Y



2x 40G QSFP

C9300-NM-2Q

Modular uplink options on all C9300 SKUs

Cisco Catalyst 9300L Series fixed uplink models



4x 1G Fixed uplinks
C9300L-24/48P-4G, C9300L-24/48T-4G



4x 10G Fixed uplinks
C9300L-24/48P-4X, C9300L-24/48T-4X



2x 40G Fixed uplinks
C9300L-24/48UXG-2

Fixed uplink options on C9300L SKUs

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Catalyst 9300 Flexible Tables – UADP 2.0

Forwarding resources

- MAC: 32,000
- Host route: 24,000
- IGMP groups: 8000
- LPM route: 8000
- Multicast route: 8000
- Scalable group tags (SGT): 8000

Feature resources

- Security ACL: 5000
- QoS ACL: 5000
- Service ACL: 4000
  - PBR
  - NetFlow ACL
  - SPAN
  - MACsec
  - CoPP
  - Tunnel
  - LISP

NetFlow — NetFlow entries: 64,000 per ASIC

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Catalyst 9300 Flexible Tables – UADP 2.0 XL*

Forwarding resources

- MAC: 64,000
- Host route: 48,000
- IGMP groups: 16,000
- LPM route: 64,000
- Multicast route: 16,000
- SGT: 8000

Feature resources

- Security ACL: 18,000
- QoS ACL: 18,000
- Service ACL: 4000
  - PBR
  - Netflow ACL
  - SPAN
  - MACsec
  - CoPP
  - Tunnel
  - LISP

NetFlow — NetFlow entries: 128,000 per ASIC

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* Only for C9300-B model switches with Network Advantage

Cisco Catalyst 9300 Series Switches

Platinum-rated power supply options

Platinum rated (90% efficiency)



350W AC-P



715W AC-P



1100W AC-P

New



1900W AC-P



715W WDC

Supported on all Cisco Catalyst 9300 Series Switches

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StackPower

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



StackPower is supported only on C9300 SKUs.

- 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 9 switches in a star topology with Cisco® Expandable Power System (XPS)

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High availability

Cisco Catalyst 9300 Series Switches
High availability

StackWise®– 480/320

Hardware redundancy

Ability to stack multiple switches through stack cables

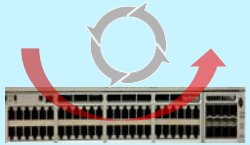


Patchability

Hot patching

Ability to patch the software without reloading the switch

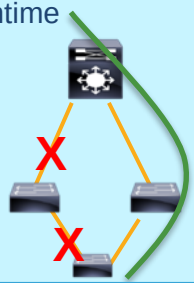
Hot patching vs. cold patching



GIR

Graceful insertion and removal

Ability to remove the switch from the data path during maintenance with negligible downtime

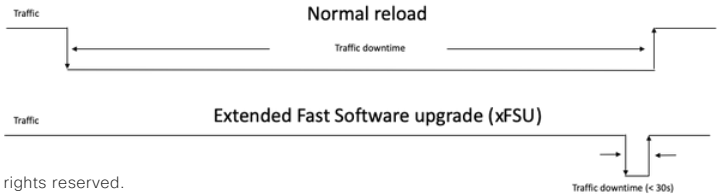


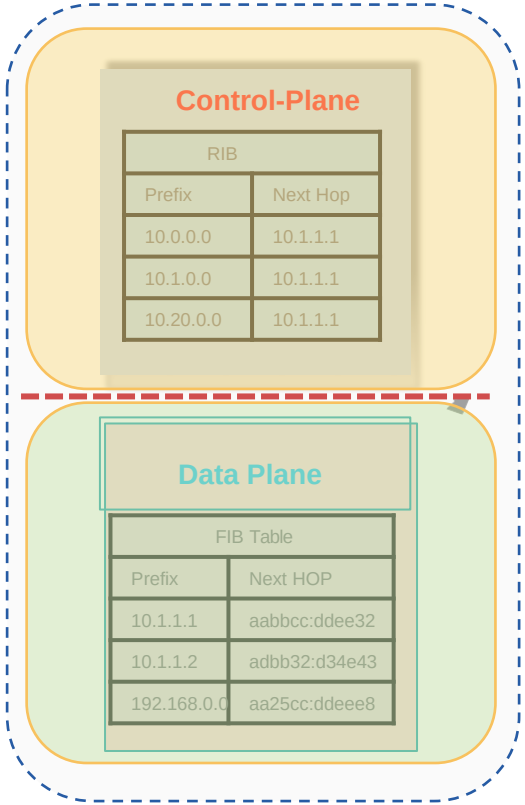
Providing redundancy and zero downtime

Extended Fast Software Upgrade (xFSU)

Extended Fast Software Upgrade

- xFSU – процесс, направленный на снижение времени простоя во время перезагрузки или апгрейда ПО
- UADP ASIC и Data plane продолжают передачу трафика в то время, пока CPU перегружает коммутатор.
- Частью процесса инициализации нового софта является и перепрограммирование ASIC – происходит кратковременная остановка передачи трафика.





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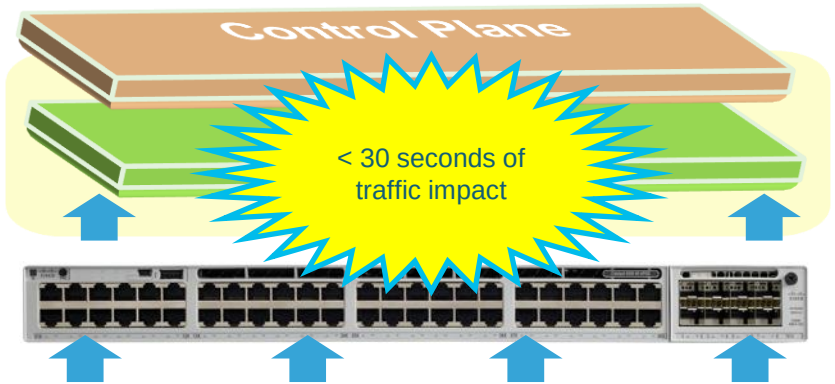
Extended Fast Software Upgrade

17.3.2

17.3.2

9300 Standalone

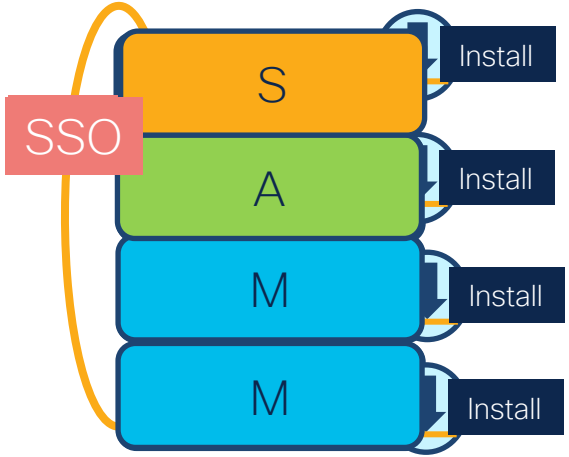
#Install add file image activate reloadfast commit



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Fast Software Upgrade on Stack

#Install add file image activate reloadfast commit

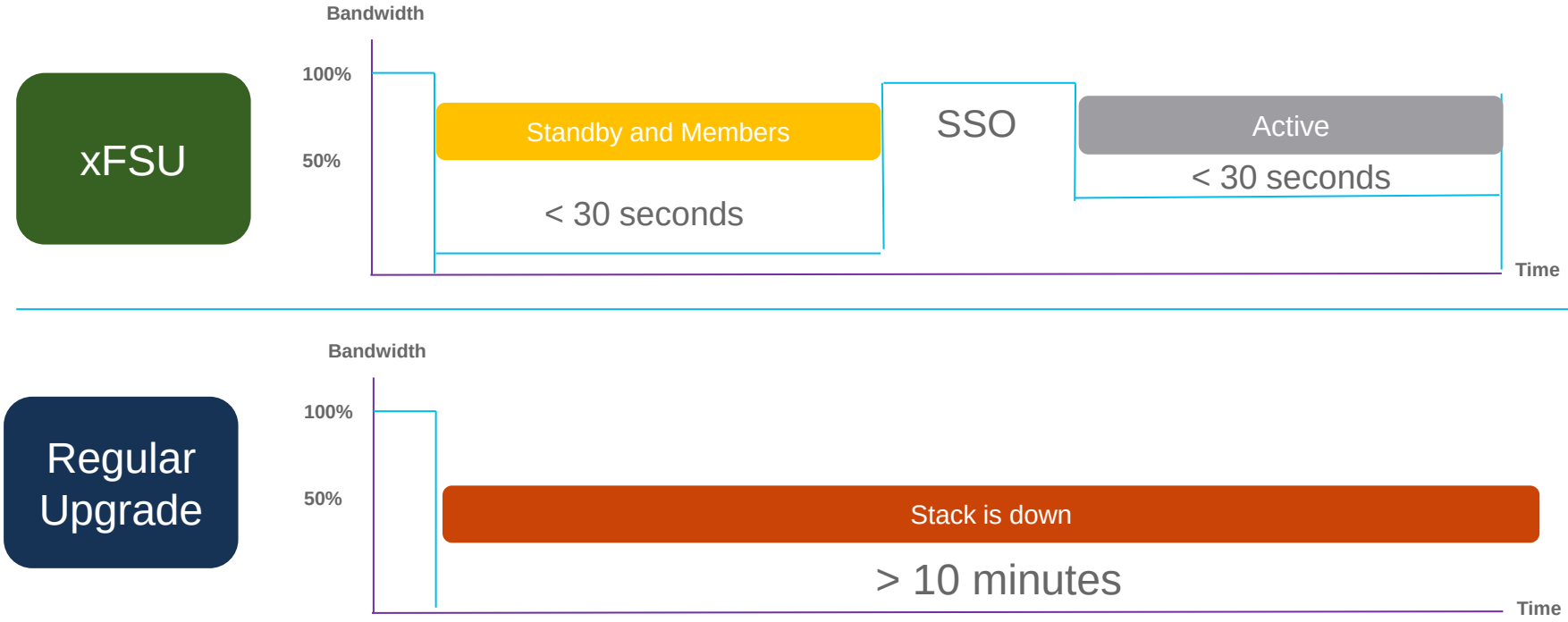


1. Install the images on all switches
2. Fast reload the standby and member switches
3. Fast reload the active switch only
4. Standby becomes the new active
5. Old Active switch becomes the new standby

Traffic Impact during the complete upgrade is less than 30 seconds

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Время восстановления работы с xFSU и без

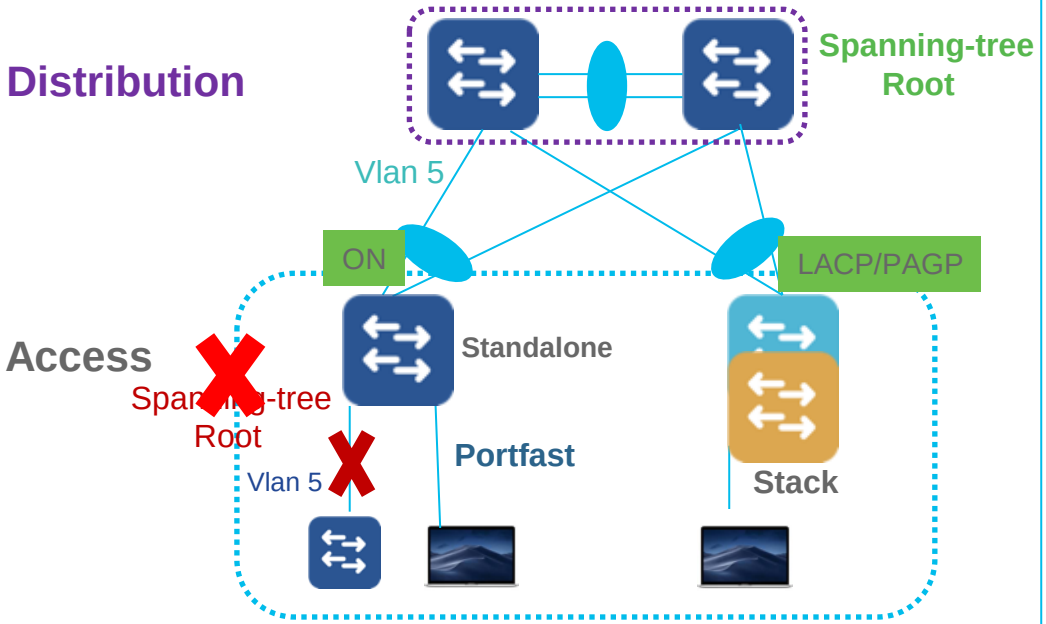


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Design Caveats

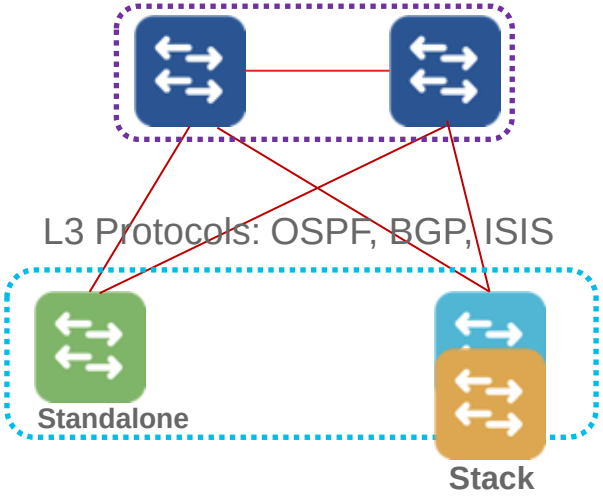
- C9300/C9300L

Layer2 Designs



- xFSU switch cannot be a root switch
- XFSU switch cannot have more than one forwarding port for the same VLAN

Layer3 Designs



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Encrypted Traffic Analytics (ETA)

Finding malicious activity in encrypted traffic

Cisco® Catalyst® 9300 Series

Cisco Stealthwatch®

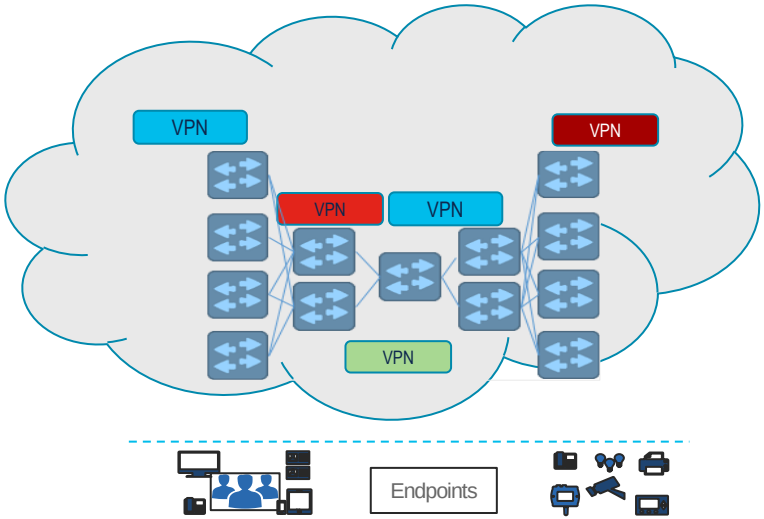


Leveraged network	Faster investigation	Higher precision	Stronger protection
Enhanced NetFlow from Cisco’s newest switches and routers	Enhanced analytics and machine learning	Global-to-local knowledge correlation	Continuous enterprise-wide compliance

Note: ETA is not supported with SPAN/ERSPAN

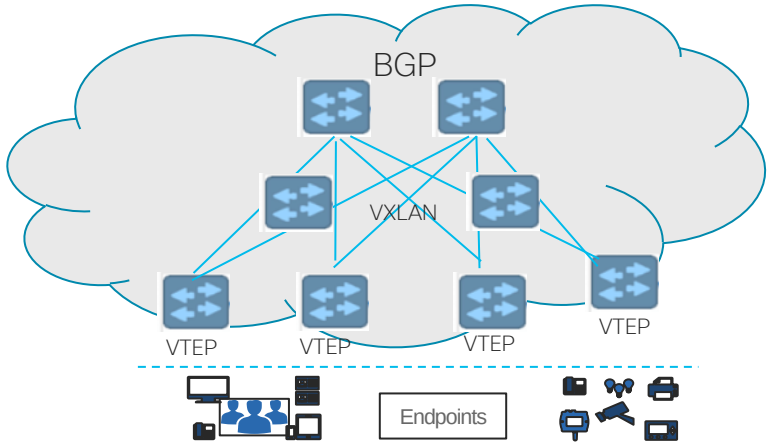
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Advanced Routing/MPLS in Campus/ VXLAN BGP EVPN



MPLS Based Segmentation

- Bringing MPLS to Access with Routed Access Design
- Traditional label-based Segmentation with L3VPN
- P2P and P2MP overlay over MPLS.
- Multicast over VPN

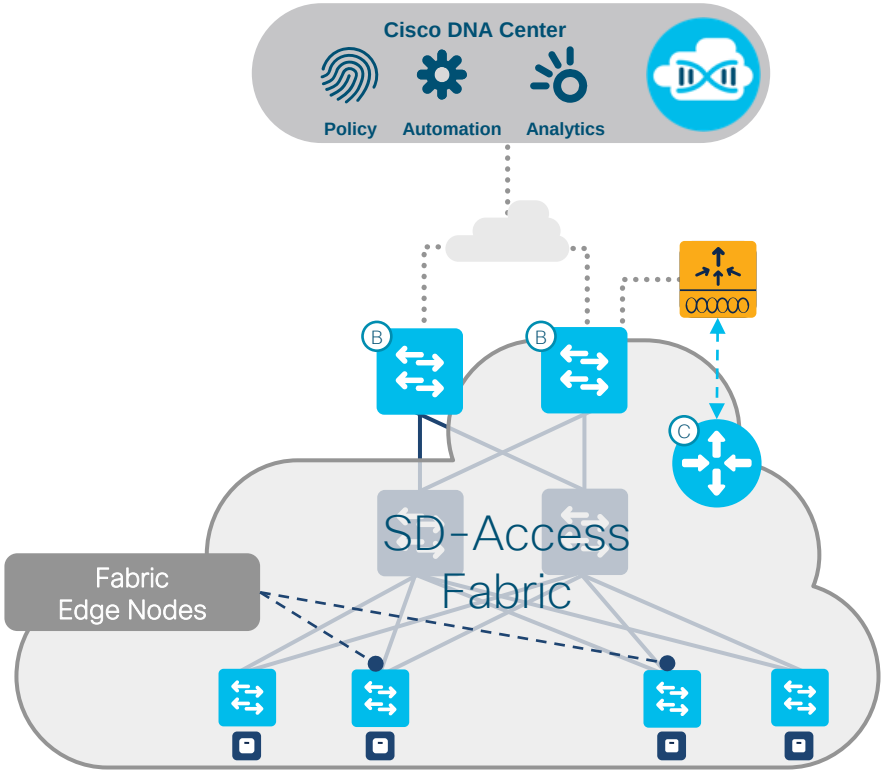


VXLAN BGP EVPN Based Fabric

- Bringing VXLAN to Routed Access Design
- BGP Control Plane Learning
- VxLAN Bridging and Routing Support
- Anycast Gateway Support
- Ingress Replication and Multicast for BUM Traffic
- Border Handoff with VRF Lite and L2/L3VPN*
- 9300 Supported in VTEP Role

* Supported with 16.12

Cisco Software-Defined Access (SD-Access)



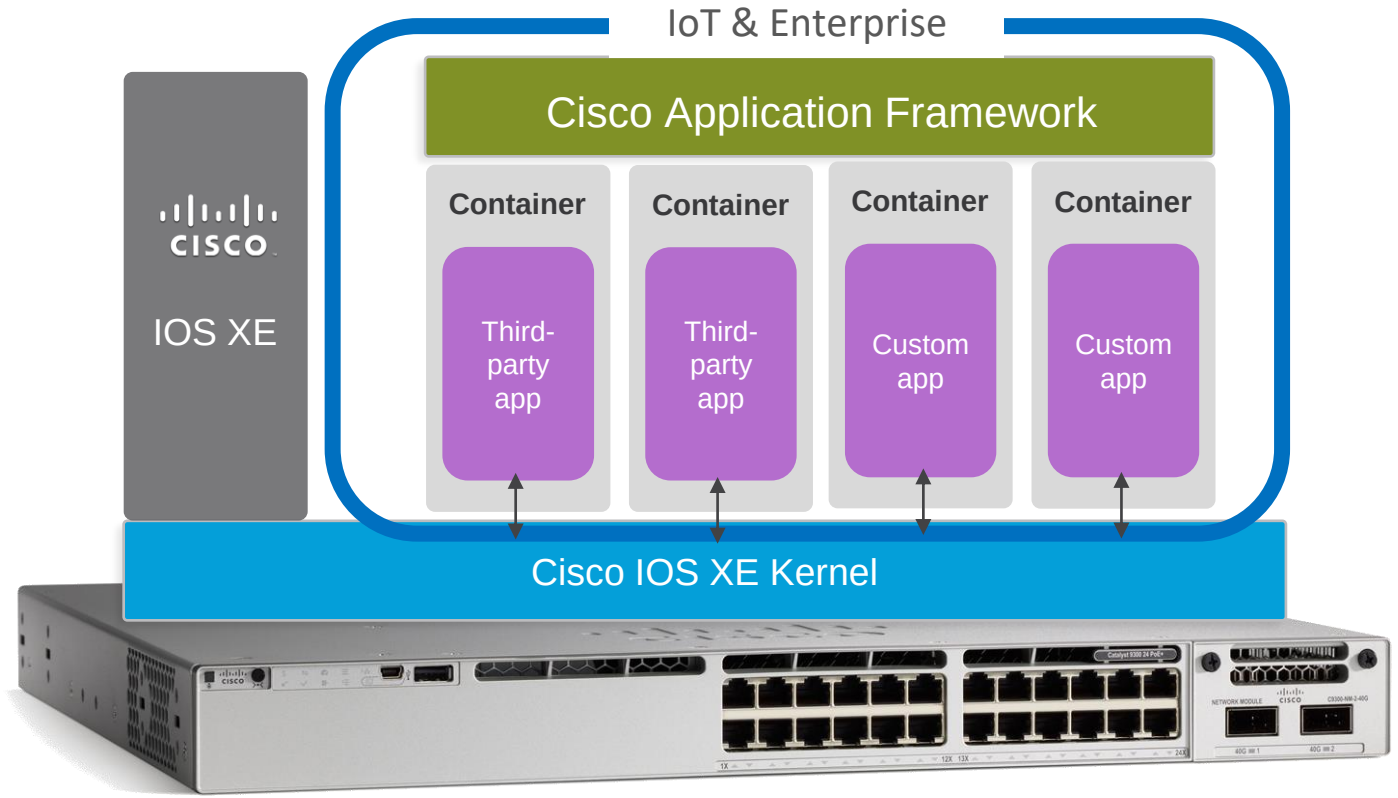
Role	C9300	C9300L
Fabric Edge	Yes	Yes
Fabric Control Plane	Yes	Yes
Fabric Border	Yes	Yes

	C9300	C9300L
Number of User VRFs	256	256
Cisco® Catalyst® 9800 Series embedded WLC	200AP's	50 AP's

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B – Border Node
C – Control Plane Node

Application Hosting in Catalyst 9K Platforms



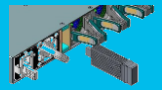
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Catalyst 9000 switch storage and compute

	Resource type	Catalyst 9200	Catalyst 9300**	Catalyst 9400*	Catalyst 9500	Catalyst 9500 High Perf	Catalyst 9600
Networking	AppGig Port (1G)	No	Yes	Yes	No	No	No
	Management Port	No	Yes	Yes	Yes	Yes	Yes
Resources	Memory	No	2GB	up to 8GB	up to 8GB	up to 8GB	up to 8GB
	CPU	No	1 core (25%)	1 core (25%)	1 core (25%)	1 core (25%)	1 core (25%)
	Storage	No	120GB (USB3.0/SSD)	240-960GB (SATA)	120GB (USB3.0/SSD)	240-960GB (SATA)	240-960GB (SATA)

Catalyst 9300/9500

USB 3.0
120GB



Back panel



Catalyst 9400

M2 SATA
240/480/960GB



Plug into removable SUP



Catalyst 9500 high-performance

M2 SATA
240/480/960GB



Back panel



For local storage and app hosting production

- 3rd party USB drives in front panel are not supported
- Applications can be hosted via CLI too

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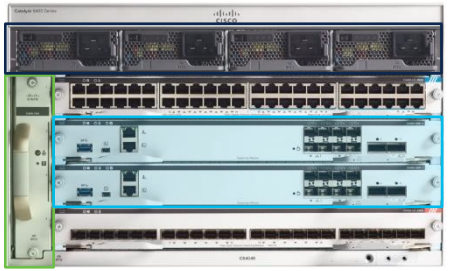
* Roadmap for 9410 chassis

** 1+1 Auto Restart

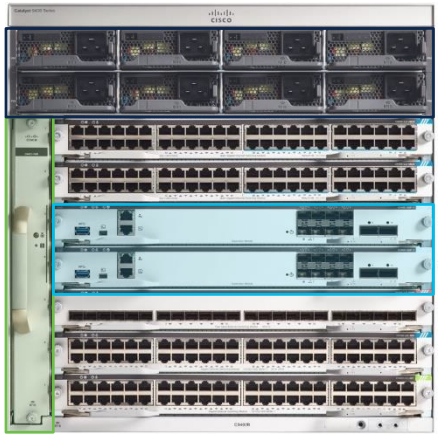
Cisco Catalyst 9400 Series



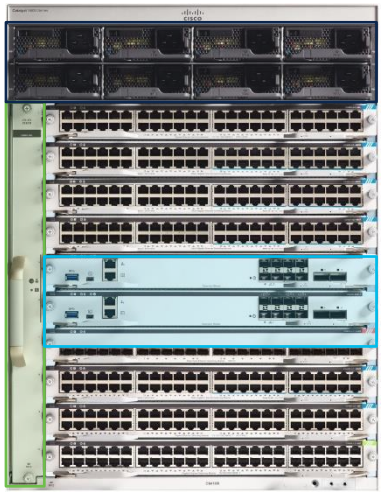
Cisco Catalyst 9400 Series chassis



4-slot



7-slot



10-slot

Power supplies	Fan tray	Supervisors	Line cards

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Chassis







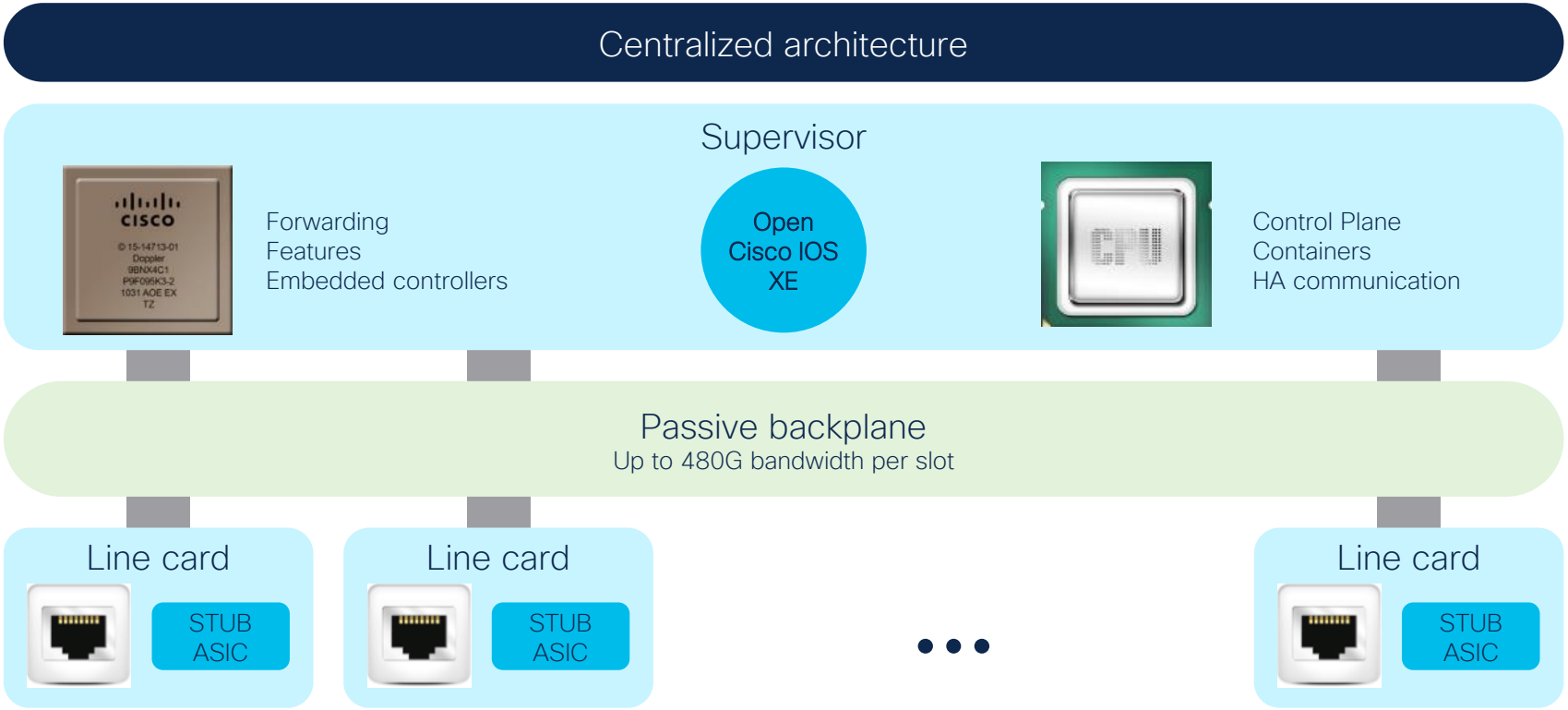
	4-slot	7-slot	10-slot
Supervisors	2 (redundant)		
Line cards	2	5	8
Ports	96x 10/100/1000 48 Multigigabit 56 SFP/SFP+, 2 QSFP+	240x 10/100/1000 120 Multigigabit; 128 SFP/SFP+, 2 QSFP+	384x 10/100/1000 192 Multigigabit 200 SFP/SFP+, 2 QSFP+
Dimensions	W:17.5 in.; D:16.25 in.; H:6RU	W:17.5 in.; D:16.25 in.; H:10RU	W: 17.5 in.; D:16.25 in.; H: 13RU
BW per line card slot	480G	480G	480G
BW between Sup slots	720G		
Power supply	4 PS (N+1 and N+N)	8 PS (N+1 and N+N)	8 PS (N+1 and N+N)
PoE per slot	4800W		
Cooling	Side to side (front to back for PS)		

High-density 10G ports, 100G uplinks

Ready for future higher-power PoE devices

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Cisco Catalyst 9400 Series
Centralized Modular Architecture



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Sup-1XL – Overview

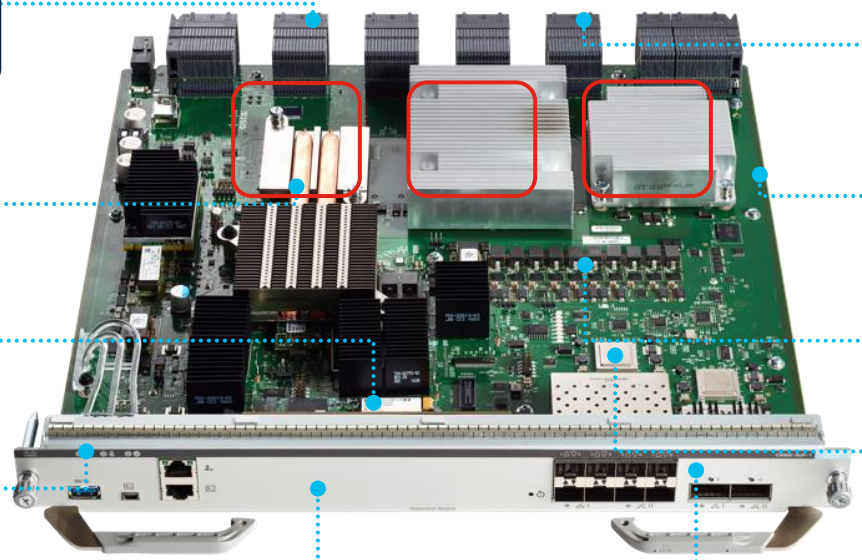
720G line cards/uplinks

UADP 2.0 XL ASICs

M.2 SATA SSD
(optional: Up to 1 TB)

USB 2.0/3.0

MACsec 256



Line card slot BW:
4-slot: 240G (> 150 byte)
7-slot: 120G (> 150 byte)
10-slot: 80G (> 150 byte)

Templates:
Access, Core, SDA

16 GB DRAM and
16 GB flash

2.4-GHz quad-core
x86 CPU

Uplinks:
8x 10G, 2x 40G

Optimized for core deployment

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Cisco Catalyst 9400 Series Supervisors

Feature		Access	Access/Aggregation	
		 SUP1	 SUP1-XL-Y	 SUP1-XL
25GE Support		✗	✓	✗
SDA Support	Fabric Edge Node	✓	✓	✓
	Border Node/Control Plane	✗	✓	✓
Max. Bandwidth (Per Slot)		80G	240G (4 slot), 120G (7 slot), 80G (10 slot)	
Switch Database Management (SDM) template		Access	Access, SD-Access, Core, NAT	
HA Capabilities	Stackwise Virtual	✓*	✓	✓
	NSF/GIR	✓	✓	✓
	SSO	✓	✓	✓

* Requires additional License (C9400-SUP-UPG-LIC=)

Lead with SUP-1XL/SUP-1XL-Y for High Performance Access & Low/Mid scale Aggregation Deployments

Cisco Catalyst 9400 templates (for Sup-1XL, 1XL-Y)

	16.6 to 16.8	16.9 and beyond			
	Access	Access	Core	SD-Access	NAT
Longest prefix match (LPM)	64,000	64,000	64,000	64,000	64,000
Host route	48,000	48,000	32,000	**80,000**	48,000
Layer 2 multicast	16,000	16,000	16,000	16,000	16,000
Layer 3 multicast	16,000	16,000	**32,000**	16,000	32,000
MAC addresses	64,000	**64,000**	16,000	16,000	16,000
SGTs	8000	8000	8000	8000	8000
Flexible NetFlow entries	128,000 per ASIC	128,000 per ASIC	128,000 per ASIC	128,000 per ASIC	128,000 per ASIC
Security ACLs	18,000	18,000	18,000	18,000	18,000
QoS ACLs	18,000	18,000	18,000	18,000	3000
PBR/NAT	2000	2000	2000	2000	**16,000**
Tunnels	1000	1000	1000	1000	1000
LISP	1000	1000	1000	1000	1000
MPLS L3VPN VRFs	256	256	256	N/A	256
MPLS labels	8000	16,000	**24,000**		16,000
MPLS L3VPN routes VRF	16,000	32,000	32,000		32,000
MPLS L3VPN routes prefix	4000	4000	4000		4000
MVPN MDT tunnels	256	1000	1000		1000
L2VPN EoMPLS attachments	256	1000	1000		1000

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NetFlow

NetFlow entries: 128,000 per ASIC

Sup-1, Sup-1XL, Sup-1XL-Y uplink – Single Sup



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Sup-1, Sup-1XL, Sup-1XL-Y dual Sups – Uplink



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Active Disabled

Line cards – Copper 1G



48x 10/100/1000 data

RJ-45 (data)
48x 10/100/1000
Cisco TrustSec® and MACsec 256

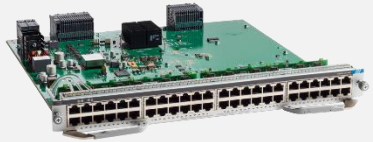


48x 10/100/1000 PoE, PoE+



48x 10/100/1000 PoE, PoE+, Cisco UPOE®

RJ-45 (Cisco UPOE)
48x 10/100/1000
PoE, PoE+; PoE, PoE+, Cisco UPOE
TrustSec and MACsec 256

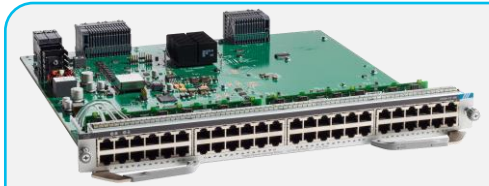


48x 10/100/1000 PoE, PoE+, UPOE®, UPOE+®(802.3bt)

RJ-45 (UPOE+® / 802.3bt)
24x 10/100/1000 plus
24x 100M/1G/2.5G/5G/10G
PoE, PoE+, Cisco UPOE
TrustSec and MACsec 256

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Line Cards – Copper mGig



24x 1G + 24x mGig UPOE®

RJ45 (mGig) multiGigabit
24x 10/100/1000 +
24x 100/1G/2.5G/5G/10G
PoE/PoE+/UPOE®
TrustSec and MACsec(256

Line cards – Fiber



24x SFP



48x SFP

SFP (1G)
48x 100/1000
Cisco TrustSec® and MACsec 256



24x SFP/SFP+

Fiber (1G/10G)
24x 1G/10G
TrustSec and MACsec 256

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Cisco Catalyst 9400 Series – Power supplies

- Modular design: 4 PS for 4-slot chassis; 8 PS for 7- and 10-slot chassis
- Combined mode by default, and Redundant mode N+N or N+1
- Slot priority: Lower-number slot with higher power priority (user configurable)
- Platinum-rated PS: 90%+ efficiency
- Output:
  - 3200W AC PS with 240V input (1570W with 120V input. 16A input)
  - 2100W AC PS with 240V input (940W with 120V input. 10.4A input)
  - 3200W DC PS input voltage (-40 to -72 VDC)

Cisco® Catalyst® 9400 Series supports mixed-voltage input and mixed-capacity power supply. But for simplicity, use the same input voltage and the same capacity power supplies

Use redundant mode (N+1 or N+N).





N+N



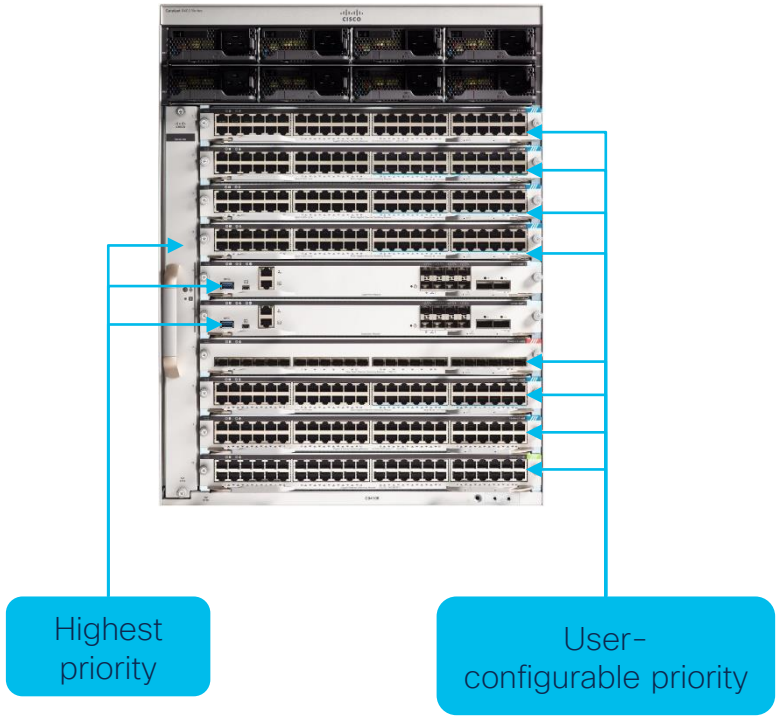
N+1

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Приоритет питания

- All components in the system are assigned a power priority level
- Supervisors and fan tray have the same highest priority level
- Line cards with lower slot numbers have the higher power priority level by default if "`power supply autoLC shutdown`" is configured
- Software allows user-configurable power priority for line card slots

```
C94(config)#power supply autoLC priority ?
  <1-7>  Physical slot number
  <cr>
C94(config)#power supply autoLC priority
```



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Cisco Catalyst 9400 Series – Fan tray

- Redundant: N+1 Fans
- Flexible service:
  Fan tray can be replaced from the front or the back
- Efficient:
  Variable speed per fan depends on the load, temperature, and altitudes (=> lower noise)
- The system can safely run without a fan tray for only 2 minutes
- Enabling **service mode** before servicing increases fanless operation to **4 minutes**
- All fans operate at full speed for 10 minutes in service mode







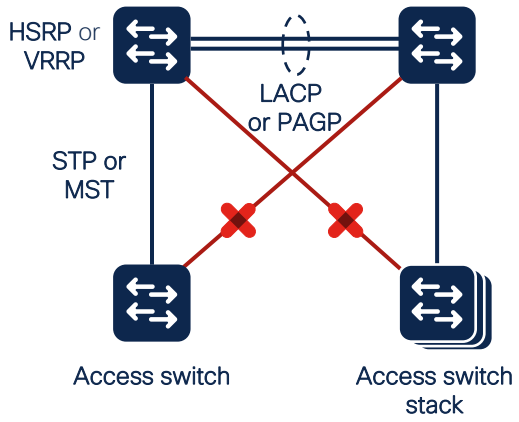
Command to enable fan tray service mode

C9400# test platform hardware chassis fantray service-mode on
fantray service mode on

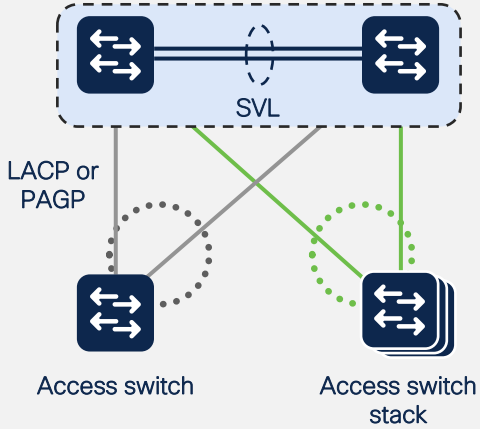
StackWise Virtual

StackWise Virtual
Topology comparisons

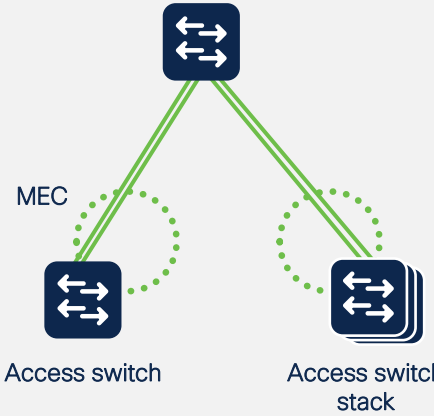
Traditional



SV – physical



SV – logical



Benefits of StackWise® Virtual

Simplify operations by eliminating STP, FHRP, and multiple touchpoints

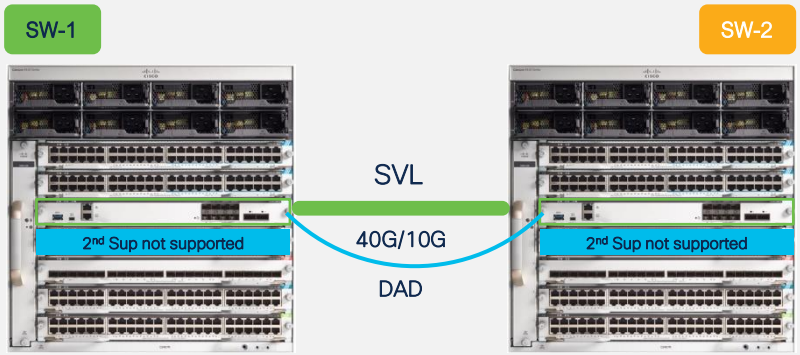
Double bandwidth and reduce latency with Active-Active Multichassis EtherChannel (MEC)

Minimize convergence with subsecond stateful and graceful recovery (SSO/NSF)

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StackWise Virtual – 9400 Series
Stacking and cables

StackWise® Virtual



SVL is supported on all 9400 Series chassis with all supervisors Sup-1, Sup-1-XL, Sup-1-XL-Y

- SVL links should be on the **same speed ports** (10G or 40G, cannot be mixed)
  - **Up to 8** ports in 10G or 2 ports in 40G are supported.
- DAD links should be on the **same speed** ports (1G, 10G or 40G, cannot be mixed)
  - **Up to 4** ports are supported
- SVL and DAD configuration is also supported on Line Cards starting 16.12.2 release.
- In SVL mode, **2nd Supervisor** is not supported in the chassis and will be powered off if inserted.
- **SVL is only supported between same 9400 models with same supervisors in the same slots**

- Cisco StackWise Virtual is a distribution layer technology, allowing stacking of **only** two switches using fixed front panel ports.
- Cisco StackWise Virtual supports flexible distances with support for all supported cables and optics.
- With Cisco IOS® XE Release16.11.1, SVL and DAD are supported on line cards with controlled availability.

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In-Service Software Upgrade (ISSU)

(16.9.1 and later)

Dual-supervisor ISSU

In-Service Software Upgrade (ISSU) overview

- ISSU provides a mechanism to perform software upgrades and downgrades (major or minor release) without taking the **complete switch** out of service
- Leverages the capabilities of Nonstop Forwarding (NSF) and SSO to always allow one of the supervisors in the chassis to keep forwarding traffic during a Cisco IOS® Software upgrade (or downgrade)
- ISSU supports upgrades, downgrades, and rollbacks



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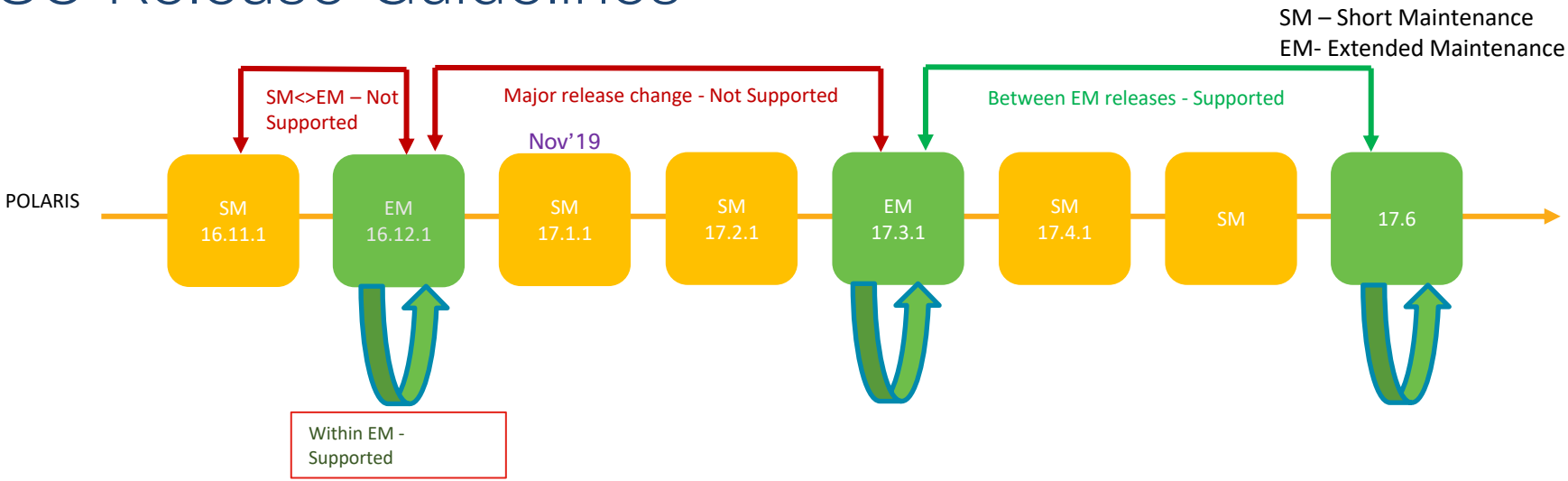
Dual-supervisor ISSU prerequisites

Prerequisites

- Ensure that both active and standby supervisors are configured in SSO mode
- System must be booted with packages/install mode
  - ✗ Bundle mode : `(config)# boot system flash:[BIN FILE]`
  - ✓ Install mode : `(config)# boot system switch all flash:packages.conf`
- Auto boot must be enabled
- NSF should be configured if a supported routing protocol is enabled on the chassis

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ISSU Release Guidelines



ISSU support start from 16.9.1 Release on C9400

[Cisco IOS XE Software Support Timeline for Cisco IOS XE Software Release Starting with 16.x.x and 17.x.x Product Bulletin]

Supported

- Within EM Release - Any to Any within the EM Release (16.12.X <>16.12.X)
- Between EM Releases but within major releases [within +/- 2 EM releases]

Not Supported

- SM to EM or EM to SM.(16.11.X <>16.12.x)
- Within SM Release - (16.11.1<>16.11.2)
- Beyond the +/- 2 EM Releases.
- When there is a major release change.
    - For example 16.x.x to 17.x.x

StackWise Virtual ISSU upgrade steps

3-step process

1. #Install add file <tftp/ftp/flash/disk:*.bin>
2. #Install activate ISSU
3. #Install commit

Granular control over the upgrade process with the ability to roll back

1-step process

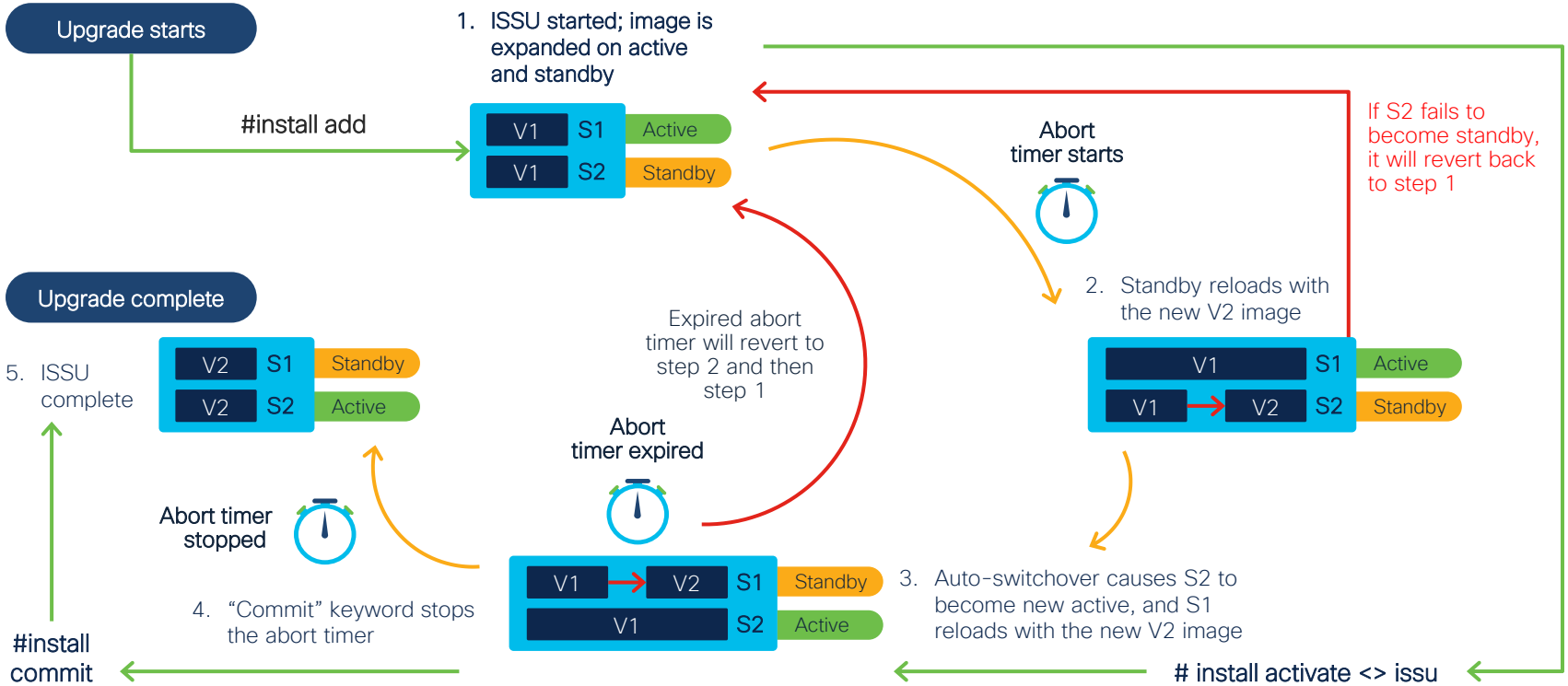
#install add file <tftp/ftp/flash/disk:*.bin>activate ISSU commit

However, the system has the capability to roll back to older images in case of single fault scenarios (such as a crash etc.) during the upgrade process. In this workflow no manual rollback is allowed.

Single command to perform complete ISSU

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Cisco Catalyst 9000 family ISSU workflow



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Catalyst 9000 – Access Comparison





* Default SDM Template	9200		9300		9400	
Model	9200L	9200	9300L	9300	SUP1	SUP1XL
Stack/Slot Bandwidth	80G	160G	320G	480G	80G	240G
MAC Addresses *	16K	32K	32K	32K	64K	64K
IP Routes *	3K	4K	8K	8K	64K	64K
Flexible Netflow *	16K per ASIC	16K per ASIC	64K per ASIC	64K per ASIC	128K per ASIC	128K per ASIC
Power Over Ethernet	15,30W	15,30W	15,30,60W	15,30,60,90W	15,30,60,90W	15,30,60,90W
Perpetual & Fast POE	Yes	Yes	Yes	Yes	Yes	Yes
Precision Time Protocol	Yes	Yes	Yes	Yes	--	--
App Hosting	No	No	Yes	Yes	Yes	Yes
MACsec Encryption	128-bit AES	128-bit AES	256-bit AES	256-bit AES	256-bit AES	256-bit AES
Software Defined Access	Edge	Edge	Edge, Border, CP	Edge, Border, CP	Edge, Border, CP	Edge, Border, CP



Cisco Catalyst 9500 Series

Cisco Catalyst 9500 Series

Новое поколение фиксированных коммутаторов ядра/агрегации

UADP 2.0XL

- 40G at the price of 10G
- Industry's first 40G enterprise switch
- Optimized 10G switch for midsize backbone

C9500-16X
C9500-40X
C9500-24Q
C9500-12Q



10G and 40G модели

UADP 3.0

- 1 TB SSD storage
- Industry's first 100G enterprise switch
- Flexible templates

C9500-24Y4C
C9500-48Y4C
C9500-32QC
C9500-32C



100G/40G модели

25G/10G модели



Modular fans



Modular uplinks



Modular power supplies



Storage for application hosting

Extending Cisco® Catalyst® 4500-X and 6800 Series leadership in fixed core
13x throughput (3.2 Tbps)
6x performance (1 Bpps)
No oversubscription
8x 40G density
Pluggable SSD storage
USB 3.0
4x memory and flash
2x CPU cores
Customizable templates
Cisco StackWise® Virtual

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Cisco Catalyst 9500 Series

High-level overview

UADP 2.0 XI



Built-in RFID (passive)

USB 2.0 flash drive

2.4-GHz quad-core x86 CPU
16 GB of DDR4 DRAM
32 MB per ASIC packet buffer

UADP 2.0 XL ASIC
240G bandwidth

Every port 40G,10G,* and 1G* capable

Cisco StackWise Virtual



C9500-24Q
24x 40G



C9500-12Q
12x 40G



C9500-40X
40x 1/10G



C9500-16X
16x 1/10G

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* With QSFP to SFP or SFP+ (QSA) adapter

Cisco Catalyst 9500 Series
Network modules

C9500-NM-2Q

Cisco Catalyst 9500 Series network module 2-port 40G with QSFP+



C9500-NM-8X

Cisco Catalyst 9500 Series network module 8-port 1G/10G with SFP and SFP+

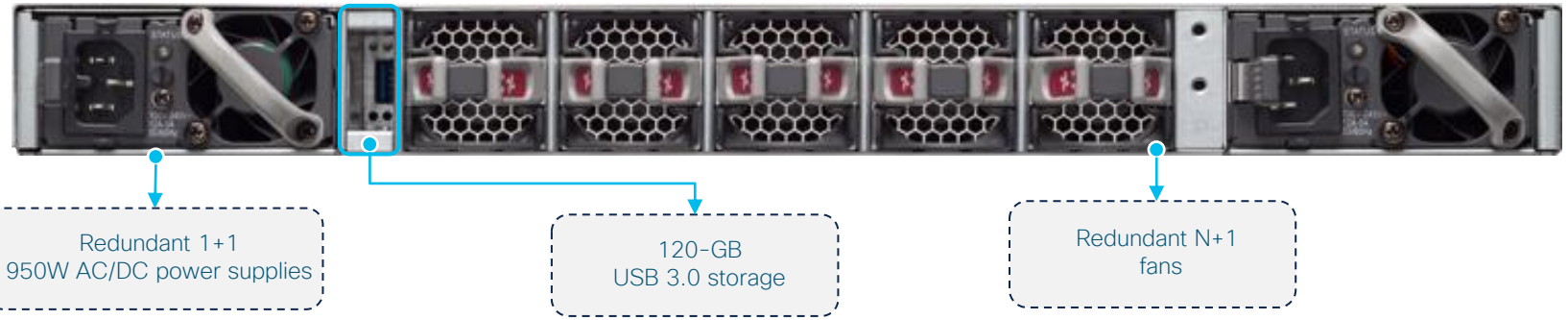


Uplink modules supported on C9500-40X and C9500-16X
Support for Online Insertion and Removal (OIR)

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Cisco Catalyst 9500 Series

Redundant power supplies and fans



Power supply highlights

- Hot-swappable
- AC, DC, and mixed power supplies supported
- Maximum output 12V/950W at 220V/110V AC input
- More than 90% power efficiency at 50% to 100% of load
- **Redundant load sharing (1+1) mode only**

Fan highlights

- Variable-speed high-efficiency fans
- Detect ambient temperature and adjust fan speeds
- Individual fans are OIR capable up to 120 seconds
- **Front-to-back airflow**
- Can still operate with individual fan tray failure

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Cisco Catalyst 9500 Series Switches scale comparison

Model	C9500-16X	C9500-40X	C9500-12Q	C9500-24Q	C9500-32C	C9500-32QC	C9500-48Y4C, C9500-24Y4C
Switching capacity	240G	480G	480G	960G	3.2T	1.6T	1.6T
Forwarding rate	320 Mpps	720 Mpps	720 Mpps	1440 Mpps	2 Bpps	1 Bpps	1 Bpps
MAC addresses	64,000*	64,000*	64,000*	64,000*	82,000*	82,000*	82,000*
LPM/host routes (IPv4/v6 routes)	64,000/32,000* 32,000/16,000	64,000/32,000* 32,000/16,000	64,000/32,000* 32,000/16,000	64,000/32,000* 32,000/16,000	212,000/ 212,000*	212,000/ 212,000*	212,000/ 212,000*
Multicast routes	48,000*	48,000*	48,000*	48,000*	32,000*	32,000*	32,000*
Security ACLs	18,000*	18,000*	18,000*	18,000*	27,000*	27,000*	27,000*
QoS ACLs	18,000*	18,000*	18,000*	18,000*	16,000*	16,000*	16,000*
Flexible NetFlow	128,000 per ASIC	128,000 per ASIC	128,000 per ASIC	128,000 per ASIC	96,000*	96,000*	96,000*
Spanning Tree instances**	256	256	256	256	1000	1000	1000

* Depends on SDM template.
** For 16.11.1 release.

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UADP 3.0



Cisco Catalyst 9500 25G/100G

High-performance

Built-in RFID (passive)

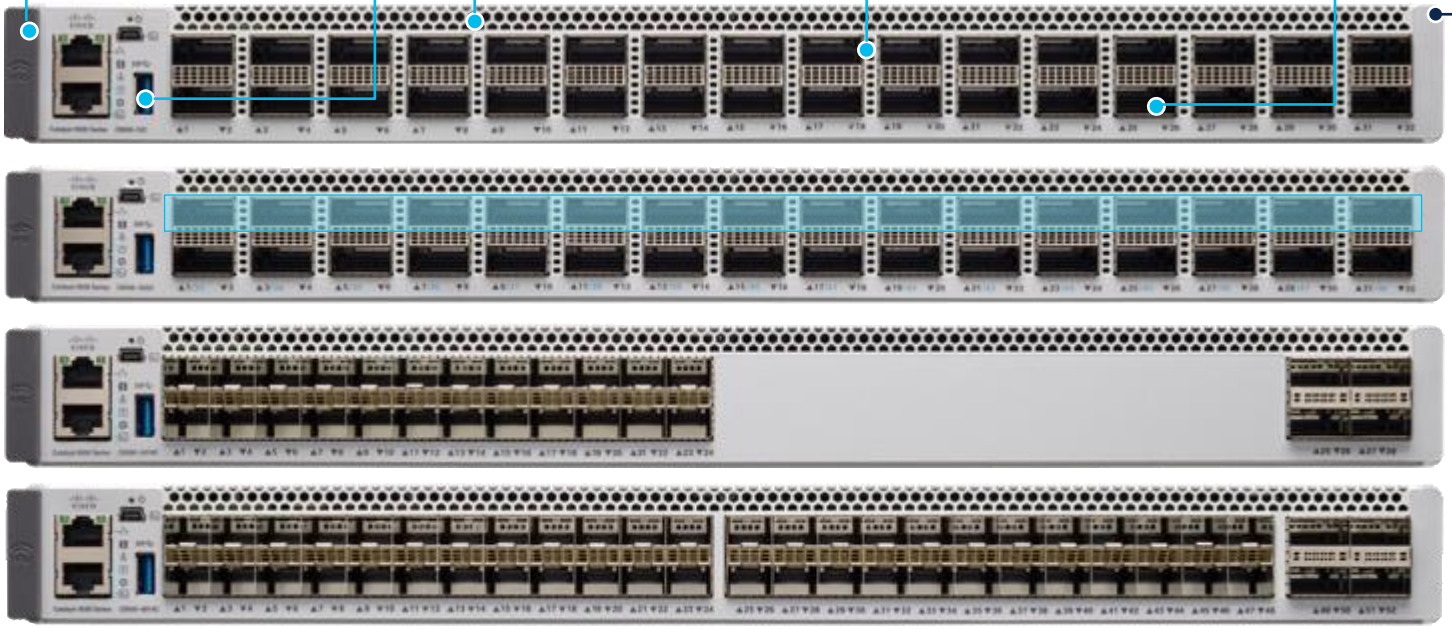
USB 3.0 flash drive

2.4-GHz quad-core x86 CPU
16 GB of DDR4 DRAM
16 GB flash
36 MB per ASIC unified packet buffer

Next-generation UADP 3.0 ASIC 1.6-Tb bandwidth

Every port 100G, 40G, 10G,* and 1G* capable

Cisco StackWise Virtual



C9500 – 32C
32x 40G/100G

C9500-32QC
16x 100G or
32x 40G

C9500-24Y4C
24x 1G/10G/25G +
4x 40G/100G

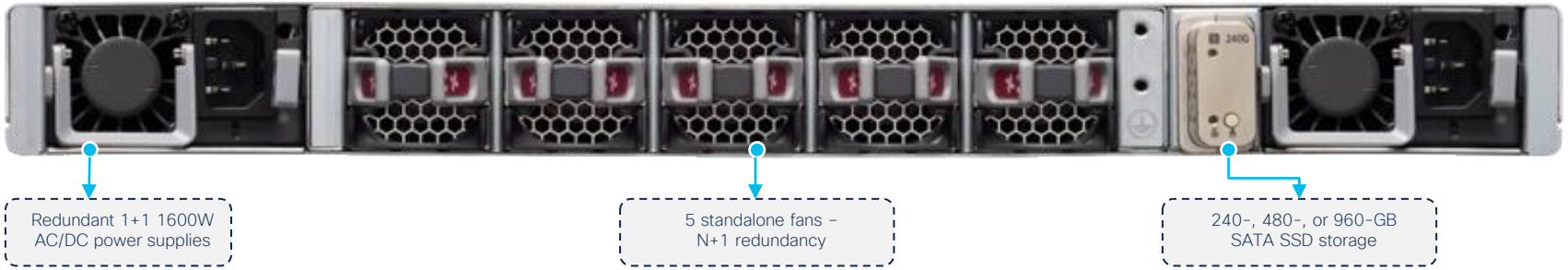
C9500-48Y4C
48x 1G/10G/25G +
4x 40G/100G

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* With QSFP to SFP or SFP+ (QSA) adapter

Cisco Catalyst 9500 – C9500-32C

Redundant power supplies and fans



Power supply highlights

- Hot-swappable
- AC, DC, and mixed power supplies supported
- Maximum output is **1600W at 220V and 1000W at 110V**
- More than 90% power efficiency at 50% to 100% of load
- Redundant load sharing (1+1) mode only

Fan highlights

- 5 variable-speed high-efficiency fans at rear of chassis
- Detect ambient temperature and adjust fan speeds
- Fans are hot-swappable
- **Front-to-back airflow**
- Can still operate with one fan unit failure

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Cisco Catalyst 9500 – C9500-32QC,24Y4C,48Y4C

Redundant power supplies and fans



Power supply highlights

- Hot-swappable
- AC, DC, and mixed power supplies supported
- Maximum output **12V/650W at 220V/110V AC Input**
- More than 90% power efficiency at 50% to 100% of load
- Redundant load sharing (1+1) mode only

Fan highlights

- **Dual variable-speed high-efficiency fan trays**
- Thermal sensor to detect ambient temperature and adjust fan speeds
- Fan trays are hot-swappable
- **Front-to-back airflow**
- Can still operate with individual fan tray failure

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Cisco Catalyst 9500 – какую модель выбрать?

	10G	25G	40G	100G
> 24 ports	 40P 10G (Uplinks: 8P 10G, 2P 40G)	 48P 25G (Uplinks: 4P 100G)	 32P 40G	 32P 100G
<= 24 ports	 16P 10G (Uplinks: 8P 10G/2P 40G)	 24P 25G (Uplinks: 4P 100G)	 24P 40G  12P 40G	 16P 100G

Порты 25G обратно совместимы с 100M/1G/10G
Порты 100G обратно совместимы с 40G и с 1G/10G (при использовании QSA адаптера)
Подробнее о совместимости трансиверов: tmgmatrix.cisco.com

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Cisco Catalyst 9500 Series

Switch Database Management (SDM) template

Core template
Максимальные ресурсы для unicast и multicast маршрутизации и безопасности
(Default: C9500 High Performance)

SD-Access template
Максимальные ресурсы для безопасности и поддержка SDA фабрики

Пользователь может настраивать шаблоны в 9500



Cisco® Catalyst® 9500 Series

Distribution template
Максимальные ресурсы для MAC адресов и безопасности
(Default: C9500 Switches)

NAT template
Максимальные ресурсы для настройки NAT на коммутаторе

Применение шаблонов доступно на 9400 Sup-1XL(Y) и Catalyst 9500 с UADP 2.0 XL и Catalyst 9500 **High Performance** с UADP 3.0

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New - IOSXE 17.4.1

Cisco Catalyst 9600 & 9500H Series

SDM Templates, Scale & Customization

Feature		Distribution	Core (default)	SDA	NAT
Routes (IPv4/IPv6)		114K/114K	212K/212K	212K/212K	212K/212K
Multicast routes (IPv4/IPv6)		16K/16K	32K/32K	32K/32K	32K/32K
MAC address table		82K	32K	32K	32K
IGMP/MLD snooping		2K	2K	2K	2K
Flexible NetFlow (Ingress)		49K/ASIC	32K/ASIC	32K/ASIC	32K/ASIC
Flexible NetFlow (Egress)		49K/ASIC	32K/ASIC	32K/ASIC	32K/ASIC
SGT label		32K	32K	32K	32K
Security ACL	Ingress	12K		8K	12K
	Egress	15K		19K	8K
QOS ACL	Ingress	8K		8K	4K
	Egress	8K		8K	4K
NetFlow ACL	Ingress	1K		1K	1K
	Egress	1K		1K	1K
SPAN	Ingress	0.5K		0.5K	0.5K
	Egress	0.5K		0.5K	0.5K
PBR/NAT		3K		2K	15.5K
CPP		1K		1K	1K
Tunnel termination and MACsec		3K		3K	2K
LISP		1K		2K	1K

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Higher scale

Customizable resources

Cisco Catalyst 9600 Series



Cisco Catalyst 9600 Series Switches

Ready for Catalyst 6500/6800 migration with Industry-leading feature set

20 years of innovation
$50B of install base



Catalyst 6500/6800

Resiliency | Security | Breadth of services

Catalyst® 6000 parity

- L2, L3, Multicast, ACL, QoS
- Resiliency: ISSU and SWV
- Full Flexible NetFlow
- SD-Access, MPLS

IBN-ready

- ETA*, Trustworthy Systems MACsec-256 encryption,
- Programmability/ telemetry
- NBAR2 AVC*, Assurance
- Hot patching, GIR
- EVPN BGP VxLAN

Powered by UADP 3.0 and open Cisco IOS XE



Catalyst 9600 Series

Catalyst 6000 – Gold standard for campus core

Catalyst 9600 Series – Raising the bar on campus core

* Roadmap

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Cisco Catalyst 9600 Series
Quick Overview

Dual-serviceable Fan tray

Built-in RFID

Blue Beacons (system, fan tray, sup, cards)

4 Modular N+1 Power Supplies



4 Line-Card slots

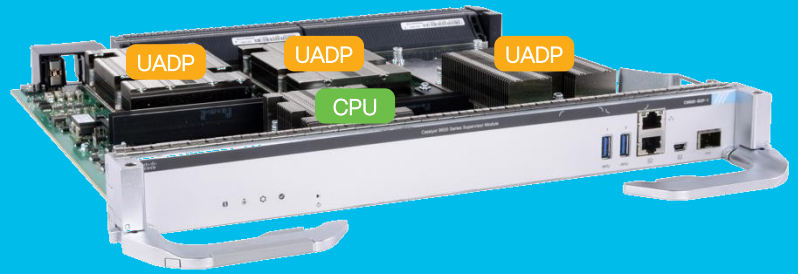
2 Supervisor slots (dedicated)

6.4 Tbps per slot from each Supervisor slot

Dimensions
8RU
13.95 x 17.4 x 16.1
(H x W x D in inches)

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Cisco Catalyst 9600 Series
Supervisor 1



9.6 Tbps capacity	**2.4 Tbps** per slot
3x **UADP 3.0** ASIC	**8 core X86 CPU** @2.0 Ghz
Mgmt ports: **copper** and **fiber**	**16G DDR4** memory
Built-in RFID	M.2 SATA SSD (optional: up to 1 TB)
Blue Beacon	2x USB3 1x mini-B USB console

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Cisco Catalyst 9600 Series
Line cards

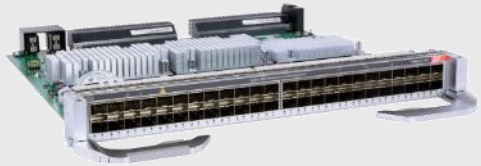


C9600-LC-24C - 100G/40G (fiber)

- 24 ports
- QSFP28/QSFP+
- Supports 100G and 40G

C9600-LC-48YL - 25G/10G/1G (fiber)

- 48 ports
- SFP28/SFP+/SFP
- Supports 25G, 10G, and 1G





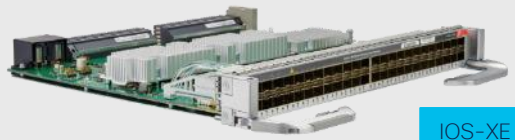
IOS-XE 17.1.1

C9600-LC-48TX - mGig (copper)

- 48 ports
- Copper 10G (NBASE-T/10BASE-T)
- Supports 10G,5G,2.5G,1G,100M and 10M

C9600-LC-48S- 1G (fiber)

- 48 ports
- SFP
- Supports 1G



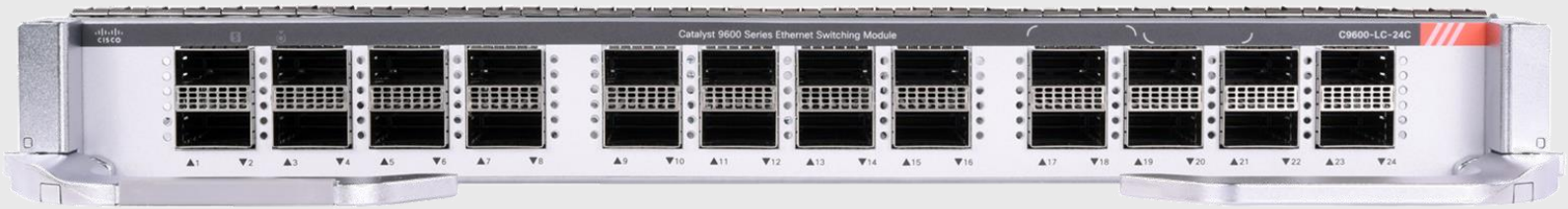
NEW

IOS-XE 17.2.1

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Cisco Catalyst 9600 Series

C9600-LC-24C – 100G/40G Line-Card



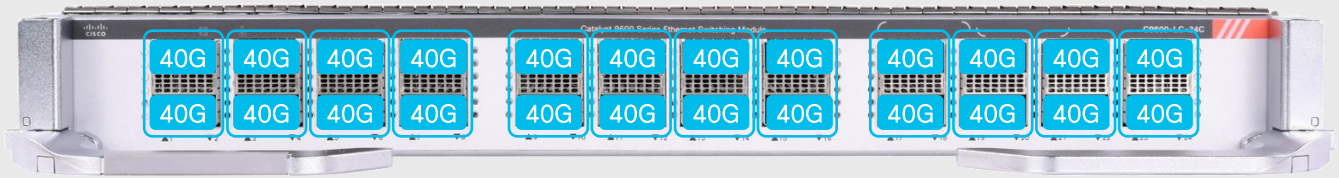
- All 24 ports are capable of 100G (QSFP28) OR 40G (QSFP+)
  - Hardware-ready with QSA (for 1G/10G)
- With Supervisor Engine 1
  - 40G: 24 x 40G (line rate with 148 byte or higher)
  - 100G: 12 x 100G (line rate with 187 byte or higher)
  - Every 2 ports in a port-group. Odd number ports can be 100G, and next even number port is disabled

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Cisco Catalyst 9600 Series
C9600-LC-24C with Supervisor Engine 1

- This line card appears in 40G mode by default
- Future supervisors can support 100G speed on all ports at the same time

Default mode
(all ports 40G)



100G
configuration



Fo<slot#>/0/1
Hu <slot#>/0/25

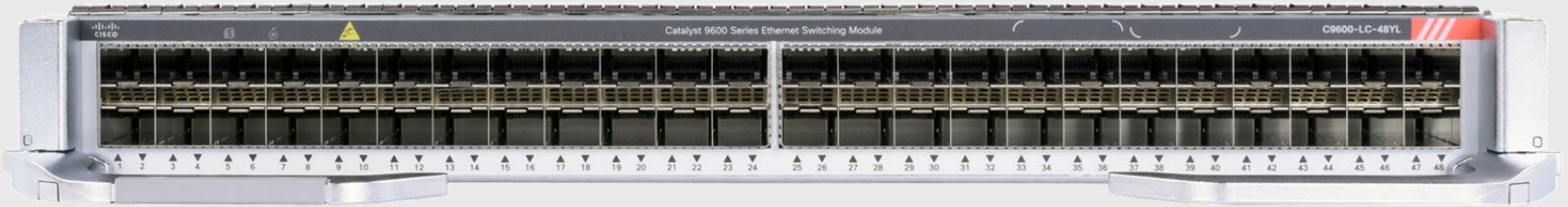
interface HundredGigE1/0/25 enable

- Enable Hu1/0/25 as 100G
- Disable Fo1/0/1 and 1/0/2

Fo<slot#>/0/23
Hu <slot#>/0/47

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Cisco Catalyst 9600 Series
C9600-LC-48YL - 25G/10G/1G Line-Card



- All 48 ports support 25G/10G/1G (SFP28/SFP+/SFP)
  - Line rate on all ports (at 187 bytes for 25G; any size for 10G/1G)
  - Any port, Any supported speed
- Port reference is always ”TwentyFive<slot#>/0/<port#>”
  - Port speed is auto-detected (based on the inserted transceiver)

* hardware capable of 10/100M

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Cisco Catalyst 9600 Series

C9600-LC-48TX – mGig Line Card

IOS-XE 17.1.1



For collapsed-core copper deployments and connectivity to servers

- All 48 ports can support 10G/5G/2.5G/1G/100M/10M
  - Line rate on all ports (any frame size)
  - Any port, Any supported speed
  - No PoE support (Data Only)
- Port reference is always “TenGigabit<slot#>/0/<port#>”
  - Port speed is auto-negotiate (default)

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Cisco Catalyst 9600 Series
1G Line card - C9600-LC-48S

IOS-XE 17.2.1



- All 48 ports support 1G
- Hardware capable of 10/100M*
- Line rate with 1G (any packet size with 1G)
- Port reference is always “Gig<slot#>/0/<port#>”

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*Roadmap

Cisco Catalyst 9600 Series
Fan tray





- N+1 (8+1) fan redundancy
- Flexible service - fan tray can be replaced from the portside or the back
- Efficient - variable speed per fan depends on the load, temperature, and altitudes (=>lower noise)
- Airflow – side-to-side airflow

Fan tray hot-swappable needs to be done within 120 seconds

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Cisco Catalyst 9600 Series
Power supplies



- Chassis has 4 slots for power supply
- Individual on/off switch for each power supply
- Supports a mix of AC (@220V) and DC power supplies

AC





- Supports both 110V and 220V input
- 2 KW output with 220V (1050W with 110V)
- Platinum rate power supply
- Redundant mode: Combined and N+1

DC

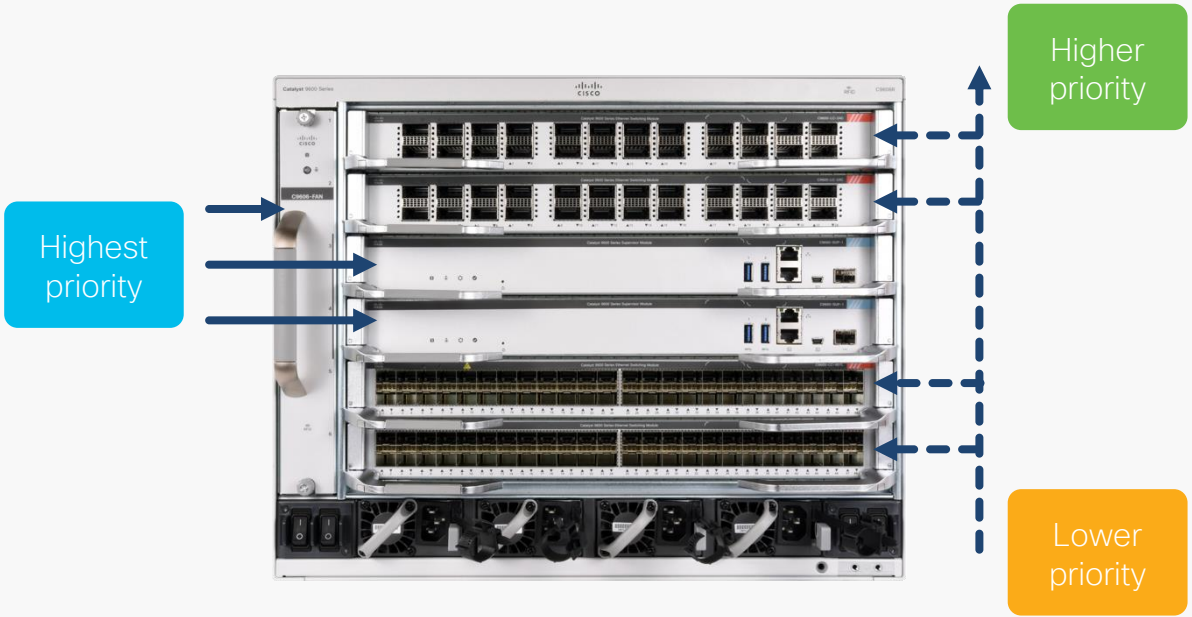




- Supports input range of -40V to -72V
- 2 KW output
- Platinum rate power supply
- Redundant mode: Combined and N+1

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Cisco Catalyst 9600 Series
Power Priority

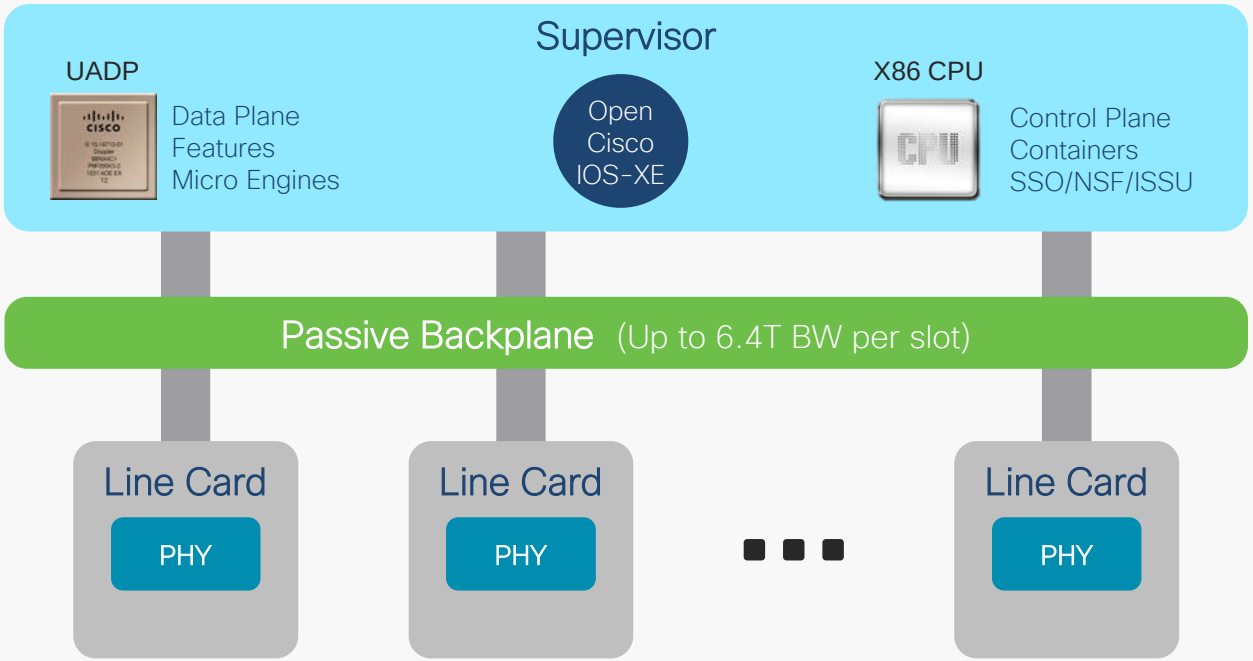


- All components in the system are assigned a power “priority” level
- Supervisors and Fan tray have the same “highest” priority level
- Line cards with lower slot numbers (top) have the “higher” priority level by default
- User-configurable power priority for Line card slots is on the roadmap

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Cisco Catalyst 9600 Series

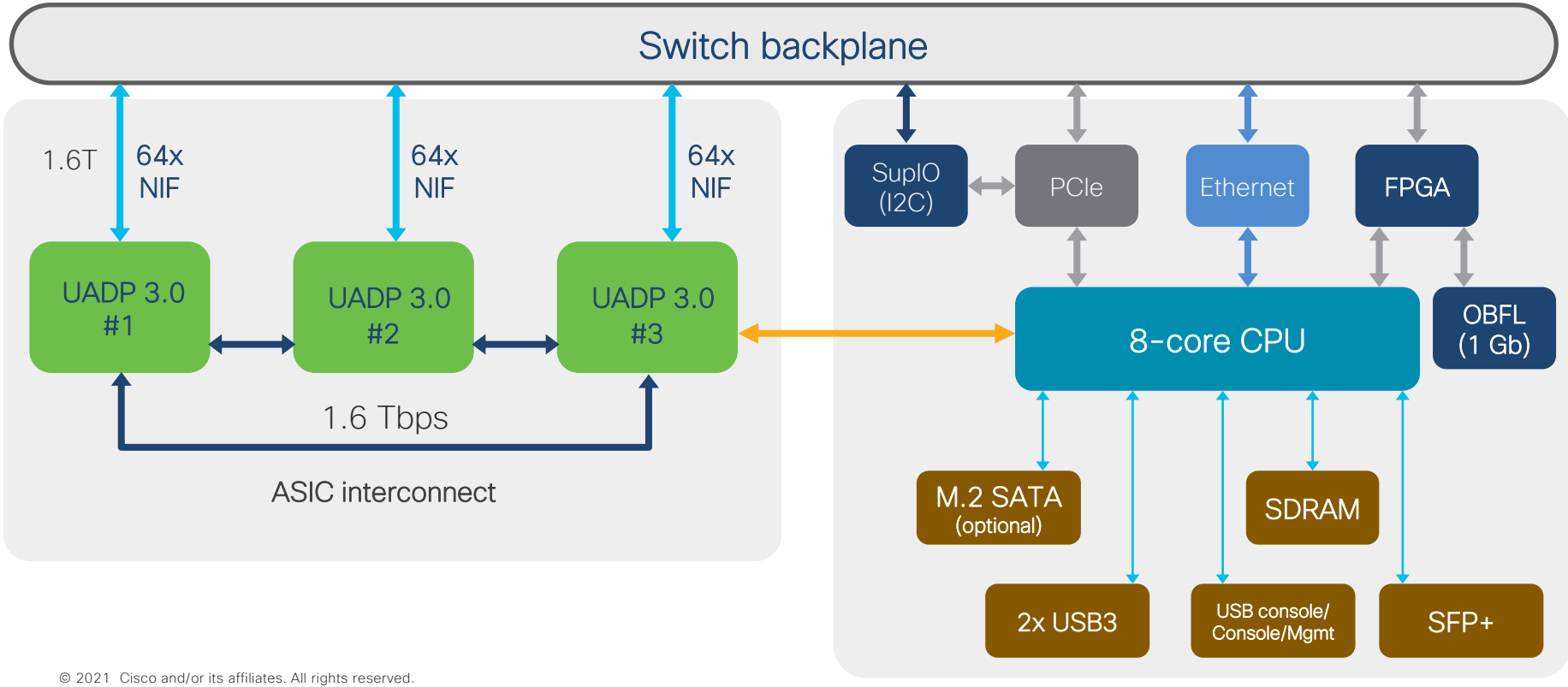
Centralized Modular Architecture



- **Centralized Architecture**
  - Hitless Switchover & Upgrades
  - Lower Latency (fewer ASIC)
- Forwarding, Queuing & Security on the Supervisor (UADP)
  - Unlock new performance & features with new Supervisor
- X86 CPU + Storage
  - Native Docker App Hosting
- **Passive Backplane**
- **Transparent Line Cards**
  - Increases MTBF (fewer ASIC)
  - Compatible with new Sup

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Cisco Catalyst 9600 Series
Supervisor 1 – Block Diagram



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Cisco Catalyst 9600 & 9500H Series
Switch Database Management (SDM) Templates

Core template
Maximizes system resources for **Layer 3 unicast** and **multicast routes** and **security**

(default for UADP3)

SD-Access template
Maximizes system resources for **policy entries** to support **fabric deployment**

User-Customizable
allows customizable ACL TCAM resources



Cisco® Catalyst® 9600 Series

Distribution template
Balances system resources between **Layer 3 routes** and **Layer 2 MAC** and **Netflow**

(default for UADP2 XL)

NAT template
Maximizes system resources for **NAT configurations** on the switch

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Cisco Catalyst 9600 & 9500H Series

SDM Templates, Scale & Customization

IOSXE 17.4.1

Feature		Distribution	Core (default)	SDA	NAT
Routes (IPv4/IPv6)		114K/114K	212K/212K	212K/212K	212K/212K
Multicast routes (IPv4/IPv6)		16K/16K	32K/32K	32K/32K	32K/32K
MAC address table		82K	32K	32K	32K
IGMP/MLD snooping		2K	2K	2K	2K
Flexible NetFlow (Ingress)		49K/ASIC	32K/ASIC	32K/ASIC	32K/ASIC
Flexible NetFlow (Egress)		49K/ASIC	32K/ASIC	32K/ASIC	32K/ASIC
SGT label		32K	32K	32K	32K
Security ACL	Ingress	12K		8K	12K
	Egress	15K		19K	8K
QOS ACL	Ingress	8K		8K	4K
	Egress	8K		8K	4K
NetFlow ACL	Ingress	1K		1K	1K
	Egress	1K		1K	1K
SPAN	Ingress	0.5K		0.5K	0.5K
	Egress	0.5K		0.5K	0.5K
PBR/NAT		3K		2K	15.5K
CPP		1K		1K	1K
Tunnel termination and MACsec		3K		3K	2K
LISP		1K		2K	1K

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Higher scale

Customizable resources

IOSXE 17.3.1

FIB Allocation Examples

* Netflow requires 2X for flow records

Feature	Customer 1 (L2 focus)	Customer 2 (L3 focus)	Customer 3 (FNF focus) *
L2 MAC	**128K**	32K	32K
L3 Unicast	144K	**256K**	64K
L3 Multicast	32K	16K	16K
L2 Multicast	16K	32K	16K
SGT & MPLS IP-to-Tag labels	64K	64K	32K
Netflow - Input	32K	32K	**64K** *
Netflow - Output	0	0	**64K** *
Total Resources	**416K**		

16K – 16384
32K – 32768

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Cisco Catalyst 9600 Sup1 and 9500 Switch Scale

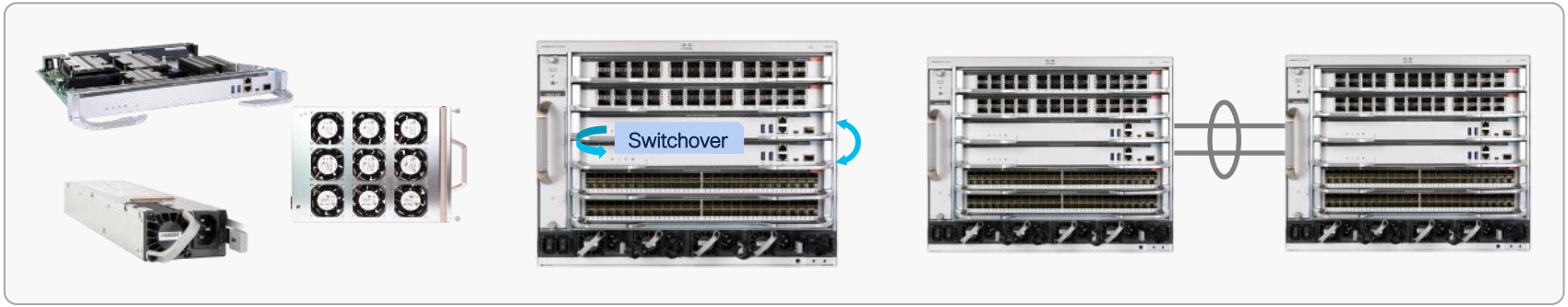
Model	C9600- Sup1	C9500-32C	C9500-32QC	C9500-48Y4C/ C9500-24Y4C
Switching capacity	9.6T	6.4T	3.2T	3.2T
Forwarding rate (IPv4/IPv6)	3 Bpps 3 Bpps	2 Bpps 2 Bpps	1 Bpps 1 Bpps	1 Bpps 1 Bpps
MAC addresses	82,000*	82,000*	82,000*	82,000*
LPM/host routes (IPv4/IPv6))	212,000/ 212,000*	212,000/ 212,000*	212,000/ 212,000*	212,000/ 212,000*
Multicast routes	32,000*	32,000*	32,000*	32,000*
Security ACLs	27,000*	27,000*	27,000*	27,000*
QOS ACLs	16,000*	16,000*	16,000*	16,000*
Flexible NetFlow (per ASIC)	96,000*	96,000*	96,000*	96,000*
VLAN ID	4,000	4,000	4,000	4,000
Spanning Tree instances	1,000	1,000	1,000	1,000

* Depends on SDM template

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High Availability

High availability
Protect business continuity



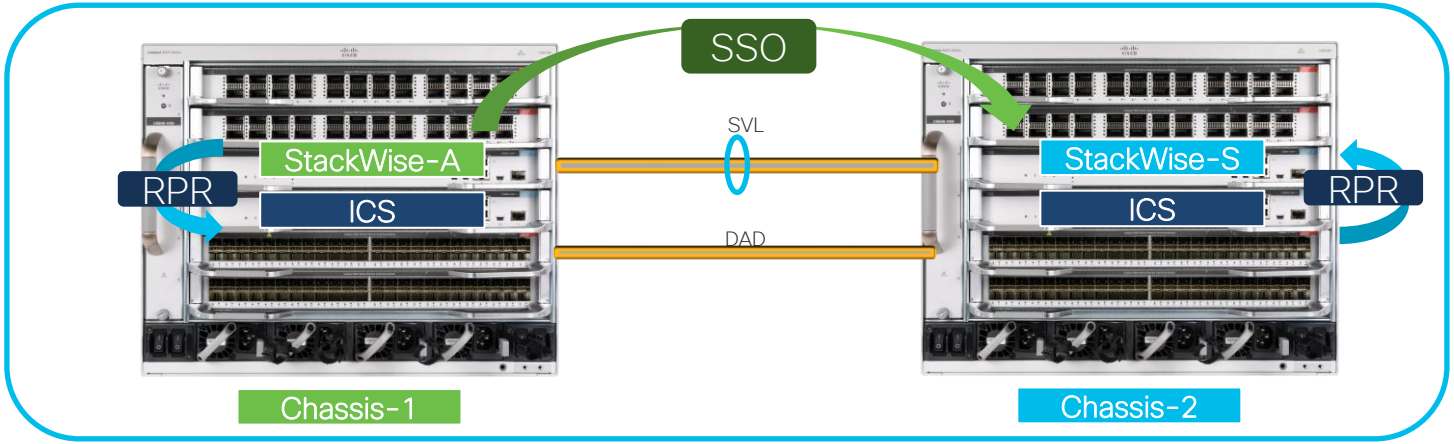
Physical redundancy	Stateful Switchover (SSO)	Non-Stop Forwarding (NSF)	In-Service Software Upgrade (ISSU)	StackWise®-Virtual
Redundant hardware • Redundant power supplies • Redundant fan in the fan tray • Redundant supervisors	**Sub-second failover** • Between supervisors within chassis (<5ms) • Between chassis with StackWise-Virtual	**Resilient L3 topologies** • NSF support for OSPF, EIGRP, ISIS, BGP	**Minimize upgrade downtime** • SMU • ISSU • GIR*	**Infrastructure resilience** • Multi-chassis EtherChannel (MEC) provides hardware-based failover

* Roadmap

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Quad Sup Support - 9600

StackWise Virtual Quad Sup RPR

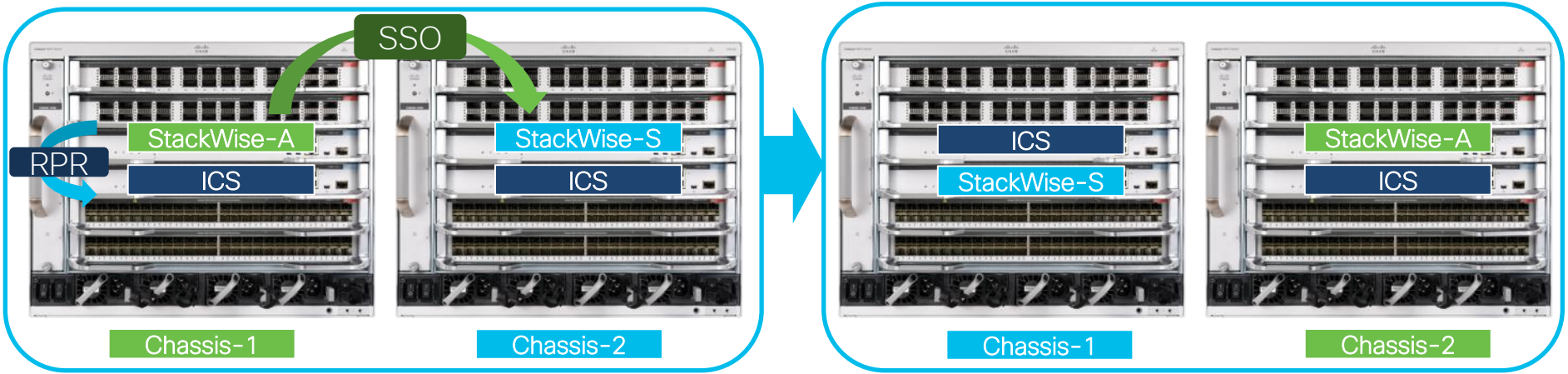


Role	Description	Control Plane	Data Plane
StackWise-A	StackWise Virtual Active In Chassis Active	Active	Active
StackWise-S	StackWise Virtual Standby In Chassis Active	Hot Standby	Active
ICS	In-Chassis Warm Standby	Warm Standby	Warm Standby

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Catalyst 9600 StackWise Virtual
Quad SUP RPR

IOSXE 17.2.1



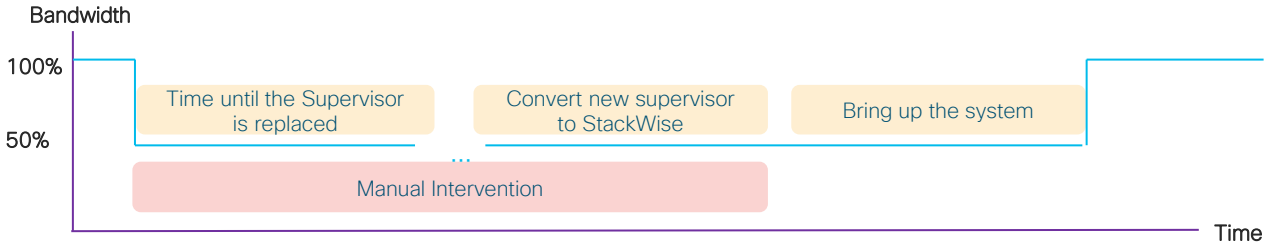
- Active supervisor in chassis-2 become StackWise Active
- Warm standby supervisor in chassis-1 continue the boot process
- Become StackWise standby while the line cards in chassis-1 reset

RPR:	Route Processor Redundancy
SSO:	Stateful Switchover
StackWise-A:	StackWise Virtual Active
StackWise-S:	StackWise Virtual Standby
ICS:	In-chassis Warm Standby

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StackWise Virtual Switchovers

Single SUP per Chassis



- Manual Intervention
- Non-Deterministic Recover time
  - Single-homed device
  - Back to full bandwidth

Dual SUP per Chassis



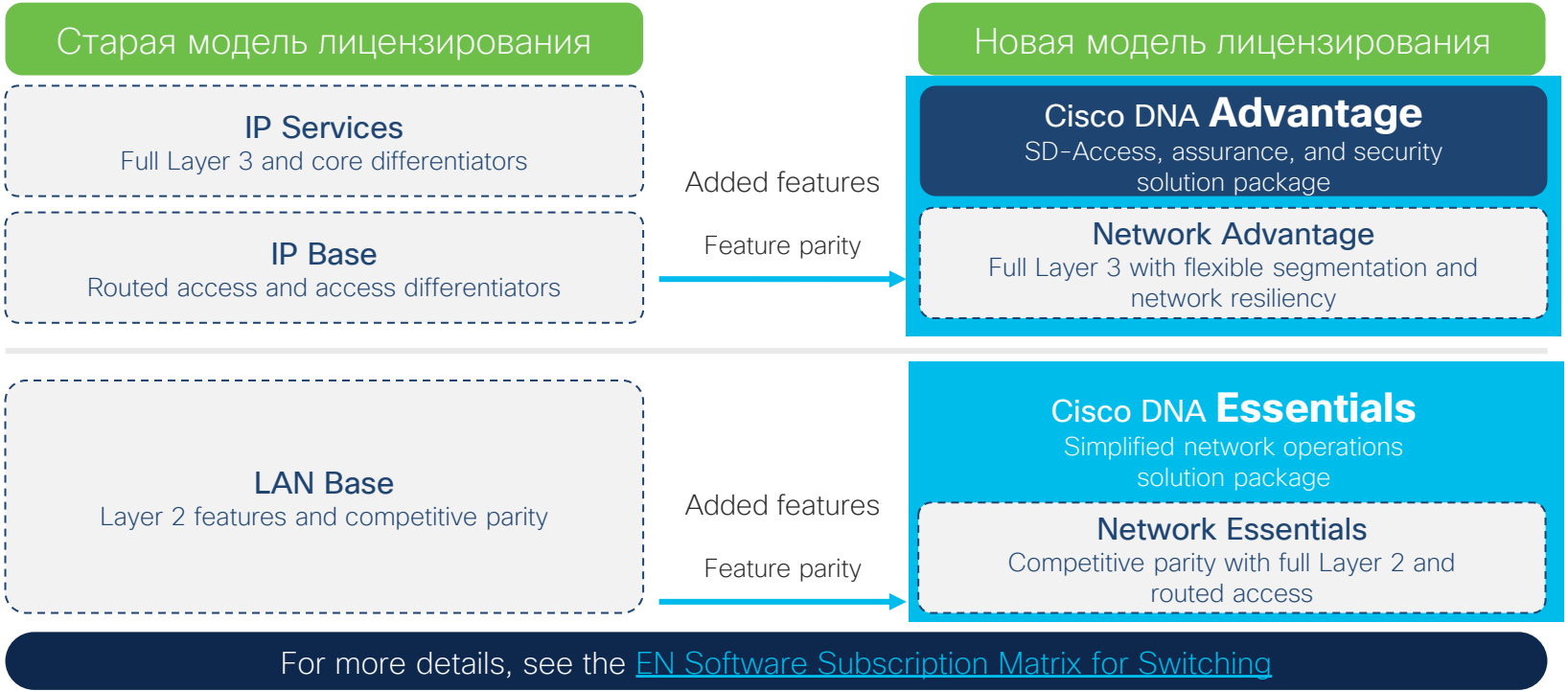
- Manual Intervention
- Non-Deterministic Recover time
  - Single-homed device
  - Back to full bandwidth

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Лицензирование

Cisco Catalyst 9000: всего 2 типа лицензий



Cisco DNA subscriptions required (minimum 3-year term) at time of Cisco Catalyst 9000 order

EA customers will receive a free upgrade from IP Base to IP Services on their legacy devices as part of the Enterprise Agreement. The upgrade of LAN Base to IP Base is available at 50% of the cost.

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Лицензирование для коммутаторов

Cisco DNA **Essentials**

Simplified management and base automation and monitoring for entry-level customers

Single SKU — 3/5/7 Year Subscriptions

- Centralized Management
- Base Automation and Monitoring

\+

Network Essentials
(Layer 2 Routed Access)

Cisco DNA **Advantage**

SD-Access capable, with policy-based automation and assurance for small to midsize customers

Single SKU — 3/5/7 Year Subscriptions

- Flexible Network Segmentation
- Assurance and Analytics
- Cisco Prime Infrastructure*
- Cisco DNA **Essentials**

\+

Network Advantage
(Full Layer 3 Routing)

Cisco DNA **Premier**

SD-Access ready, with advanced security features bundled for midsize to large customers

Single SKU — 3/5/7 Year Subscriptions

- Cisco Secure Network Analytics (previously Stealthwatch)
- ISE Base + ISE Plus
- Cisco DNA **Advantage**
- Cisco DNA **Essentials**

\+

Network Advantage
(Full Layer 3 Routing)

If you choose not to renew the subscription, the box will continue to function with the perpetual license features (Network Essentials/Advantage).

Cisco Software Support Service (SWSS) included in all subscriptions

Must Attach Cisco DNA Premier, Cisco DNA Advantage or Cisco DNA Essentials as Subscription with Cisco Catalyst 9000 switches

*PI licenses included for customers currently using PI to help them transition to Cisco DNA Center

Catalyst 9000 Switches–Advantage vs. Essentials

C9200, C9300, C9400, C9500, C9600

Advantage

Подписка 3,5,7 лет

Cisco DNA Advantage

(Включает все функции Cisco DNA Essentials)

Advanced Automation
- SD-Access
- Cisco Catalyst 9800 Series embedded wireless controller
- Application policy creation
- Encrypted Traffic Analytics*
- Cisco Wide Area Bonjour**
- Application hosting*

Element Management
Patch/SMU Lifecycle Management

Assurance and Analytics
- Compliance and Reports
- Device 360 and Client 360
- Network Health Insights
- Cisco AI Network Analytics, AI Endpoint Analytics, Group-based Policy Analytics

Telemetry and Visibility
- ERSPAN**
- AVC (NBAR2)***
- Wireshark*

Постоянная часть

Network Advantage

Включает все функции Network Essentials

Enhanced Security Controls
MACsec-256**

Patch/SMU Lifecycle Management
Manual/CLI operations or through WebUI only

Full L3 Routing Functionality
BGP**, OSPF, IS-IS

Flexible Network Segmentation
VRF, VXLAN, LISP, SGT, MPLS**, BGP-EVPN with VXLAN**

High Availability and Resiliency
NSF**, GIR, HSRP, Stackwise Virtual**, ISSU/eFSU**

Optimize Bandwidth Utilization (Advanced Multicast)
RP Discovery, PIM BI-DIR

- Catalyst 9000 switching HW includes the perpetual network stack–Network Essentials or Network Advantage
- Mandatory to attach Cisco DNA license when ordering Catalyst 9000 switches
- Cisco DNA License includes switch and Cisco DNA Center features

Essentials

Подписка 3,5,7 лет

Cisco DNA Essentials

Basic Automation
- Network Plug and Play (PnP) provisioning application
- LAN Automation
- Cisco Local Area Bonjour

Element Management
Software Image Management (SWIM)

Basic Assurance
Health Dashboards – Network, Client, Application

Telemetry
Full Flexible NetFlow

Постоянная часть

Network Essentials

Essential Switch Capabilities
Layer 2, Routed Access, OSPF, PBR, PIM Stub Multicast, PVLAN, VRRP, Cisco Discovery Protocol, QoS, FHS, 802.1X, Mac-sec 128, CoPP, SXP, IP SLA Responder, SSO, Stackwise (9200/9300)

L3 Routed Access
RIP, EIGRP Stub, OSPF (1000 routes)

- Programmability, NETCONF/RESTCONF/gRPC/YANG
- Zero Touch Provisioning
- MACsec encryption
- Advanced telemetry SPAN, RSPAN
- Streaming telemetry and visibility
- Cisco trustworthy solutions
- Software image management (SWIM)

Network Essentials/Cisco DNA Essentials is not available on C9600
* Not available on Catalyst 9200, 9500, 9600
** Not available on Catalyst 9200 ***Not available on Catalyst 9500, 9600

Наглядное представление DNA/Network лицензий

- Cisco DNA Software Subscription Matrix for Switching
https://www.cisco.com/c/m/en_us/products/software/dna-subscription-switching/en-sw-sub-matrix-switching.html

	Network Essentials	Network Advantage	Cisco DNA Essentials	Cisco DNA Advantage	Cisco DNA Premier
Essential switch capabilities	✓	✓	✓	✓	✓
L3 Routed access	✓	✓	✓	✓	✓
Programmability, NETCONF/RESTCONF/gRPC/YANG	✓	✓	✓	✓	✓
Zero Touch Provisioning	✓	✓	✓	✓	✓
128-bit MACsec encryption	✓	✓	✓	✓	✓
Advanced telemetry SPAN, RSPAN	✓	✓	✓	✓	✓
Streaming telemetry and visibility	✓	✓	✓	✓	✓
Cisco trustworthy solutions	✓	✓	✓	✓	✓
Software Image Management (SWIM)	✓	✓	✓	✓	✓
Full L3 routing functionality		✓		✓	✓
Flexible network segmentation		✓		✓	✓
High availability		✓		✓	✓
Patch/SMU lifecycle management		✓		✓	✓
Optimize bandwidth utilization (Advanced Multicast)		✓		✓	✓
256-bit MACsec encryption		✓		✓	✓
Full Flexible NetFlow			✓	✓	✓

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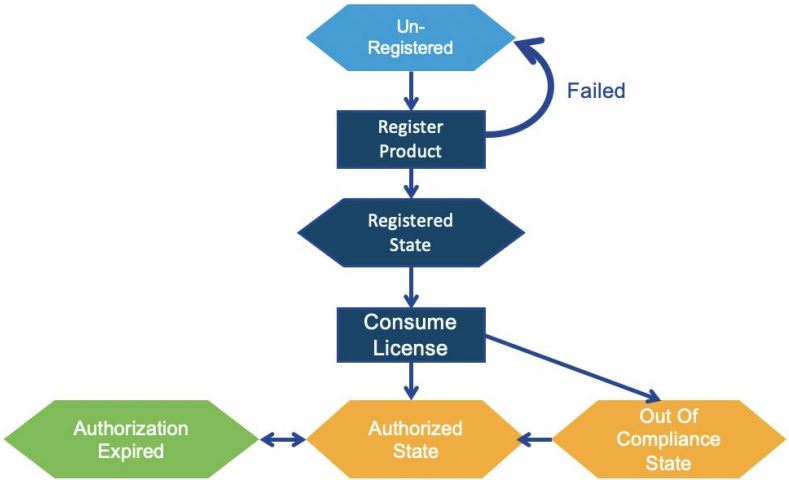
Smart Licensing Using P
или как просто купить и начать эксплуатировать коммутатор Cisco

Для коммутаоров release 17.3.2 и позднее, Ноябрь 2020
Extended Maitenance (Long Live)

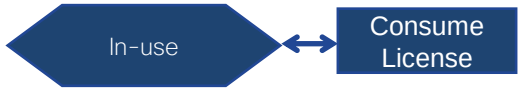
*Linux support is coming mid 202

Как меняется статус лицензии?

Smart Licensing (SL)



Smart Licensing USING POLICY (SLP



- Остаётся только один статус лицензии“In-use”
- Модель построена на доверии
- Устройство ведёт учёт использованных функций и лицензионного уровня
- В Smart Account требуется отправлять отчеты в течение 90 дней, если вы активировали более высокую лицензию, чем приобрели

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Smart Licensing Using Policy – Nov 2020 (17.3.2)



Без изменений в процедуре заказа оборудования и лицензий

Note: Не забудьте сообщить партнёру свой Smart Account



Больше НЕТ Evaluation периода. Не нужно регистрировать лицензию перед использованием

Note: Не нужно регистрировать лицензию перед использованием оборудования. Если заканчивается срок лицензии или изменяется уровень нужно отправить отчет в SA



Не требуется регулярная коммуникация оборудования с cisco.com

Note: При условии, что вы не повышаете уровень лицензии. Каждое устройство в сети ведёт учёт используемой лицензии самостоятельно.



Отправьте отчет об использовании лицензий только при изменении уровня лицензии или при окончании срока действия.

Note: Отправка отчёта может быть on-line или off-line

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Когда необходимо отправлять отчёт?

When should I report?

Perpetual
Report on-change



Know when:
Am I using what I purchased?
Yes – no report needed
No – report within 90 days

Recommended: Establish a smart account SW asset baseline, report after upgrade to 17.3.2. / 17.4.1 or >

Subscription
Report on-change

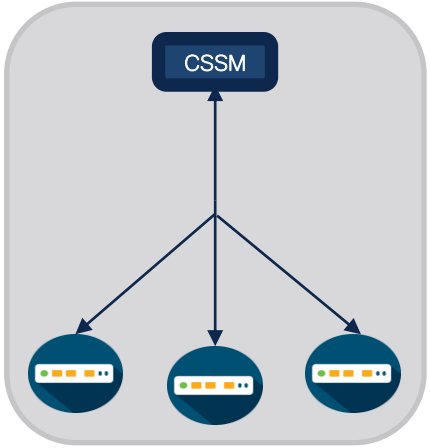


Know when:
Am I using what I purchased?
Yes – with EA, report per policy
Yes – no EA, report upon renewal
No – report within 90 days

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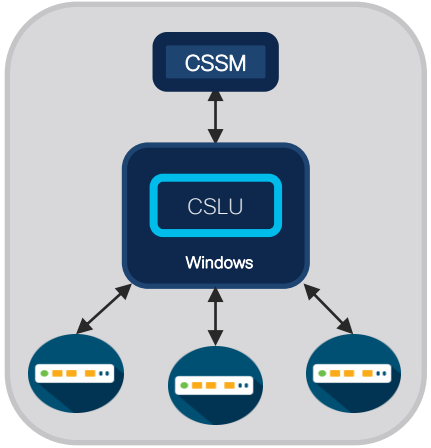
Reporting options

1 Direct Connect



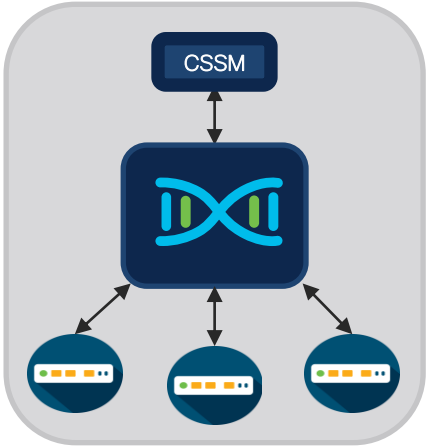
- ✓ Devices directly connected to CSSM on Cloud either HTTPS or through proxy.
- ✓ No dependency on external tools

2 Using CSLU/ SSM on Prem*



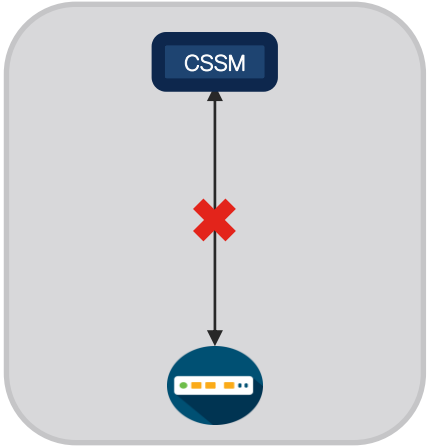
- ✓ Standalone Win 10 Tool**.
- ✓ Devices can push reports or CSLU can pull reports.
- ✓ Can be either offline or online.

3 Using DNAC



- ✓ Uses DNAC to set/change licenses.
- ✓ Can be used to send reports to the CSSM on Cloud.
- ✓ Can be either offline or online.

4 Air-Gapped Networks



- ✓ Manually copy files between Catalyst devices and CSSM
- ✓ No dependency on external tools

reserved.

*SSM on Prem support expected March 2021 **Linux support is coming mid 20

Что происходит с лицензиями при апгрейде на релиз с Smart Licensing Using Policy (IOS XE 17.3.2 / 17.4.1 and later)?

- Уже активированные через PAK лицензии при переходе на Smart Licensing Using Policy для non-export controlled/ export-controlled SW, **никаких действий не требуется**. Обновляйтесь, используйте, отправляйте отчёт при необходимости.
- RTU to Smart Licensing Using Policy for non-export controlled SW, **никаких действий не требуется**. Обновляйтесь, используйте, отправляйте отчёт при необходимости.
- SL to Smart Licensing Using Policy for non-export controlled SW/ export-controlled SW, **никаких действий не требуется**. Обновляйтесь, используйте, отправляйте отчёт при необходимости.
- **Новая покупка export-controlled лицензий** (HSEC): требуется Auth Codes на каждыйUDI (unique device identifier) / SN. Cisco tools или APIs доступны для автоматизации процесса.

Note:

- Cisco uses SW use reports sent to a SA to determine deltas between purchase vs. use
- US Commerce requires all trade-controlled SW to be purchased in advance

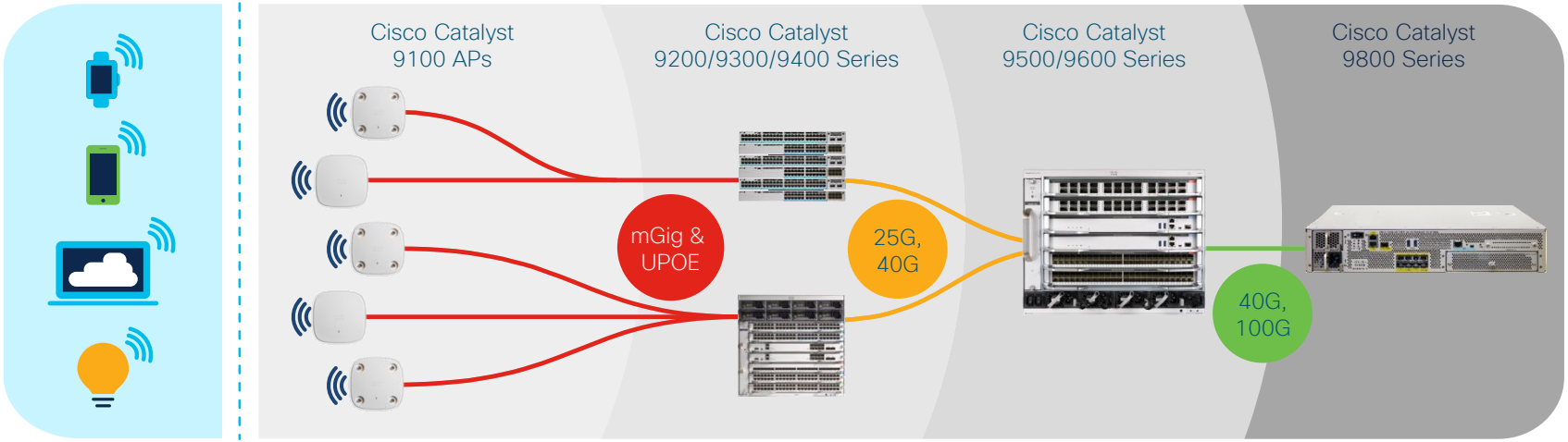
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Catalyst 9000
Заключение

Cisco Catalyst 9000 Family

Scalability, Reliability, Security across the network



The Full Experience, End to End

Built for Intent-Based Networking

Automation

Security

Analytics

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Заключение



- Общая архитектура для всего семейства Catalyst 9000 =>
  единый набор функций, версия ПО, лицензирование
- Рекомендованное позиционирование для каждой модели, ключевые функции
- Переход на Smart Account Using Policy позволяет после покупки коммутатора начать его использовать без регистрации в Smart Account (в рамках купленной лицензии)
- Лицензия содержит и постоянный набор функций (Network) и по подписке (DNA). Всегда.

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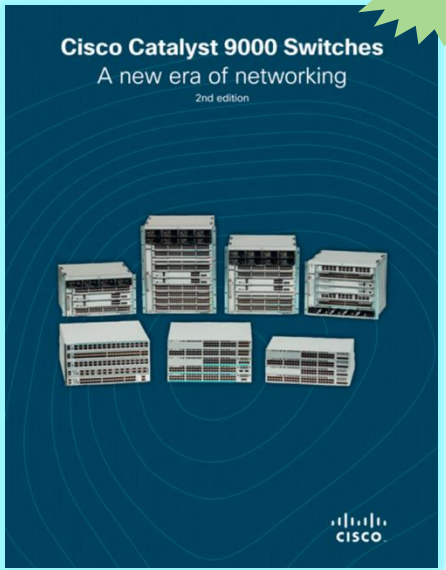
- И самое главное.....Устройство продолжит работать даже, если подписка


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Would you like to know more?

- cisco.com/go/cat9K
- Cisco Catalyst 9000 At-a-Glance
- Cisco Catalyst 9000 Family FAQ
- Catalyst 9000 Series – Cisco Community
- Catalyst 9000 Series – CiscoLive Library

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