

# Juniper high-end core router systems

November 11, 2009 NIF Workshop - Mátrafüred

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## Leadership and Innovation



# Leadership and Innovation in Core Networking



← *Powered by JUNOS* →

1998

2002

2004

2007

2008

2009



M40

T640

TX Matrix

T1600

JCS1200

TX Matrix Plus

1st

1st

1st

1st

1st

1st

215G/slot

40G/slot

Multi-chassis routing system

100G/slot

High-Performance Control Plane Scaling Platform

100G Fabric

ASIC Forwarding

640G system

1.6T system

Most energy efficient system

Most Flexible and efficient multi-chassis system

Separation of control and forwarding plane

# Industry's First 100 GE Interface

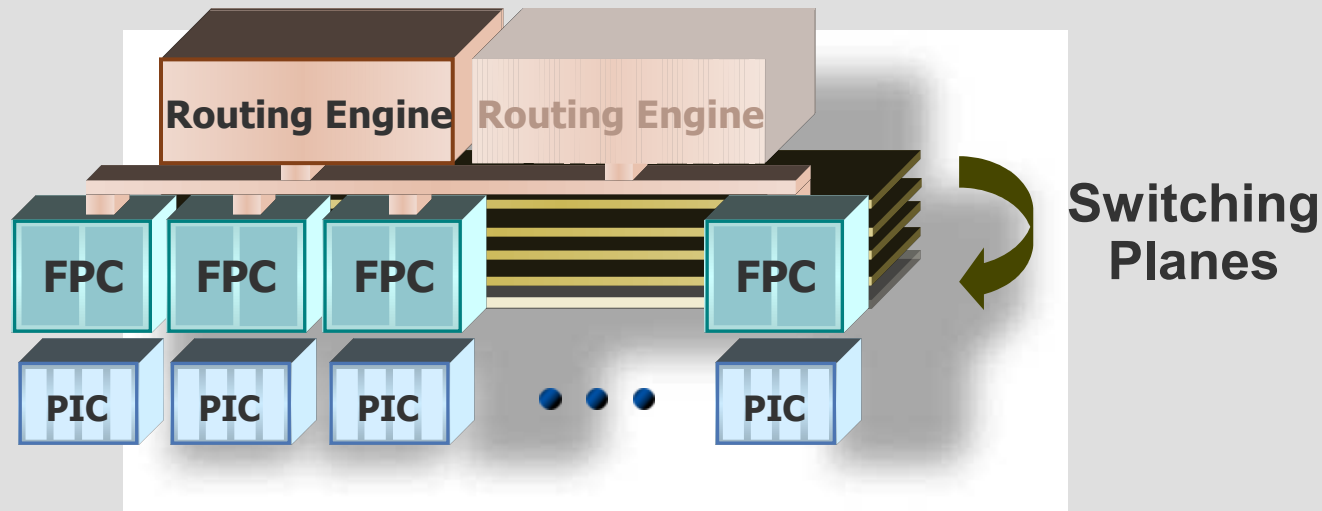


IEEE 802.3ba  
compliant

# Architecture



## T-Series Architecture



Separate Routing and Forwarding Planes

Cross Bar Switch Fabric

Distributed Packet Forwarding Engines on each FPC

Patented tree-based multicast replication in fabric

# Non-Disruptive Upgrade Ensures Investment Protection



**Gain of 200+% throughput with only 40% more power**  
**No loss of service!**  
**Total upgrade time <90 minutes!**

3. Swap the face panel

2. Swap Switch Interface Boards  
5 SIBs per chassis, can run on 4  
Disable a SIB, swap it, re-enable  
Repeat 4 times

1. Swap Power Entry Modules:  
2 PEM per chassis, system can run on one  
Disable, power off first PEM, swap it,  
power back on



# T-Series Scaling

2007



100G/slot

## T1600

64 10G ports  
16 40G ports  
8 100G ports

## TX Matrix Plus

1280 10G ports  
256 40G ports  
128 100G ports

2009



## T640

32 10G ports  
8 40G ports



2002

## TX Matrix

128 10G ports  
32 40G ports



2004

Single chassis

Multi chassis



# T-Series Scaling

Investment protection

Operational continuity

- Regular technology “refresh” has kept core networks future proof since 2002
- Non-disruptive upgrades
- All platforms operate the same consistent JUNOS operating system

## TX Matrix Plus

2009

1280 10G ports

256 40G ports

128 100G ports



11 standard racks

**Still half the size and half the power consumption  
of comparable competitive systems**

25 custom racks



## Virtualizing the Network:

Independent Scale on Control and Forwarding Planes



# TX Matrix Plus Scaling Capabilities



A 25Tbps 16-chassis routing node built with T1600 technology!

## Interfaces

- OC3 – OC768 SONET/SDH; 100M, 1G, 10G, 40G, 100G; Ethernet (IQ); OC-12 ATM(IQ); DS-3, E-3, Ch-OC12 (IQ); Tunnel services.

## Routing features

- Complete feature set for IGP, BGP, MPLS, VPN, Logical routers, Multicast, IPv6; extensive QoS capabilities; predictable latency and jitter.

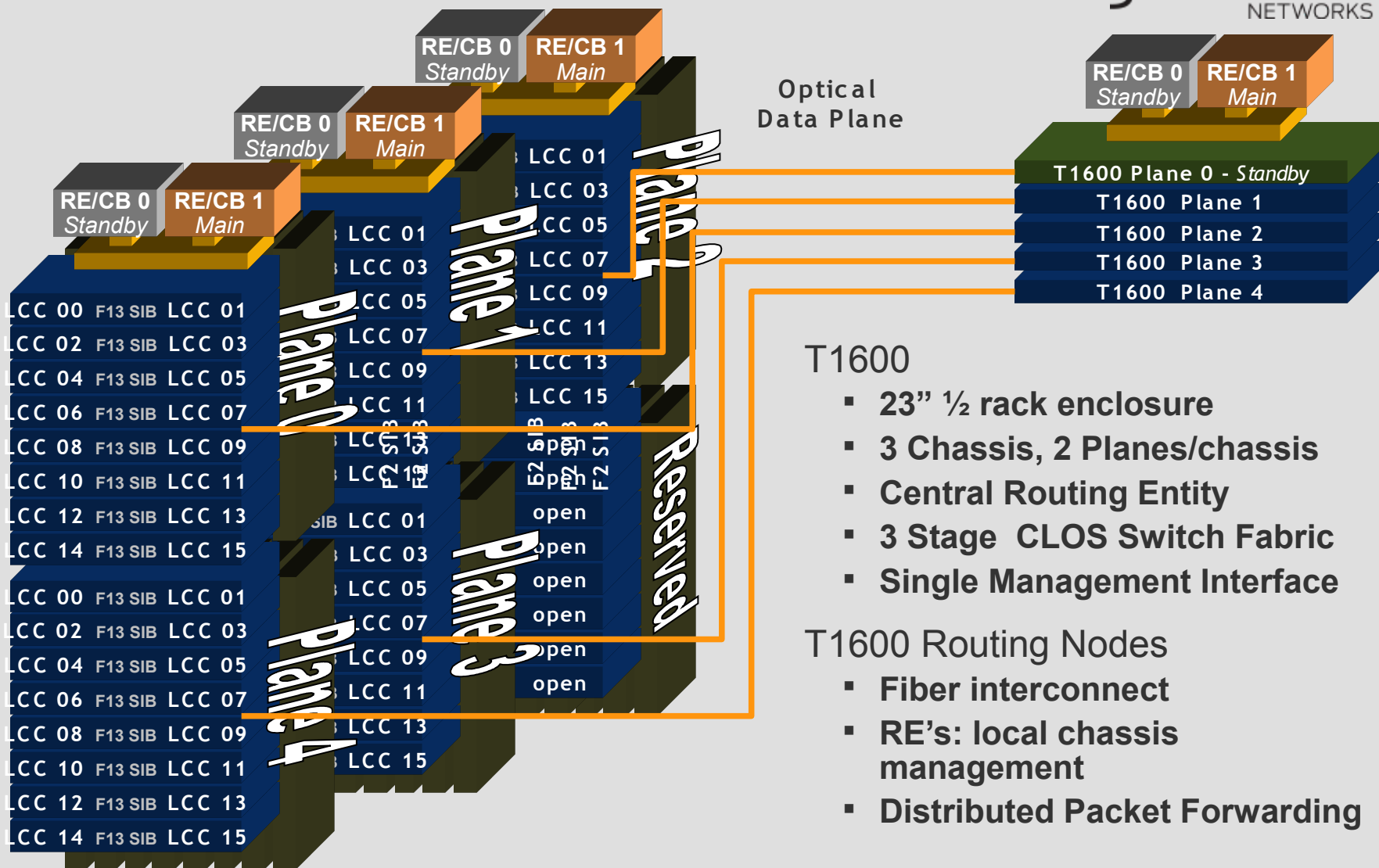
## High availability features

- Fully redundant hardware, MPLS fast reroute, aggregated interfaces, protocol graceful restart, graceful RE switchover, ISSU, NSR.



- **25Tbps**
- **3 Switch Chassis**
- **1-16 Line card chassis**
- **128 100GbE**
- **256 40G**
- **1280 10GbE**
- **256 OC-768/STM-256**
- **1024 OC-192/STM-64**

# TX Matrix Plus: Switching Architecture

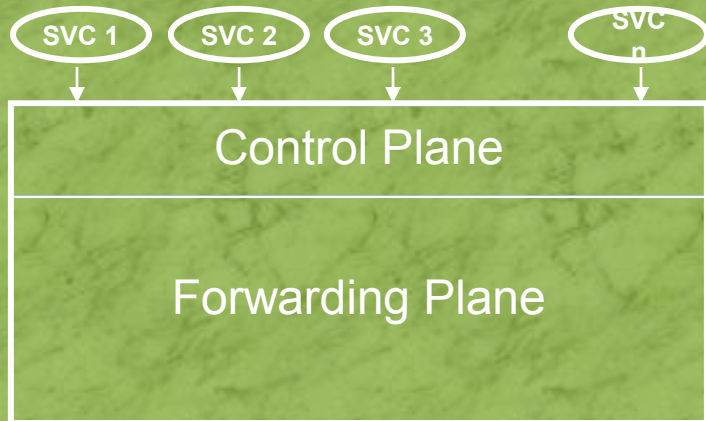


## JCS 1200

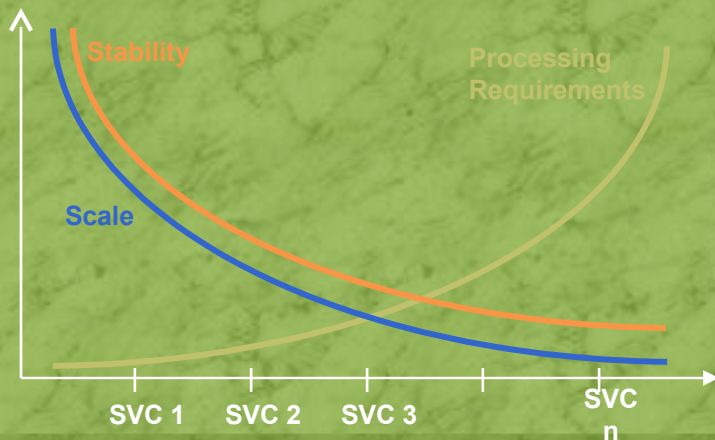


# JCS1200: Control Plane Scaling

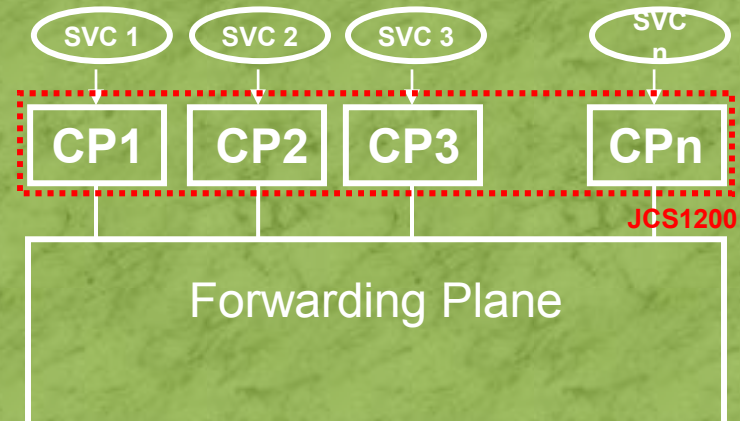
## Shared Control Plane



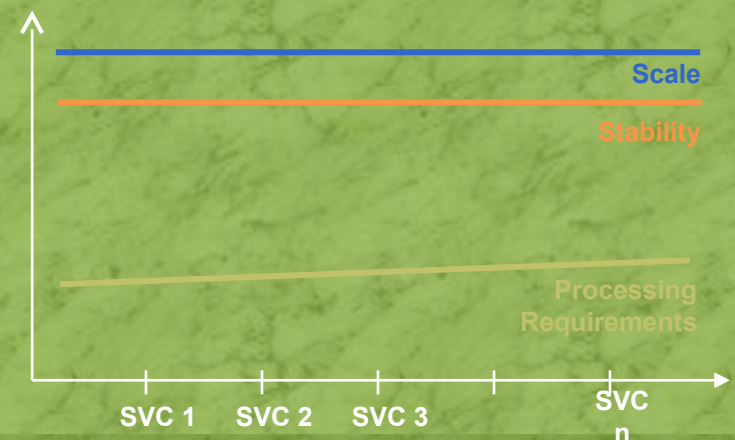
Router



## Standalone Control Plane



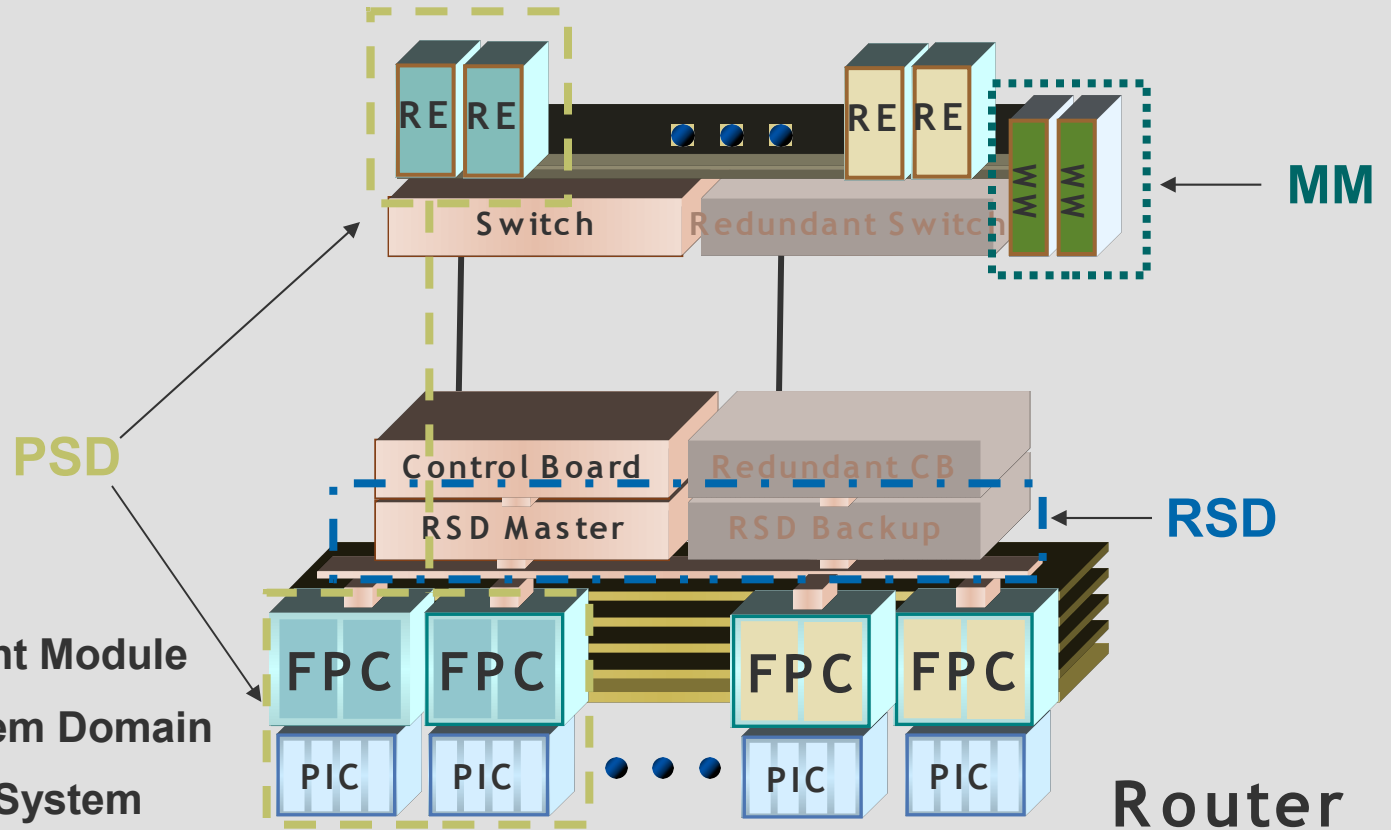
Router



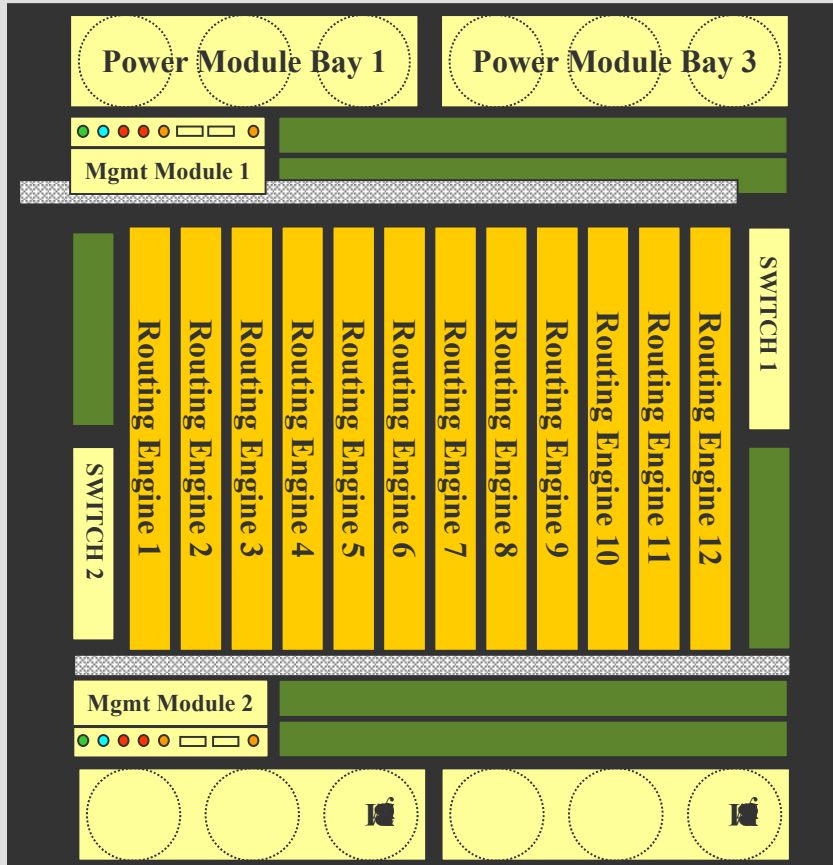
# JCS 1200: Principles of Operation



## JCS 1200



# JCS 1200 Technical Details



12RU, 19" rack-mounted chassis

12 routing engine slots

High-speed multi-core Intel CPUs

High-speed scalable memory/storage

AC and DC power options

~3KW max, two power domains

Front to rear cooling, redundant fans

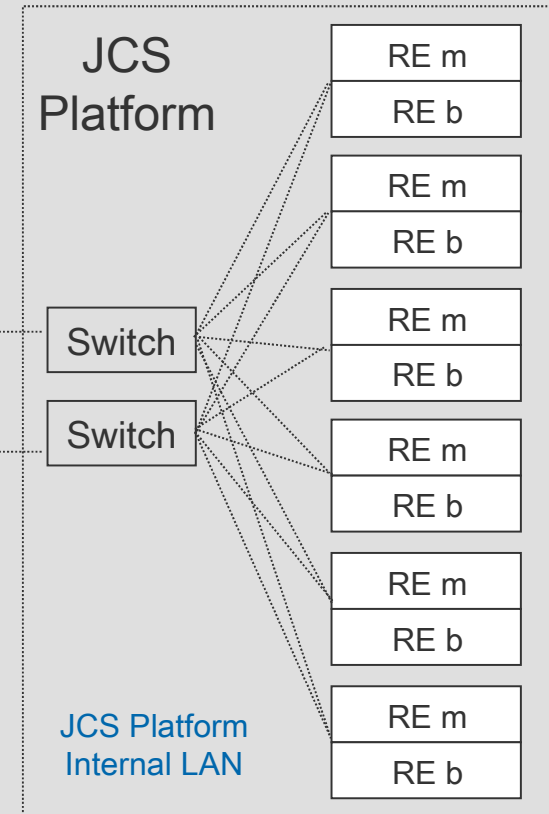
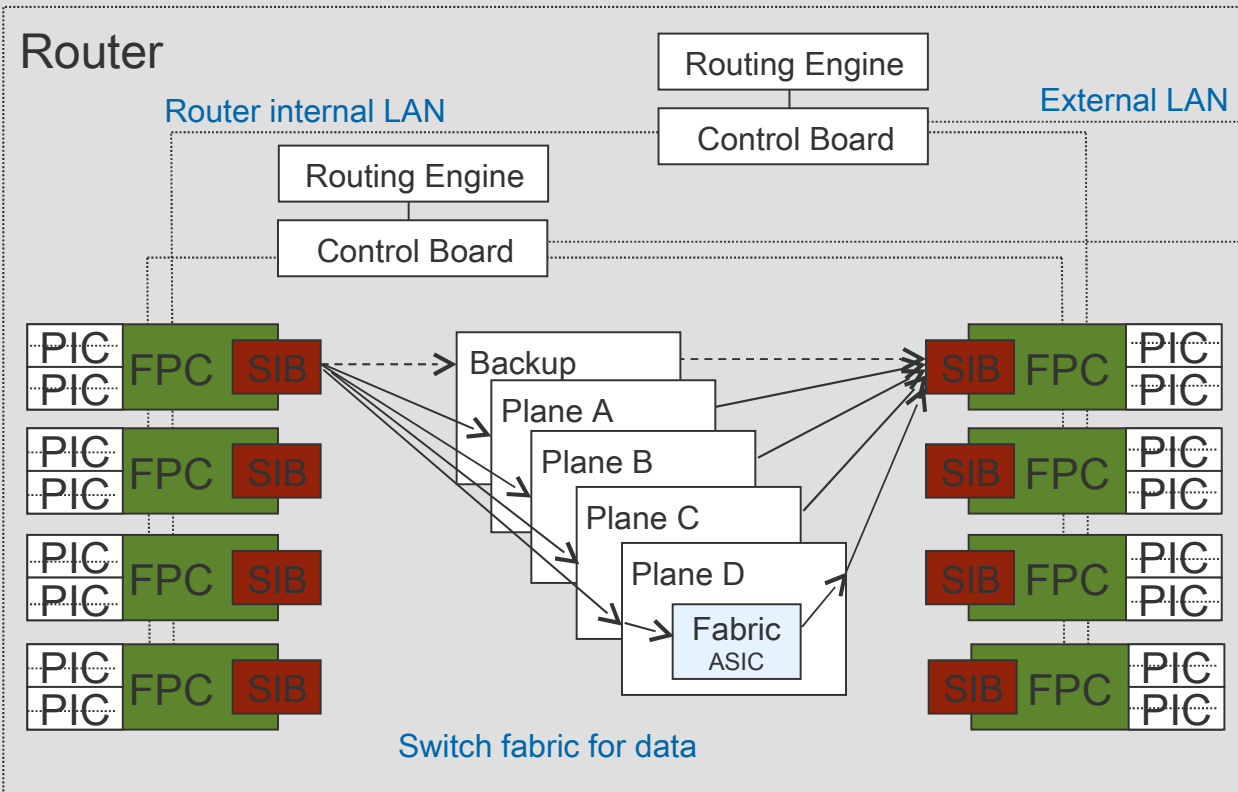
Two GE switch modules for redundant router connection, dual star internal fabric

Two Management Modules

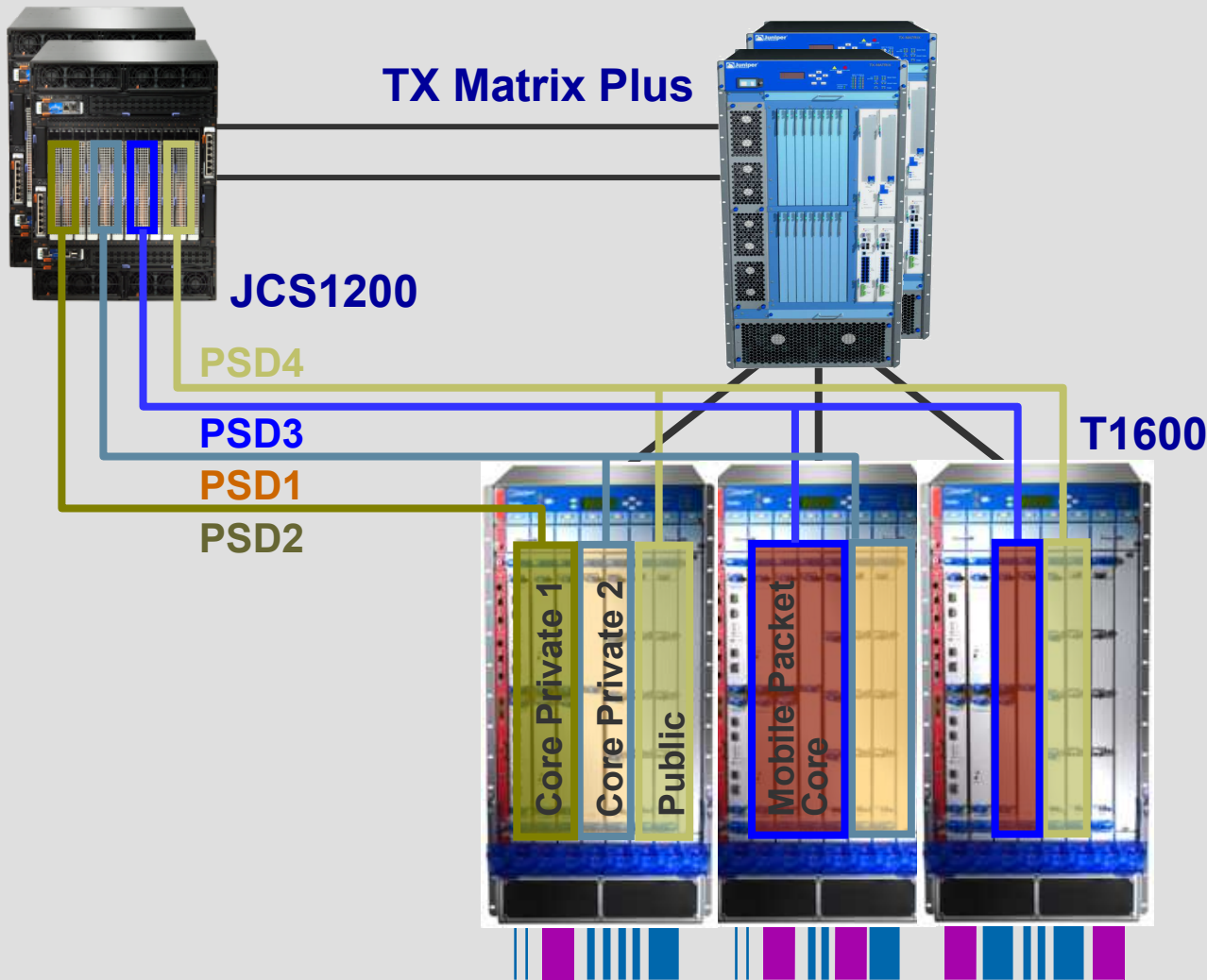
Highly redundant: power, cooling, switch modules, MM, media trays



# Router Connectivity with JCS1200 Platform



# Enabling Technology Components



Shared uplinks, Integrated optics, 100GE,  
High-density 10GE, Service interfaces

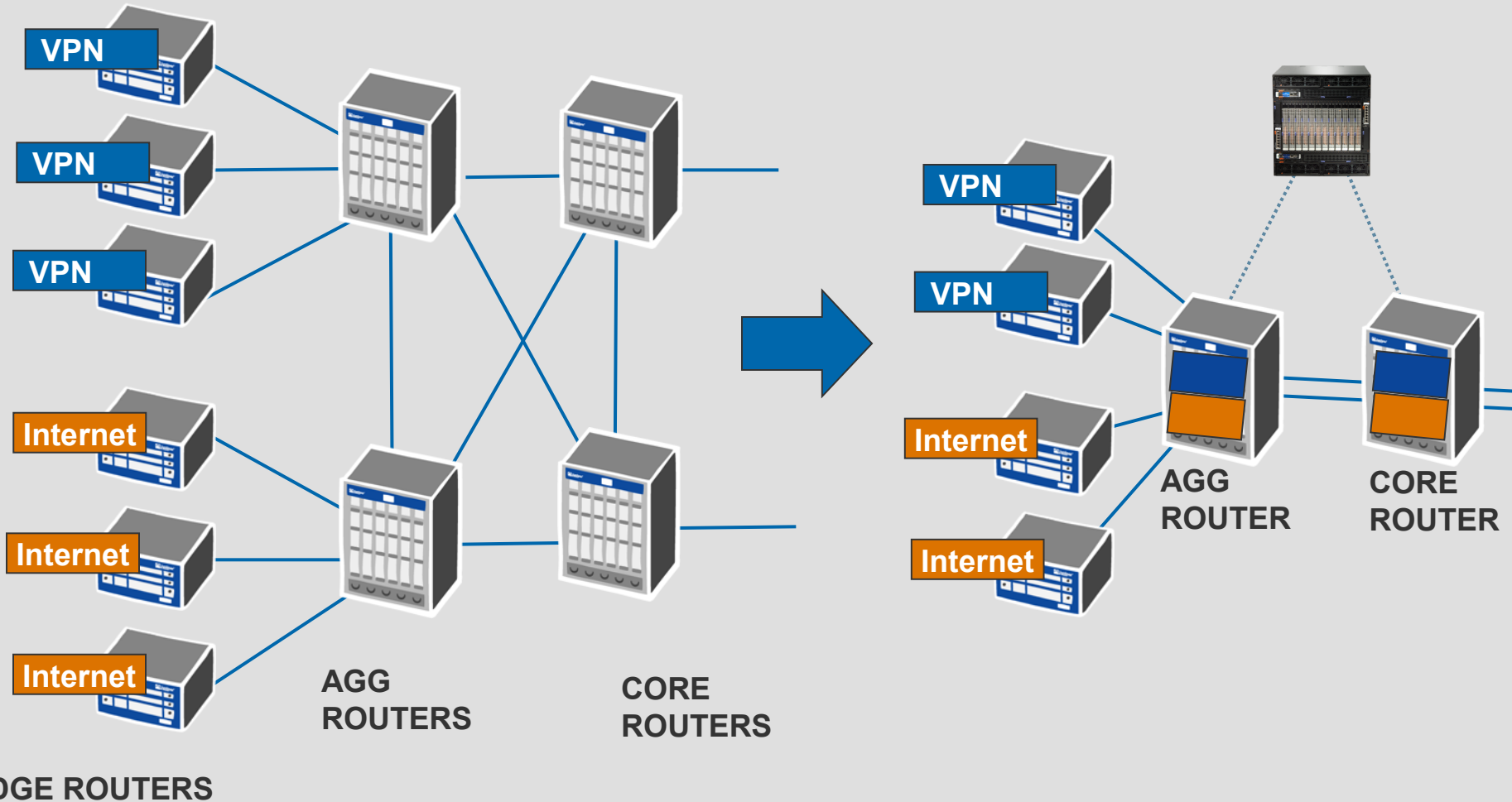
- Shared chassis, blades, interfaces, power, links
- Transcend “physical” router boundaries
  - Shared “pool” of slots
  - Each slot is a “router”
  - Up to 25Tbps of capacity
- Physically secure, individually managed networks

## Reference Case: Virtualization



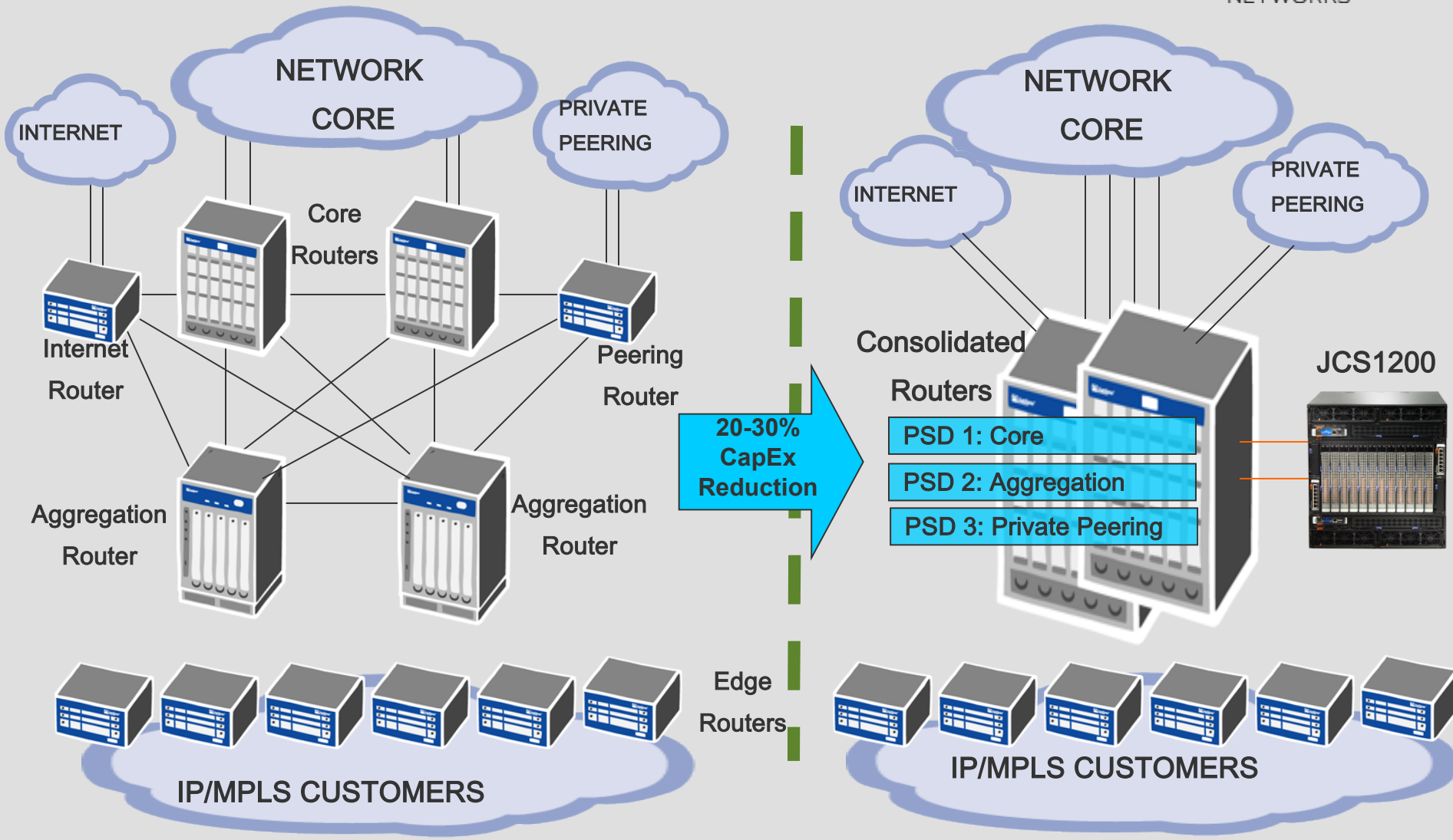
# Consolidating Separate Networks

Consolidation of Chassis, Blades, Interfaces, Power, Links

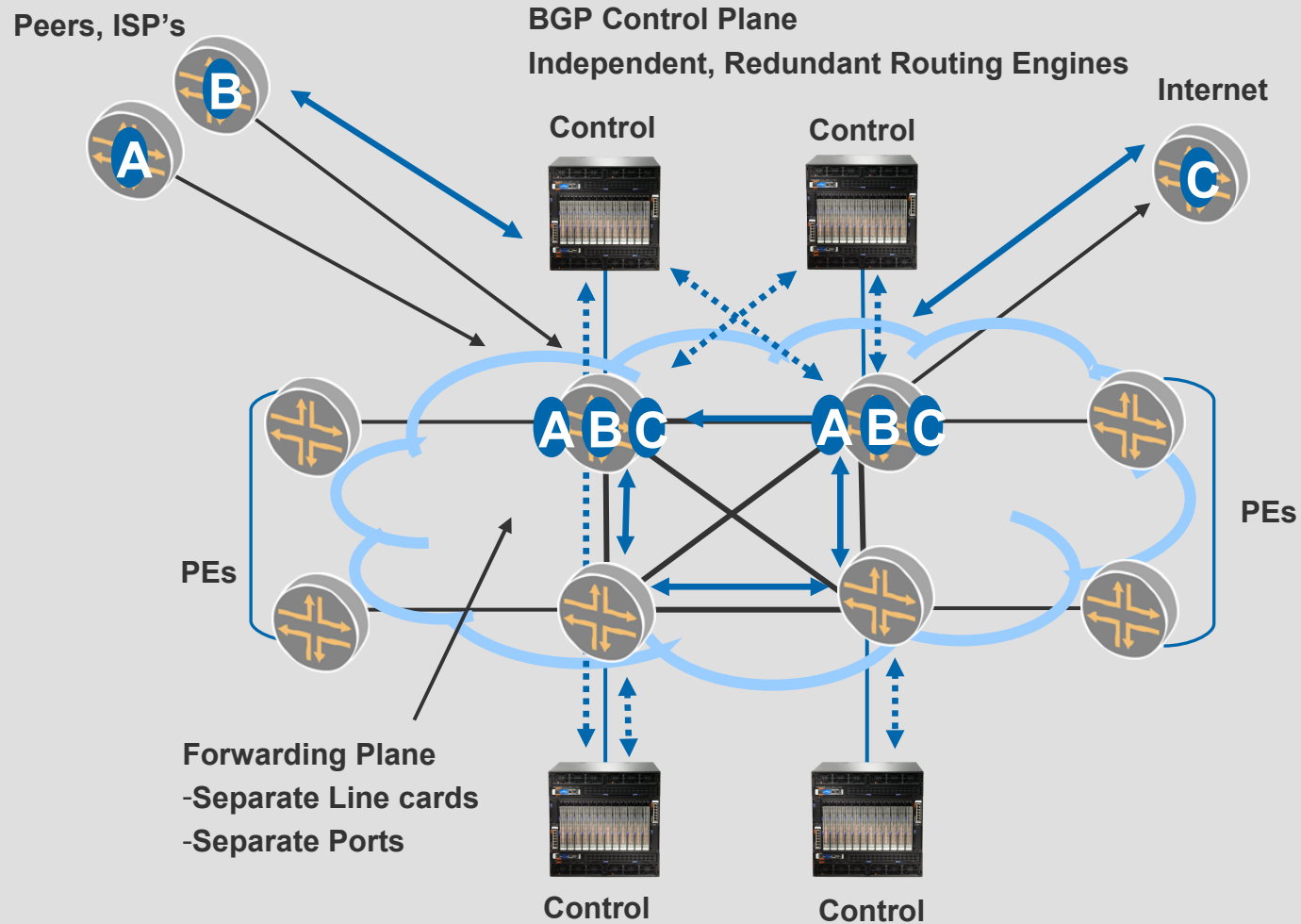


EDGE ROUTERS

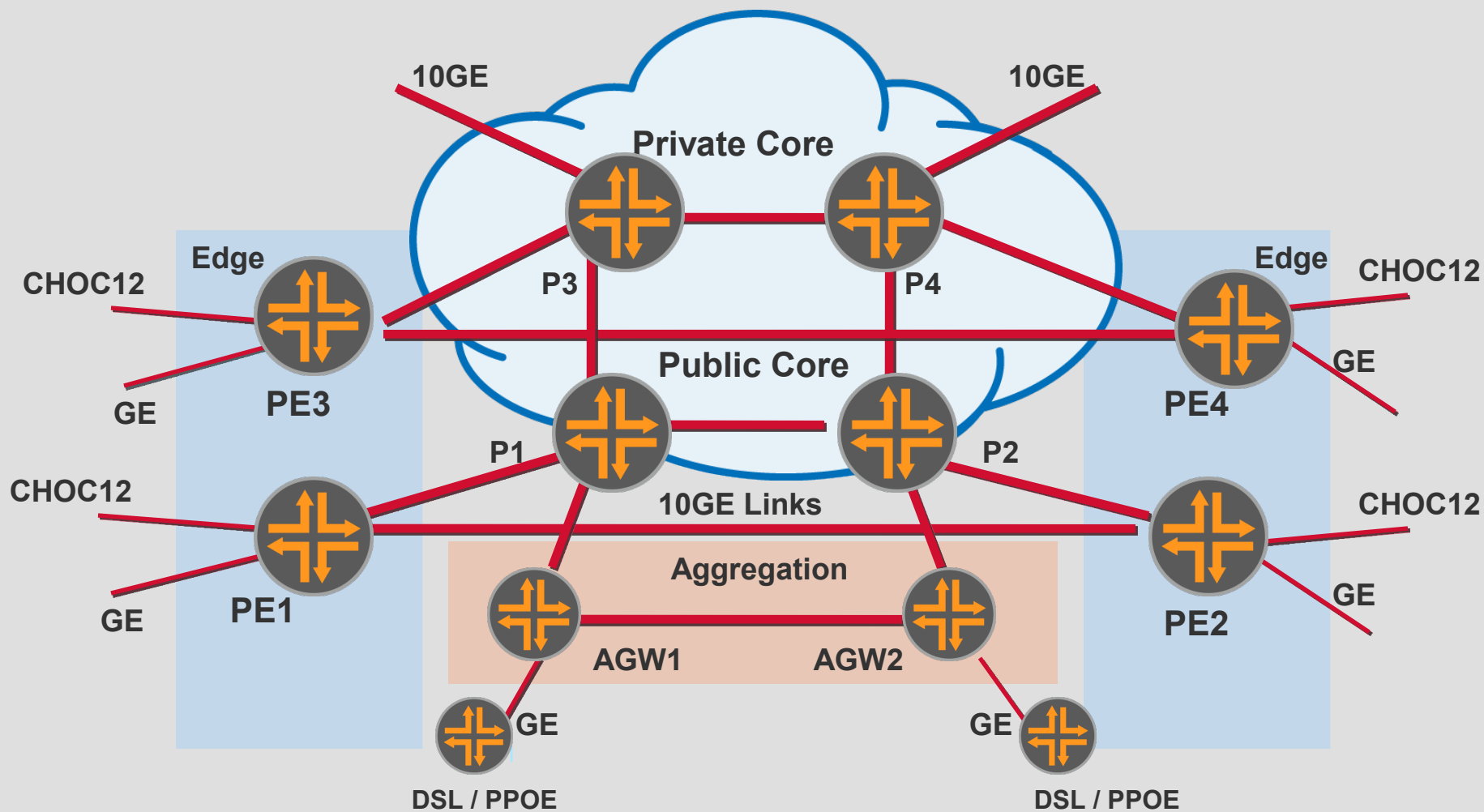
# Virtualized Routing System for Collapsed POP



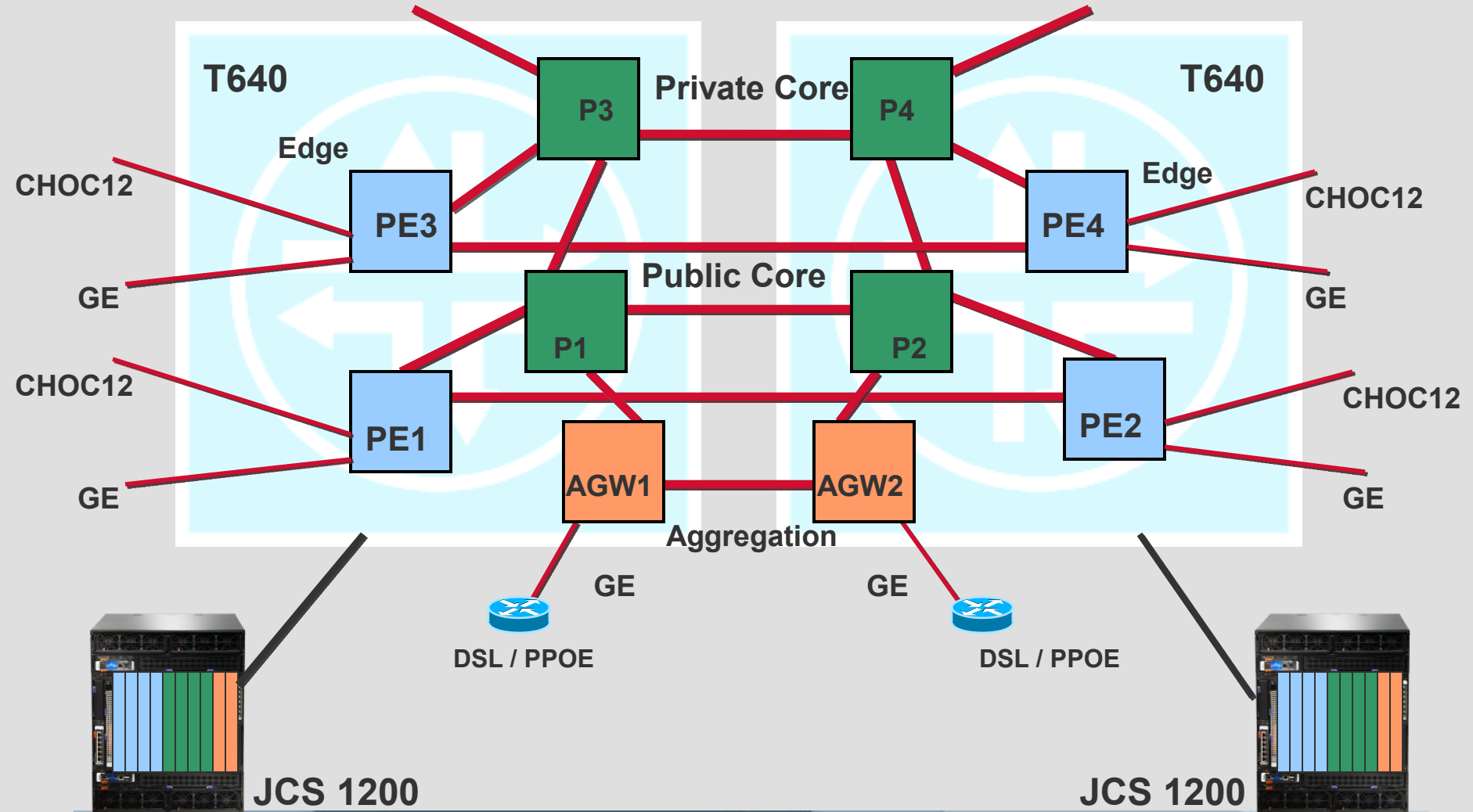
# Carrier Supporting Carrier



# Before Virtualization



# After Virtualization

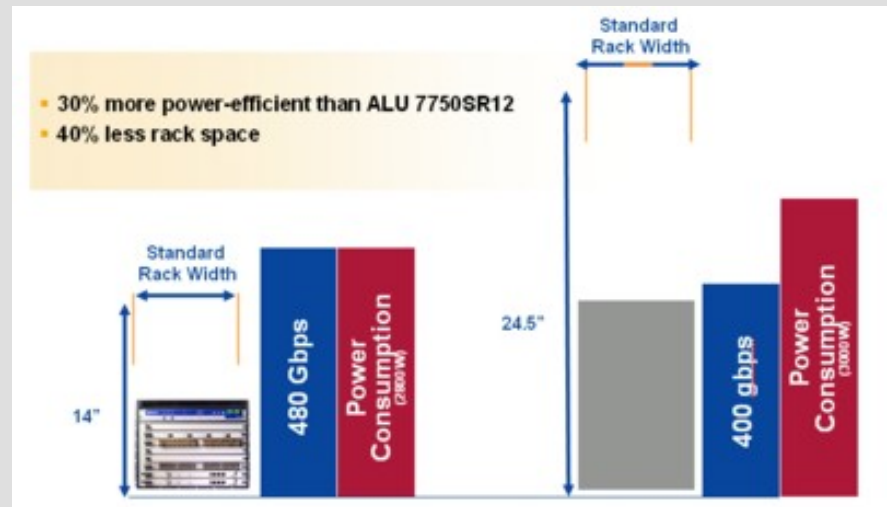
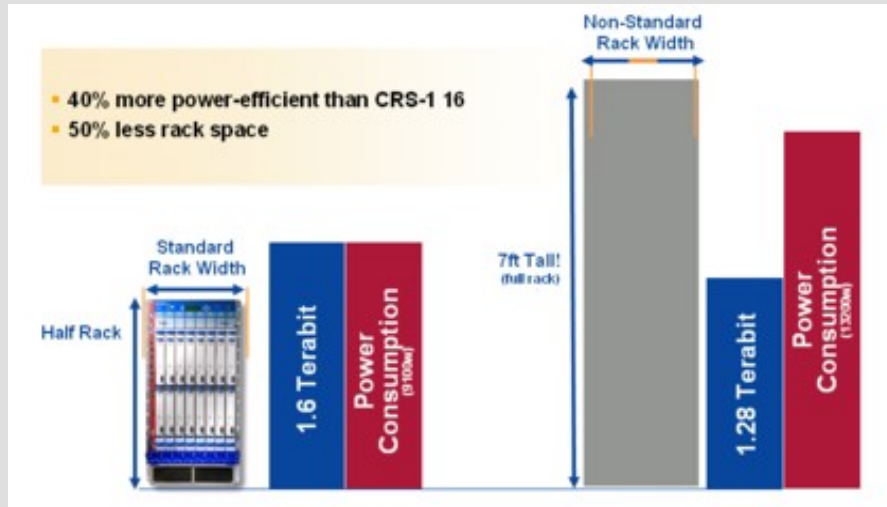




## Energy Efficiency



# Power/Density: Core and Edge





everywhere