NIC.br
Infra-estrutura do ISP
SP Access Platforms

Adalberto Lins
Adalberto@cisco.com

Tendências no Mundo Digital

Digital Signage

Cloud/SaaS Apps

IoT

Thin Client Apps

Video

Escritório

Especialista Remoto

Redes Sociais

Mobilidade

Guest Wi-Fi

Mais Dados

8GB
De tráfego Internet por mês de PCs e tablets em 2021*

Mais Dispositivos

6.1B
Usuários de smartphones no mundo em 2020***
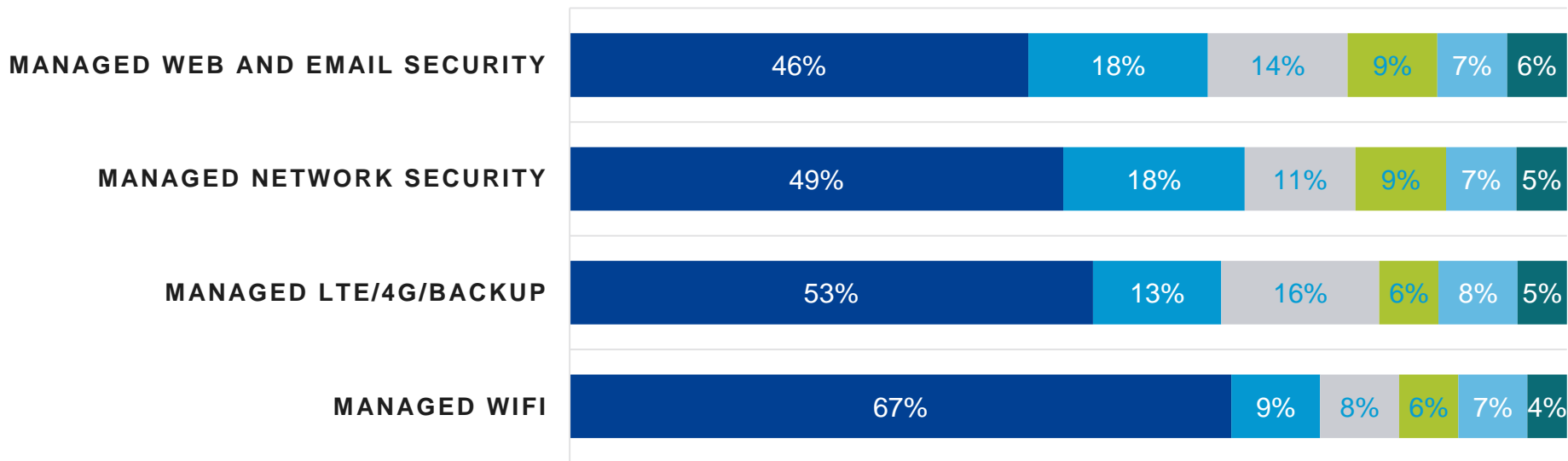
Mais Apps

20-50%
Aumento de banda nas empresas por ano até 2018**

* Cisco Visual Networking Index
**US The Census Bureau of the Department of Commerce, 2015
*** Ericsson mobility report - http://www.ericsson.com/ericsson-mobility-report

CISCO

Forte Preferência de Contratar do Provedor

Legend:
- ■ Network Service Provider
- ■ Direct from Vendor
- ■ Value Added Reseller
- ■ Local Consultant
- ■ Don't want Managed
- ■ Don't Know

	Network Service Provider	Direct from Vendor	Value Added Reseller	Local Consultant	Don't want Managed	Don't Know
MANAGED WEB AND EMAIL SECURITY	46%	18%	14%	9%	7%	6%
MANAGED NETWORK SECURITY	49%	18%	11%	9%	7%	5%
MANAGED LTE/4G/BACKUP	53%	13%	16%	6%	8%	5%
MANAGED WIFI	67%	9%	8%	6%	7%	4%

SMBs querem comprar Serviços Gerenciados do provedor de rede.
Menos de10% não quer uma solução gerenciada.

Confidential   4

SOURCE: Cisco conducted blind survey of 883 businesses with 11-250 employees in June 2017

Capturando Essa Oportunidade...

Aumento da Margem
Com mais oferta de SVA

Eficiência Operacional
Aproveitando a automação da nuvem

Simplicidade/ Melhor Experiência
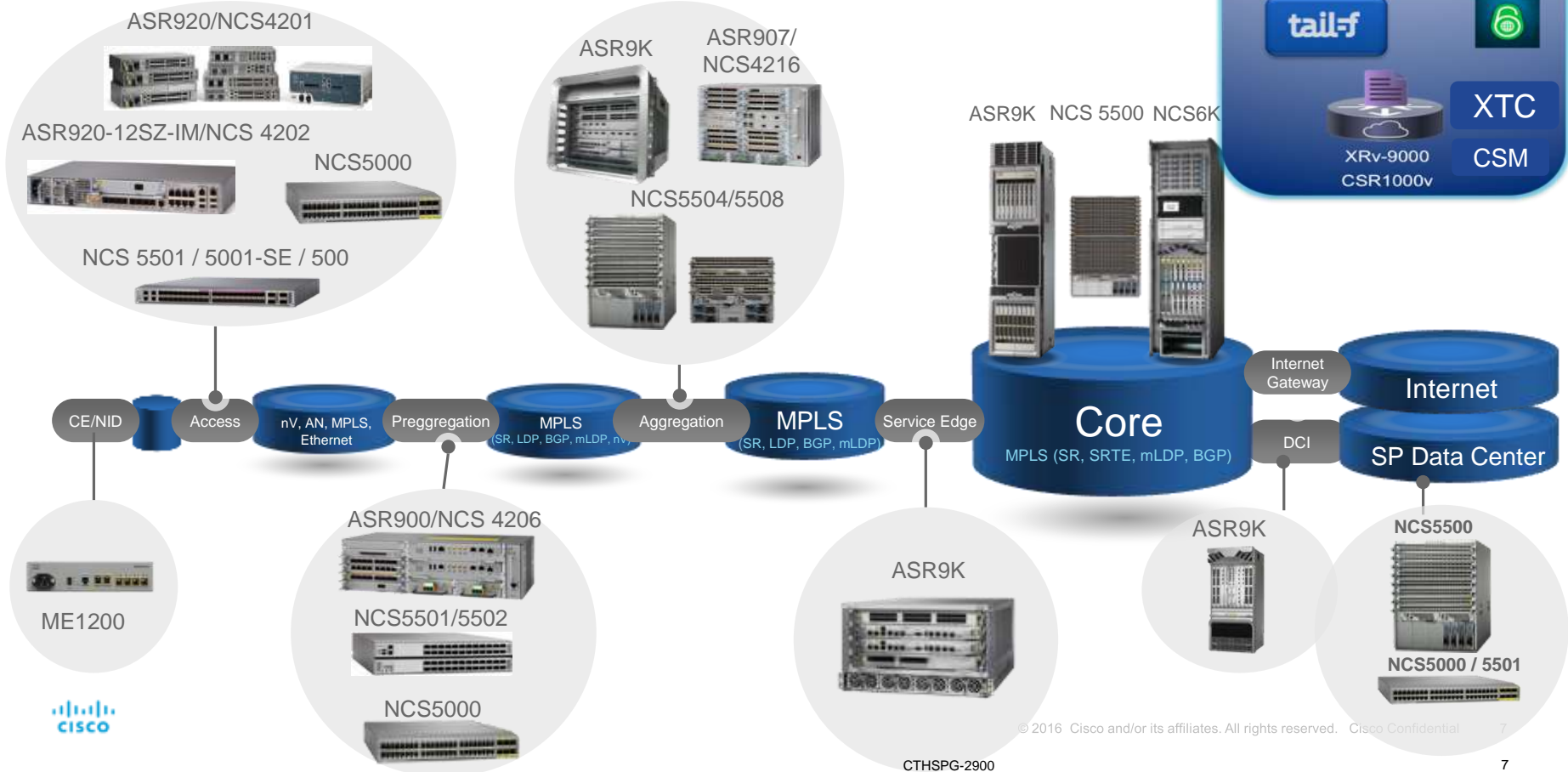*Reduzindo o custo de aquisição, operação*

Lealdade
Redução da perda de clientes

- Mais de 50% dos SMBs comprariam SVAs do provedor de rede
- 75% dos clientes mudariam de provedor caso este não oferecesse serviço gerenciado baseado em nuvem

Large Telecom
Service Provider Access Portfolio
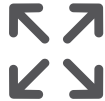
Service Provider Access Portfolio

ASR920/NCS4201

ASR920-12SZ-IM/NCS 4202

NCS5000

NCS 5501 / 5001-SE / 500

ASR9K

ASR907/ NCS4216

NCS5504/5508

ASR9K   NCS 5500   NCS6K

XRv-9000
CSR1000v

XTC

CSM

ODL/OSC

DDoS

EPN Manager

tail=f

| CE/NID | Access | nV, AN, MPLS, Ethernet | Preggregation | MPLS (SR, LDP, BGP, mLDP, nV) | Aggregation | MPLS (SR, LDP, BGP, mLDP) | Service Edge | Core MPLS (SR, SRTE, mLDP, BGP) | Internet Gateway | DCI | Internet | SP Data Center |

ME1200

ASR900/NCS 4206

NCS5501/5502

NCS5000

ASR9K

ASR9K

NCS5500

NCS5000 / 5501

Trends: New Opportunities

The world has gone mobile

Changing Customer Expectations With AI, VR

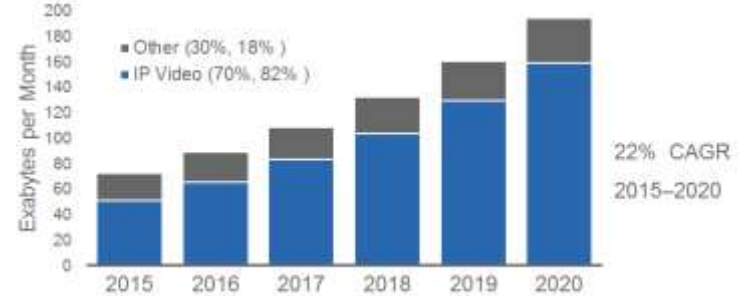**8X Mobile Traffic Growth**
From 2015-2020

Ubiquitous Access
to Apps & Services

Traffic growth in Access, driven by video

- Other (30%, 18%)
- IP Video (70%, 82%)

Exabytes per Month

200, 180, 160, 140, 120, 100, 80, 60, 40, 20, 0

2015 2016 2017 2018 2019 2020

22% CAGR
2015–2020

Rise of cloud computing

Soon to Change SP Architectures/ Service Delivery

Changing Enterprise Business Models
Efficiency & Capacity

Digitization leading to IoE
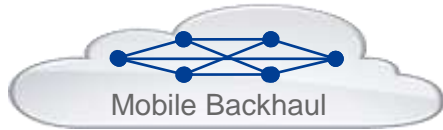
Emergence of the Internet of Everything

People + Process + Data + Things

Market Trend: Network Infrastructure Convergence
## Single Any-Service Network for Lower CAPEX & OPEX

Decoupled Service from Infrastructure

- One efficiently utilized network
- One operational model
- All services on a single network

Mobile Backhaul

Business / Private Cloud

Residential Triple Play

SONET/ATM

Converged Infrastructure

Multiple under-utilized networks
No integration between services
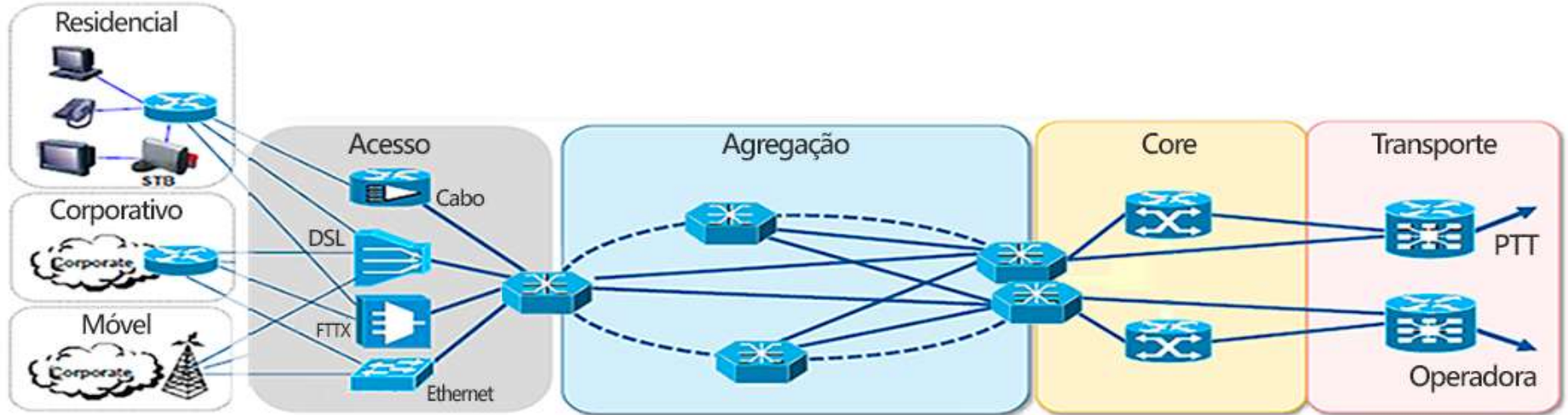Different operational skill sets
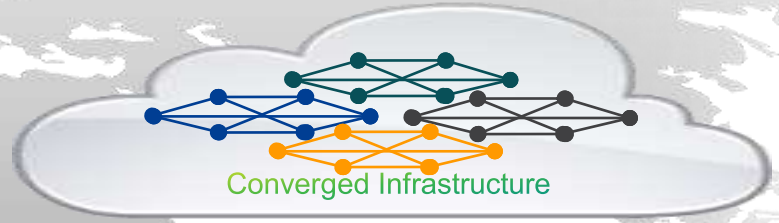
Convergence Benefits

- Up to 75% CAPEX savings
- OPEX efficiency – one skill set
- Revenue opportunities – one access, multiple services

Referencia Regional
Service Provider Access Portfolio

Topologia de Referencia

Residencial
Corporativo
Móvel

Acesso — Cabo, DSL, FTTX, Ethernet
Agregação
Core
Transporte — PTT, Operadora

CPE
WiFi
SD WAN
Security
IPv6

FTTH, PON
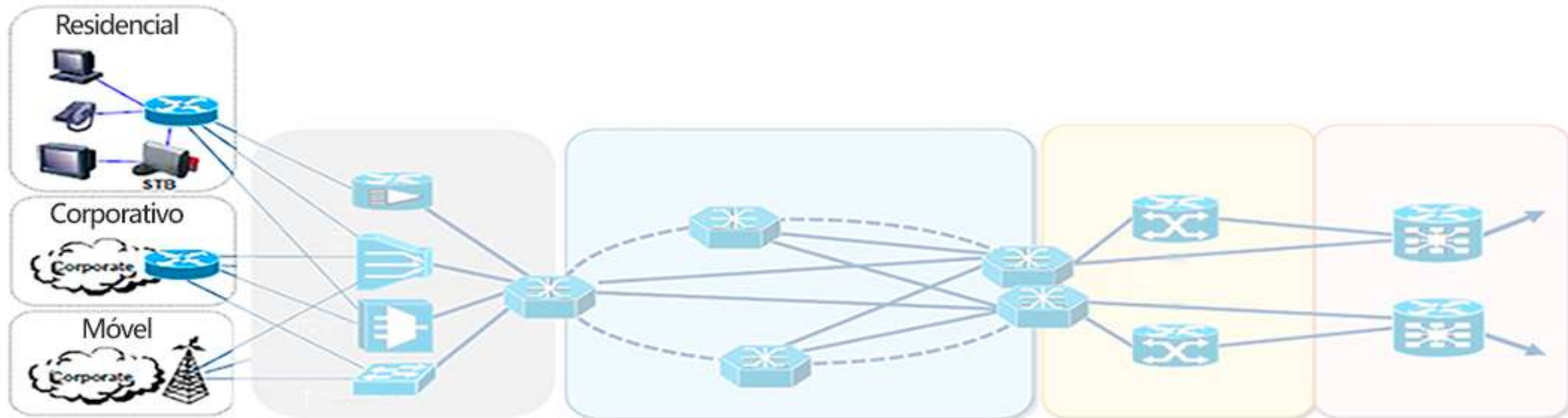GPON, STP,
REP, 802.1Q
Etc,

OSPF, MPLS,
VPLS, L3VPN

Segment Routing
BGP-eVPN

BGP, PPPoE,
CGNAT, IPoE,

NAT64

BGP
BGP Full
IPv4/IPv6

CPE

ISR 1000

Meraki

Cisco Enterprise Routing Portfolio

Cloud

Branch

WAN Edge

CSR 1000V

- 10 Mbps to 10 Gbps
- DNA Virtualization
- Extend enterprise routing, security and management to cloud

vEdge Cloud

- 10 Mbps to 100 Mbps
- Extend overlay to public cloud

ISR 800

- Up to 100 Mbps
- Fixed and fanless
- Enterprise-class branch routing with security

ISR 1000

- Up to 250 Mbps
- Fixed and fanless
- Integrated wired and wireless access

vEdge 100

- 100 Mbps
- 4G LTE & Wireless

ISR 4000

- Up to 2 Gbps
- Modular
- Integrated container applications
- Compute with UCS E

vEdge 1000

- Up to 1 Gbps
- Fixed

ASR 1000

- 2.5–200Gbps
- High-performance service with hardware assist
- Hardware and software redundancy

vEdge 2000

- 10 Gbps
- Modular

Virtual

ISRv

- 50 Mbps to 2.5 Gbps
- Virtual enterprise-class networking
- Run on x86 compute platform
- ENFV orchestration & management

Cisco ENCS

- Service chaining virtual functions
- Modular WAN connectivity
- Open for 3rd party services & apps

Cisco 1000 Series Integrated Services Routers
Foundation for the digital branch

Pay-as-You-Grow

Investment Protection

WAN and Application Assurance
IWAN App over APIC-EM and DNA-C
Application Visibility and Link Optimization
VPN and Security

Advanced Mobility
LTE Advanced
Mobility Express

High Performance
High WAN-WAN and LAN-WAN performance
High Performance VPN and Security

Proactive Security
Secure connectivity
Branch threat defense
Visibility and analytics

Physical

Cisco 1100
Integrated
Services Router

Connectivity

Ethernet | xDSL | LTE Advanced | 801.11ac Wave 2

Manageability

| APIC-EM | WebUI |
| Prime | DNA Center |

Cisco 1000 Series Integrated Services Routers
Value and Benefits

Speed and Performance

Multi-core hardware architecture

Open and programmable operating system IOS® XE

Trustworthy Systems

Connectivity

Ethernet, DSL, LTE Advanced,

Gigabit Ethernet LAN

802.11ac wave2 with Mobility Express

Ease of Use

Centralized management and orchestration with Cisco DNA Center
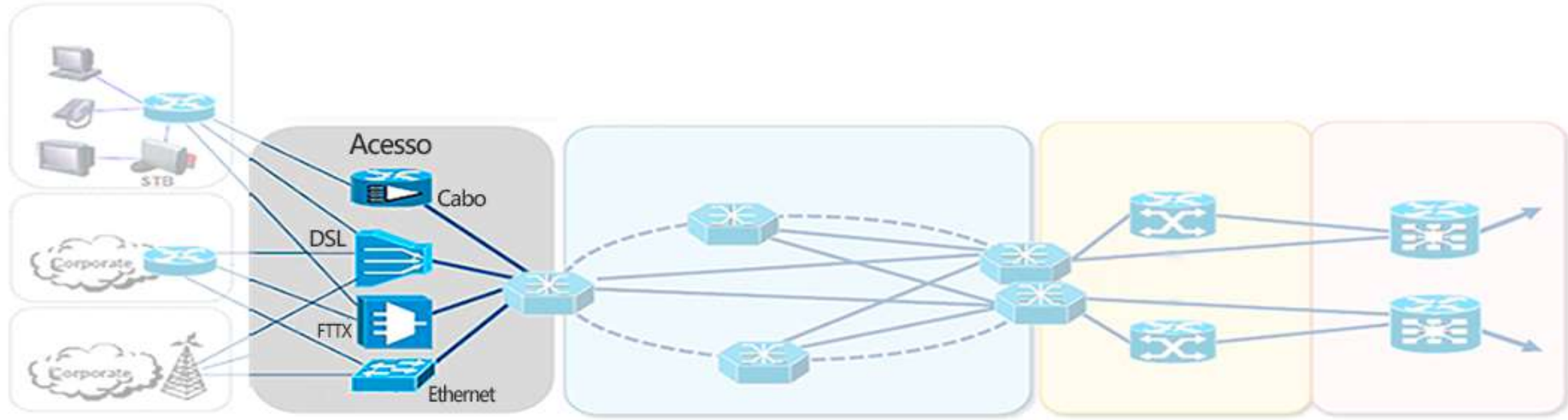
Zero touch deployment and provisioning

Comprehensive Security

Advanced threat defense with encryption at high-performance

Umbrella Branch provides secure WAN and enterprise-class security.

Encrypted Traffic Analytics using machine learning for anomaly detection

Acesso

ASR920

NCS 540

ASR 903

ASR 907

Cisco ASR 920 Portfolio

	ASR-920-4SZ-A/ASR-920-4SZ-D	ASR-920-12CZ-A/ASR-920-12CZ-D	ASR-920-10SZ-PD	ASR-920-24TZ-M	ASR-920-24SZ-M	ASR-920-24SZ-IM	ASR-920-12SZ-IM
Size	1RU	1RU	2-4RU	1RU	1RU	1.5RU	1RU
IM Slots	-	-	-	-	-	1	1
Air Flow	Front to Back	Front to Back	-	Front to Back	Front to Back	Front to Back/Side to Back	Front to Back
1G ports	2/6	12/14	10	24	24	24	12/16
10G ports	4	2	2	4	4	4	4

ASR 920 Series

Secured Cell Site Router	High Density Model	Low Density Models
12xGE + 4x10GE	Up to 24xGE + 4x10GE	Up to 12xGE and 2x10GE
Full line rate	Full line rate	Full line rate
One modular slot	Fixed or one modular slot	-40C to 65C, < 300mm depth
-40C to 65C, < 300mm depth	-40C to 65C, < 300mm depth	Passively cooled model available
IPSec, GPS. PoE support	SyncE/1588/BITS	SyncE/1588/BITS
Redundant and modular PS: AC and DC	Redundant and modular PS: AC and DC	Fixed redundant PS: AC and DC

Premium fixed access routers for Carrier Ethernet, Mobile Backhaul, or Fiber to the Home Deployment. Single ASIC and OS across portfolio

Cisco ASR 920 Foundational Pillars
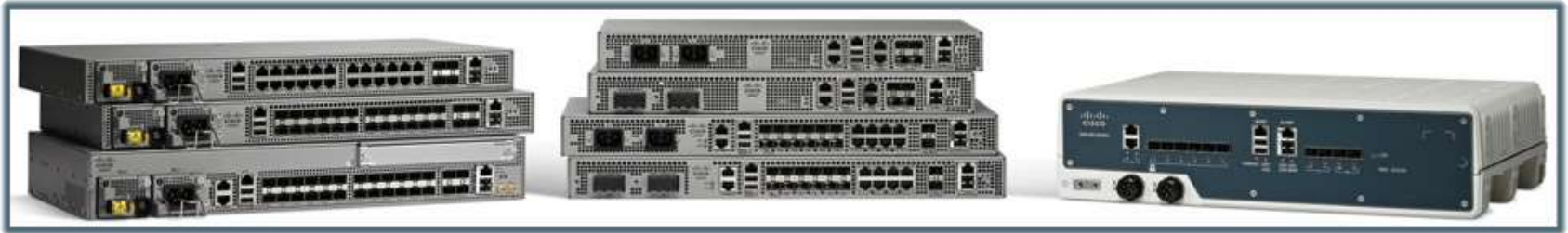
- **Sharing Single OS, Single ASIC:** Optimize network operations and manageability

- **Breadth of product portfolio:** Multiple product variants - Indoor and Outdoor

- **Compact:** Small form-factor and temperature hardened platforms

- **Advanced Carrier Ethernet & MBH DNA:** Single converged platform running on same OS and ASIC addressing needs of both CE and MBH

- **Enables Network Convergence** of Business & Residential Services for both Fixed & Mobile Networks

ASR 900 Chassis

ASR 902 (2RU)

Single Route Switch Processor

4 interface module slots

480G backplane capacity

I-Temp -40C to 65C, < 300mm depth

Redundant and modular PS AC and DC

ASR 903 (3RU)

Dual Route Switch Processor

6 interface module slots

480G backplane capacity

I-Temp -40C to 65C, < 300mm depth

Redundant and modular PS AC and DC

50 msec ISSU support

ASR 907 (7RU)

Dual Route Switch Processor

16 interface module slots

2T backplane capacity

I-Temp -40C to 65C, < 300mm depth

Redundant and modular PS AC and DC

50 msec ISSU support

Compact , Redundant, and High Capacity Small Aggregation Platforms with Flexible Interface Support

Agregação

Agregação
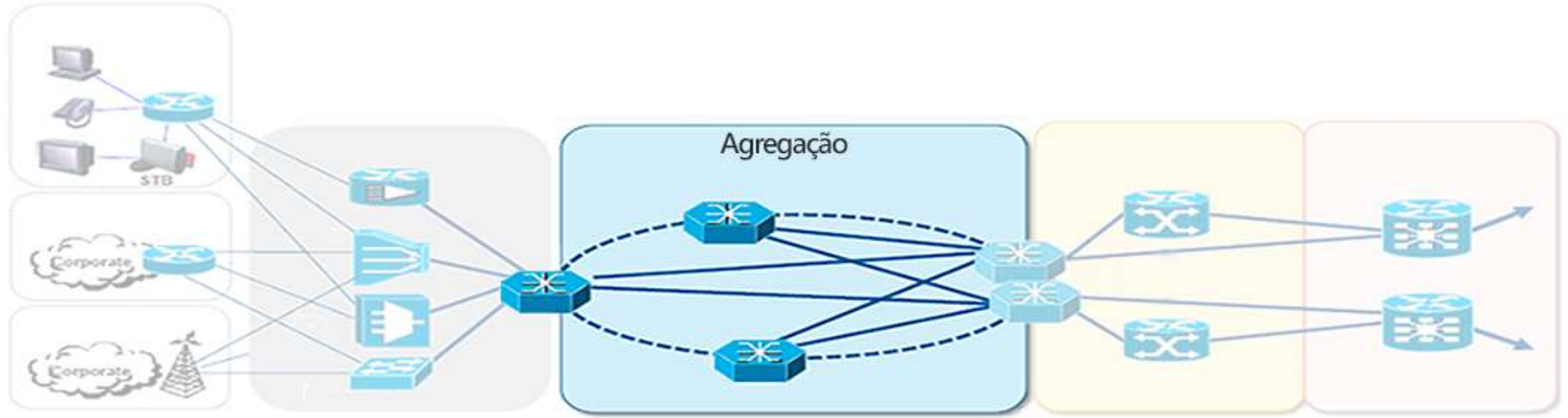
ASR920

NCS 540

NCS5000 / NCS5500

IOS XR Family

Cisco IOS-XRv 9000 — Virtual RR/PE/DC Forwarder

Cisco NCS 5500 & NCS 5000

Cisco ASR 9000, CRS & NCS 6000

OPTIMIZED Cisco vXR Software

Elastic

Cost Optimized

Ultra-high Density

Carrier Grade

Programmability and Automation

NCS 5500 Product Family
100G-optimized, Scalable IOS XR Routers

| NCS 5501	NCS 5502	NCS 5504	NCS 5508	NCS 5516
800 Gbps – 1 RU	4.8 Tbps – 2 RU	14.4 Tbps – 7 RU	28.8 Tbps – 13 RU	57.6 Tbps – 21 RU

Platforms Comparison

Scale Chart

	NCS 5501	NCS 5501-SE	NCS 5502/-SE	NCS 5508	NCS 5516	NCS 55A1-36H	NCS 5001	NCS 5002	NCS 5011
10G	48+6x4	40+4x4	48x4	8x36x4	16x36x4	36x4	40+4x4	80+4x4	32x4
40G	6	4	48	8x36	16x36	36	4	4	32
100G	6	4	48	8x36	16x36	36	4	4	32
BW Gbps	800	800	4,800	28,800	57,600	3,6000	800	960	3,200
Total Mpps	720	600	5,760*	34,560	69,120	3,340	1,440	1,440	?
Power W	240	320	1,850*	6,940	14,750	1,300	200	300	228
Pfx scale	1.1M+	2.75M	Up to 2.75M IPv4			Up to 8M	128k IPv4 + 16k MPLS		
Buffer	4GB per Forwarding ASIC						16MB		
Queues	96k						2,960		1,280

CORE
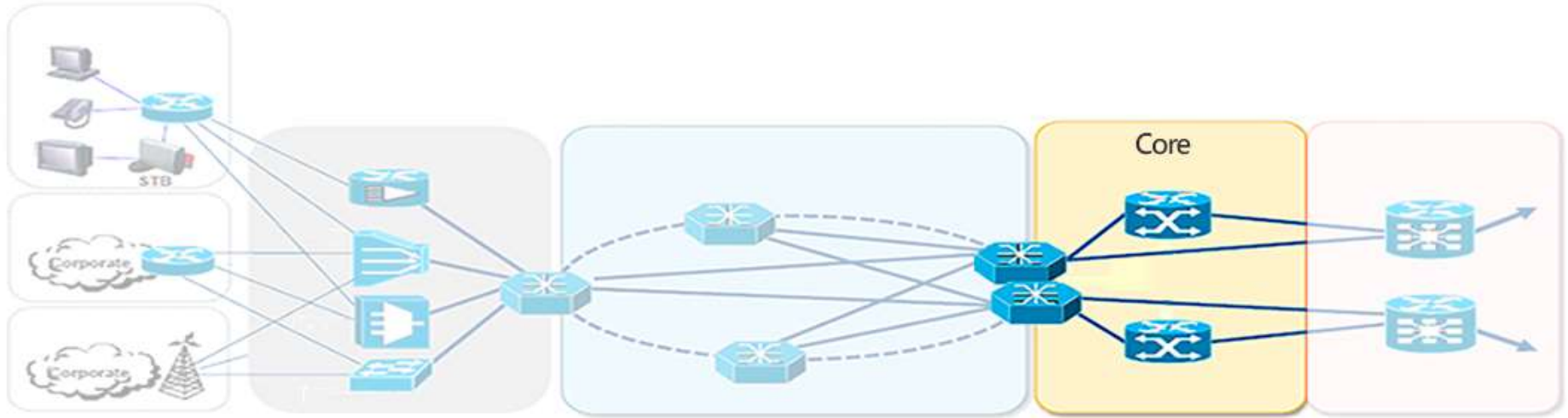
ASR1001/
ASR1002

ASR1001 HX
ASR1002 HX

ASR9001 /
ASR9901

The Cisco ASR 1000 Series Router Family

▶ Compact, Powerful Router	▶ Business-Critical Resiliency	▶ Instant-On Service Delivery

Fixed Chassis ◄——— IOS-XE ———► Modular Chassis

ASR1001-X
2.5 to 20 Gbps

ASR1001-HX
44 to 60 Gbps

ASR1002-X
5 to 36 Gbps

ASR1002-HX
44 to 100 Gbps

ASR1004
10 to 40 Gbps

ASR1006
10 to 100 Gbps

ASR1006-X
40 to 100 Gbps

ASR1009-X
40 to 200 Gbps

ASR1013
40 to 200 Gbps
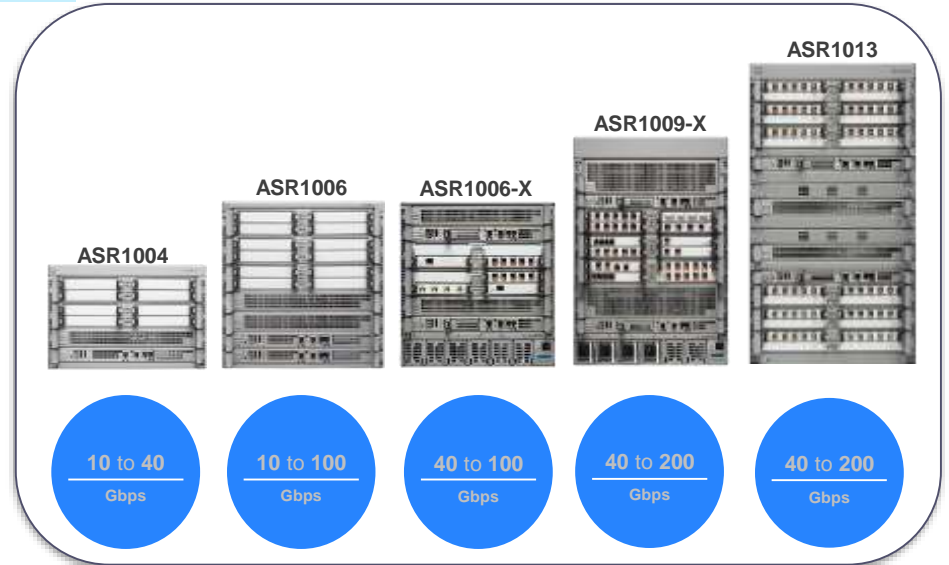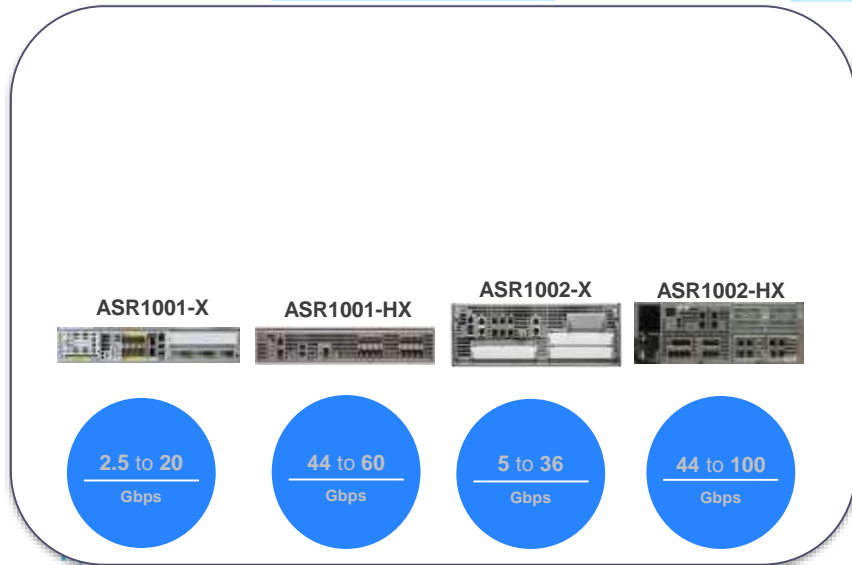
ASR 1000 Series Momentum

Customer Adoption

- 44,500+ customers (SP + ENT)

- 300,000+ chassis sold

Feature Velocity & Adoption

- 28 major releases since FCS in May 2008
- Over 3,000 features to support many solutions
  - SD-WAN, SD-Access, DNA, VPN, DCI, Segment Routing, Programmability, etc.

of Features

Cisco ASR9000/ASR9900 Portfolio

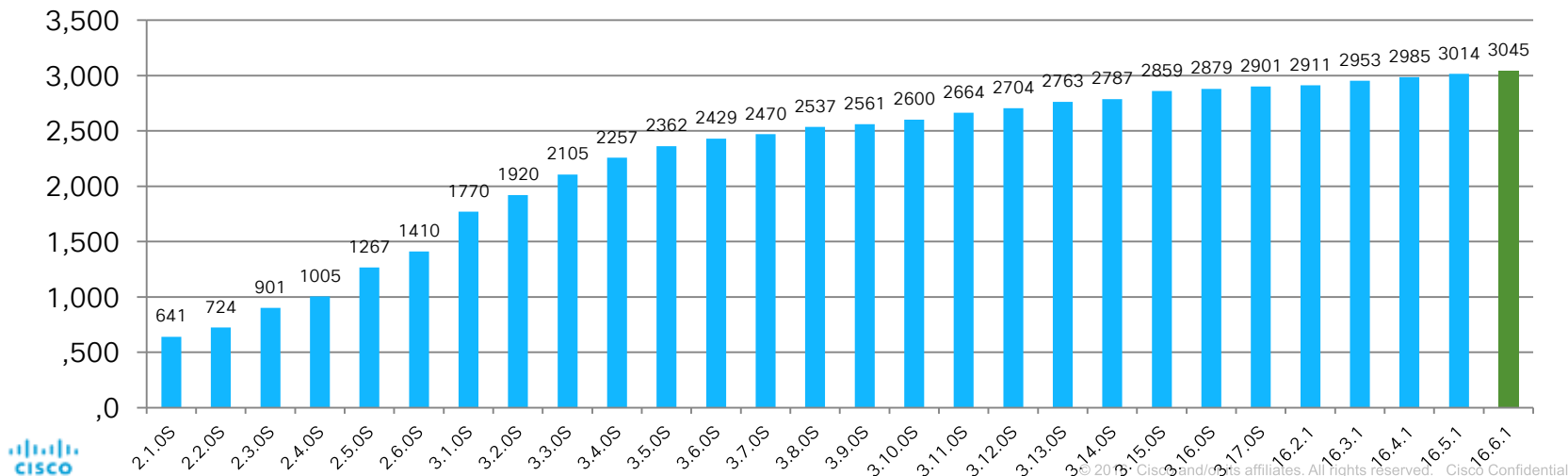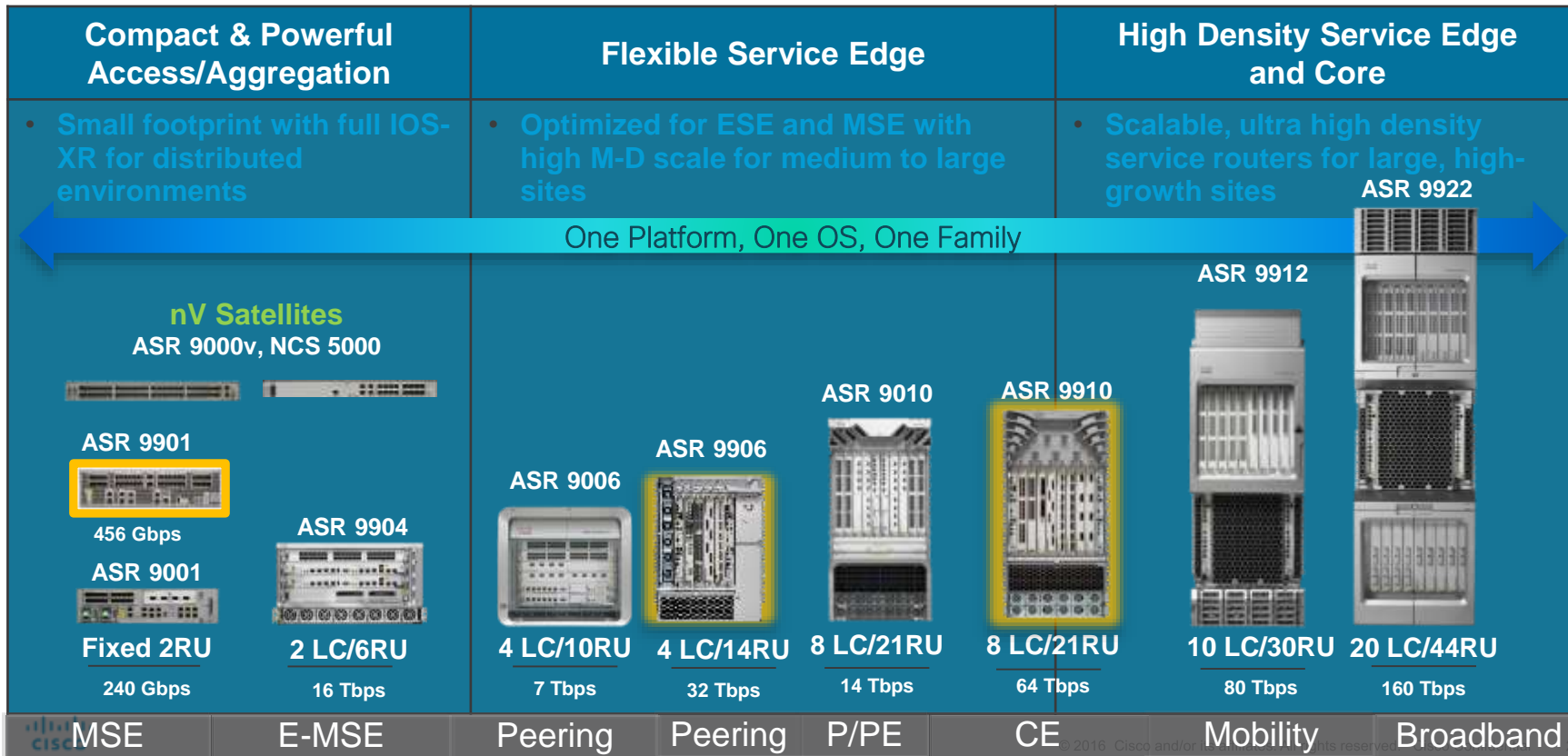| Compact & Powerful Access/Aggregation	Flexible Service Edge	High Density Service Edge and Core
• Small footprint with full IOS-XR for distributed environments	• Optimized for ESE and MSE with high M-D scale for medium to large sites	• Scalable, ultra high density service routers for large, high-growth sites

One Platform, One OS, One Family

nV Satellites
ASR 9000v, NCS 5000

ASR 9922

ASR 9912

ASR 9901

456 Gbps

ASR 9904

ASR 9906

ASR 9010

ASR 9910

ASR 9006

ASR 9001

Fixed 2RU	2 LC/6RU	4 LC/10RU	4 LC/14RU	8 LC/21RU	8 LC/21RU	10 LC/30RU	20 LC/44RU
240 Gbps	16 Tbps	7 Tbps	32 Tbps	14 Tbps	64 Tbps	80 Tbps	160 Tbps

MSE	E-MSE	Peering	Peering	P/PE	CE	Mobility	Broadband

Transporte

Transporte

PTT

Operadora

NCS5500-**SE**

ISR-4k

ASR9000 /
ASR9900

ASR-1k

Pay-As-You-Grow with Cisco ISR 4000 Series

ISR 4451
1-2 Gbps

ISR 4431
500-1000 Mbps

ISR 4351
200-400 Mbps

ISR 4331
100-300 Mbps

ISR 4321
50-100 Mbps

ISR 4221
35-75 Mbps

4-10X Faster

Add performance and services anytime

Flexible consumption options
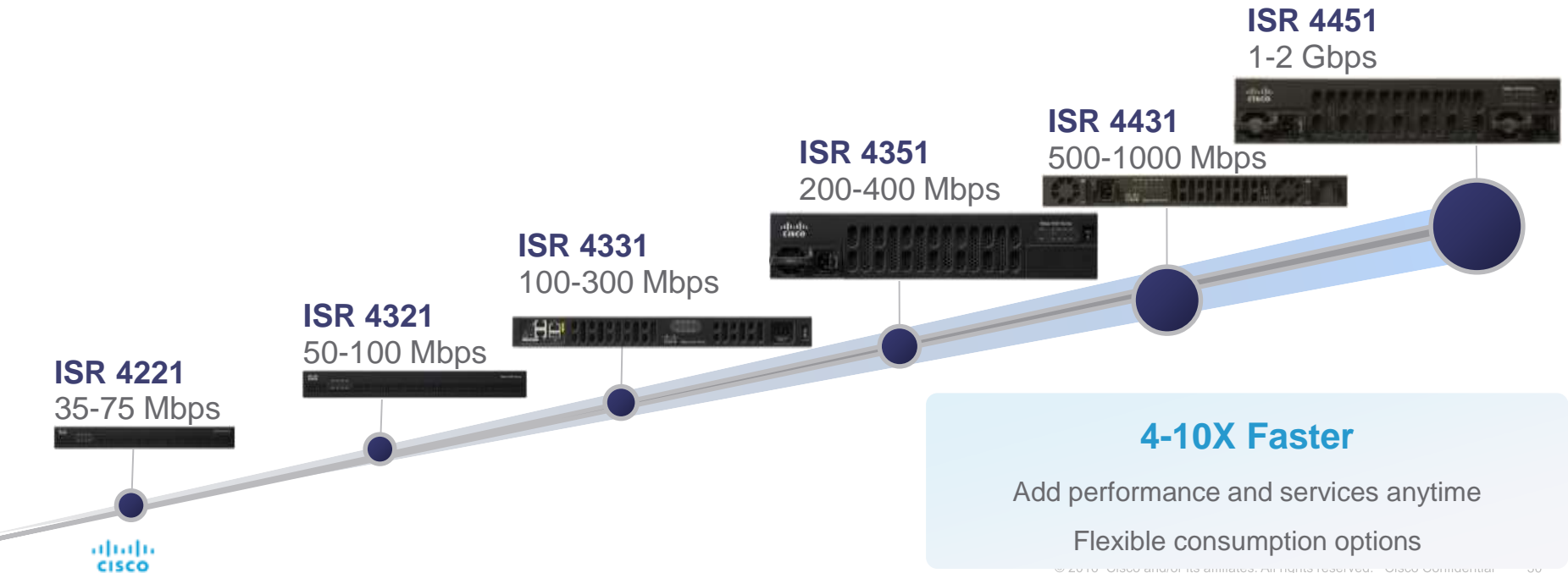
ISR4K Specifications Summary

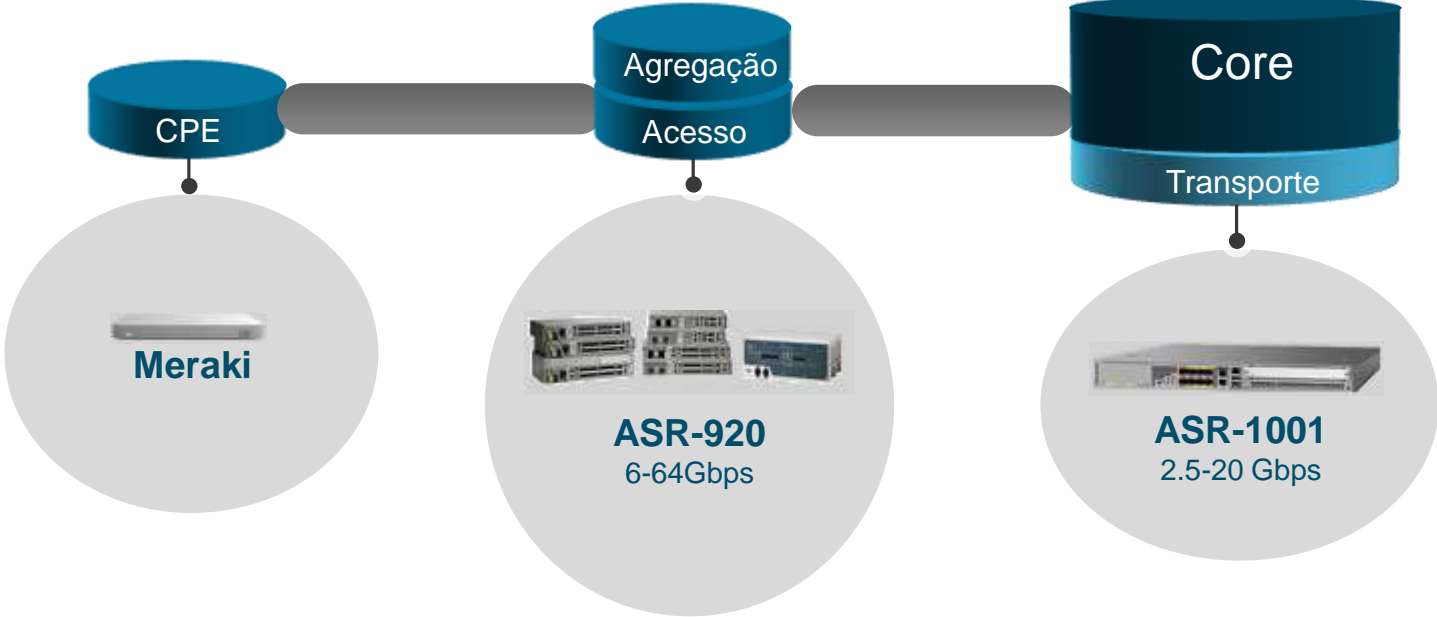| Platform	Performance	Height	GE / RJ45 / SFP	NIM	SM-X / DW	Default / Max Memory	Default / Max Flash Memory	RPS
ISR 4451	1 – 2 Gbps	2RU	4/4/4	3	2 / 1	4GB / 16GB	8GB / 32GB	Yes
ISR 4431	500 – 1000 Mbps	1RU	4/4/4	3	0	4GB / 16GB	8GB / 32GB	Yes
ISR 4351	200 – 400 Mbps	2RU	3/3/3	3	2 / 1	4GB / 16GB	4GB / 16GB	No
ISR 4331	100 – 300 Mbps	1RU	3/2/2	2	1 / 0	4GB / 16GB	4GB / 16GB	No
ISR 4321	50 – 100 Mbps	1RU	2/2/1	2	0	4GB / 8GB	4GB / 8GB	No

Exemplos de Topologia

Service Provider Portfolio (P)

CPE — Meraki

Agregação / Acesso — ASR-920 — 6-64Gbps

Core / Transporte — ASR-1001 — 2.5-20 Gbps

Service Provider Portfolio (P1)

CPE
- Meraki
- ISR 1k

Agregação / Acesso
- ASR-920 — 6-64 Gbps
- NCS-540 — 300 Gbps

Core / Transporte
- ASR-1001 — 2.5-20 Gbps
- ASR-9001 — 60-120 Gbps

Service Provider Portfolio (M)

CPE — Acesso — Agregação — Core — Transporte

Meraki

ISR-1k

ASR-920
6-64Gbps

ASR-903
64Gbps – 400Gbps

NCS-540
300Gbps

ASR-1002-HX
44 – 100 Gbps

ASR-9001
60-120Gbps

Service Provider Portfolio (M1)

CPE

Acesso

Agregação

Core

Transporte

Meraki

ISR-1k

ASR-920
6-64Gbps

NCS-540
300Gbps

ASR-903
64Gbps – 400Gbps

NCS-540
300Gbps

ASR-1k
2.5 – 100 Gbps

ASR-9001
60-120Gbps

ISR-4k
35Mbps – 2Gbps

ASR-1k
2.5 – 100 Gbps

Service Provider Portfolio (G)

CPE

Acesso

Agregação

Core

Transporte

Meraki

ISR 1k

ASR920
6-64Gbps

NCS540
300Gbps

ASR903
ASR907
64Gbps – 400Gbps

NCS5000/5500
800Gbps-1.2Tbps

ASR1k
2.5 – 100 Gbps

ASR-9001
60-120Gbps

ASR-9901
120-456Gbps

NCS5501-SE
800Gbps-1.2Tbps

ASR-9001
60-120Gbps

ASR-9901
120-456Gbps

Novidade: NCS 540

NCS 540 Front & Back Details

10MHz
1pps
Ethernet Mgmt
Serial Console

2 Modular AC/DC
Power Supplies
1+1

GNSS
Antenna

USB
Memory

ToD

24x 10GE
SFP+
24x 1/10GE, 100ME

8x 25GE
SFP28
8x 1/10/25GE

2x 100GE
QSFP28
2x 40/100GE
2x 4x10/25GE

4 Modular Fan Trays 3+1

Alarm

N540-24Z8Q2C-SYS

Shipping
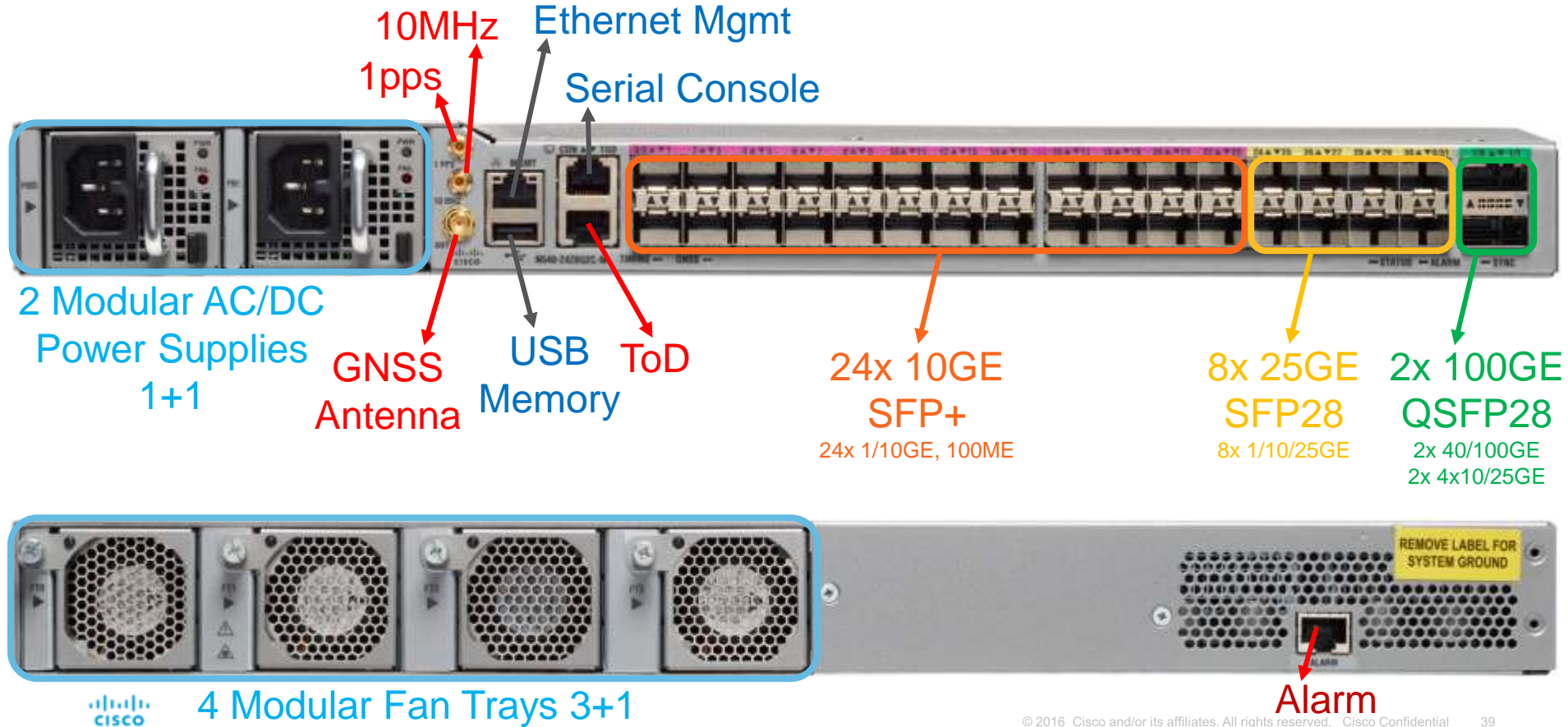
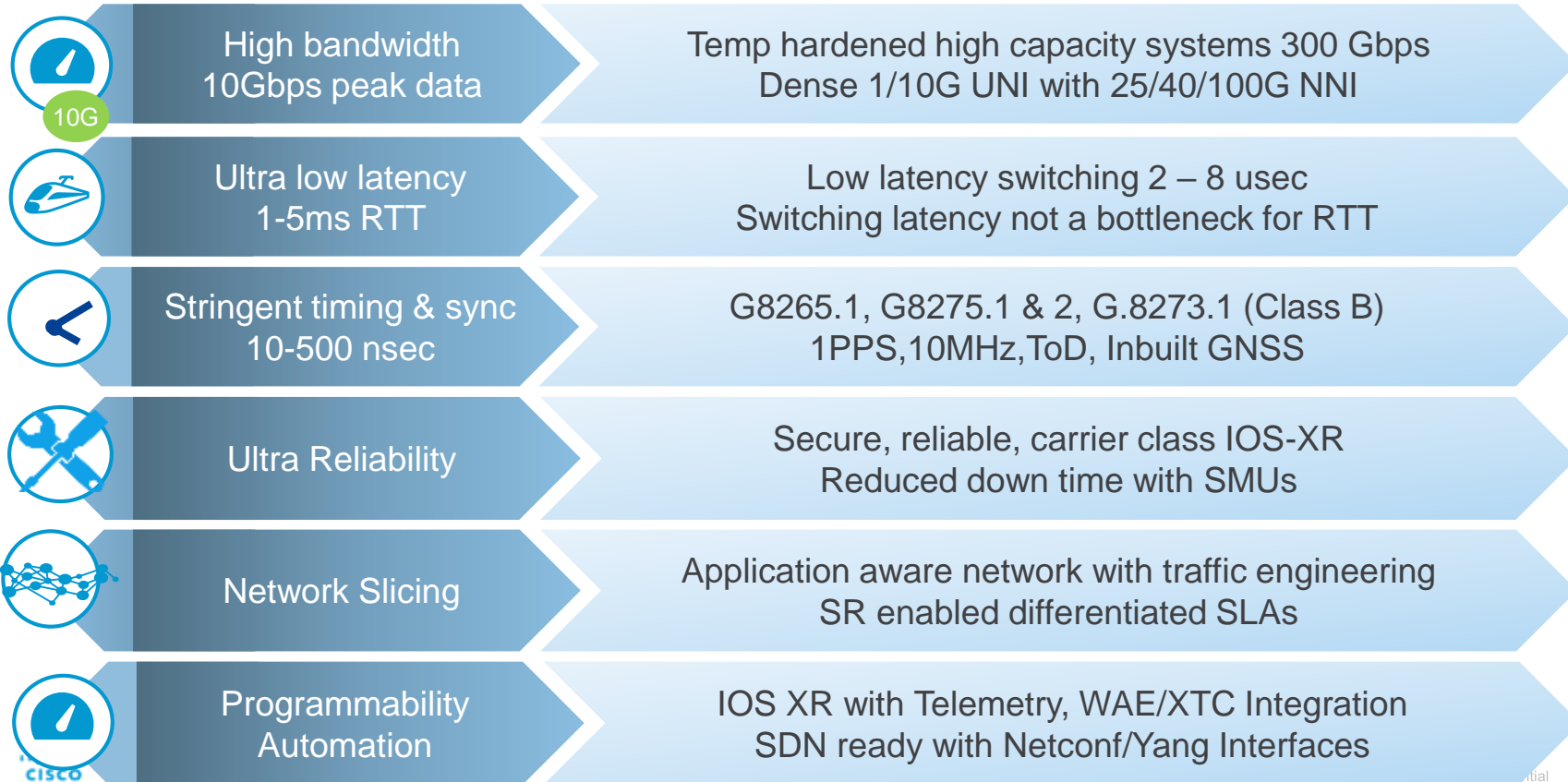| ASIC/CPU/Mem	• 300 Gbps BCOM, Intel Broadwell 4C 1.8GHz CPU • 32GB RAM, 128G SSD
Port Config	• 24x1/10G SFP+, 8x 25G SFP28, 2x100G QSFP28 • DWDM/ZR support on all SFP+ interfaces
PSU/Fan	• Modular & redundant PSUs and fans • Front to back airflow
Temp Range	• iTemp 40C to +70C • Conformal coated SKU for hot humid conditions
Optics	• 1/10G: SR/LR/ER/ZR/DWDM • 25G: SR/LR, 40G: SR/LR/ER, 100G: SR/LR/ER4L
Timing	• 1PPS in/out, 10Mhz in/out, ToD, Internal GNSS • SyncE, G.8265.1, G.8275.1/2, Class B BC
Service Scale	• 256 L3VPN, 2K PWs
Software	• FCS 64 bit IOS XR 6.3.2 • Full SW feature parity with NCS 5500

| SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP28 | SFP28 | SFP28 | SFP28 | QSFP28 |
| SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP+ | SFP28 | SFP28 | SFP28 | SFP28 | QSFP28 |

SFP+
- 24 x GE
- 24 x 10GE

SFP28
- 8 x GE
- 8 x 10GE
- 8 x 25GE

QSFP28
- 8 x 10GE
- 8 x 25GE
- 2 x 40GE
- 2 x 100GE

NCS 540 5G Readiness

High bandwidth 10Gbps peak data		Temp hardened high capacity systems 300 Gbps Dense 1/10G UNI with 25/40/100G NNI
Ultra low latency 1-5ms RTT		Low latency switching 2 – 8 usec Switching latency not a bottleneck for RTT
Stringent timing & sync 10-500 nsec		G8265.1, G8275.1 & 2, G.8273.1 (Class B) 1PPS,10MHz,ToD, Inbuilt GNSS
Ultra Reliability		Secure, reliable, carrier class IOS-XR Reduced down time with SMUs
Network Slicing		Application aware network with traffic engineering SR enabled differentiated SLAs
Programmability Automation		IOS XR with Telemetry, WAE/XTC Integration SDN ready with Netconf/Yang Interfaces

10G

Novidade: ASR9901

ASR 9901 Highlights

Form Factor & BW

- *2 RU box with 2 Tomahawk NPU (ASR 9001 is 2 RU with 2 Typhoons)*

- *Depth of ~23 inches,(9001 is 18")*

- *456G Duplex BW (9001 is 120G Duplex)*

Ports / Port Density

- *Fixed ports available; **no MPAs***

- *42 ports on the faceplate : 16X1G, 24X1/10G, 2X100G(QSFP28)*

- *1G ports : LAN & MACSEC 10G ports: LAN & MACSEC 100G port : LAN & MACSEC*
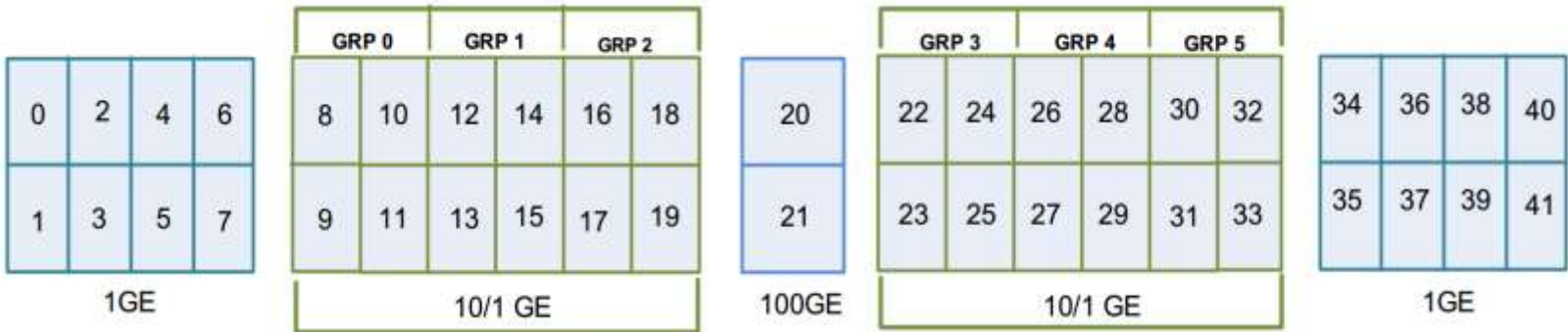
SW & Licensing

- ***64 bit XR only***

- *PAYG mode for **120G, 256G** and **456G***

- *Full feature parity with Tomahawk feature-set*

Mechanicals & Commons

- *Redundant Power & Fan-trays*

- *Front to back Airflow*

- *NEBS, EMC Compliant*

- *All ports/power cabling on front plate; fan trays on backside*
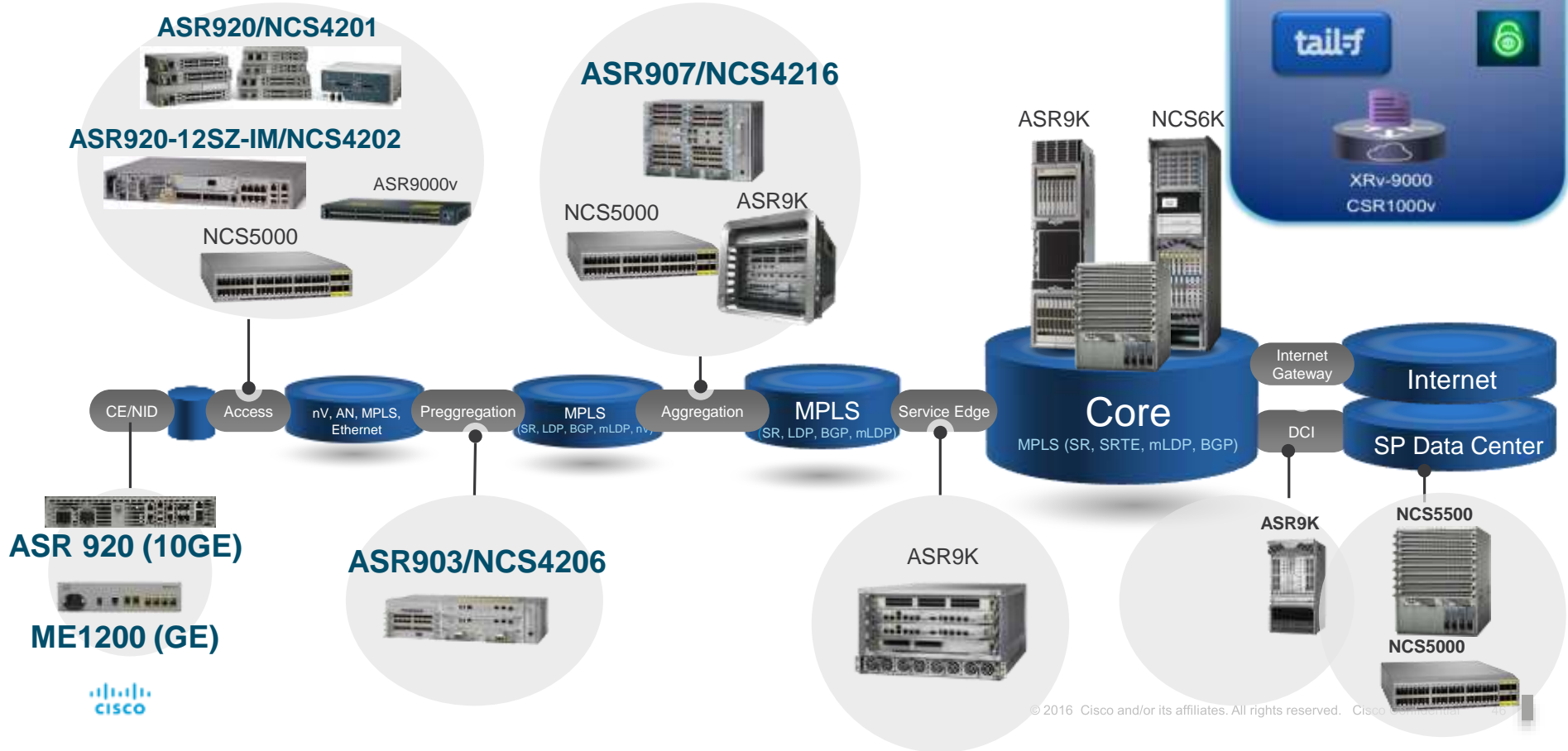
- *Typical Power Consumed : 1200W*

ASR 9901 Port mapping

ASR-9901 Feature Roadmap

Phase	FCS	SW Feature Parity
1	Q3 FY18 (6.4.1) *(March 2018)*	General SW parity with Tomahawk feature-set for eXR (XR 6.3.1) in FCS release 6.4.1
2	Q4 FY18 (6.5.1) (July 2018)	• BNG • Satellite • MAC-SEC (6.4.2)

Service Provider Access Portfolio

Service Provider Access Portfolio

VAMOS CHEGAR LÁ?

OBRIGADO !!!

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