Инновации

в портфеле решений Cisco

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Cisco Systems Engineer

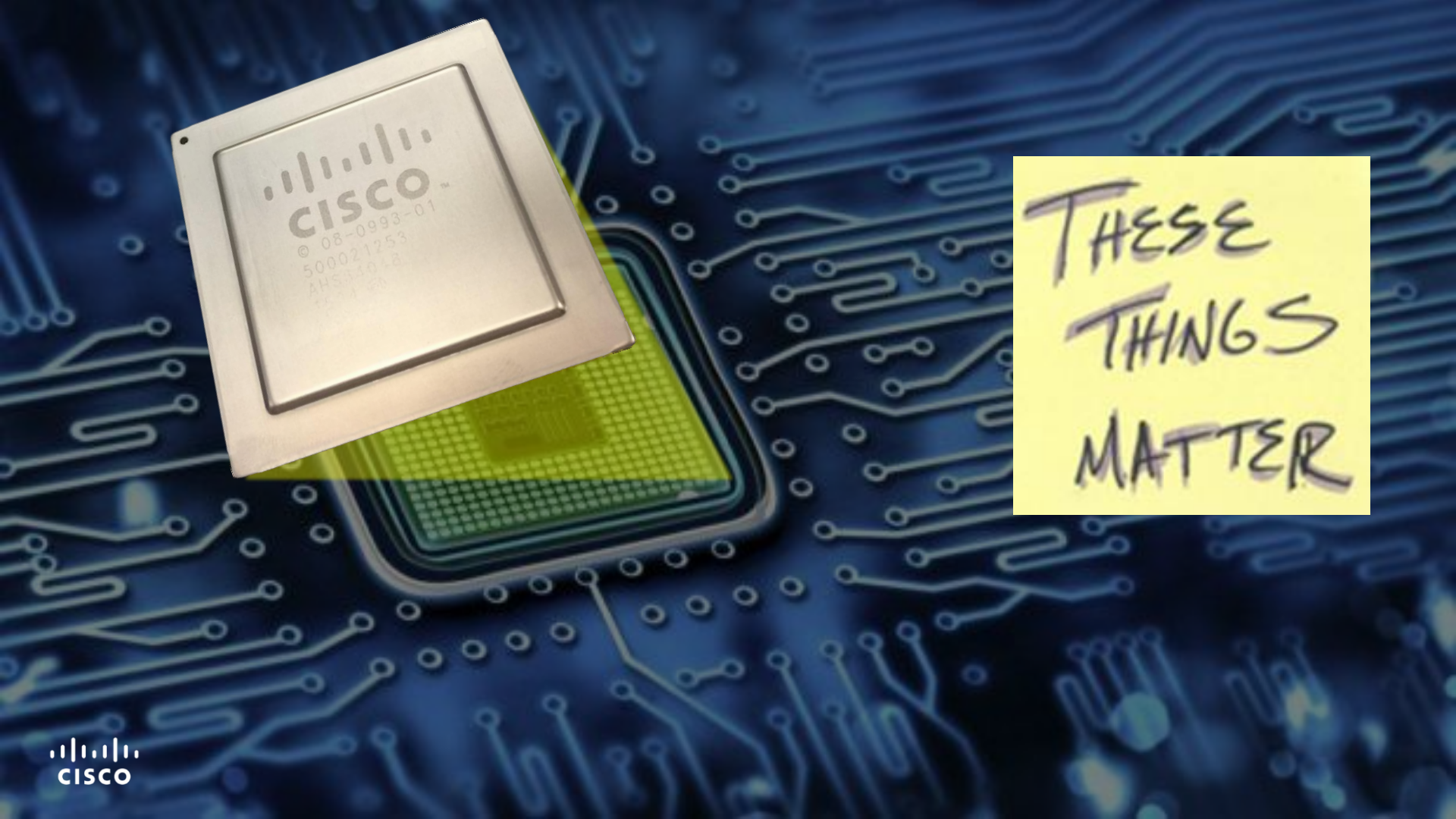
С чего всё начинается?

ASIC Engineering

Что такое ASIC?

"An *Application Specific Integrated Circuit* is an integrated circuit customized for a particular use, rather than intended for general purpose use…"

ASIC (аббревиатура от англ. *application-specific integrated circuit*, «интегральная схема специального назначения») — интегральная схема, специализированная для решения конкретной задачи.


CISCO
© 08-0993-01
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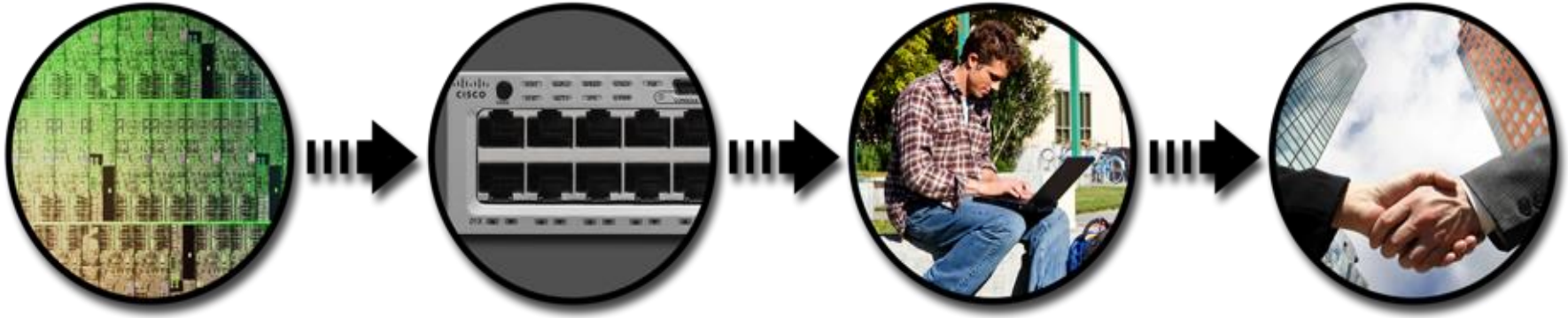
THESE
THINGS
MATTER

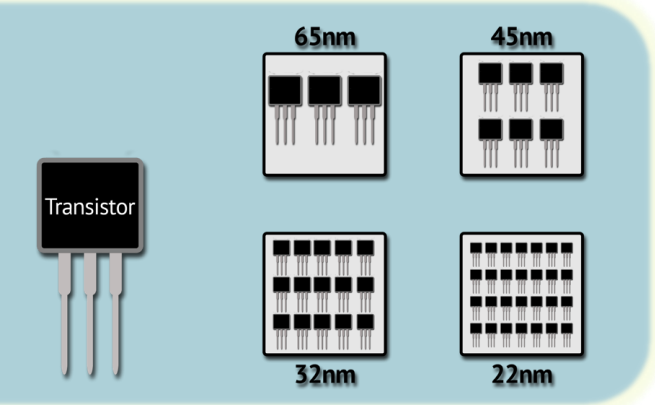
В чем сикрет производителей чипов?

ASIC → Продукты → Решения → Преимущества



ASIC в коммутаторах

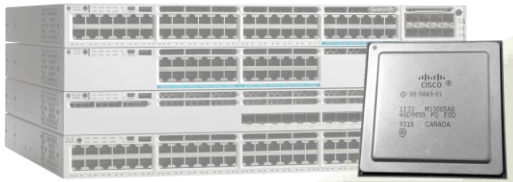
ASIC – от создания до внедрения



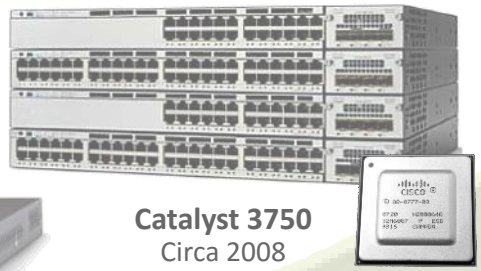
Следующее поколение устройств

7.46B transistors!
2,160,000 lines of code

New!



Catalyst 3850
Circa 2013
1300M transistors
*(Latest version: **3 BILLLION transistors**)*
1,490,000 lines of code



Catalyst 3750
Circa 2008
210M transistors
86,220 lines of code

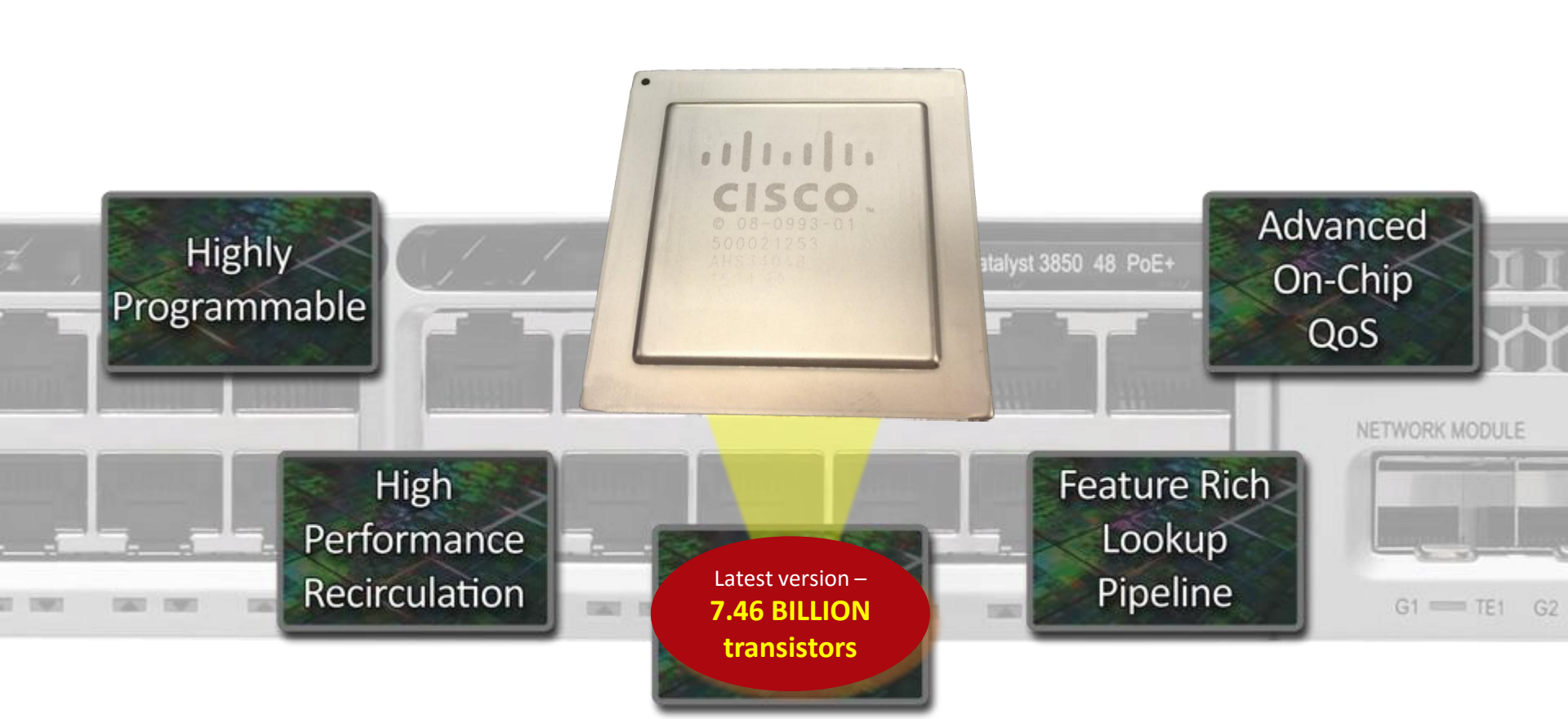
Catalyst 3550
Circa 2003
60M transistors
47,226 lines of code

Cisco-developed silicon

Преимущества интеграции возможностей железа и гибкости программного обеспечения

Что даёт собственная разработка чипов?

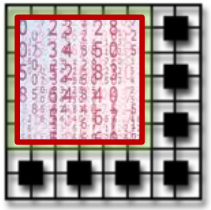
1. **Простота реализации инноваций**
2. **Возможность реализации очень специфических функций**
3. **Простота разработки софта при понимании деталей железа**
4. **Всепроникающая безопасность**
5. **Масштабруемость**
6. **Защита инвестиций за счёт программируемости**



UNIFIED ACCESS DATA PLANE (UADP)

UADP

Unparalleled Functionality



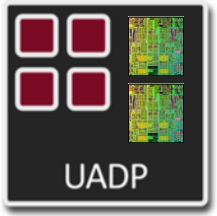
Microcode Programmable Pipeline with Flexparser

Stack Master

Stack Member

Stack Member

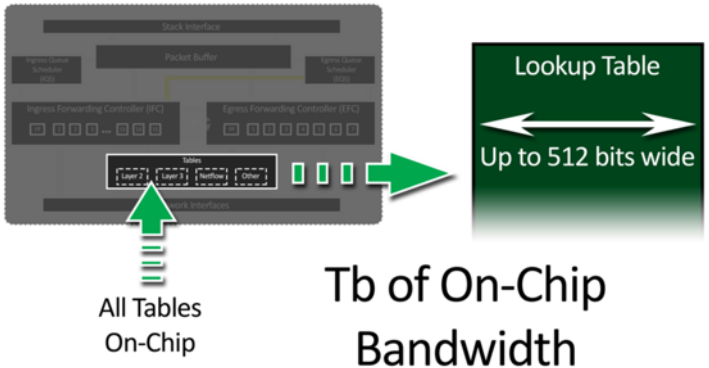
240G Stacking Interface integrated into ASIC



On Chip Micro Engines Fragmentation / Reassembly, Encryption / Decryption

High-Performance Recirculation Path (< 1usec Recirculation Latency egress to ingress)

Integrated On Chip NetFlow



Tb of On-Chip Bandwidth

UADP 1.0

First Generation of UADP ASIC

1G/10G
Ethernet

128 Bit
Encryption

24K
Netflow Records

240G
Stacking Capacity

6MB
Packet Buffer

56G
Bandwidth

Catalyst 3850
Copper

Catalyst 3650

Catalyst SFP
Fiber

First Ever **Flexible, Programmable ASIC**

UADP 1.1

First Generation of UADP ASIC with **Enhancements**

Dual Core
Running @ 500MHz

1G/10G/40G
Ethernet

256 Bit
MACSEC Encryption

24K x2
Netflow Records

1588
IEEE

240G
Stacking Capacity

6MB x2
Packet Buffer

160GE
Bandwidth

Catalyst 3850 Multigigabit

Catalyst 3850 SFP+

Catalyst 3650 Mini

Catalyst 3650 Multigigabit

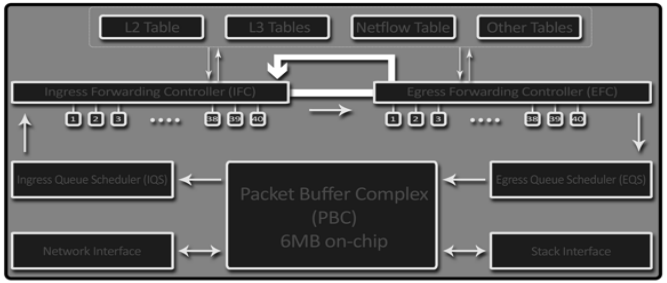
Enhanced **Performance, Capabilities & Security**

Catalyst 3650

Catalyst 3850

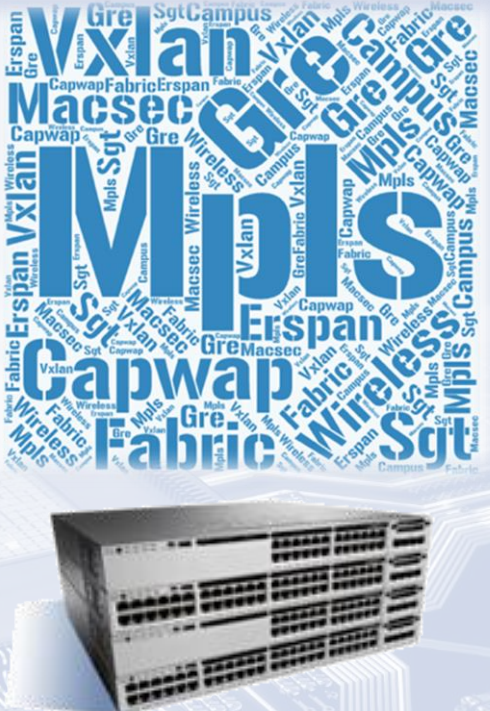
Catalyst 4500

More to come



GRE
CAPWAP
MPLS
VXLAN
…

cisco



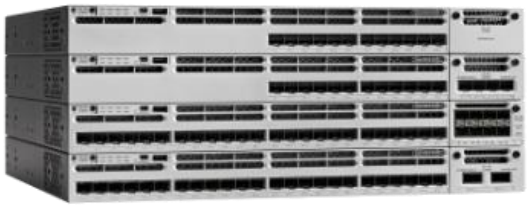
2013

2015

2017

Programmable Pipelines have Proven Investment Protection with UADP

Ключевые возможности Cisco коммутаторов



- Бесшовность коммутации проводной и беспроводной сети
- Отказоустойчивость
  Досекундная сходимость стека
- Бескомпромисная безопасность
  TrustSec & Identity Services Engine (ISE)
- Полный набор услуг питания по витой паре (PoE)
- Защита инвестиций за счёт програмируемости ASIC-ов и IOS-XE

ASIC в маршрутизаторах

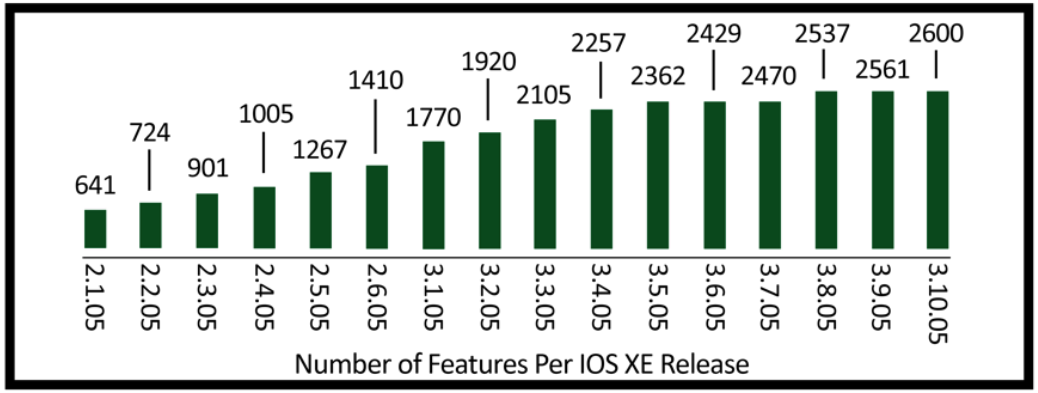
QFP
в маршрутизаторах

QUANTUM FLOW PROCESSOR (QFP)

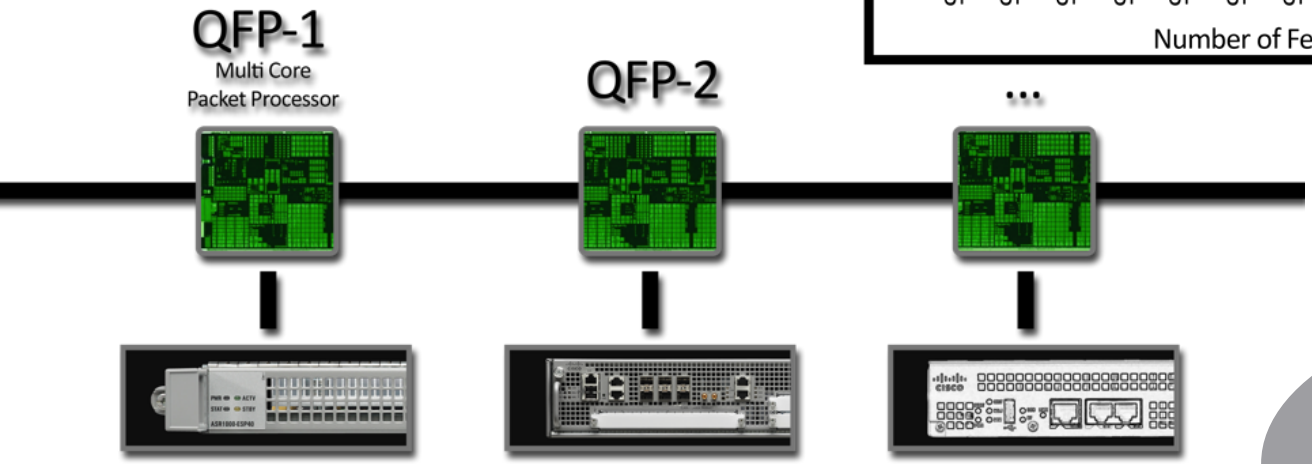
- High Performance
- Programmable
- Feature Rich
- Price/Performance
- Longevity/Flexibility

QFP

Развитие платформ и функционала



Over 2600 features



ASR 1001. 1002
1002-F, ESP-5, ESP-10
ESP-20, ESP-40,
ASR-9000 SIP

ASR 1002-X
ESP-100, ESP-200

More to come

QFP
is the foundation for modern Enterprise Routing Aggregation and Policy infrastructures

Новые платформы в семье ASR1000

Cisco ASR1000 Series Routers

от 2.5 Gbps до 200Gbps

COMPACT, POWERFUL ROUTER

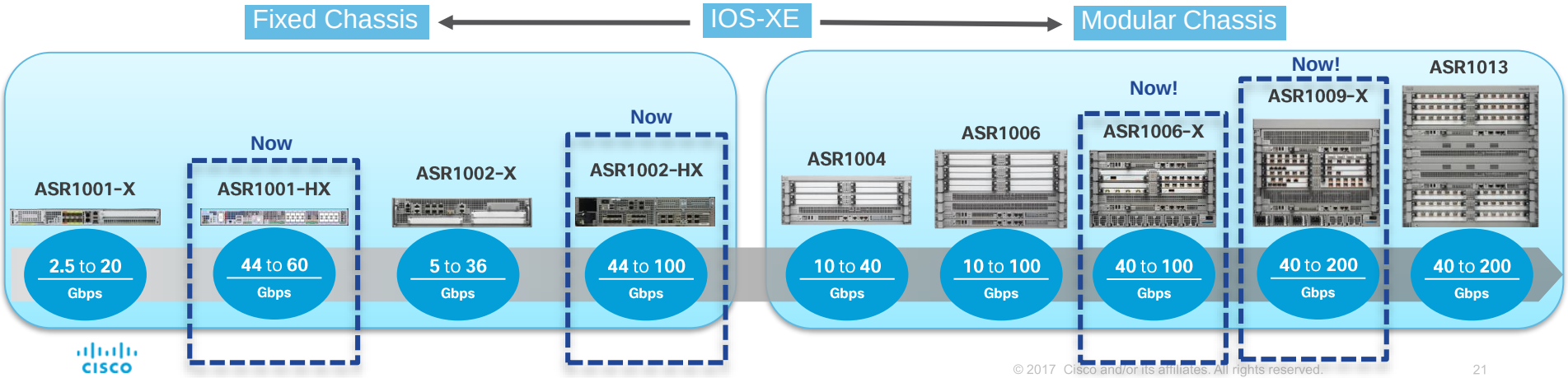
- Line-rate performance 2.5G to 200G
- Investment protection with modular engines, IOS CLI, high-density modules
- Hardware assists for ACL, QoS, etc.
- Supports up to 36x10G Ports per System
- Supports up to 12x100G Ports per System

BUSINESS-CRITICAL RESILIENCY

- Fully separated control and forwarding planes
- Hardware and software redundancy
- Flexible power supply redundancy
- In-service software upgrades
- Inter and Intra-chassis redundancy

INSTANT ON SERVICE DELIVERY

- Scalable on-chip service enablement through software licensing
- Industry leading VPN/Crypto/MACsec solutions
- Optimal user/app experience with AVC, PfR, and AppNav
- Software consumption model with CiscoONE



ASR 1001-HX 60G Fixed

Available Now

Pay as you go
- **60 Gbps** system performance
- **16** Built-in 10GE/1GE ports enabled via software license

Application level service performance
- 30M+ Packets Per Second
- Up to 16G Crypto IMIX w/ Suite B for diverse VPN security solutions
- 2M Firewall and traditional NAT Sessions

Multi-Core Network Processor
- 62 Cores
- 4 Packet Threads / Core
- 248 simultaneous threads

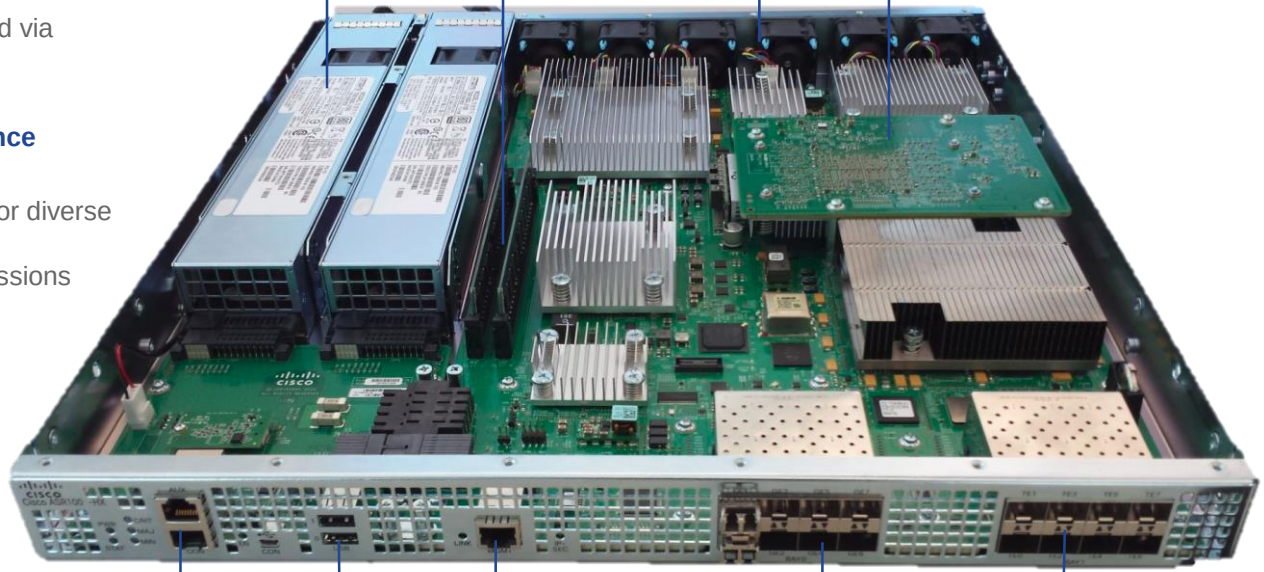
Control plane
- CPU: Quad Core @ 2.5 GHz
- Memory: 8GB DDR3 default memory, upgradeable to 16GB

Power Supplies
- 2x AC or DC

Memory
- 2x DIMM slots (8GB each)

6x Fans

Crypto module
- Field upgradeable (8 or 20Gbps)



System Management
- Console
- AUX

- 2x USB Ports

System Management
- RJ45 GE Ethernet

8x 1GE Ports
- MACSec enabled

4x 10GE / 4x 1GE or 10GE Ports
- Enabled by license
- Configurable to 1 or 10GE
- MACSec enabled

ASR 1002-HX 100G Fixed

Available Now

Pay as you go
- 100 Gbps system performance
- Port on demand performance (based on I/O licenses)

Control plane
- CPU: Quad Core @ 2.5 GHz
- Memory: 16GB DDR3 default memory, upgradeable to 32GB

System management
- Cisco Prime
- Glue Networks

Application level service performance
- 58M Packets Per Second
- Diverse VPN security solutions, up to 25G IMIX
- 13M Firewall and traditional NAT Sessions

Multi-Core Network Processor
- 124 Cores
- 4 Packet Threads / Core
- 496 simultaneous threads

Miscellaneous
- RJ45 & mini-USB console
- SSD
- Secure Boot

Network Interface Module
- 1 double wide NIM slot or
- 2 single wide NIM slots
- NIM - Compatibility with ISR4400 and ASR1001-X

Built in I/O
- 8x Gigabit Ethernet interfaces in base
- 8x TenGigabit Ethernet interfaces enabled by license
- Multipoint MACSEC for linerate encryption (1G & 10G)

EPA - Ethernet Port Adapter
- 1x EPA slot

Crypto module
- Field upgradeable

ASR 1006-X and 1009-X Chassis

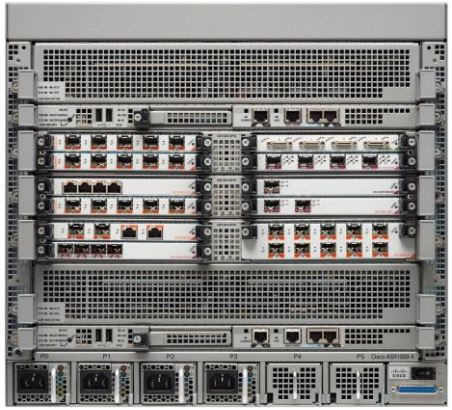
For Your Reference

	ASR 1006-X (Modular Redundant)	ASR 1009-X (Modular Redundant)
Timeline	Available Now	Available Now
Height	6RU	9RU
RP Slots	2	2
ESP Slots	2 (regular)	2 (super)
SIP/MIP Slots (I/O Slots)	2 (SIP40/MIP100)	3 (SIP40/MIP100)
SPA Slots	8	12
EPA Slots	4	6
NIM Slots	N/A	N/A
Built-In GE	N/A	N/A
Slot Bandwidth	100G(Future 200G)	100G(Future 200G)
Forwarding Bandwidth (based on current QFP)	40 to 100G	40 to 200G
Forwarding Bandwidth (with Next-Gen QFP)	Up to 200G (Future)	Up to 400G (Future)
Maximum Output Power	1100W power modules N+1, Max 6	1100W power modules N+1, Max 6

ASR 1006-X

Power Shelf

ASR 1009-X



Current

Next Gen Forwarding ASIC - Procyon

Каждый Procyon может предоставить 100Gbps без деградации производительности.

Позиционирование:

IWAN, WAN Aggregation, Internet Edge, DCI, cloud, next-NGN.

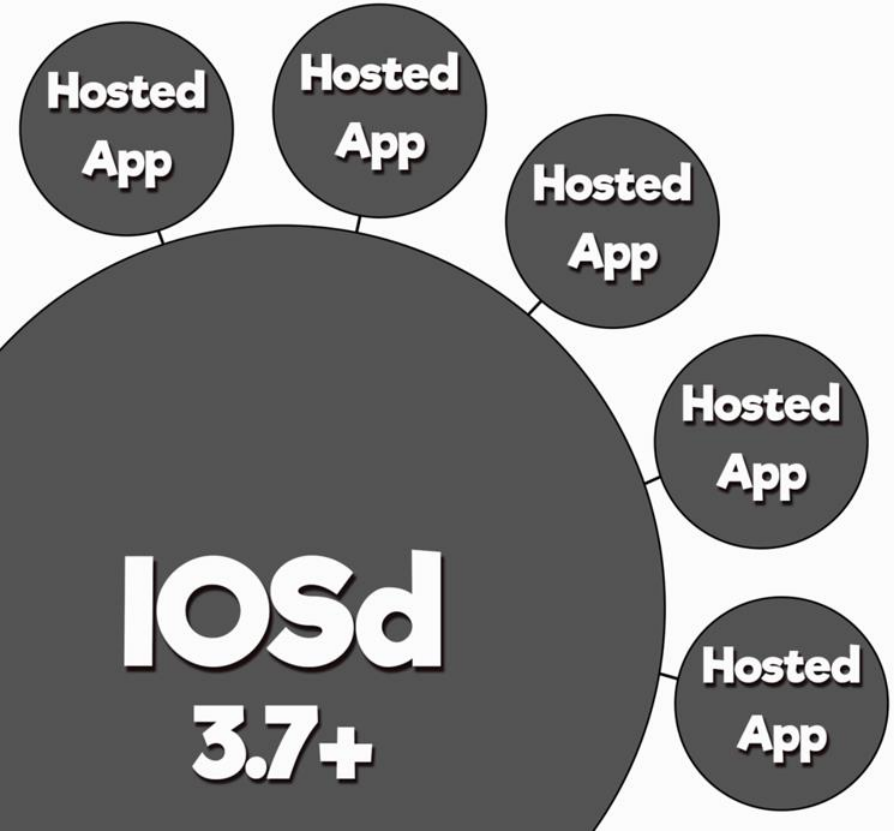
Сервисы:

- AVC and related solutions
- IPSec and MACSec
- NAT/FW
- AppNav
- High-density GE/10GE/40GE/100GE

Несколько Procyon в одном шасси = 100G/200G/400G

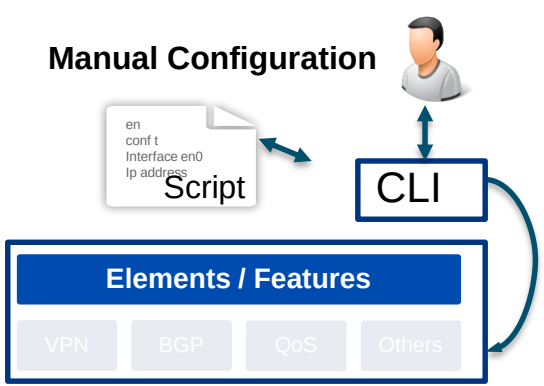
IOS Software

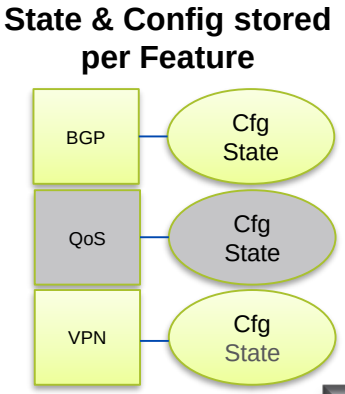
Original IOS XE

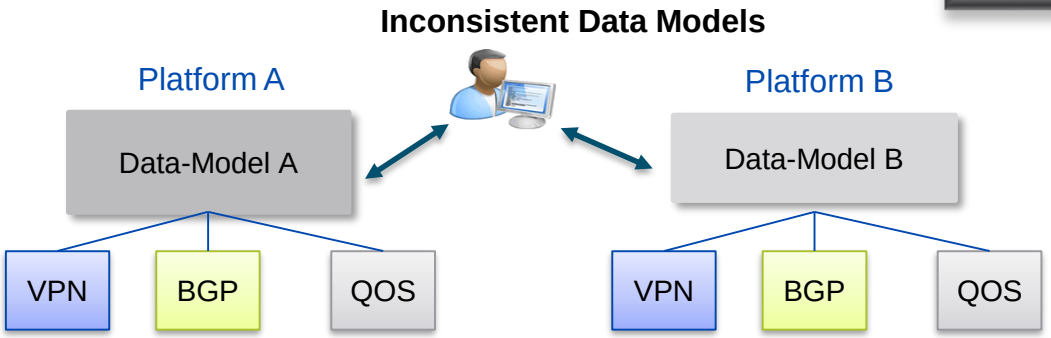


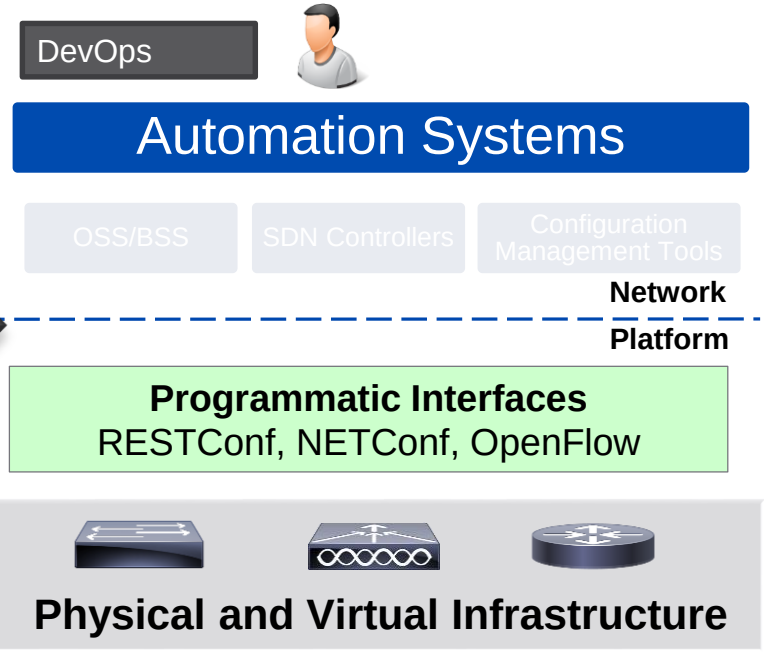
Modularity Started Through Hosted Applications Like Wireshark and WCM...

IOS-XE16
Programmability (NETConf and YANG)

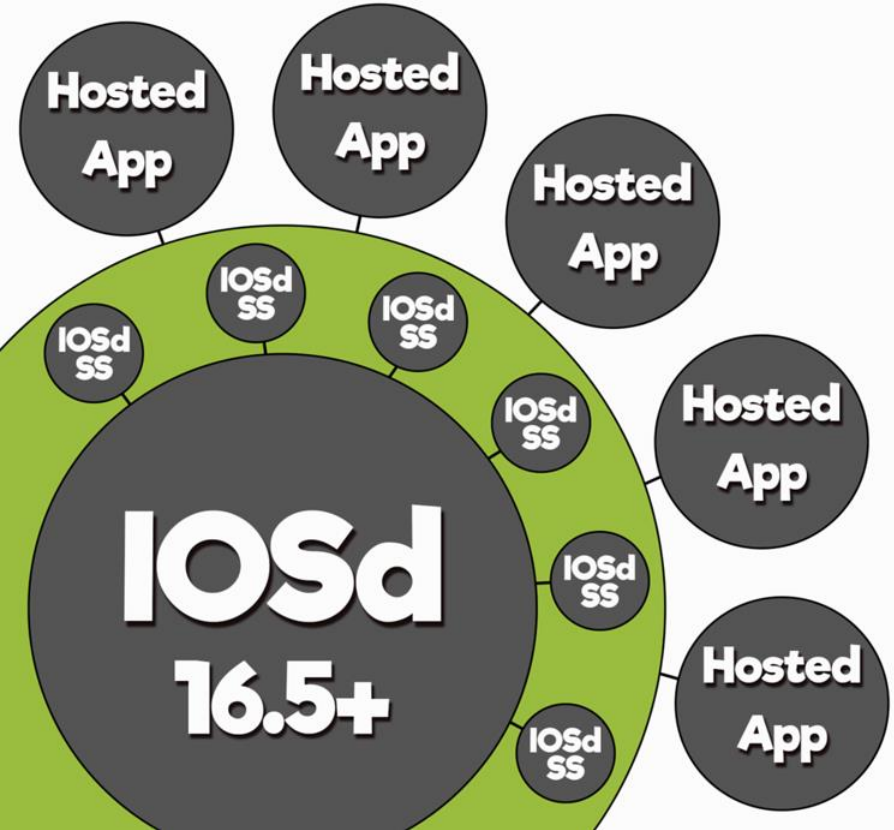






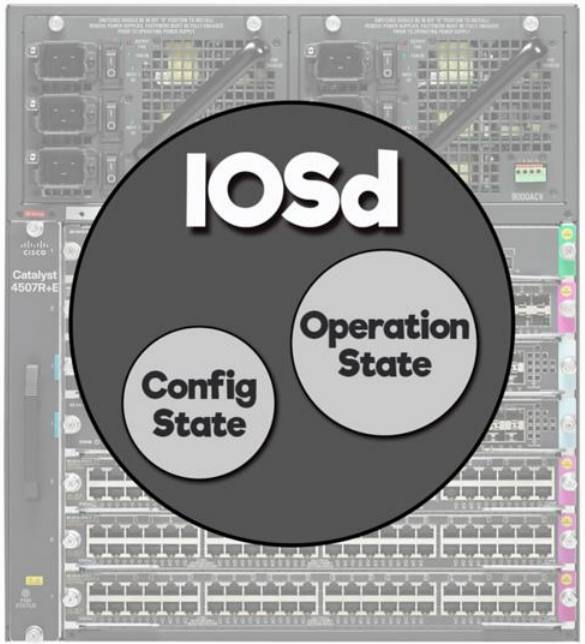


Open IOS XE

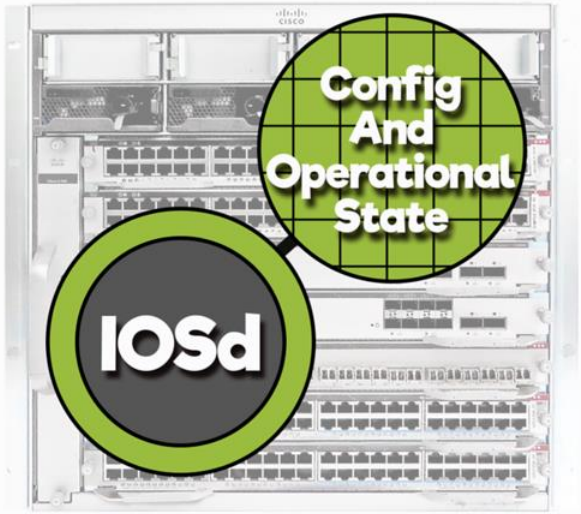


IOS Sub Systems (like OSPF, BGP) broken out from the "blob" to further enhance IOS Resiliency...

Catalyst with IOS-XE

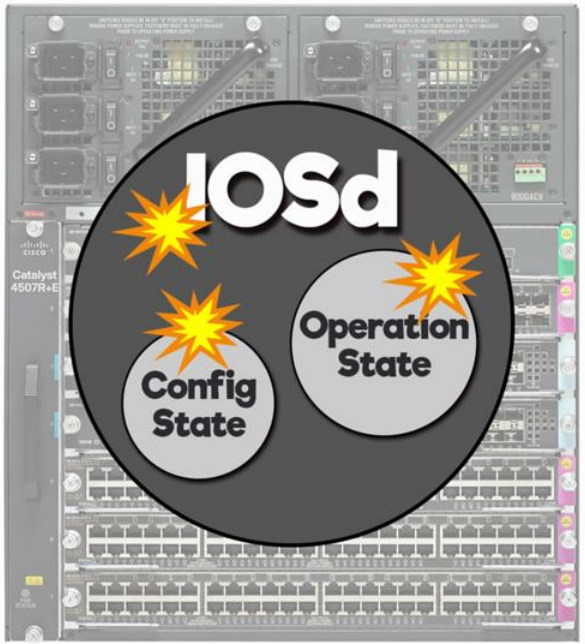


Catalyst with Open IOS-XE



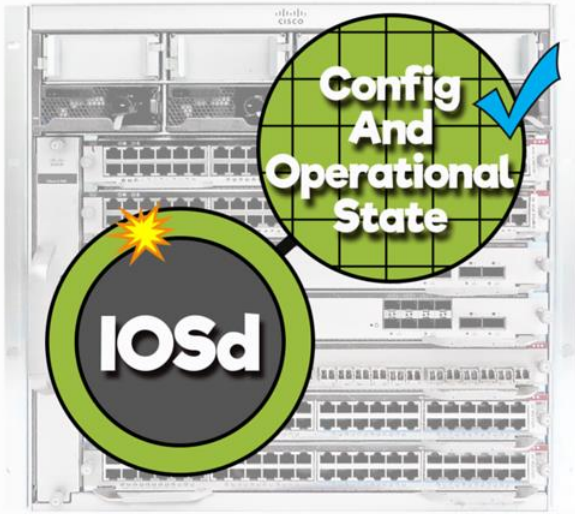
Open IOS-XE moves Operational State and Configuration State into a local DB (Crimson)

Catalyst with IOS-XE



A Process failure in IOSd will impact both the operational and configuration state

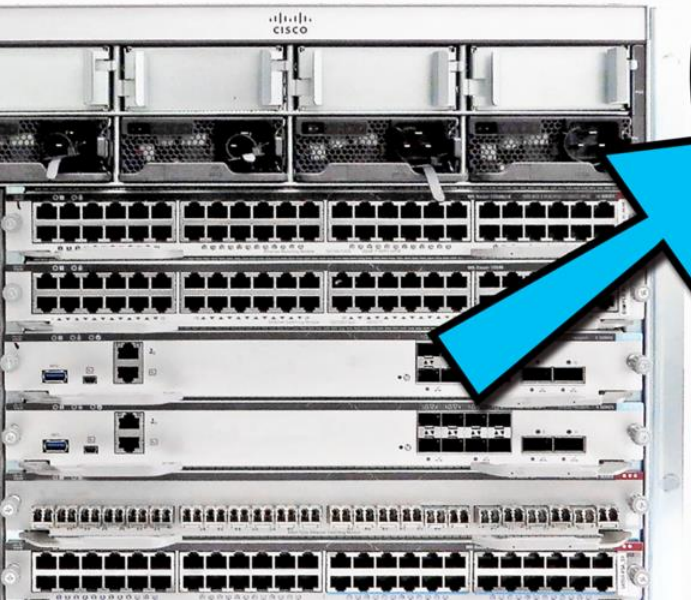
Catalyst with Open IOS-XE

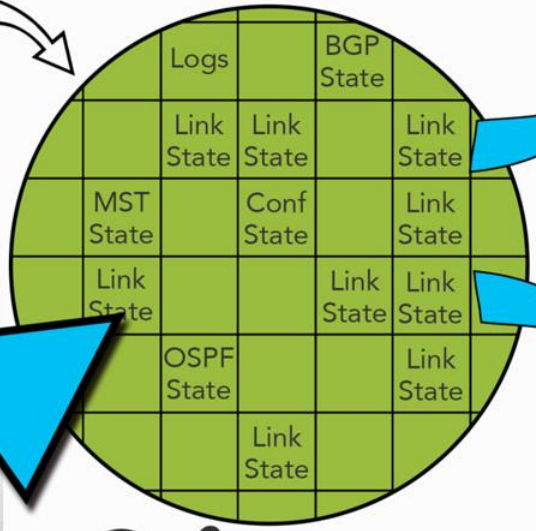


An IOSd Process (or Subsystem) failure **WILL NOT** impact the operational or configuration state

Open IOS XE Data Models

YANG Models





Crimson DB

Google

We Use Google Openconfig Models Where We Can...

cisco

67% of IETF Config Models Are Driven By Cisco...

Unified Software Stack – IOS-XE 16.x

Manageability

Prime Infra.

APIC-EM

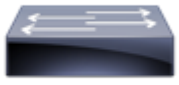
WebUI

CLI, SNMP, RESTConf, NETConf

Operating System

Unified Software Stack (IOS-XE 16)

Platform ASICs/CPU



Switches

Wireless

Routers

One OS Across Enterprise Platforms

IOS XE Denali 16.1.1

IOSd

Features Components

Hosted Apps

LXC* WCM

LXC* Wireshark

Common Infrastructure (HA)

Management Interface

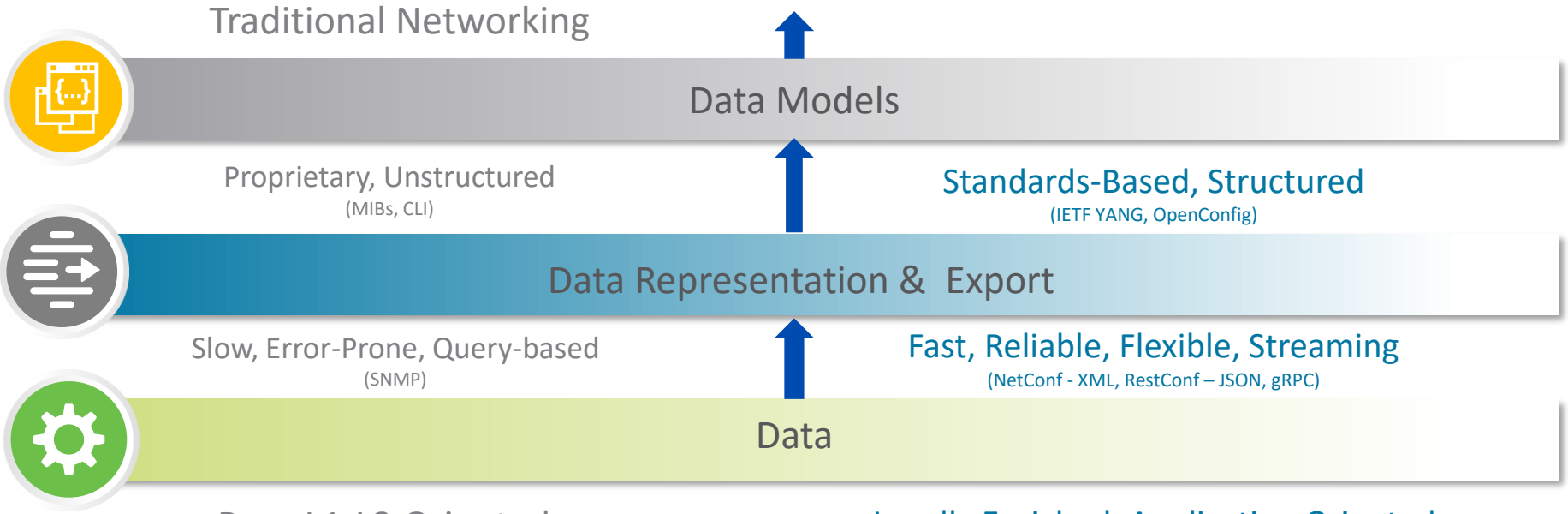
Module Drivers

Kernel

Crimson DB

The Power of Open IOS-XE

Redefining Intelligence at the Edge



Raw, L1-L3 Oriented

Port	InOctets	InUcastPkts	InMcastPkts	InBcastPkts
GE1/0	250559459	1664878	0	16
GE1/1	1615683022	1230973	0	16
GE1/2	204909	1511	0	16
GE1/3	2964385	22155	0	17
GE1/4	1612815178	12509415	0	228
GE1/6	23571170611	15545404	0	4
GE1/7	23562566444	15530432	8236	146

Port	OutOctets	OutUcastPkts	OutMcastPkts	OutBcastPkts
GE1/0	2504472376	2645877	8243	16770
GE1/1	169128719	820198	8243	17083
GE1/2	1881584	25785	8243	16771
GE1/3	5247669	47716	8245	16813
GE1/4	26893373267	20898930	8243	16561
GE1/6	539935348	8160008	8139	461
GE1/7	23563612641	15531317	7	336

Locally Enriched, Application Oriented

Application Response Times

Traffic Prioritization

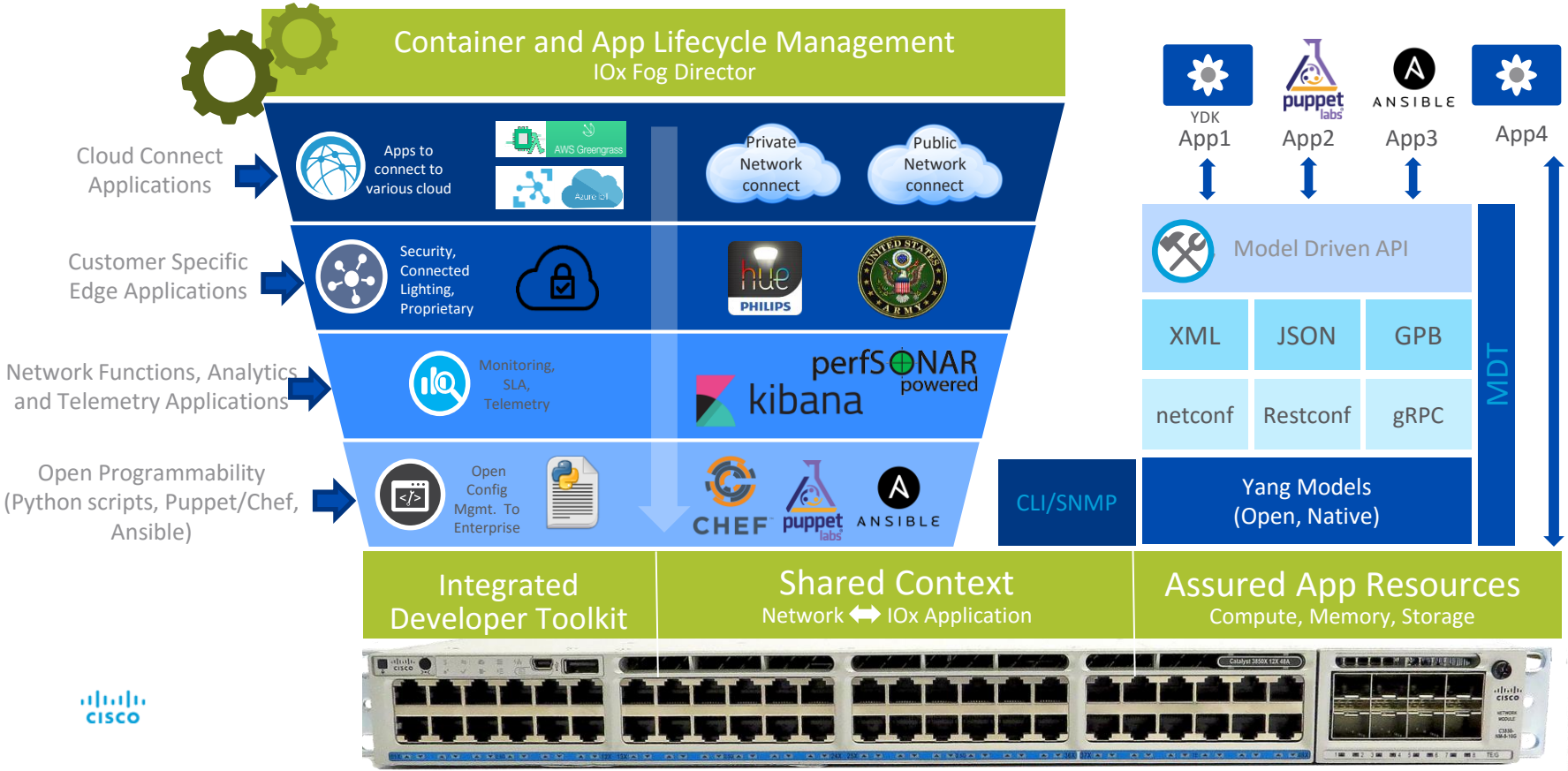
URL Stats

Policy & Security Analytics

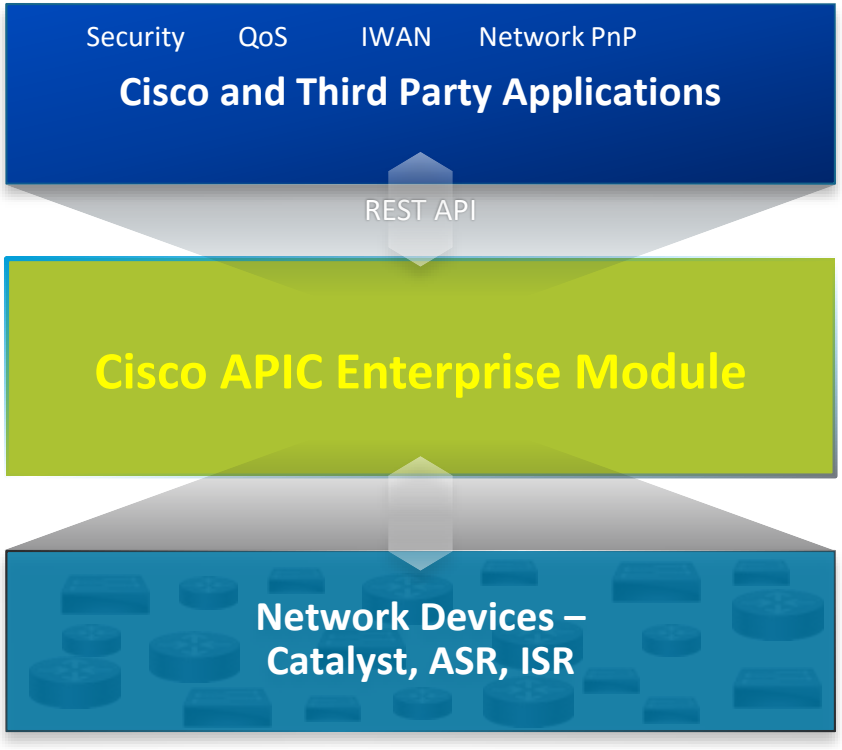
Endpoint Profiles

The Power of Open IOS-XE

Best of Turnkey and Open Solutions



Cisco APIC-EM – Enterprise Controller



APIC-EM

Masking Network Complexity, Exposing Network Intelligence

Cisco APIC-EM – эволюция в направлении Policy Model

Automation
Controller-Led
Networking Deployment

- Выражает **бизнес-задачу**
- **Трансирует** политики в настройки специфичные для железа
- **Применяет абстракцию** с помощью контроллера сети
- **Автоматизирует внедрение** по всей сети
- **Обеспечивает соответсвие** настроек изначальной задаче (sync)

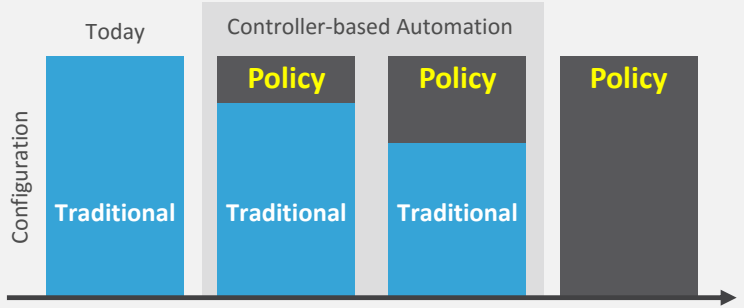
Отвязать понятия
User Identity и **Topology**

Простота трансляции **бизнес требований в функции сети**
- снижение TCO

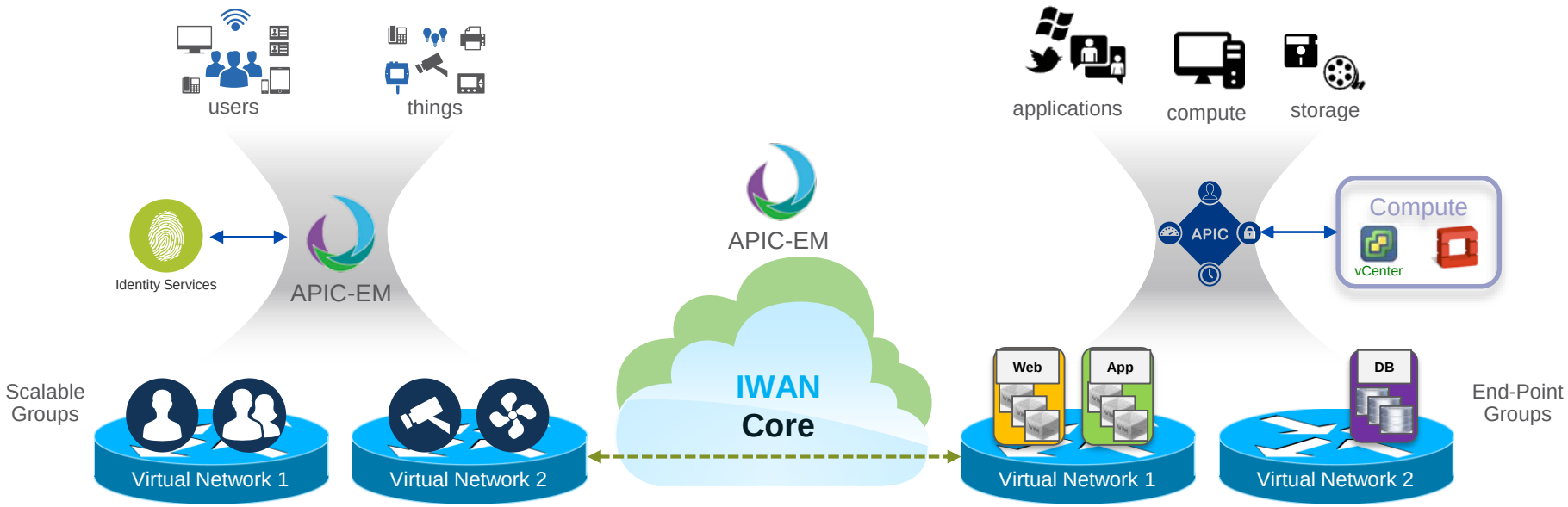
Полтики по польователям и группам

Policy based Configuration—
Динамическая, может быть автоматизарована **контроллером**

С ростом политик уменьшаетются статические настройки



Сквозные политики и сегментация сети



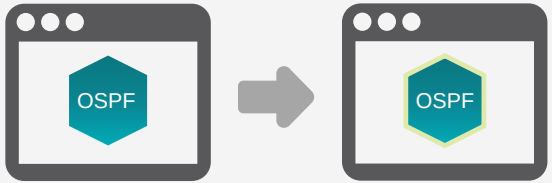
IOS-XE Patchability

IOS-XE16

IOS-XE Now enables Emergency Point Fixes through Patching

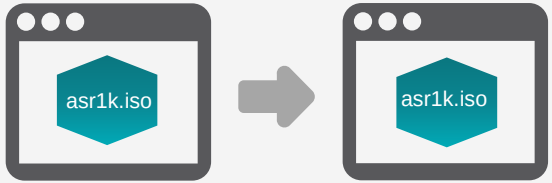
Software Patches: SMU

- In-service bug-fixes
- Less downtime with reduced reboots



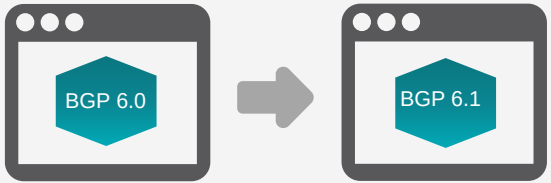
System Upgrade

- In Place Upgrade
- Config Preserved



Feature Upgrade*

- Upgrade Single Feature
- Installed like SMU



What is Patching

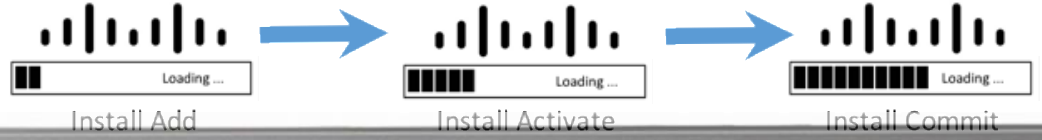
- Emergency Point Fix positioned for Expedited delivery
- Addresses a Network problem that brings Business to a Standstill

Benefits of Patching

- Reduce time to resolution in your network.
- Simplify Network Operations for defect resolution and code qualification.

Not available for all features*

Installing a SMU



Adding a SMU file

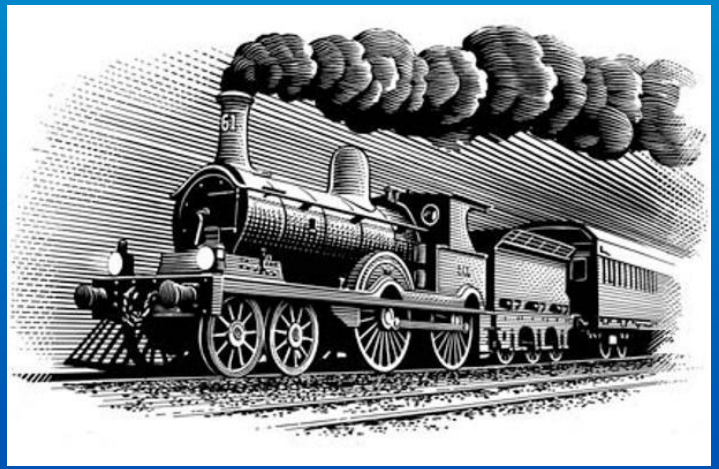
Activating SMU

Committing it

```
switch#install add file flash:cat9k-universalk9.2017-03-
17_21.53_zhangyu.301.CSCuo76464.SSA.smu.bin
install_add: START Sun Mar 26 01:13:29 UTC 2017
SUCCESS: Finished copying package(s) to the selected switch(es)
SUCCESS: install_add /flash/cat9k-universalk9.2017-03-
17_21.53_zhangyu.301.CSCuo76464.SSA.smu.bin Sun Mar 26 01:13:31 UTC 2017

switch#install activate file flash:cat9k-universalk9.2017-03-
17_21.53_zhangyu.301.CSCuo76464.SSA.smu.bin
install_activate: START Sun Mar 26 01:14:12 UTC 2017
2 install_activate: Activating SMU...

This operation requires a reload of the system. Do you want to proceed? [y/n]y
2 install_activate: Reloading the box to complete activation of the SMU...

switch#install commit
install_commit: START Sun Mar 26 01:24:41 UTC 2017
SUCCESS: install_commit  Sun Mar 26 01:24:43 UTC 2017
```

Any failures/reloads between activate and commit result in a rollback

Наш PoE самый PoE



PoE-3д

Perpetual UPOE

UPoE devices connected to switch stay powered on even on switch reboot!

UPoE devices continue to get last negotiated power

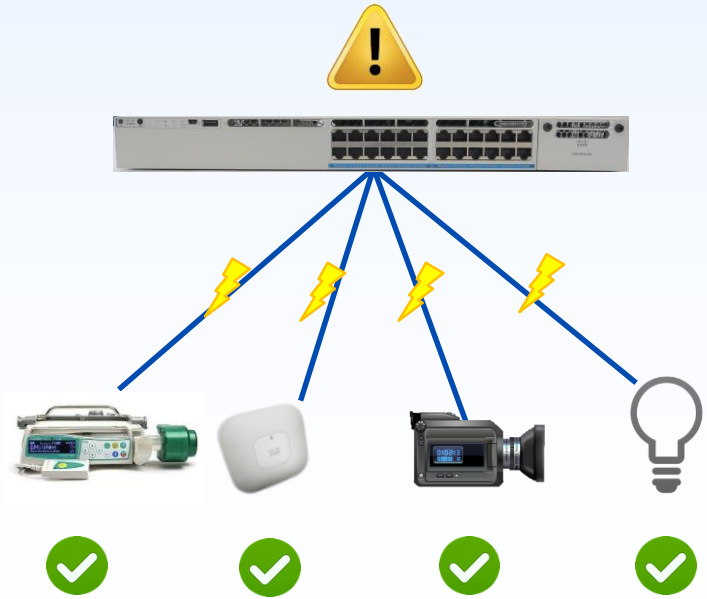
Endpoints like Lights, needs resilient power

Retain upto 60W per port

Port Configuration

Switch(config-if)#**power inline port poe-ha**

Switch reboot!



Fast UPOE

Remembers the last power drawn from a particular PSE port

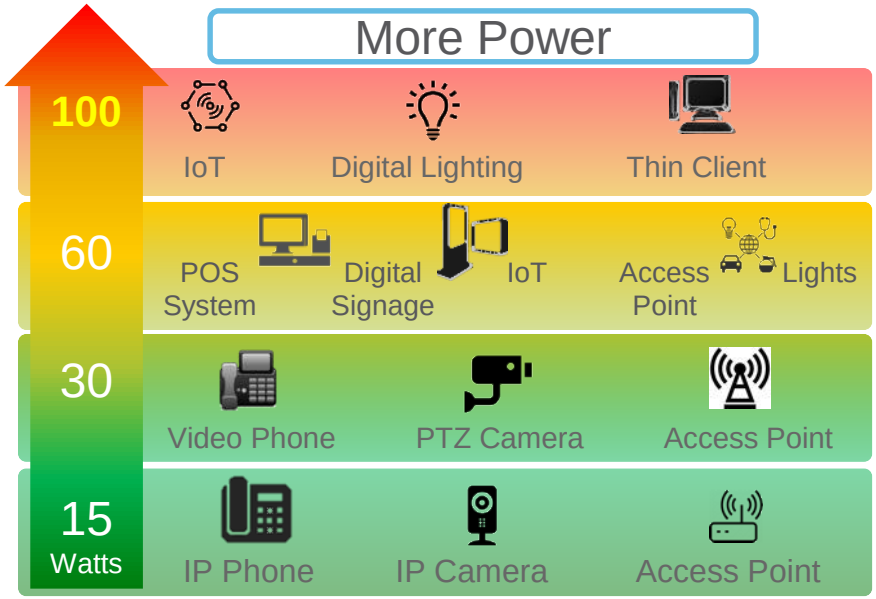
Switches on power to the Endpoint the moment AC power is plugged in

Restores power to the endpoint in less than 30 sec even before the switch is booted up.

Port Configuration

Switch(config-if)#**power inline port poe-ha**

Future proofing you campus networks



More Bandwidth

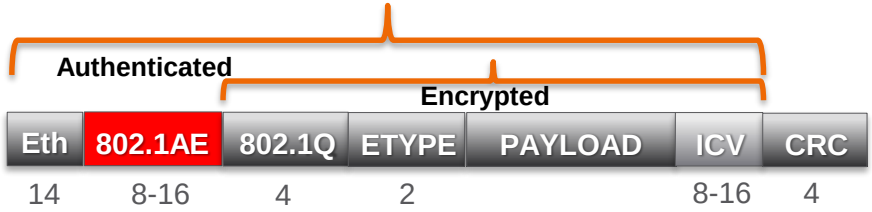
Faster wireless standard needs larger backhaul pipe

Cisco Catalyst offers UPoE (and support for upcoming powering standard like .3bt) &
Offers all 48 ports with mGig capabilities to support future data hungry devices

MACsec update

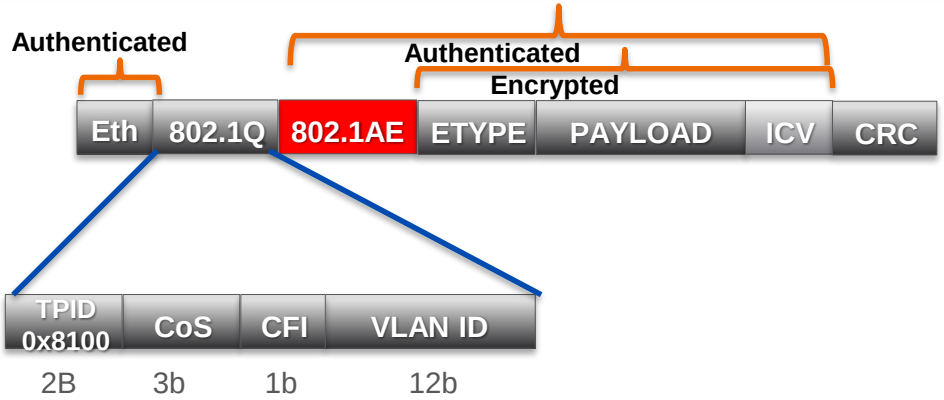
MACsec Frames

Original MACsec



MACsec ClearTag (VLAN)

"WAN MACsec"



VLAN Tag in Clear enables transport over L2VPNs

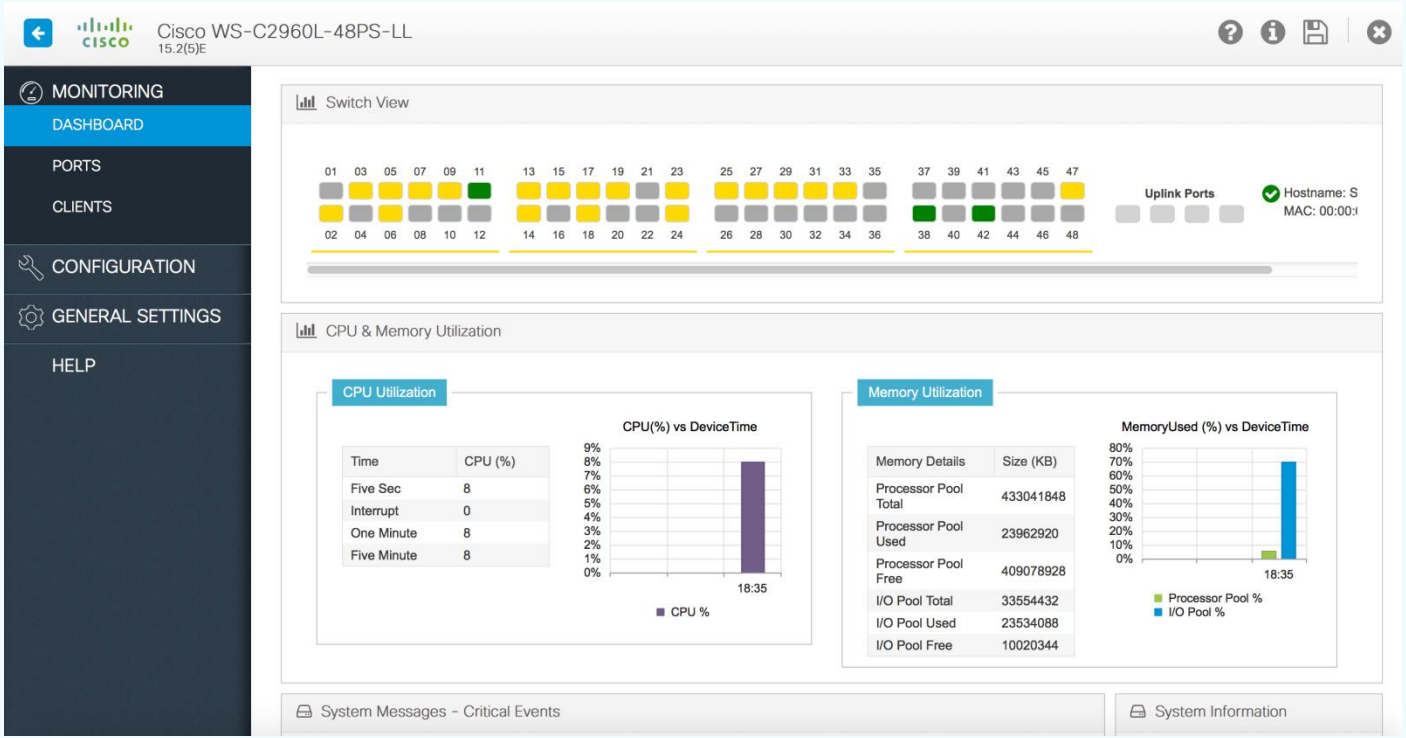
47

MACsec Product Support

Host	Access	Campus	WAN	Data Center
AnyConnect	Cat 2K- X models	Cat 6800 Sup-2T/6900 LCs	ISR-4000 NIM-2GE-CU-SFP	Nexus 9300-FX
	Cat 3850 & Cat 3650	Catalyst 4500-X	ASR-1001-X ASR-1001-HX	X7600 FX Linecards
	Cat 3750 & Cat 3560-C	Catalyst 4500-E (Sup-7E)	ASR-1002-HX	Nexus 7000 M1 Linecards
	Cat 4500-X	Cat 3850 & Cat 3650	ASR1000 10x10 & 18x1 Gig EPAs	Nexus 7000 M2 Linecards
	Cat 4500-E (Sup-7E)			Nexus 7000 M3 Linecards
		Cat 9400 Cat 9300		

Мелочь, а приятно

Simple Management: Web UI



Что нас ждёт?
(вместо roadmap)

Industrial Design

Designed by the company that designs the Ferrari

Mechanical Design Verification Test

HOT

45°C

and we even go higher !

COLD

-5°C

and we even go lower !

HUMIDITY

5% - 95%

non condensing !

ALTITUDE

10,000ft

and we even go higher !

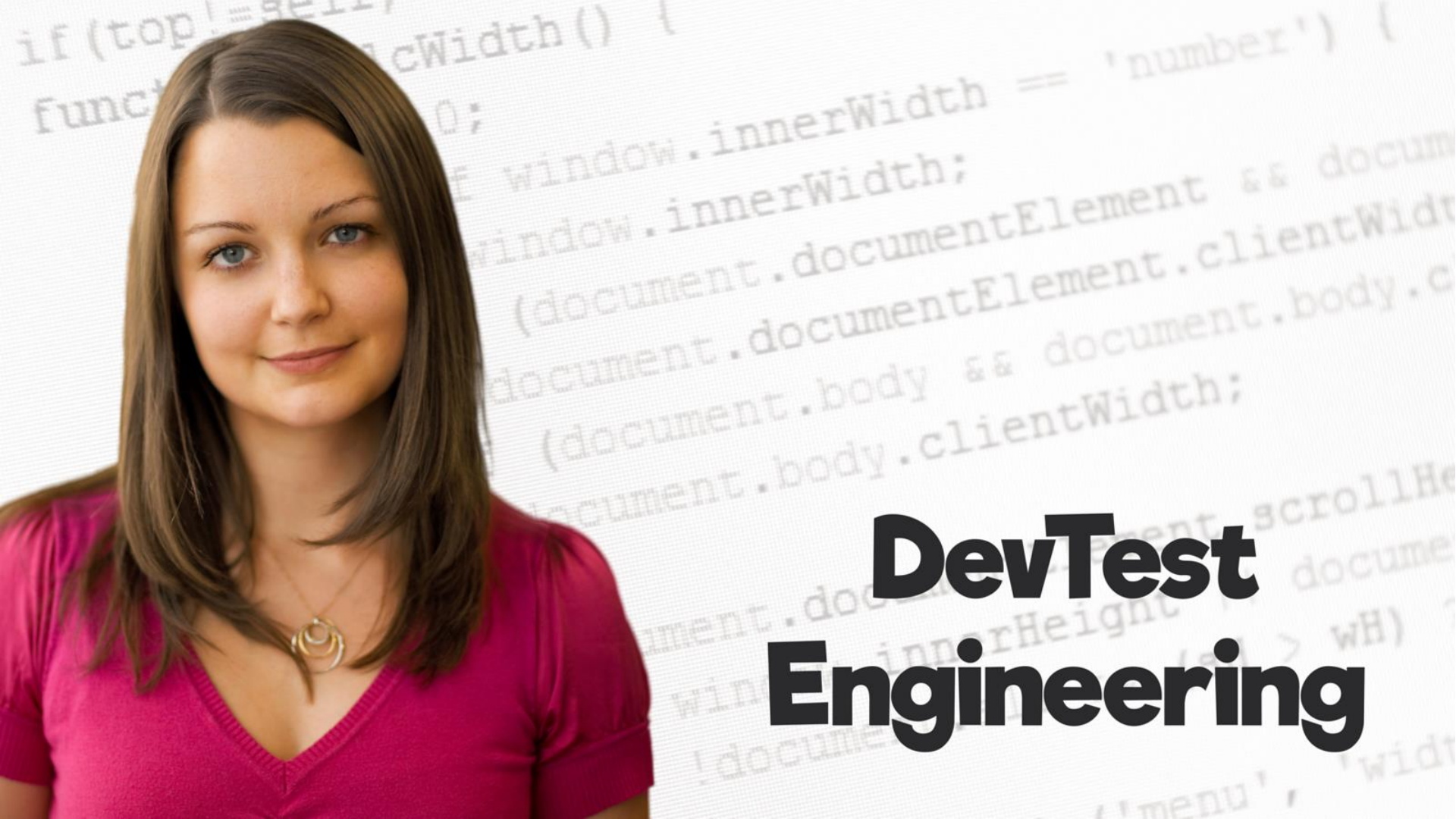
SHAKEN

not stirred

7.2

on the Richter Scale

Software Engineering

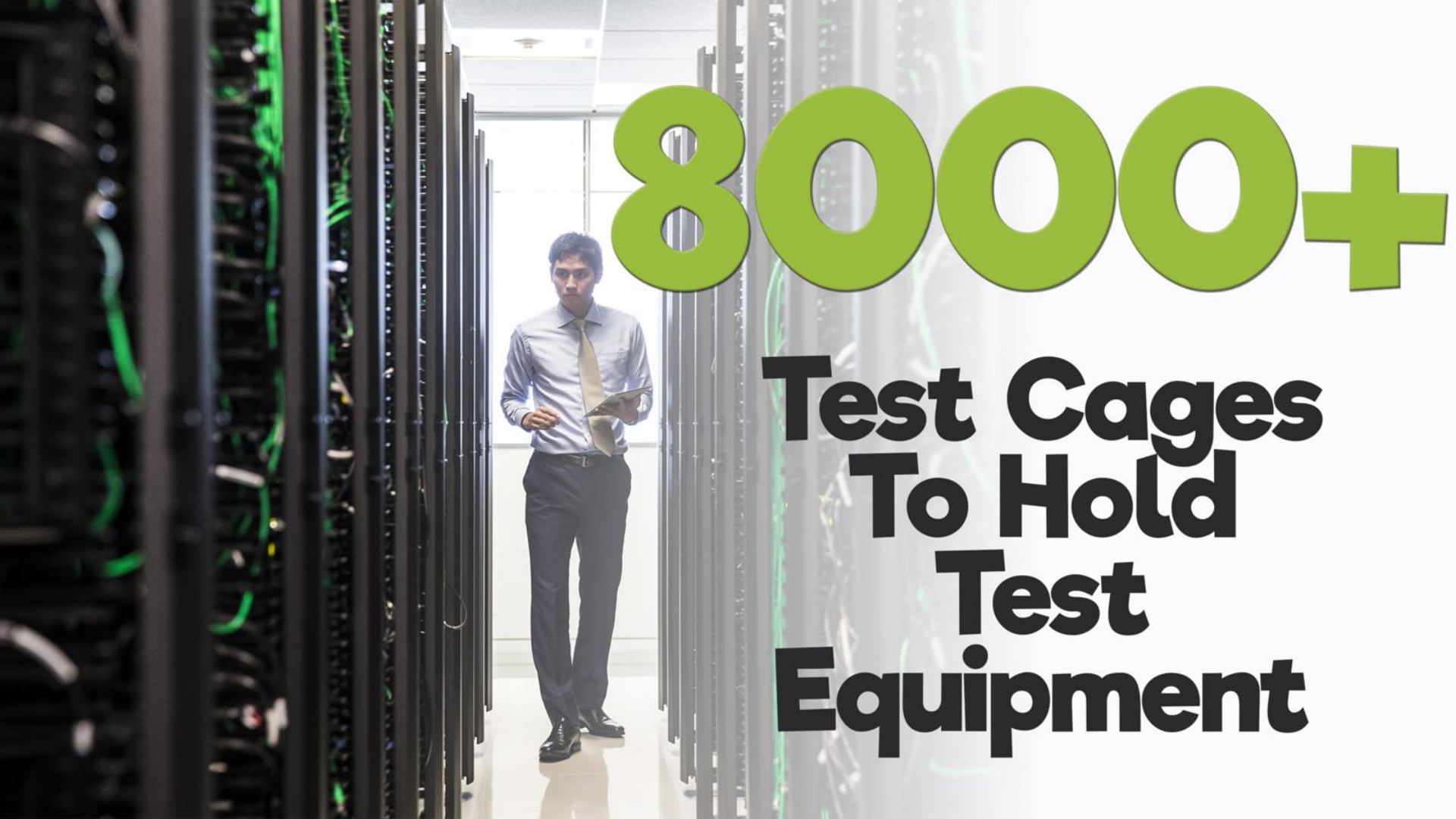

DevTest
Engineering

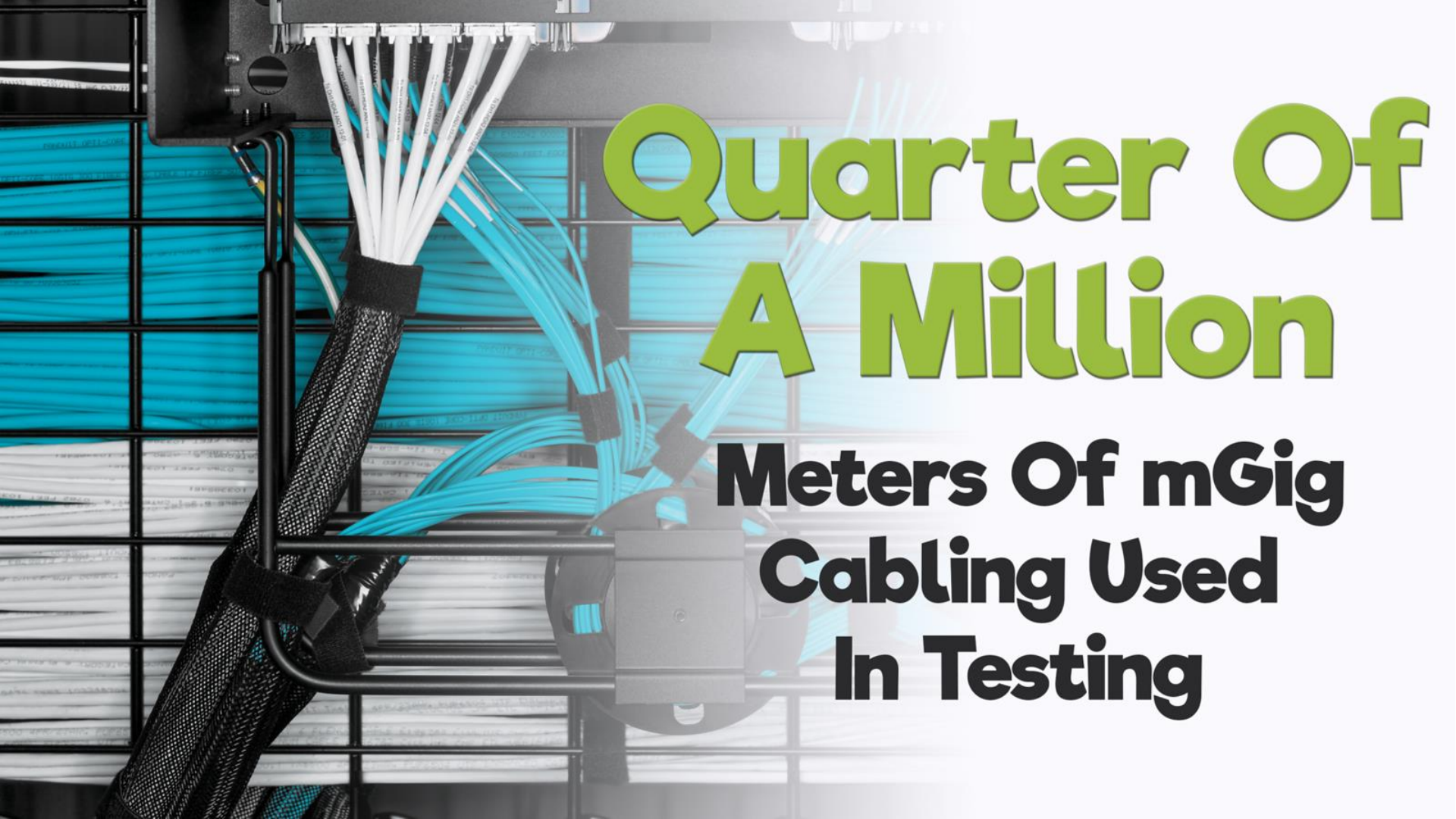

10
Months
Testing
ASIC | Functional | System

2500+

Hours Of Testing Per Day

Over Last 4 Months


8000+
Test Cages
To Hold
Test
Equipment



Quarter Of A Million

Meters Of mGig Cabling Used In Testing

22,000W

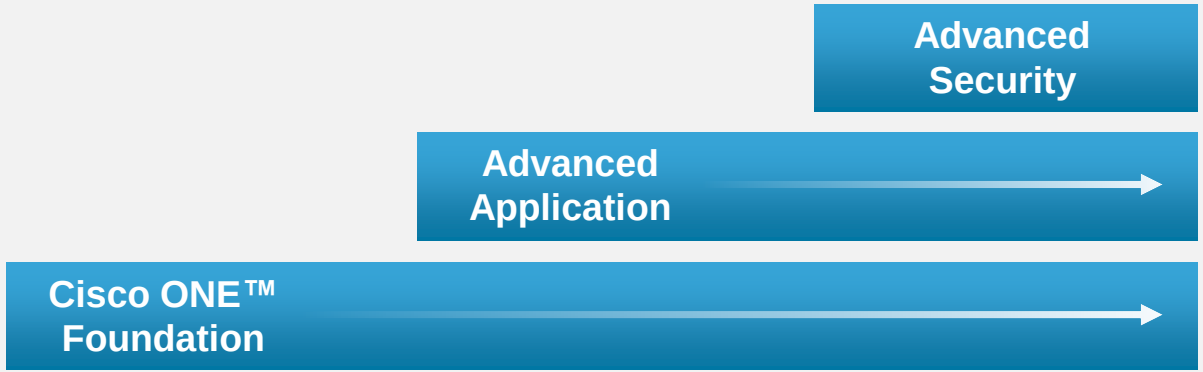
POE Power Test Capacity

enough to drive a Chevy Volt 50 Miles !

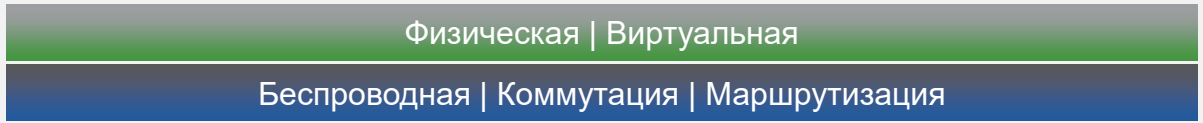

CISCO

Cisco ONE упрощает приобретение

1 Функциональные возможности ПО



2 Платформа



3 Модель покупки

- Традиционная
- Подписка
- Корпоративная модель