

The evolving Edge/Metro in the light of upcoming 5G

Javier Antich | PLM | jantich@juniper.net

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Networking Industry state of the Union

INDUSTRY BUSINESS TRENDS

Cloud Gravity



Cloud & OTT offerings

Hyper scale Web vs. rest of the World

Service Provider challenges



CAPEX Restrictions

Operational challenges

Need for agility

INDUSTRY TECHNOLOGY TRENDS

5G evolution



Digital transformation



Openness



Network Slicing



Self-Driving Network™



5G/ IoT Requirements & Key Enablers



Performance

- Ultra High Speed (10Gbps)
- Density > 1m connections/km²
- Reliability of 99.999% & 100% availability
- Latency of < 1ms

Flexible Architecture

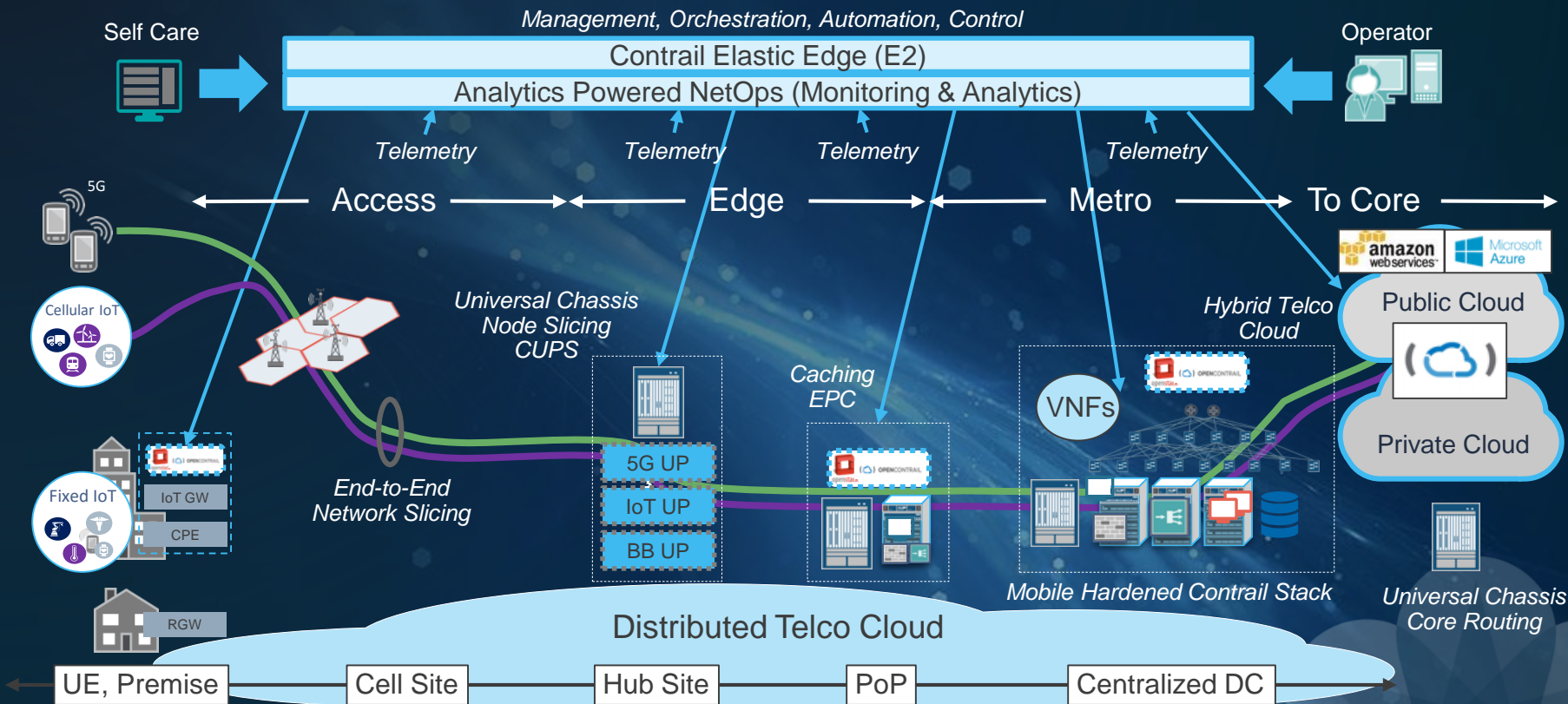
- Fixed, Mobile, Wireless & Satellite Access
- Scalable & Customizable Network; Multi-Service & Multi-Vertical
- Resource Efficiency; Low to High Bitrate
- Energy Efficiency & Battery Optimization
- Network Capability Exposure To 3rd Parties



Design Enablers

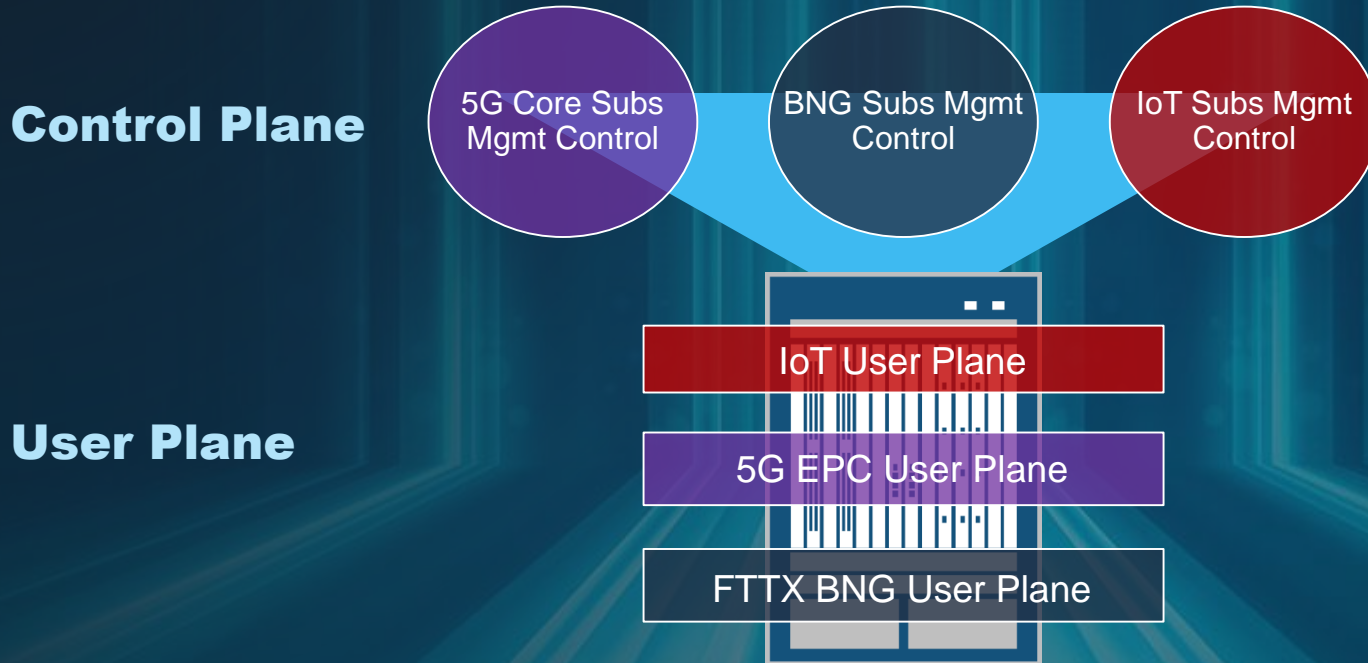
- **VIRTUALIZATION AND NFV**
- **AUTOMATED, HARDENED CLOUD STACK**
- **CONTROL AND USER PLANE SEPARATION**
- **NETWORK SLICING & OVERLAY**
- **PERVASIVE SECURITY**
- **TELEMETRY & ANALYTICS**

Juniper Architecture For 5G, Cloud, and IoT Services

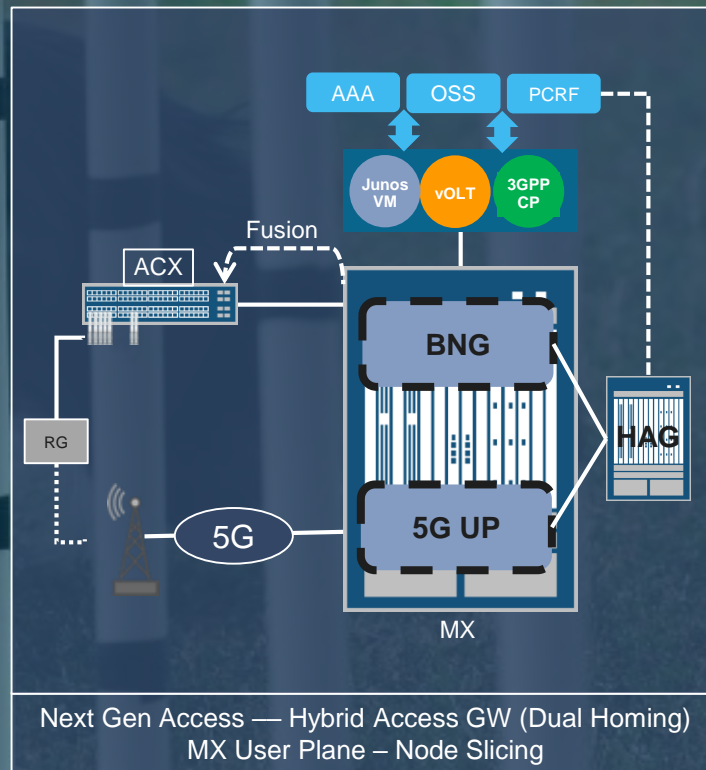
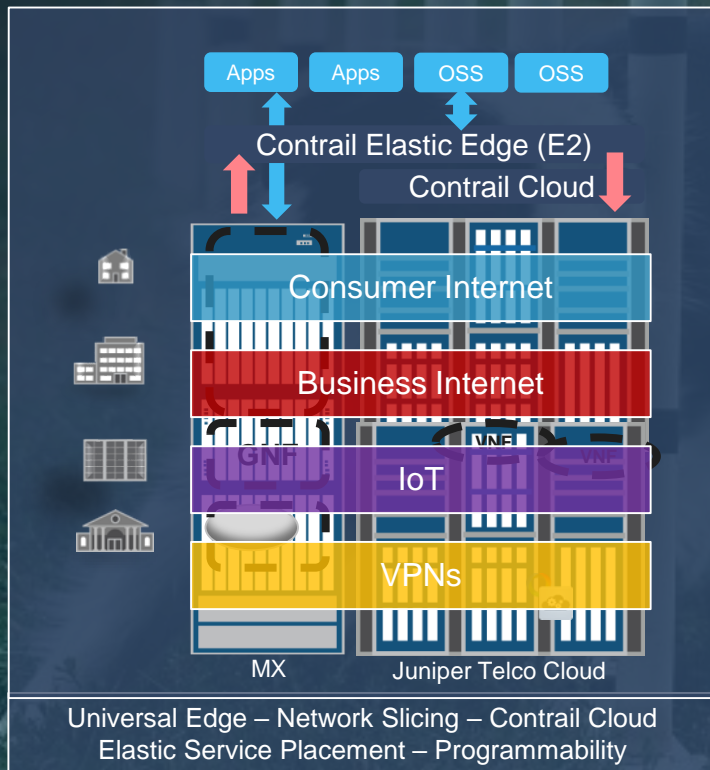


Control / User Plane Separation

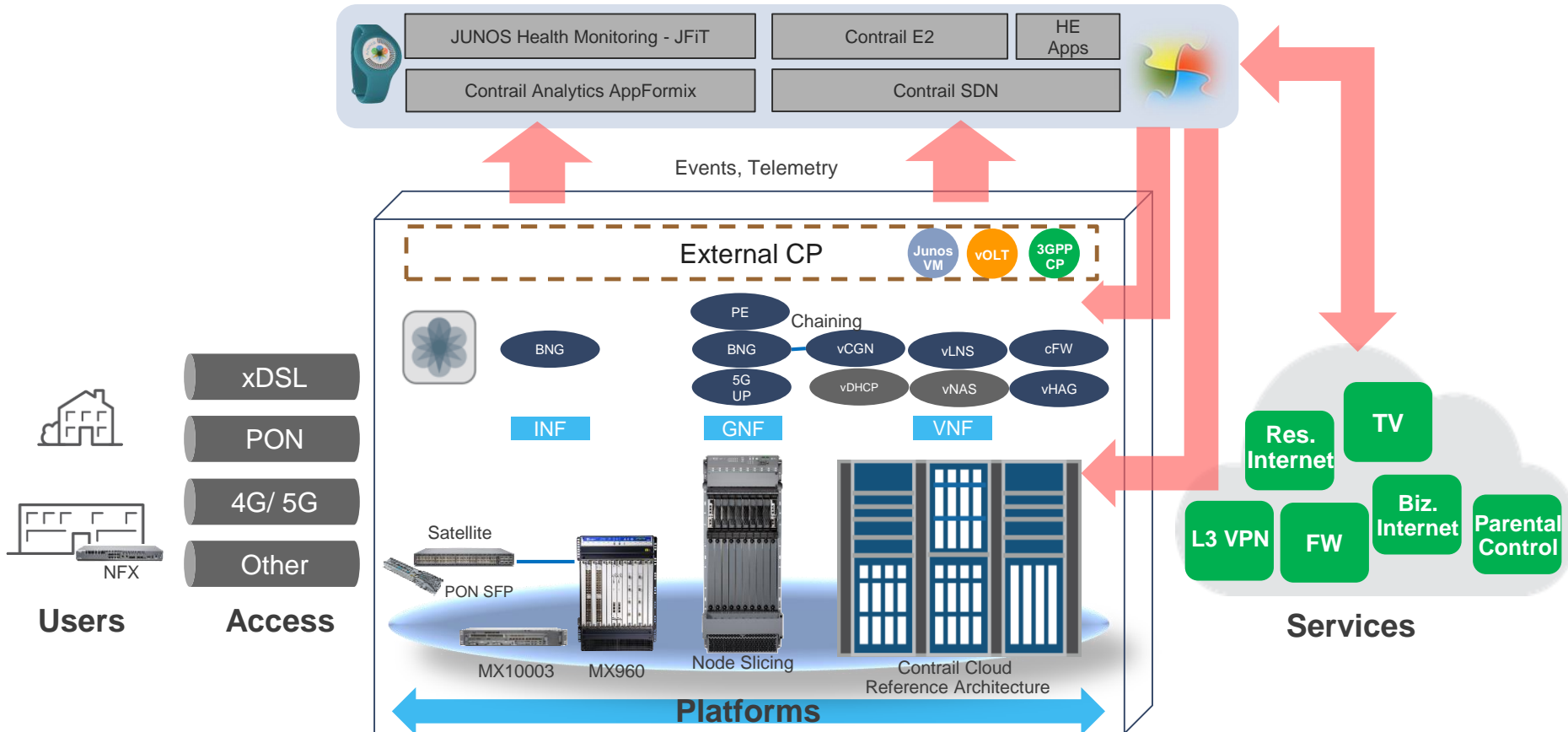
Enables scale-out while maintaining user plane performance & resiliency



In 5G the Edge is Multi-service and Multi-access



SD BROADBAND NETWORKS



The background is a complex digital visualization. It features a world map with a grid overlay, primarily in shades of blue and green. Overlaid on the map are various data elements: a prominent white arrow pointing from the top left towards the bottom right, several glowing blue and green lines representing network connections or data paths, and a series of vertical bar charts or candlestick patterns in green and red. The overall aesthetic is high-tech and data-driven.

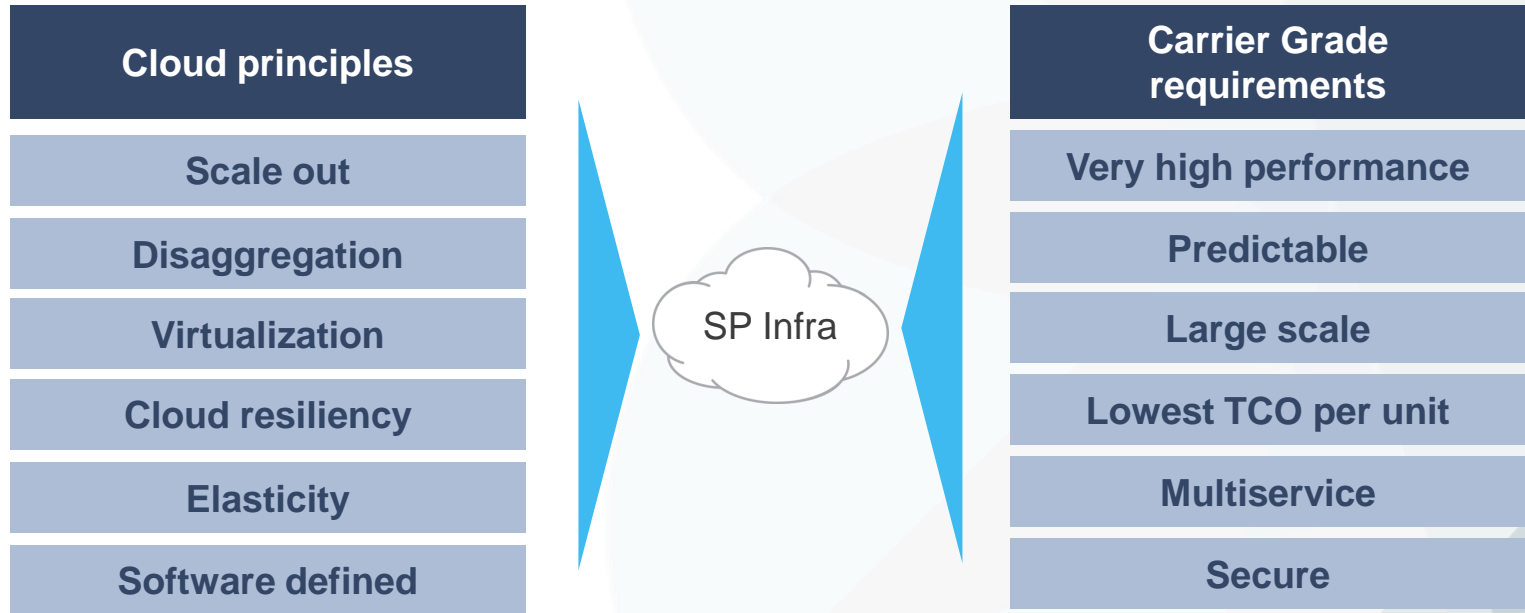
Network Slicing in 5G and beyond

What is network slicing?

- It is the realization that **in networking there is no one-size-fits-all**
 - Application diversity: one "single network" may not offer what they need.
- Need for some level of segmentation (slicing).
 - Dedicated resource allocation.
 - Dedicated administration.
 - Highly different service requirements (latency, bandwidth, security, reliability, ...)
- Such diversity already existed in wireline, now becoming more relevant in mobile/5G as well.
- Industry standardization bodies:
 - NGMN (NG Mobile Network) Association: 5G. / 3GPP
 - GSMA
 - Broadband Forum.
 - Open Networking Forum.
 - MEF
 - IETF (discussion just started)

Network Slicing

Bring cloud principles to build carrier grade Service Provider infrastructure



Network Slicing.

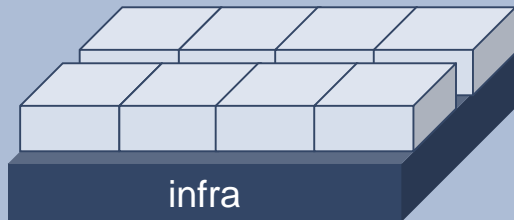
The desired benefits

LOWER ENTRY COST



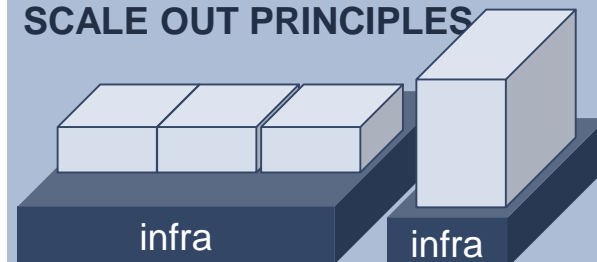
\$ vs. \$\$\$\$\$

BETTER ASSET UTILIZATION



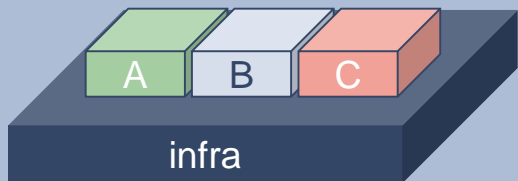
Reduce \$/service unit

SCALE OUT PRINCIPLES



Scale out vs. scale up

ADMIN/FUNCTIONAL SEPARATION



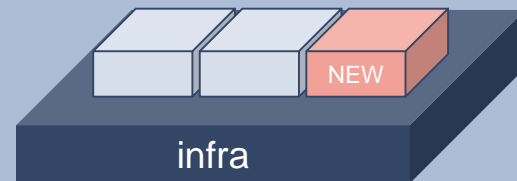
A, B, C admin domains

FAILURE ISOLATION



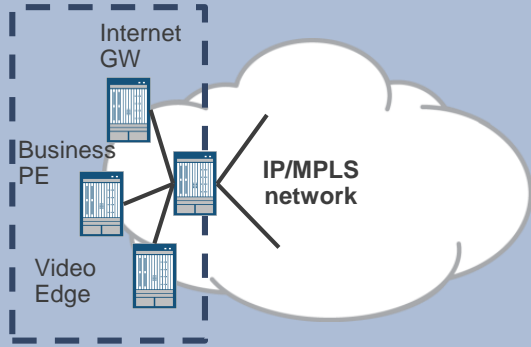
B, C happy

AGILITY/TIME TO MARKET

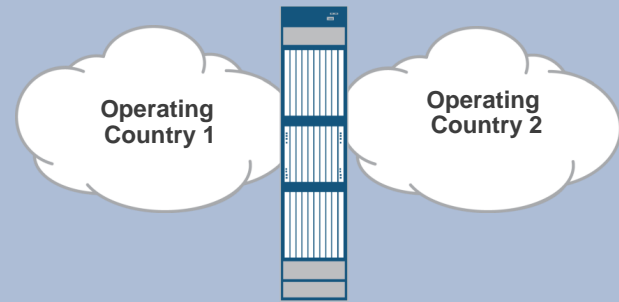
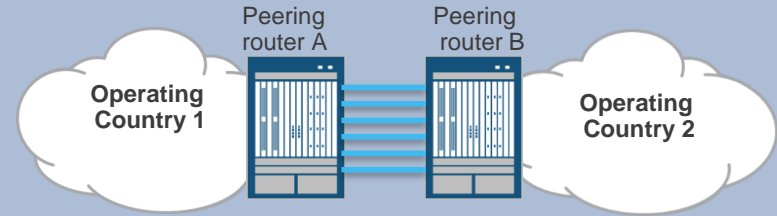
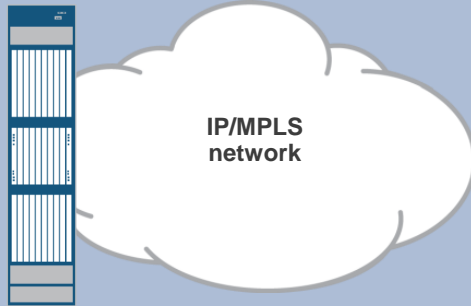


Months > weeks > days > hours ..

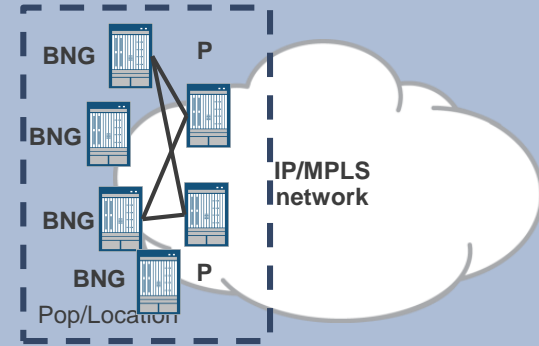
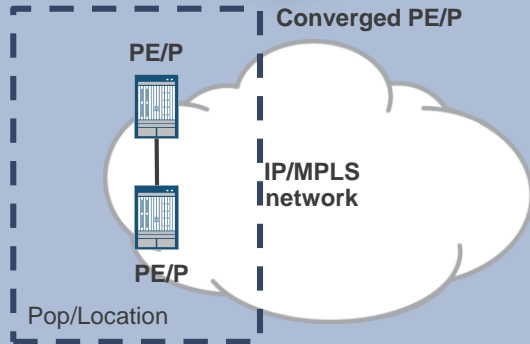
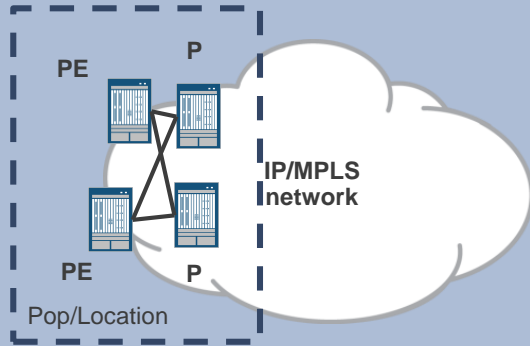
Network Slicing user stories...



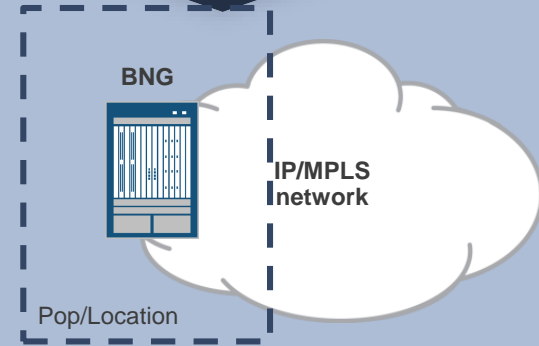
Converged Services Edge



Network Slicing user stories...

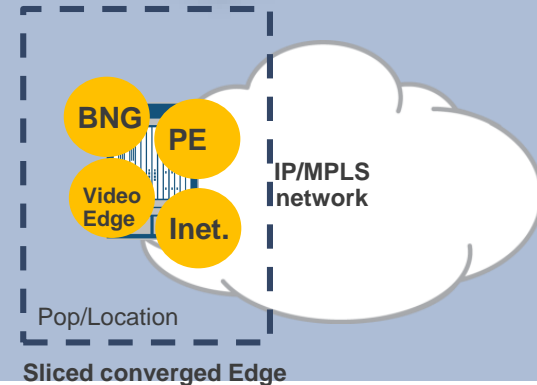
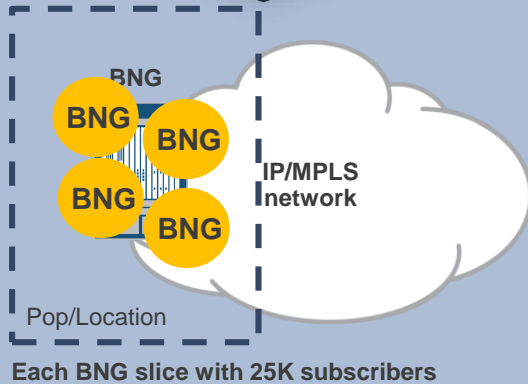
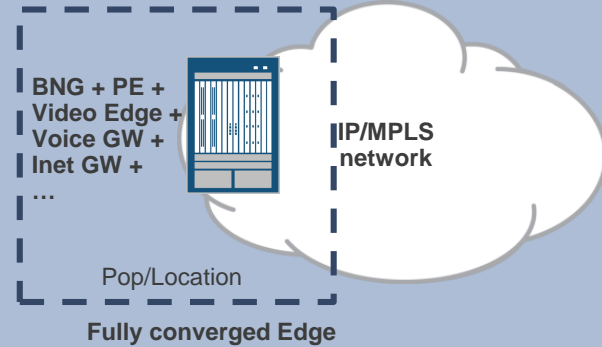
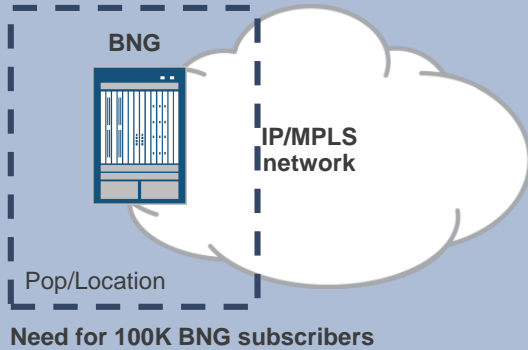


Need for 400K BNG subscribers

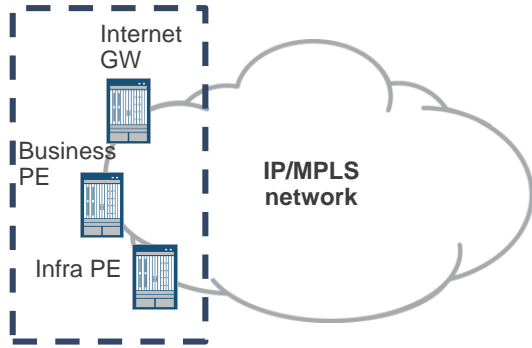


Need for 400K BNG subscribers

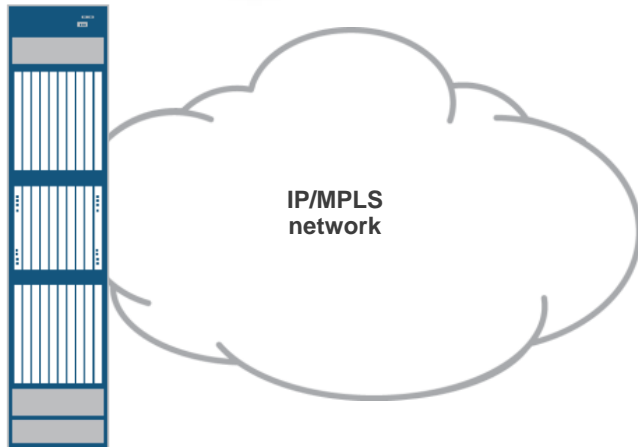
Network Slicing user stories...



Americas Tier-1 SP

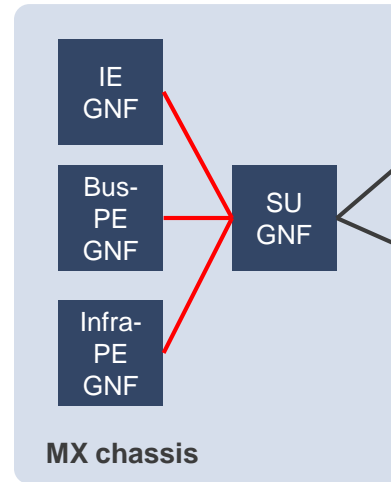


Multi-Services Edge

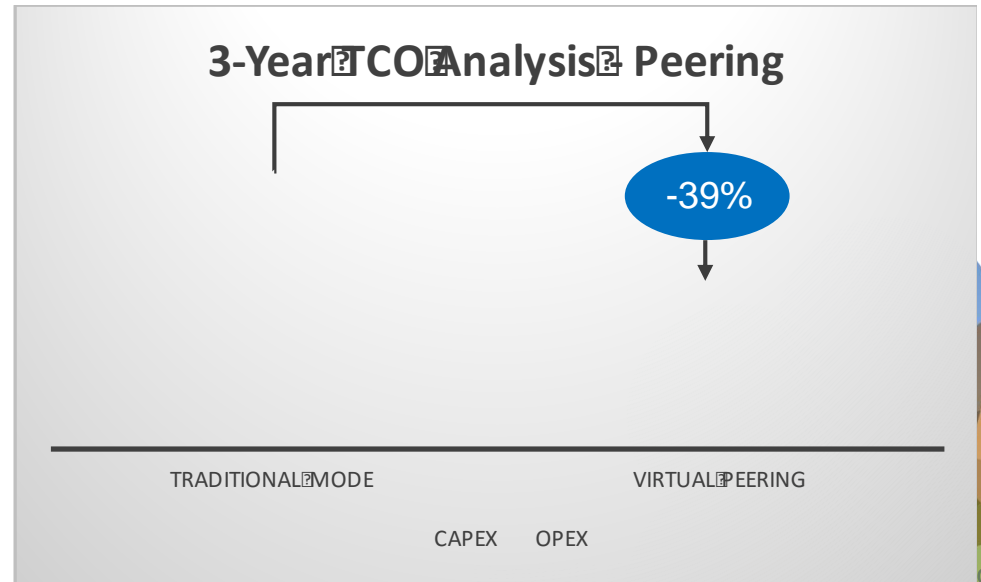
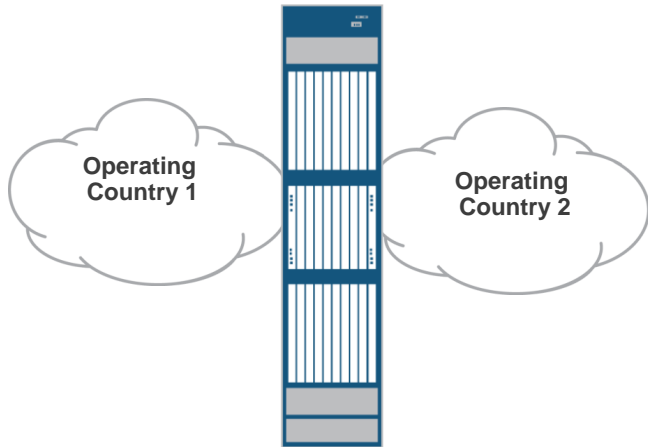
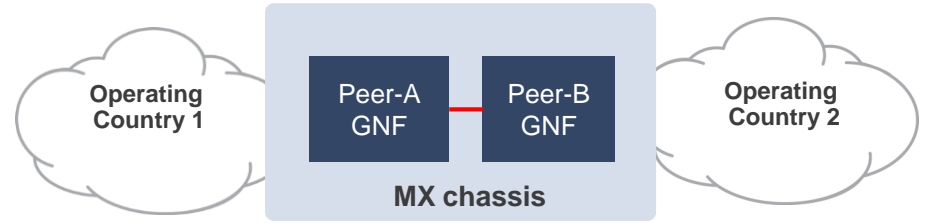
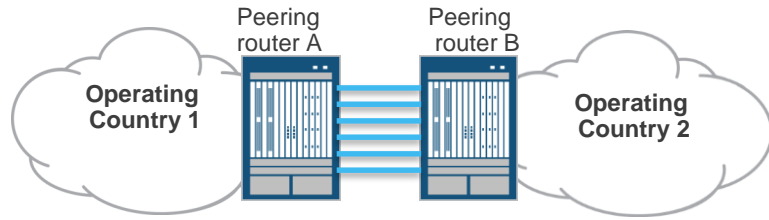


Use Case: Services Edge consolidation

- Convergence of multiple service edge functions on same chassis.
- Keep operational, administrative and failure domains separated
- Shared uplink required (Virtual Fabric Interface)

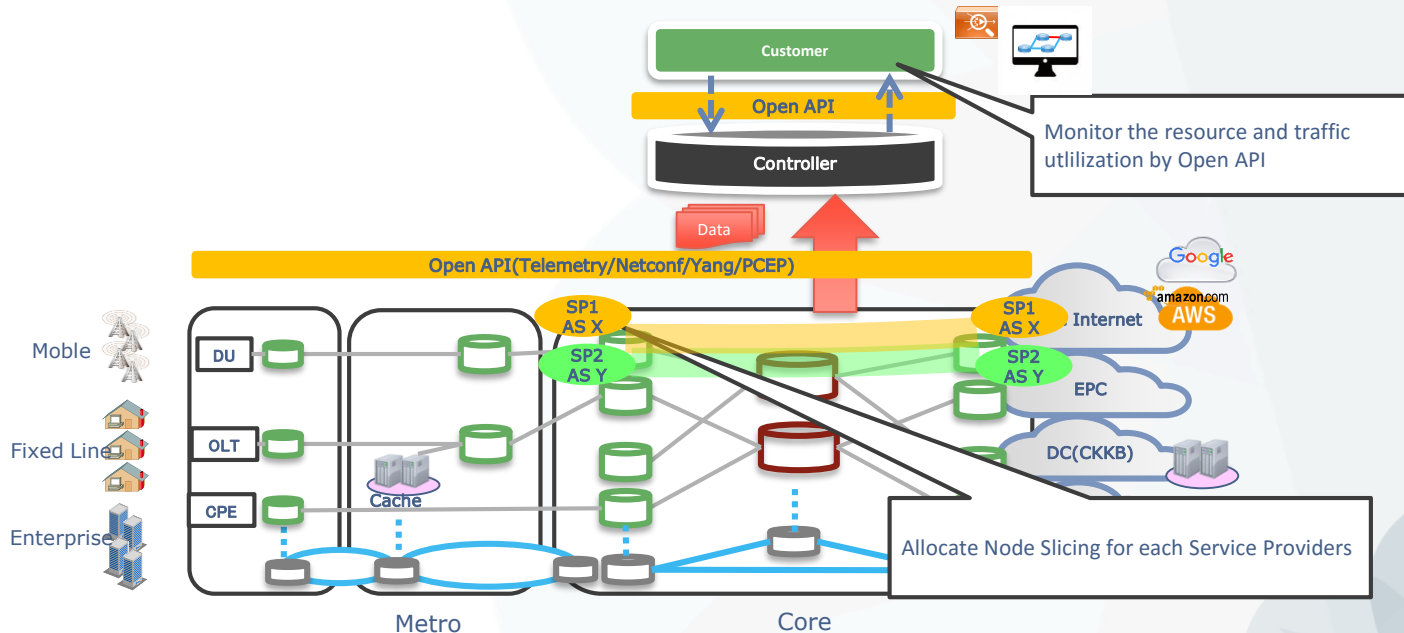


Large Tier-1 SP example



■ Tier1 SP:NaaS for SP

Use Node Slicing at Core network for each service providers.
The customer monitor the slicing network resources from Web UI.

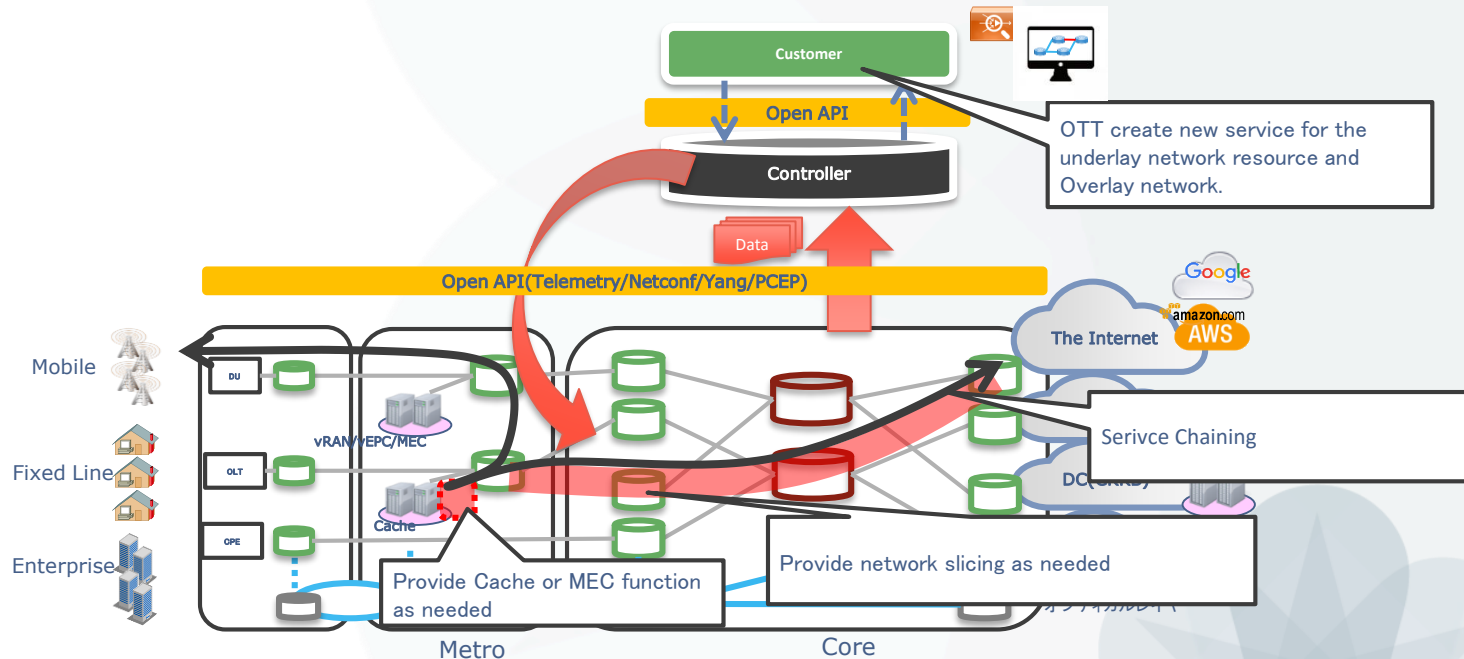


■ Tier1 SP Use Case2 :NaaS for OTT

Create isolation network at metro and core.

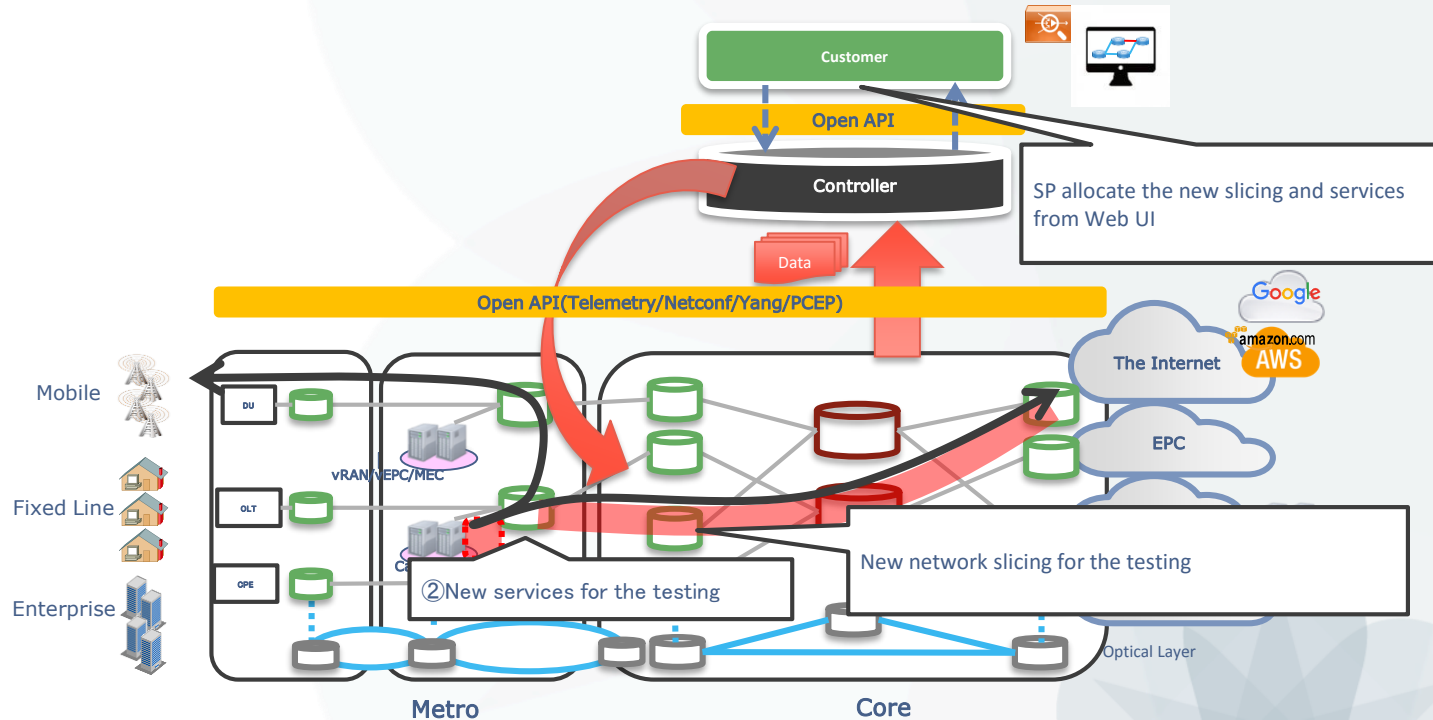
Platform at Metro provide services e.g. cache or MEC.

OTT control the above functions by using orchestrator.



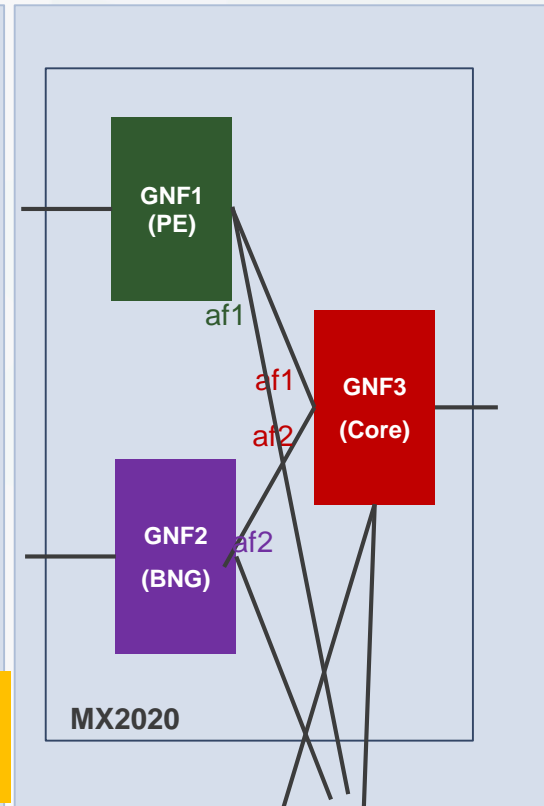
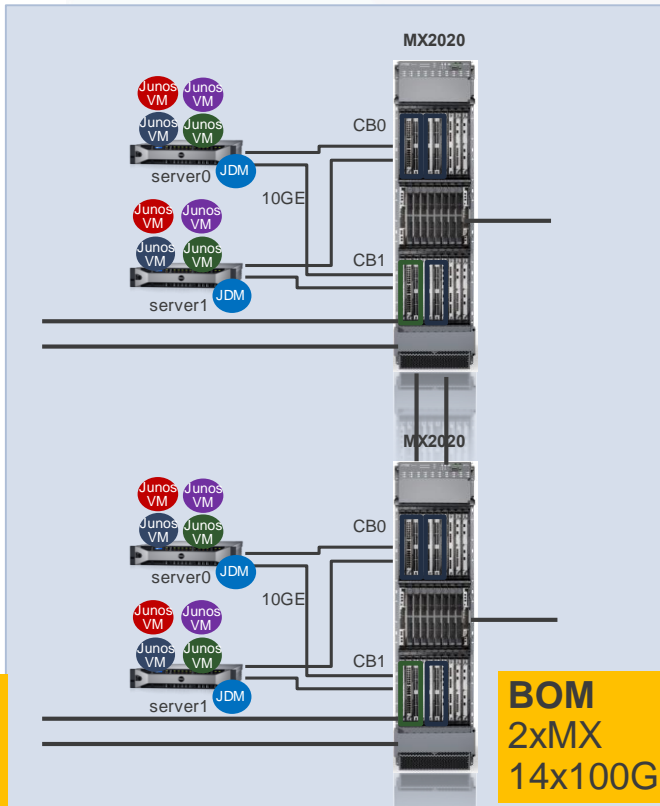
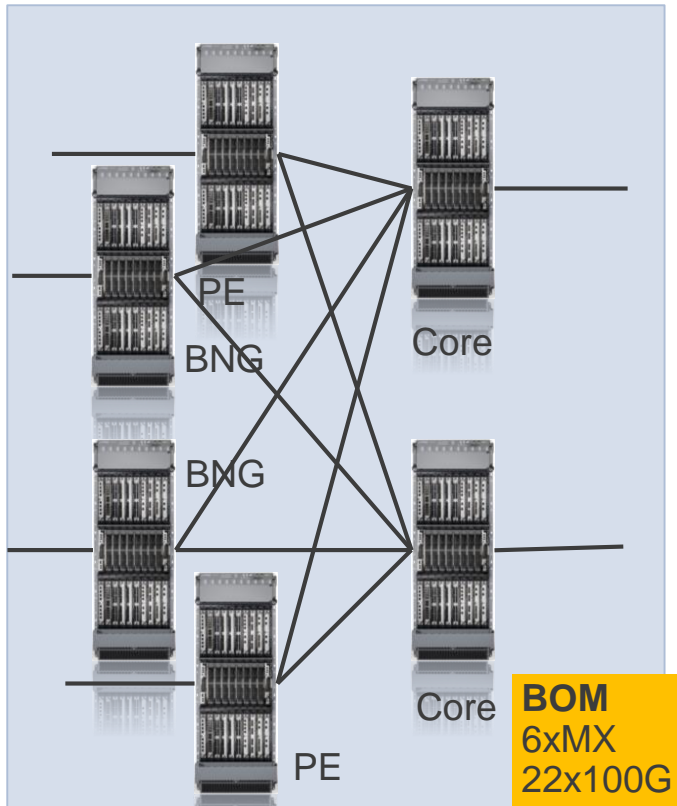
■ Tier1 SP use case: NaaS for new services introduction

- Create isolation network at metro and core.
- Test new features on the new test slicing and services.
- SP control the above functions by using orchestrator.



Junos Node Slicing

Converge, and **save CAPEX** and **OPEX**.



Network Slicing.

Opportunities for new operational modes and new revenue streams.

Network Slicing
building blocks

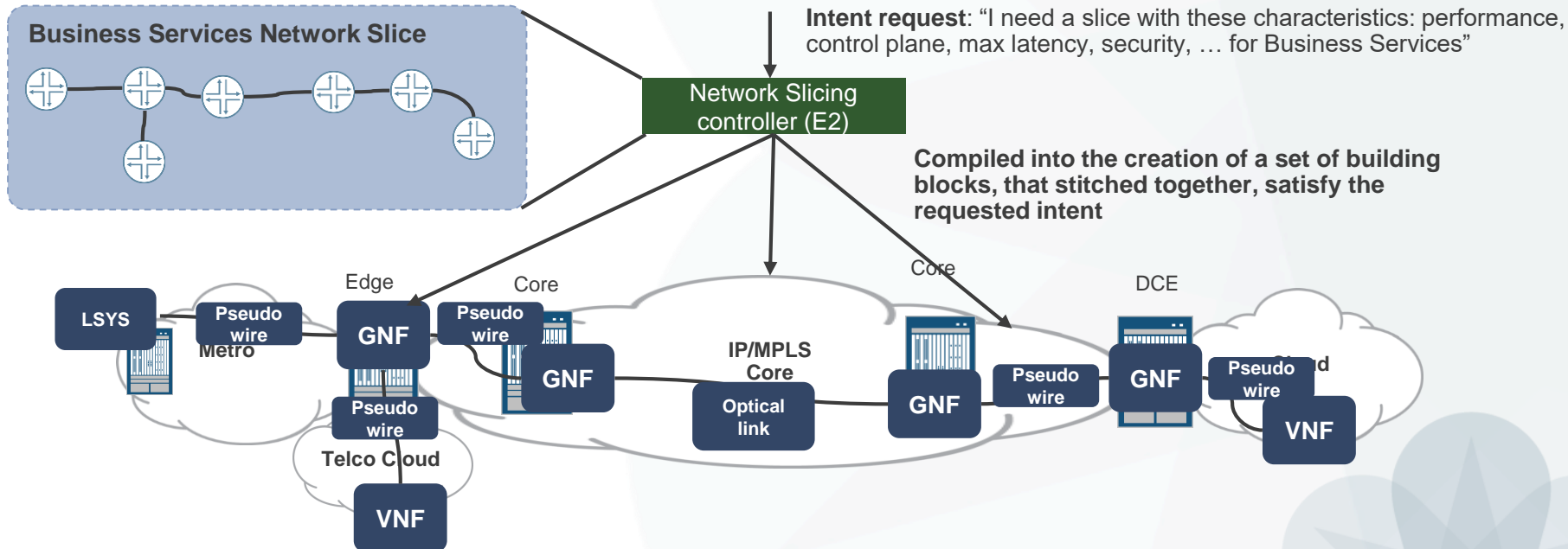
GNF

VNF

LSYS

Optical
link

Pseudo
wire

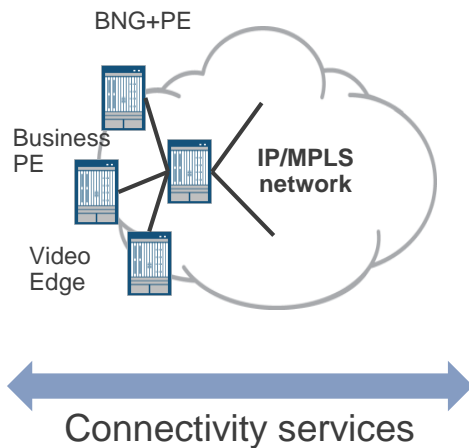




To be Cloud or not to be?

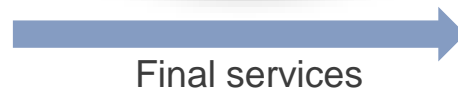
Cloud is transforming the business...

SP Network Infrastructure



The Cloud

Google,
Facebook,
Amazon, ...



I want to be cloud

But Cloud != Software on Servers?



What Does Cloud Mean?

Flexibility



Elasticity



Community



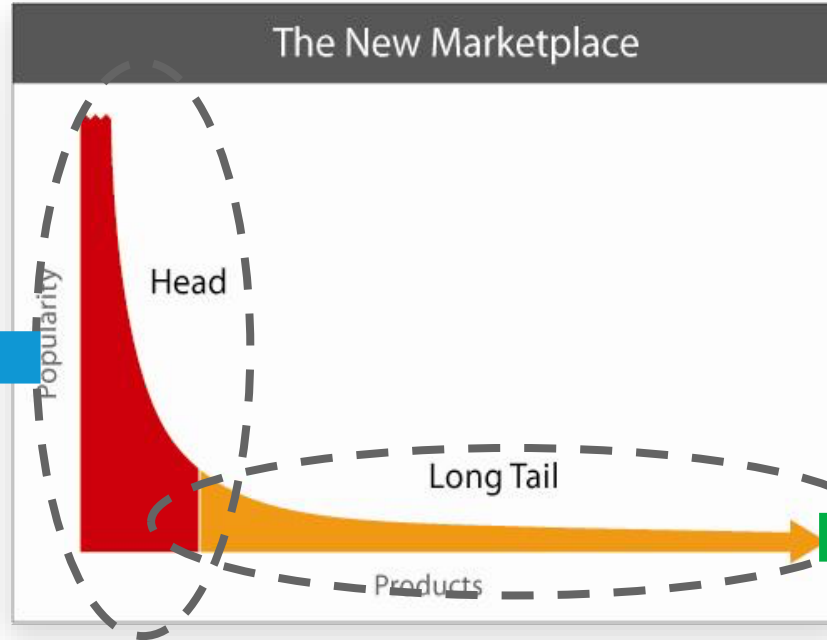
I want to be Agile like cloud

Business is evolving

Architectures and technologies need to evolve as well

THE BUSINESS OF THE MASSIVE

- The traditional business area of Service Providers (and vendors)
- The business of the statistical gain, of the economies of scale.
- Industry very well optimized for it.
- Cost per unit is key
- The perfect fit for purpose built large scale systems.



THE BUSINESS OF THE CUSTOMIZED

- The *NEW* business area of Service Providers (and vendors)
- The business of the innovation, agility, low entry cost, and fast fail.
- Industry not well optimized for it yet.
- Heterogeneous requirements.
- Cost of the first unit is key.
- New technologies required



The new Business requirement

Goal

Address many **new services**, with much **smaller TAM**, with much **faster time to market**, and much **faster fail time**, with mechanisms that enable profitability with small market penetration with customized offerings. The key is not just on the cost per unit, but on the **cost of the first unit**

How?

Digital Delivery of Services

Build once, deliver many.

Dynamic service placement

Use resources efficiently

Decouple infrastructure from services delivery architecture

Pool of reachable resources

Network as a platform for *Mass Customization*

Address the long tail

Elastic Edge (E2)

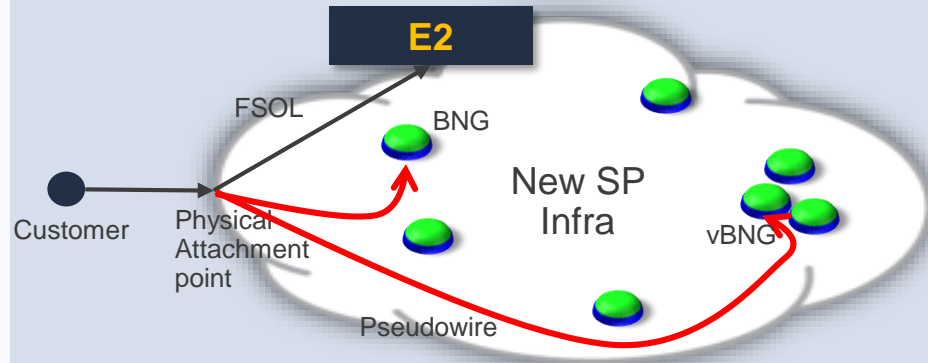
The new architecture

The role of E2 controller.

One where **any service node can be reached** from any access node, and we have **intelligent mechanisms to place customers** on the right service node based on **our intent**

- **Resource availability:** seek for efficiency.
- **Risk associated:** seek for resiliency.
- **Latencies and bandwidth:** seek for specific SLA differentiation.
- **Service capability:** seek for specialization.
- **New requirements:** seek for time to market.

E2 Controller Service Placement Orchestration



E2 Controller Applications – Key functional goals

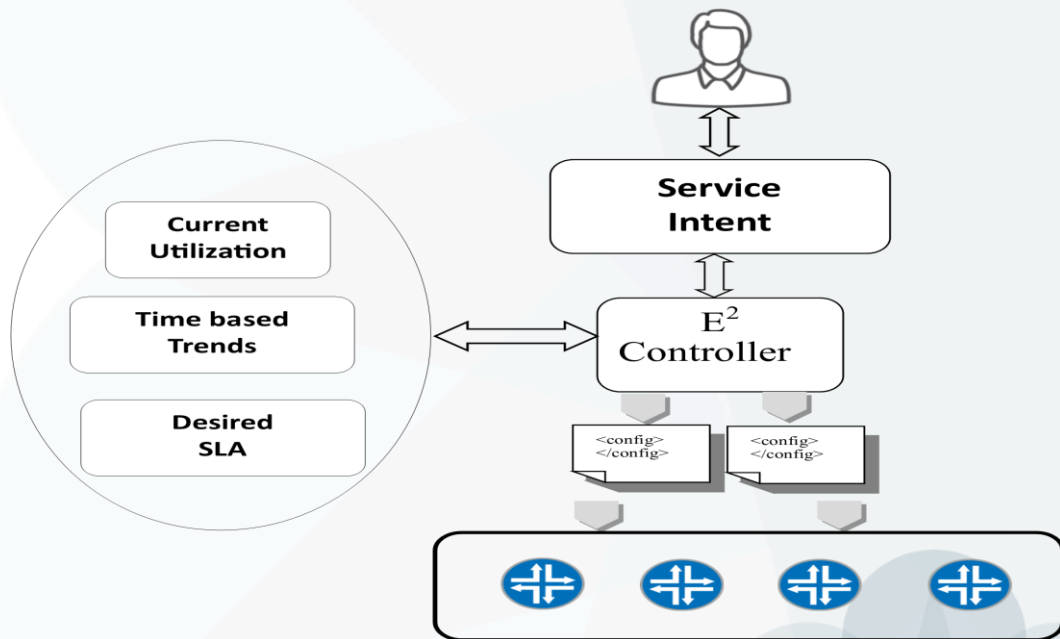
Intent based control

Automated service placement

Prediction & recommendation

Telemetry & Analytics - Visualization

Service Provisioning



E2 Current Use Cases in development

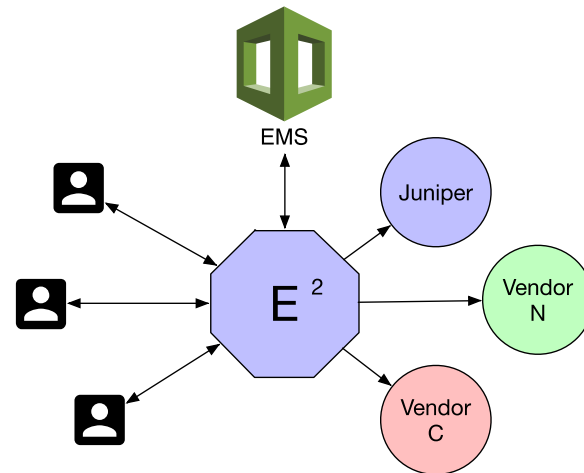
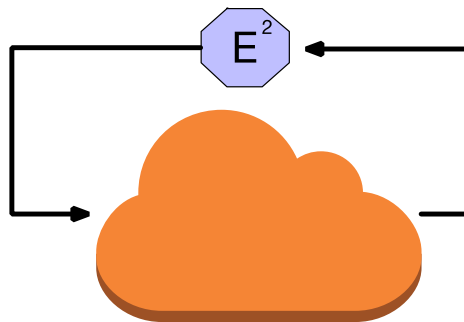
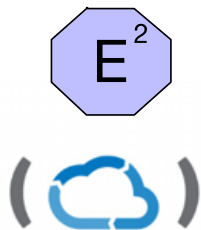
Edge/Aggregation: Backhaul user circuits to service layer

Network Slicing

Internet Exchange: Provide private peering connections to members

Self-Driving Peering

Summary



Not a generic NMS

- Focus on use cases
- Generic Infrastructure
- Use case based intent control.

Abstraction and intelligence

- Intent based
- Declarative APIs
- Telemetry, Analyze, Learn, Predict

Integrate in ecosystem

- APIs
- Enable DevOps
- Multi Vendor

Focus on Apps

Self Driving Network

Seamless integration

Thank you

