Cisco ASR 9000 reloaded
Innovation unlocked, investment protection realized

September, 2018
Growing Traffic, Growing Opportunities

IP Data Growth: Increasingly More Mobile*

<table>
<thead>
<tr>
<th>Year</th>
<th>Mobile data (46% CAGR)</th>
<th>Managed IP (13% CAGR)</th>
<th>Fixed Internet (23% CAGR)</th>
<th>Consumer (24% CAGR)</th>
<th>Business (31% CAGR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>50,000</td>
<td>100,000</td>
<td>150,000</td>
<td>200,000</td>
<td>250,000</td>
</tr>
<tr>
<td>2018</td>
<td>100,000</td>
<td>200,000</td>
<td>300,000</td>
<td>400,000</td>
<td>500,000</td>
</tr>
<tr>
<td>2019</td>
<td>150,000</td>
<td>300,000</td>
<td>450,000</td>
<td>600,000</td>
<td>750,000</td>
</tr>
<tr>
<td>2020</td>
<td>200,000</td>
<td>400,000</td>
<td>600,000</td>
<td>800,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>2021</td>
<td>250,000</td>
<td>500,000</td>
<td>750,000</td>
<td>1,000,000</td>
<td>1,250,000</td>
</tr>
</tbody>
</table>

Traffic is Moving Closer to the End User*

- **Cross-country Delivered**: 58% in 2016, 41% by 2021
- **Regional Delivered**: 20% in 2016, 23% by 2021
- **Metro Delivered**: 22% in 2016, 35% by 2021

*Source: Cisco VNI

Opportunity for Growth*

- **1.1 Zettabytes** Global IP traffic per year in 2016
- **2.3 Zettabytes** Global IP traffic per year in 2020
- **8x** Increase Global mobile data traffic by 2020

=$2 trillion At stake for Service Providers between now and 2024

Automation is the Key to Cutting Costs

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Architectural Shifts

**Fabric-based Architectures**
- Traffic patterns and network designs are changing
- Port capability mapping to service needs
- Automation to manage device scale out and increase operational ease
- Fabric of fabrics – the future

**5G: Application-driven Transport**
- Programmable, high bandwidth network fabric
- Network slicing, SR, EVPN and Security
- Open vRAN and packet-based fronthaul

**CDN Smart Peering**
- Flattening of the internet, domination of video – demand for traffic optimization
- Analytics and automation – for planning, policy and control

**Cable R-PHY**
- Migration to IP based services and transport for Network consolidation, capacity augmentation - digitize, virtualize, capacitize and automate
- Move to a Converged interconnected network
- 100,000s of miles of fiber, millions of access ports will convert to Ethernet.

**TDM2IP**
- Uproot everything to Ethernet (revolution) or migrate?
- Enable NG IP services
- Simplification and consolidation

Evolutions in play within our critical infrastructure
Preparing Service Providers for Mass-scale Networking

Massive Bandwidth
- High-density 100GE platform
- Dynamic bandwidth optimization

Scaled Operations
- Automatable networking stack
- Closed-loop automation

Secure Networks
- Trusted hardware and software
- Automated DDoS mitigation

Enabling New Architectures
ASR 9000
4th generation of line cards

8, 16 and 32 100GE ports
ASR 9000 4th Generation Linecard – Get Ready for Hyperscale!
First Customer Shipment: September 2018

Four Times Capacity Increase
Lower TCO
Powered by 64-bit XR
ASR 9000 4th Generation Linecard – Get Ready for Hyperscale!
First Customer Shipment: September 2018

- QSFP 28 based TR & SE Phase 1 Line cards:
  - 32x100G
  - 16x100G
  - 8x100G

- Route Processors & RSPs (TR & SE)
  - RP3
  - RSP5

- Switch Fabrics Cards for 9906/10/12/22
  - SFC3
  - SFC3-T
  - SFC3-S

32 x 100GE line card (SE/TR)

64-bit IOS-XR
4th Generation Linecard Program

**Innovation**

- Cisco NPU 4 in 1: Integrated NPU, PHY, FIA, Memory
- Native support for 10/25/40/100/400G

**Leading the Market**

- 4 x capacity increase per system
- 10GE, 40GE, 100GE and 400GE densities w/ rich features
- Hitless FPD upgrade possible (no LC reload)
- Sub Sec ISSU (Check SW Roadmap)

**Lower TCO**

- Low OPEX:
  - Drastically lower power profile: ~ .5W/GE
  - Improvement over 3rd Gen Linecards w/ power down capability of the complete slice path including NP
- Low CAPEX - PAYG

**Scale**

- Ultra high control plane scale with 64 bit XR
- HW acceleration for L2 classification, hashing, prefix lookup, ACL range compression, header re-write, flow ordering, statistics, policers, WRED

400GE Ready!
ASR 9000 Built to Last
80x capacity increase in eight years; 95% power reduction/G

- 40G/slot
  - 10 Watts/Gbps
  - 32 x 10G/chassis

- 80G/slot
  - 8 Watts/Gbps
  - 64 x 10G/chassis

- 360G/slot
  - 2.5 Watts/Gbps
  - 720x10G/chassis
  - 40 x 100G/chassis

- 800G/slot
  - 1.5 Watts/Gbps
  - 1600 x 10G/chassis
  - 160 x 100G/chassis

- 3.2T/slot
  - ~0.5 Watts/Gbps
  - 640 x 100G/chassis

- 1.2T/slot
  - 640 x 100G/chassis
## Cisco ASR 9000 portfolio

### Compact & Powerful Access/Aggregation
- Small footprint with full IOS-XR for distributed environments

### Flexible Service Edge
- Optimized for ESE and MSE with high M-D scale for medium to large sites

### High Density Service Edge and Core
- Scalable, ultra high density service routers for large, high-growth sites

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### One Platform, One OS, One Family

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Features</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASR 9001</td>
<td>MSE</td>
<td>nV Satellite NCS5000</td>
<td>240 Gbps</td>
</tr>
<tr>
<td>ASR 9006</td>
<td>E-MSE</td>
<td></td>
<td>7 Tbps</td>
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<tr>
<td>ASR 9007</td>
<td>Peering</td>
<td></td>
<td>32 Tbps</td>
</tr>
<tr>
<td>ASR 9010</td>
<td>P/PE</td>
<td></td>
<td>14 Tbps</td>
</tr>
<tr>
<td>ASR 9904</td>
<td>CE</td>
<td></td>
<td>64 Tbps</td>
</tr>
<tr>
<td>ASR 9906</td>
<td>Mobility</td>
<td></td>
<td>80 Tbps</td>
</tr>
<tr>
<td>ASR 9906</td>
<td>Broadband</td>
<td></td>
<td>160 Tbps</td>
</tr>
</tbody>
</table>

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### Specifications
- **ASR 9901**: 1HCY18
- **ASR 9904**: 2HCY17
- **ASR 9906**: 2HCY17
- **ASR 9910**: 2HCY17
- **ASR 9912**: 2HCY17
- **ASR 9922**: 2HCY17

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### Additional Features
- **nV Satellite NCS5000**: Optimized for ESE and MSE with high M-D scale for medium to large sites
- **Fixed 2RU**: Scalable, ultra high density service routers for large, high-growth sites
Why Upgrade to ASR 9000

- Cloud Scale Ready
- Move with Agility
- Streamline Operations
Business Outcomes

Unprecedented platform longevity with 80x capacity increase over 10 years
Enabling new architectures

Trust ensured at every level hardware, software

Investment protection

Value for Service Providers

CapEx efficiency

Lower cost per bit
Reduced upfront capital
Any role in the network

OpEx reduction

Low power consumption 0.5W/G
Network operations efficiency gains with automation

Trusted infrastructure

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Engineered for New Architectures

Scale
- 80x capacity increase per system over 10 years
- 400GE-ready
- Ultra high control plane scale with 64-bit IOS XR
- IPv6 scale and performance

Features
- Architecture simplification with Segment Routing and EVPN
- Closed-loop automation with programmability and telemetry
- 5G-readiness with timing and network slicing support
- Automated DDoS mitigation

To address the most complex places in the network

- Ethernet Service Edge
- 5G-ready Mobile Edge
- Data Center Interconnect
- Internet Transit and Peering