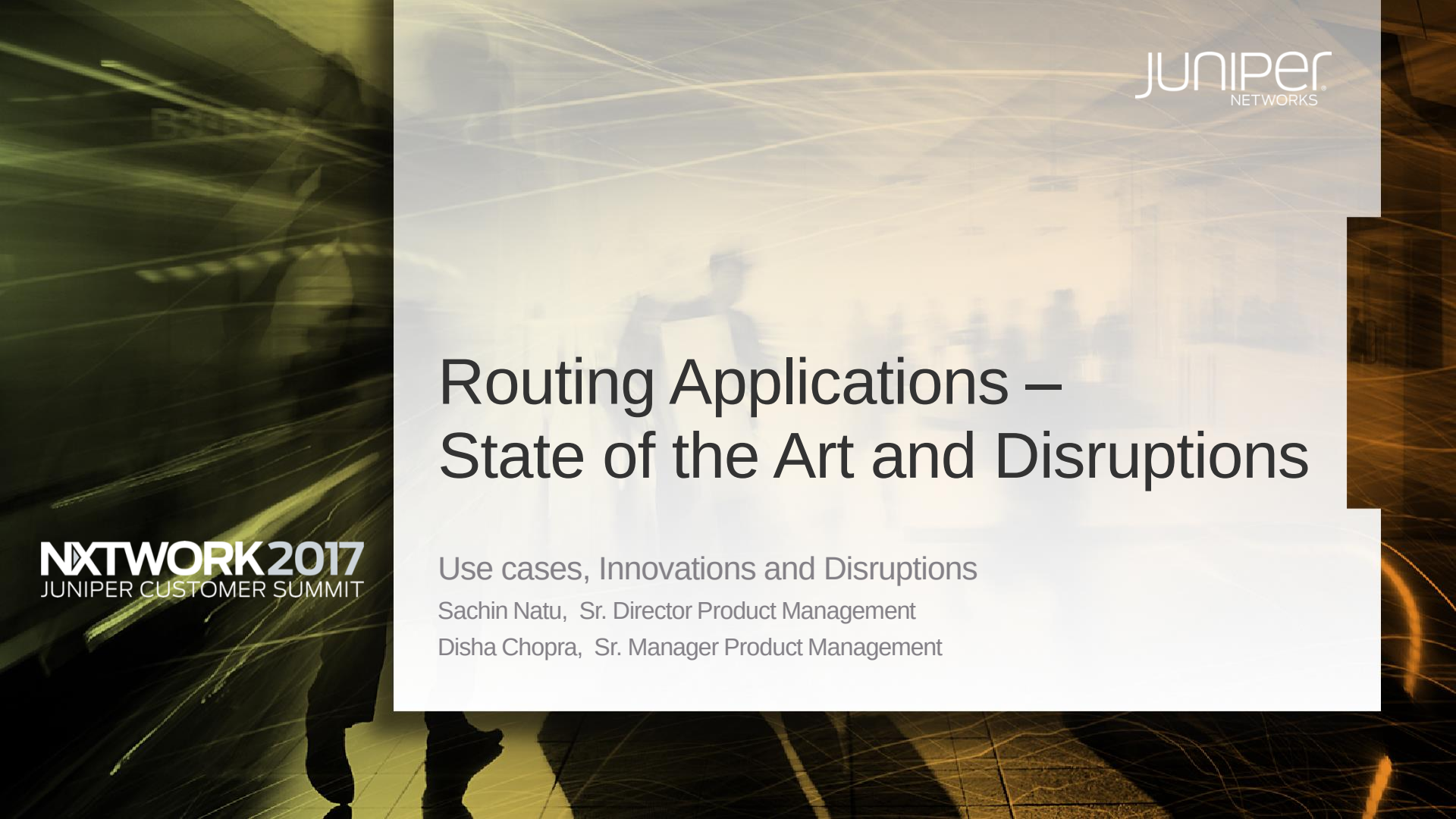

Routing Applications – State of the Art and Disruptions

Use cases, Innovations and Disruptions

Sachin Natu, Sr. Director Product Management
Disha Chopra, Sr. Manager Product Management

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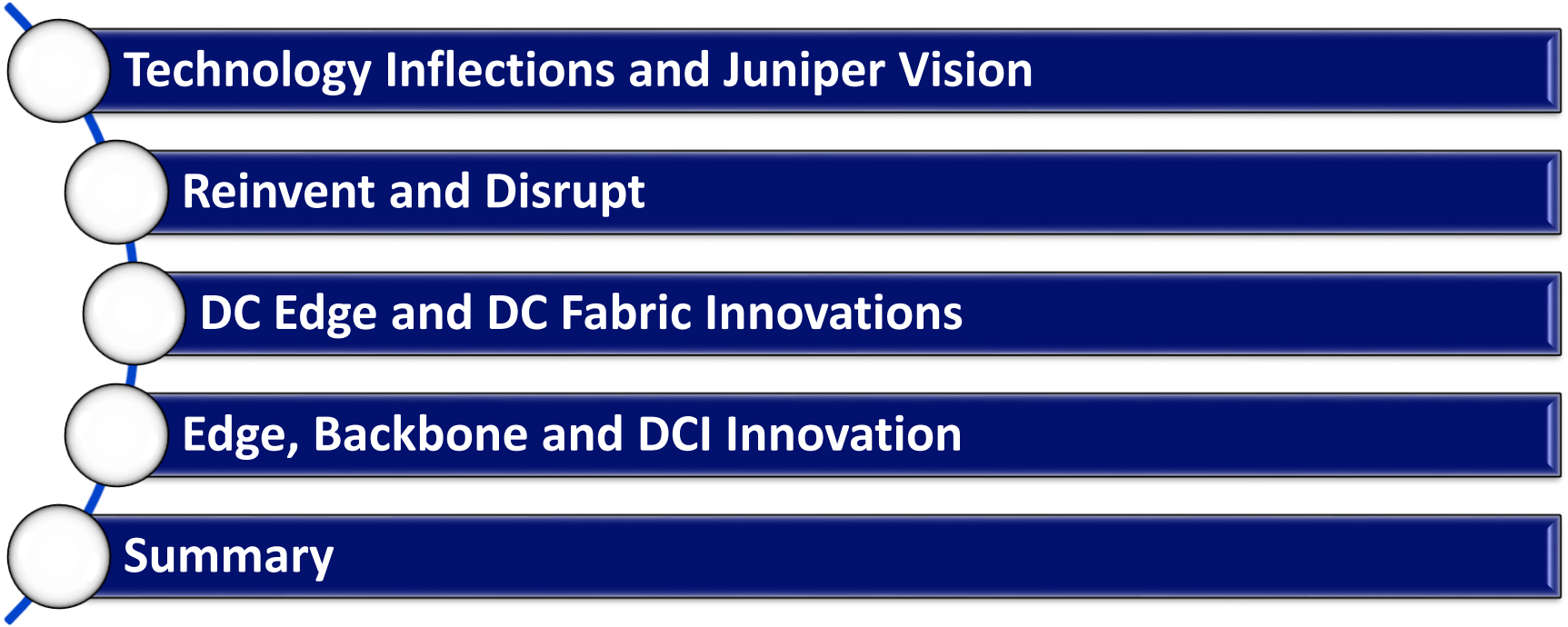
Agenda


Technology Inflections and Juniper Vision
Reinvent and Disrupt
DC Edge and DC Fabric Innovations
Edge, Backbone and DCI Innovation
Summary

Cloud Grade Networking Era

Interconnecting networks

1st Gen Router

Extending networks

2nd Gen Router

Carrier Grade Routers

3rd Gen Router

Multiservice Routers

4th Gen Router

Cloud Grade Routing

5th Gen Router

5thGen

- Cloud Grade Networking:
  - High performance & Agile
  - Simple
  - Responsive

4thGen

- Integrated BNG, services

3rdGen

- IP/MPLS routers (performance, reliability)

2ndGen

- L3 segmentation on enterprise class elements

1stGen

- Specialized software on general purpose compute

Routing Technologies for Cloud Grade Transformation

Build cloud grade architectures with modern routing technologies

Purpose Built & Extensible

- Maximize network efficiency
- Agile - application driven fabrics across networks
- Customizable stack w/ programmable APIs

Simple

- Scale up or Scale out
- Consistent experience network elements
- Integration w/ orchestration and controllers

Responsive

- Built in fault detection, isolation, and recovery
- Rich HA architectures for application SLAs
- Self healing based on real-time telemetry

Driving Graceful Architectural Transformation

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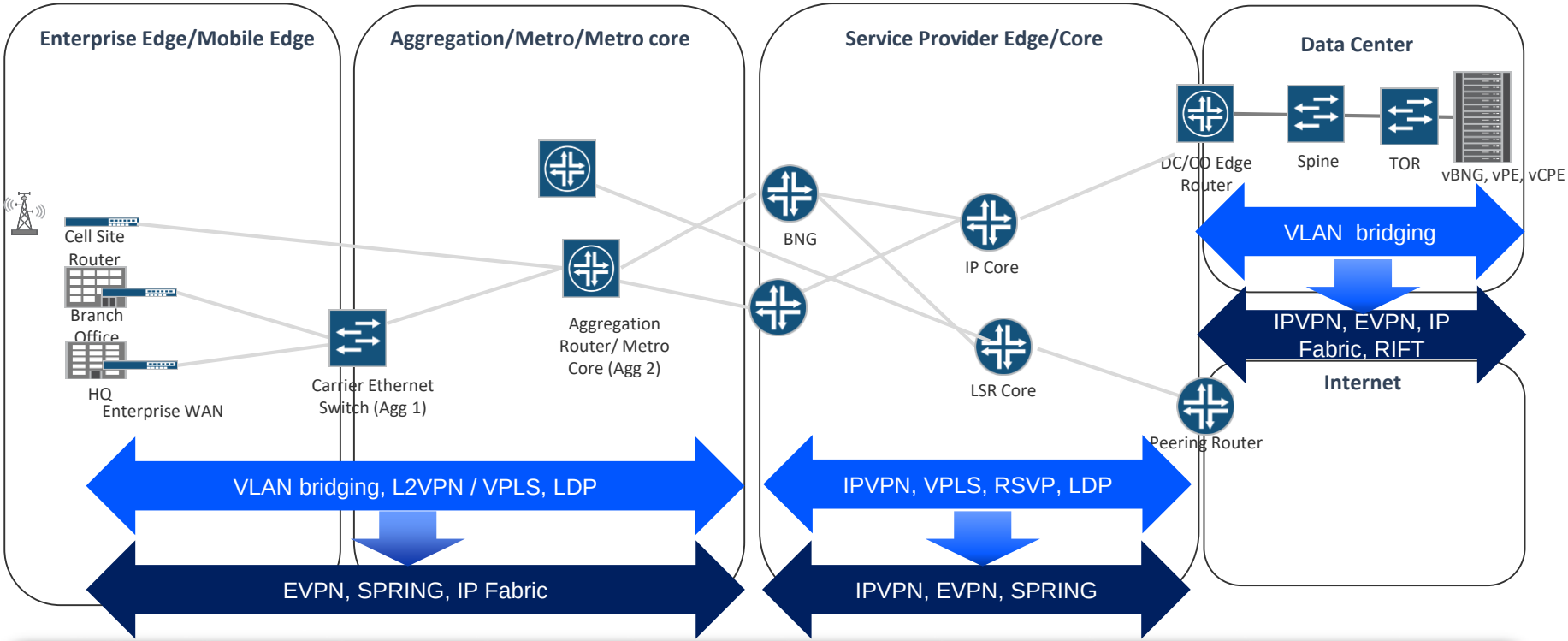
Cloud Grade Networking For All



Driving Architectural Transformation in All Domains – DCs, SPs, Metro & Enterprises

The Self-Driving Network™ – The Journey

The Self-Driving Network

Yesterday	*Today*	*Tomorrow*
Human-Driven Automation	**Machine-Driven**	**Autonomous**
		
• Standards-based interfaces • Standards-based data models • Intent driven network operations	• Actionable Real-time telemetry • Closed loop automation • Humans make decisions where machines cannot	• Machine Learning driven • Integrated with historical and real-time network telemetry • Humans design & tune ML

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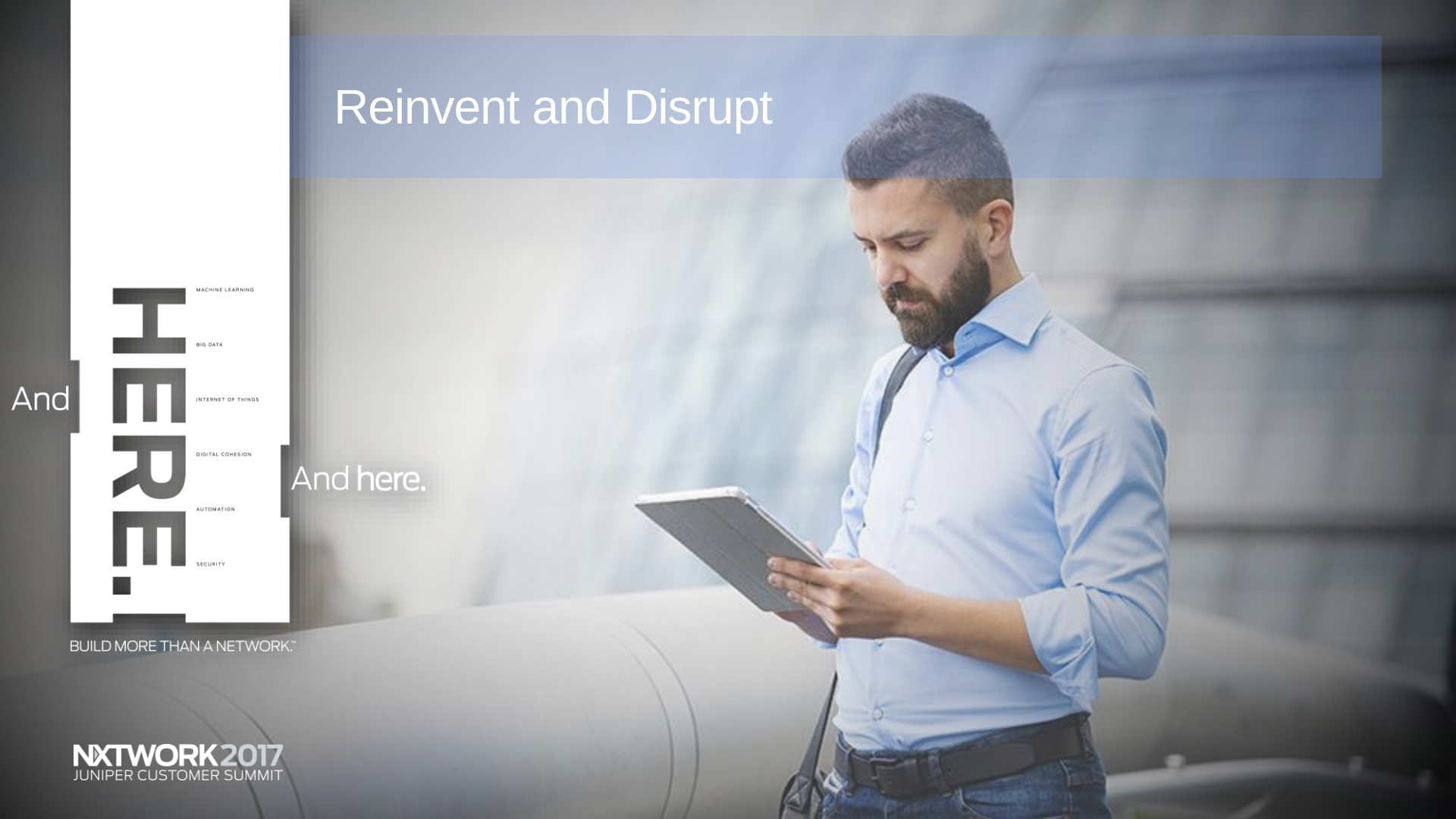
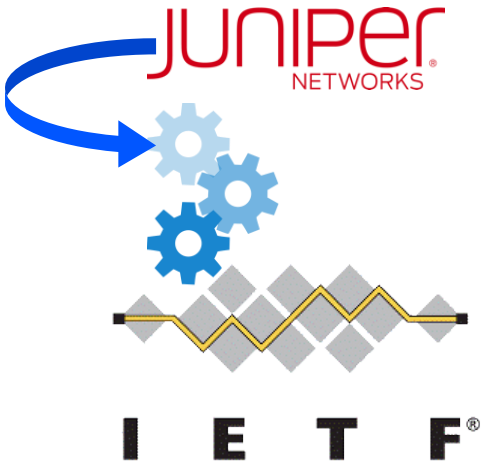
Reinvent and Disrupt



Open Standards Innovation Is Juniper DNA

- In last 12 months
  - 30 new RFCs with Juniper co-authors
  - 1/3 of all RFCs published last year
- Internet-Drafts in progress with Juniper co-authors
  - 174 working documents
- Dominant influence on cloud architecture standards



RIFT: Purpose Built for DCs

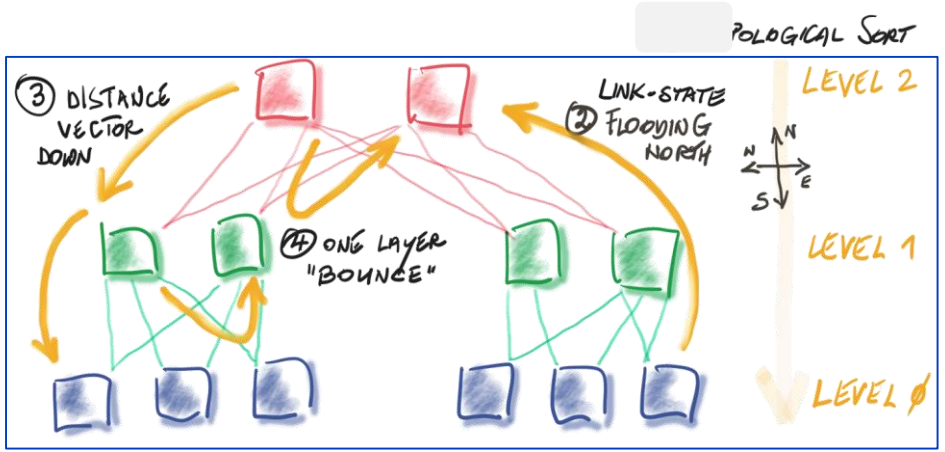
A novel routing algorithm for CLOS underlay

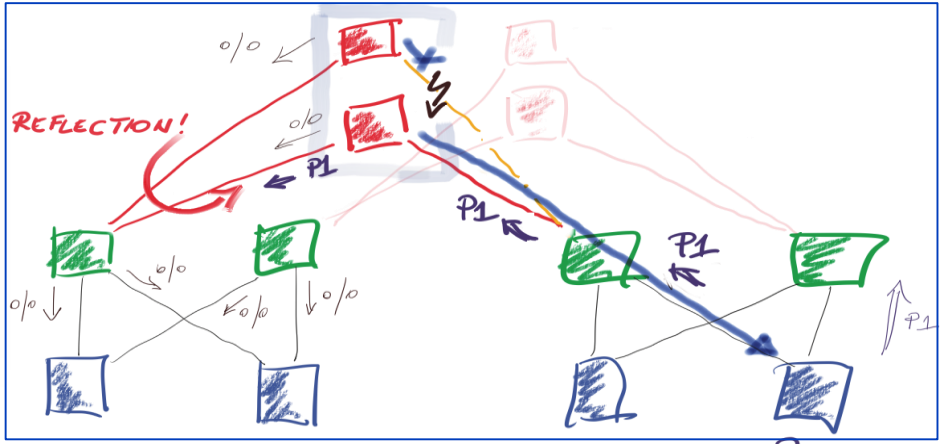
Market Needs

- CLOS optimized routing protocol
- Full BW Utilization
- Built in Fabric Provisioning
- Fast convergence

Juniper Invention

- Link-State North; Distance-Vector South
- Simplest leaf Implementation
- Failure Domain Containment
- Support all DC applications





RSVP Pop-N-Go : Ensuring Business Continuity

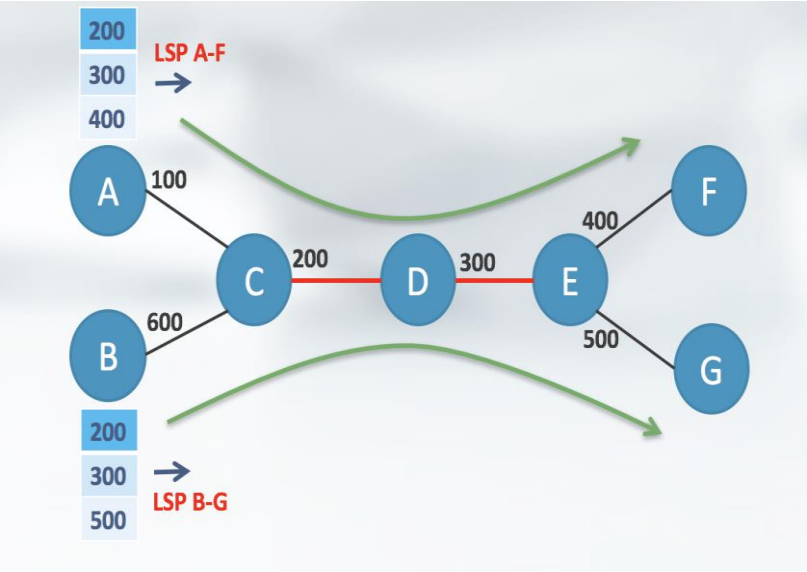
Battle Tested RSVP-TE control plane with SPRING forwarding plane

Market Requirement

- Simpler transition to SPRING

Juniper Invention

- Re-Use existing RSVP-TE control plane
- Minimal forwarding state at transit node.
- Better scale with label sharing
- No label reprogramming during LSP events
- Flexibility to manage label stack capabilities



Write Your Own Applications On Junos

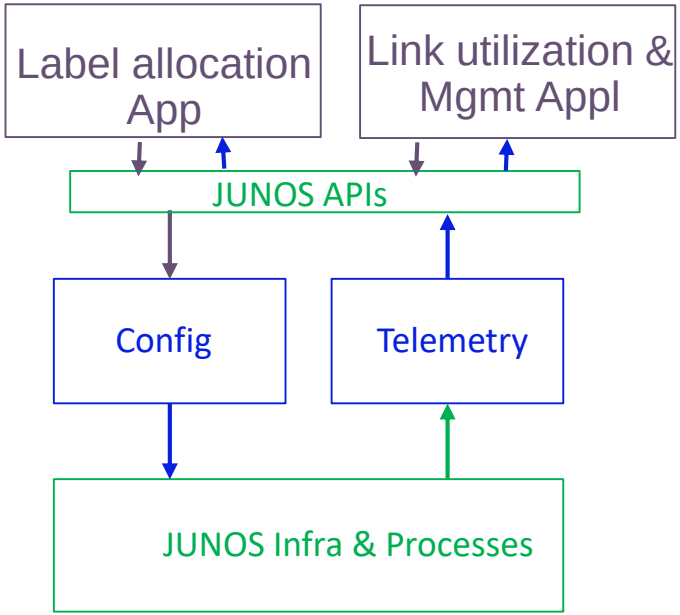
Integrate business logic in routing

Market Requirements

- Modify routing algorithms to suit business needs
- Integrate with SDN controllers

Juniper Differentiation

- Applications use Junos APIs
- Rich choices for App Development
  - (Python, GO, C++)
- Deep integration with RIB
- Single point of Control to forwarding plane
- On box / Off Box applications



DC Edge and DC Fabric Innovations

DC Edge & DC Fabric Transformation

Market Requirements

- High performance, high scale DC Edge & Fabric
- XaaS Cloud, Private Cloud, Hybrid Cloud & Multi-Cloud

Juniper Vision

- Scale and Performance for DC Edge
- High scale IP Fabric architecture
- End to end solution for hybrid cloud & multi-cloud

Product Offering

- DC Edge : MX, PTX
- DC Fabric : QFX

Data Centre Edge / Fabric

IP Fabric Optimized for Efficiency

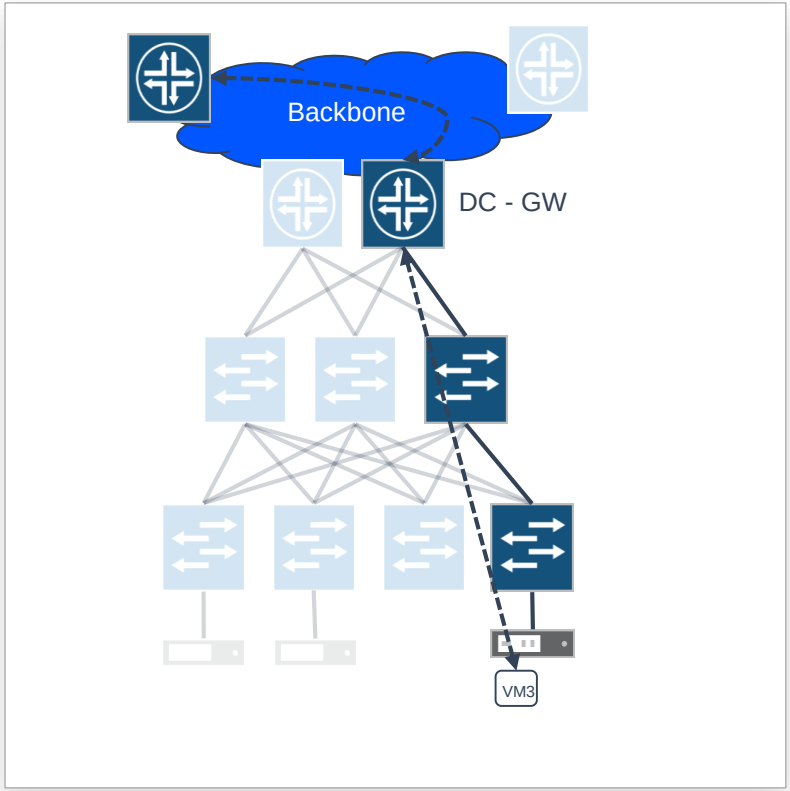
Entropy friendly overlay for DC fabrics

Market Requirement

- Load balancing for storage applications
- Proven IPVPN for DC multi-tenancy
- All IP fabric
  - MPLS/UDP, VxLAN

Juniper Differentiation

- Massive Tunnel scale on DC Gateways
  - 256k tunnels
- BGP negotiation for easy migration
- Integration with IPFIX and telemetry



Horizontal Scale Out

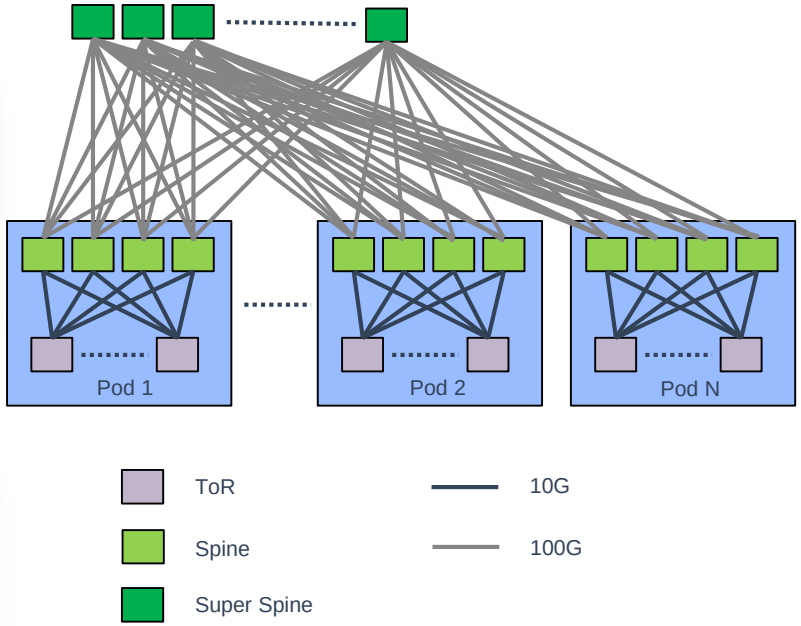
Multipath Scale in DC & WAN

Market Requirement

- Easy application scaling
- Add fabric or spine capacity in CLOS
- Contained failure impact
- Better application resiliency

Juniper Differentiation

- High Scale, high performance for edge & spine
- Plans for same ECMP fan-outs as port count
- Similar scaling for WAN



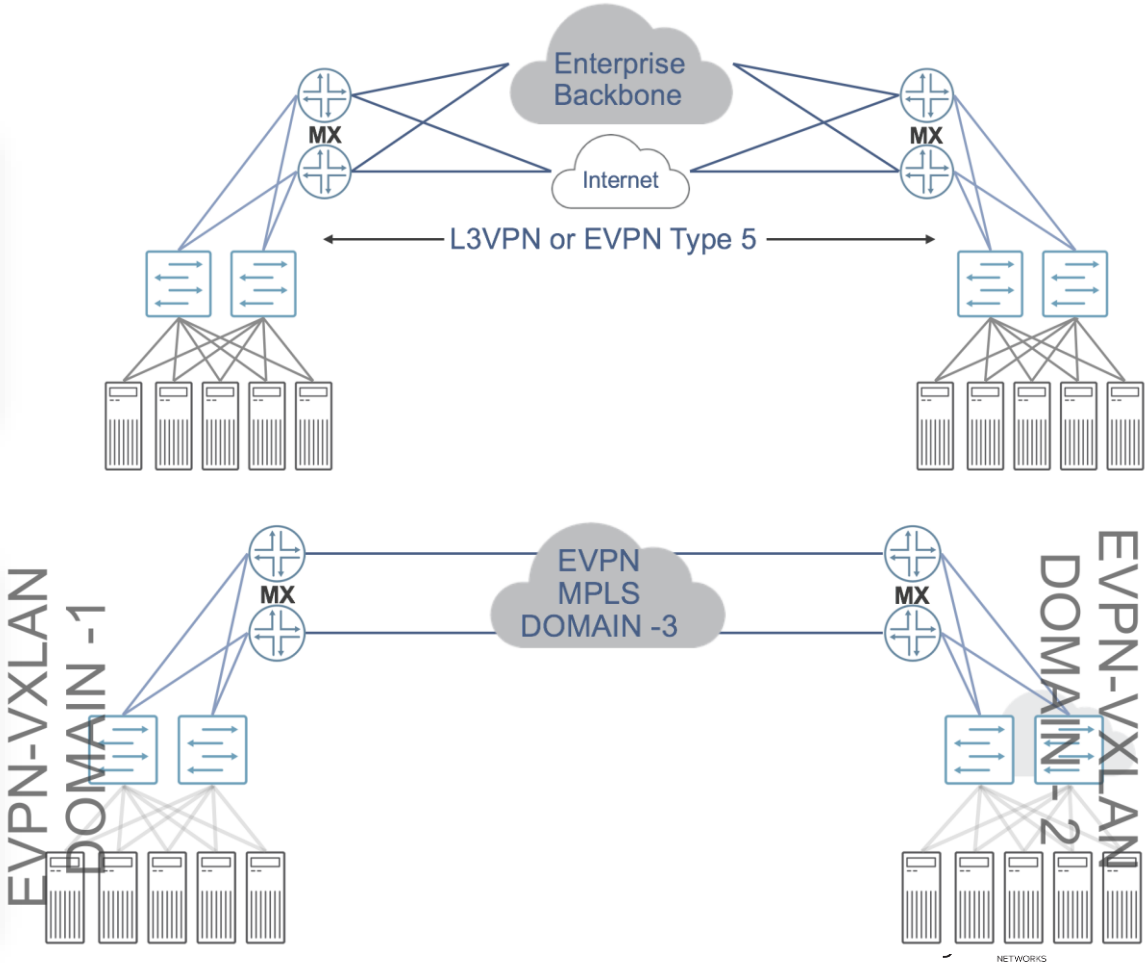
Hybrid Cloud for All Workloads

Market Requirement

- Complete hybrid cloud solution for L2 and/or L3 workloads
- BUM traffic confinement
- MPLS-TE benefits in core

Juniper Differentiation

- Same solution for private cloud DCI & private to public cloud DCI
- Inter-working between IPVPN & EVPN instances
- IP Fabric over MPLS for TE



Edge, Core and DCI Transformation

Edge Transformation

Market Requirements

- Improve Business Services Portfolio
  - Cloud connect & Better SLAs
- Full features Virtualized products for NFV Telco Cloud

Juniper Vision

- Seamless EVPN for Next Gen VPNs
- Flexible Placement of Feature rich virtual PEs
- NS as intelligent WAN controller

Product Offering

- Provider Edge : MX, vMX
- Peering Edge : MX, PTX

Cloud Grade Metro & Business Services

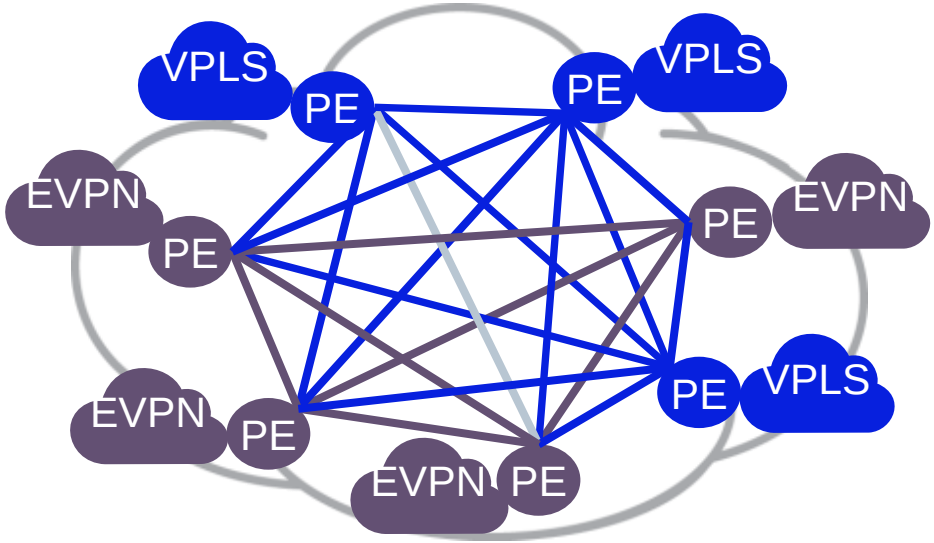
Migration of Existing L2VPNs to EVPN for Cloud Grade Networking

Market Requirement

- Business Continuity
- Smooth migration to cloud architectures
- Agile services for cloud connect

Juniper Differentiation

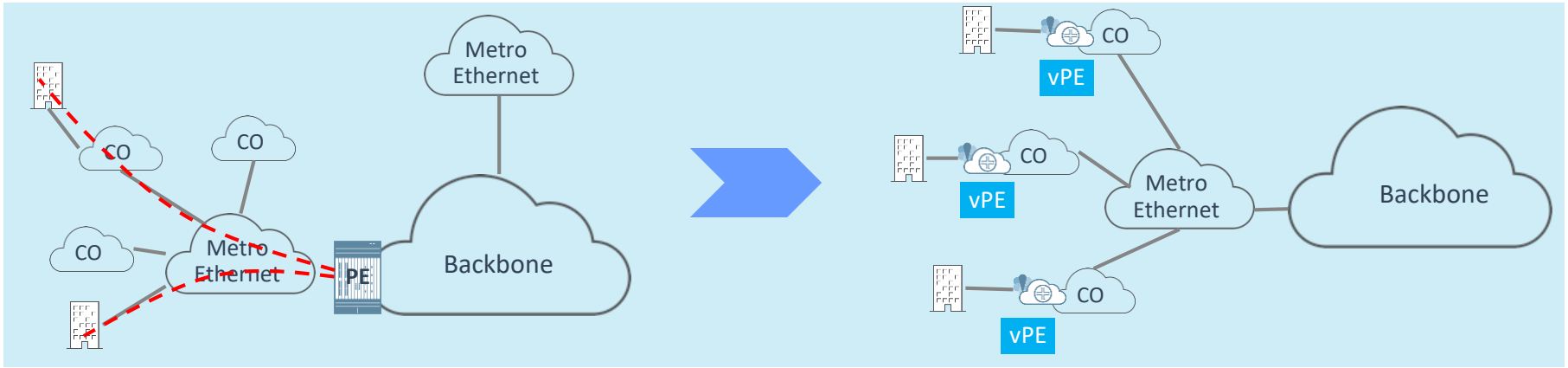
- Converged Control Plane (Single RIB/FIB for composite VPN instance)
- Integration with old VPLS & L2VPN nodes



Virtualized Edge for Telco & Hybrid Cloud

Current mode of Operation

New mode of Operation



Market Requirements	Juniper Differentiation
Agile Service Deployment Pay As You Grow CAPEX Reduction	100G @256bytes Throughput Physical MX Feature Parity

Backbone and DCI Transformation

Market Requirements

- High traffic growth with lowest cost per bit
- Simpler traffic engineering & SLA assurance

Juniper Vision

- Seamless migration to SPRING
- SPRING controller for traffic engineering

Product Offering

- LSR Core/ IP Core : PTX, MX
- DCI : QFX, MX, PTX
- SPRING Controller : NorthStar

Business Continuity with SPRING / RSVP Interop

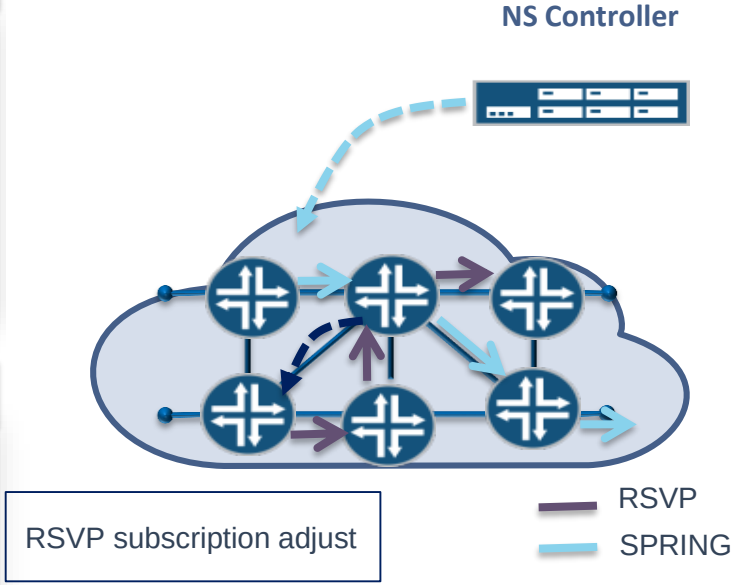
Coexistence of SPRING and RSVP for Traffic Engineering

Market Requirement

- Easy migration from RSVP to SPRING
- No change in existing RSVP behavior, n/w mgmt
- SPRING Traffic governs RSVP allocation
- Dynamic BW adjustment & max NW utilization

Juniper Differentiation

- No change in RSVP behavior
- Maximize network utilization
- Gradual deployment of SPRING TE
- Long term co-existence of RSVP and SPRING



Business Continuity for SPRING Migration

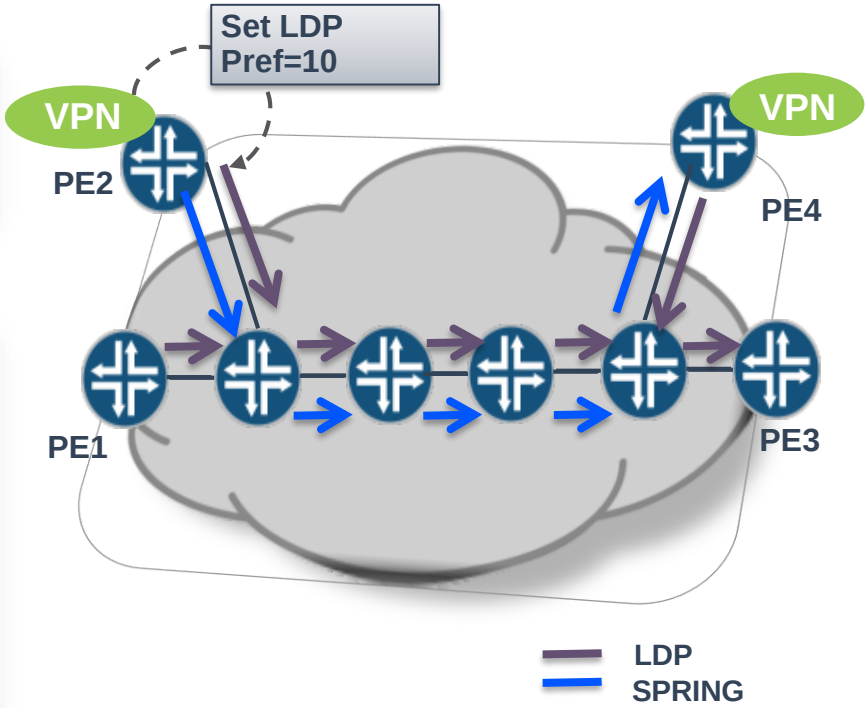
Graceful LDP to SPRING Migration

Market Requirement

- Provide smooth transition from LDP to SPRING
- Addresses LDP to SPRING mapping (Server)
- Addresses SPRING to LDP mapping (Client)

Juniper Differentiation

- Supports islands of LDP & SPRING routers in same network
- Support in Junos can be enabled by policy
- Interworking of services with existing backbone



NorthStar as SPRING Controller

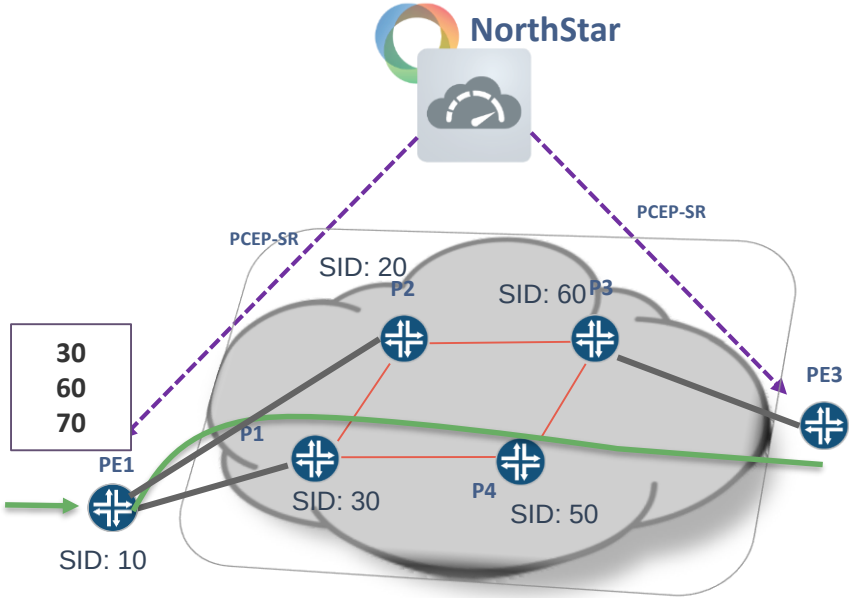
One single controller for RSVP, LDP and SPRING architectures

Market Requirement

- Centralized TE Controller
- Graceful migration to SPRING
- Service SLA assurance

Juniper Differentiation

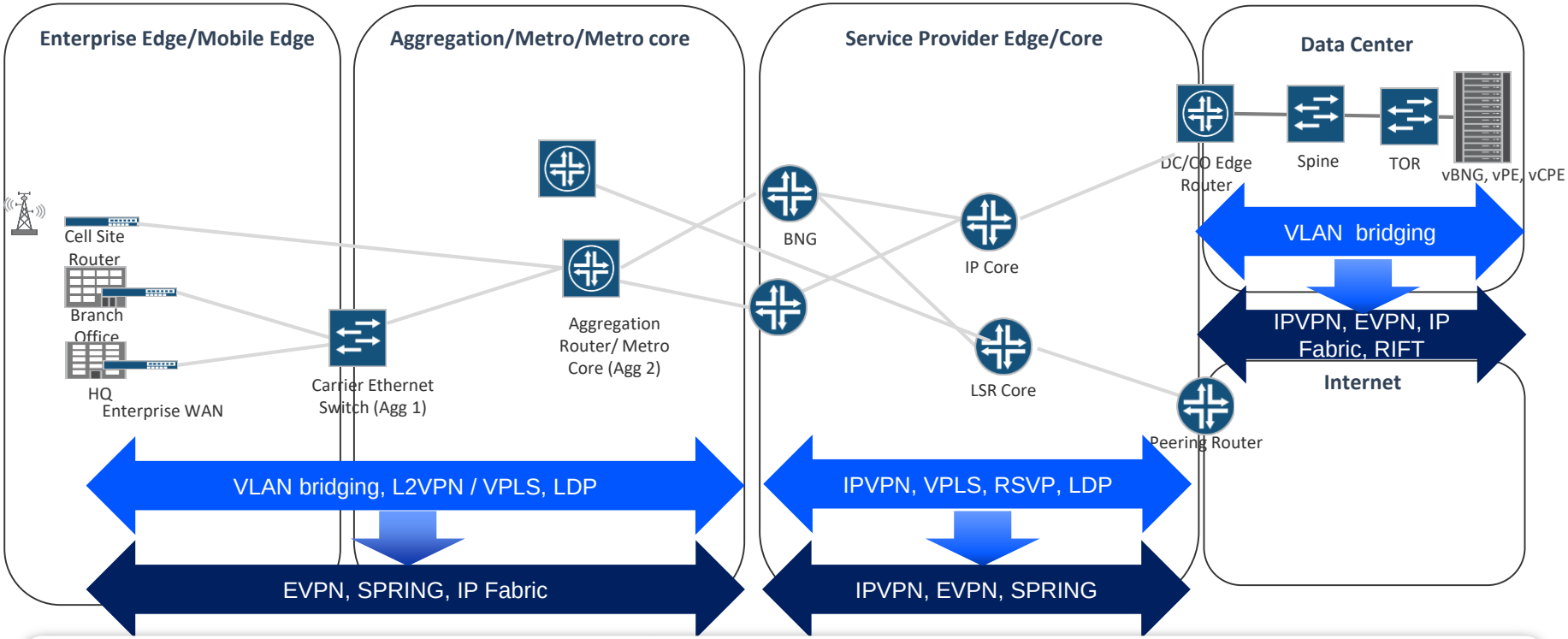
- Consistent TE experience
- PCEP extensions for RSVP, SPRING
- NetConf extensions for LDP
- SR and RSVP co existence
- SR and LDP co existence



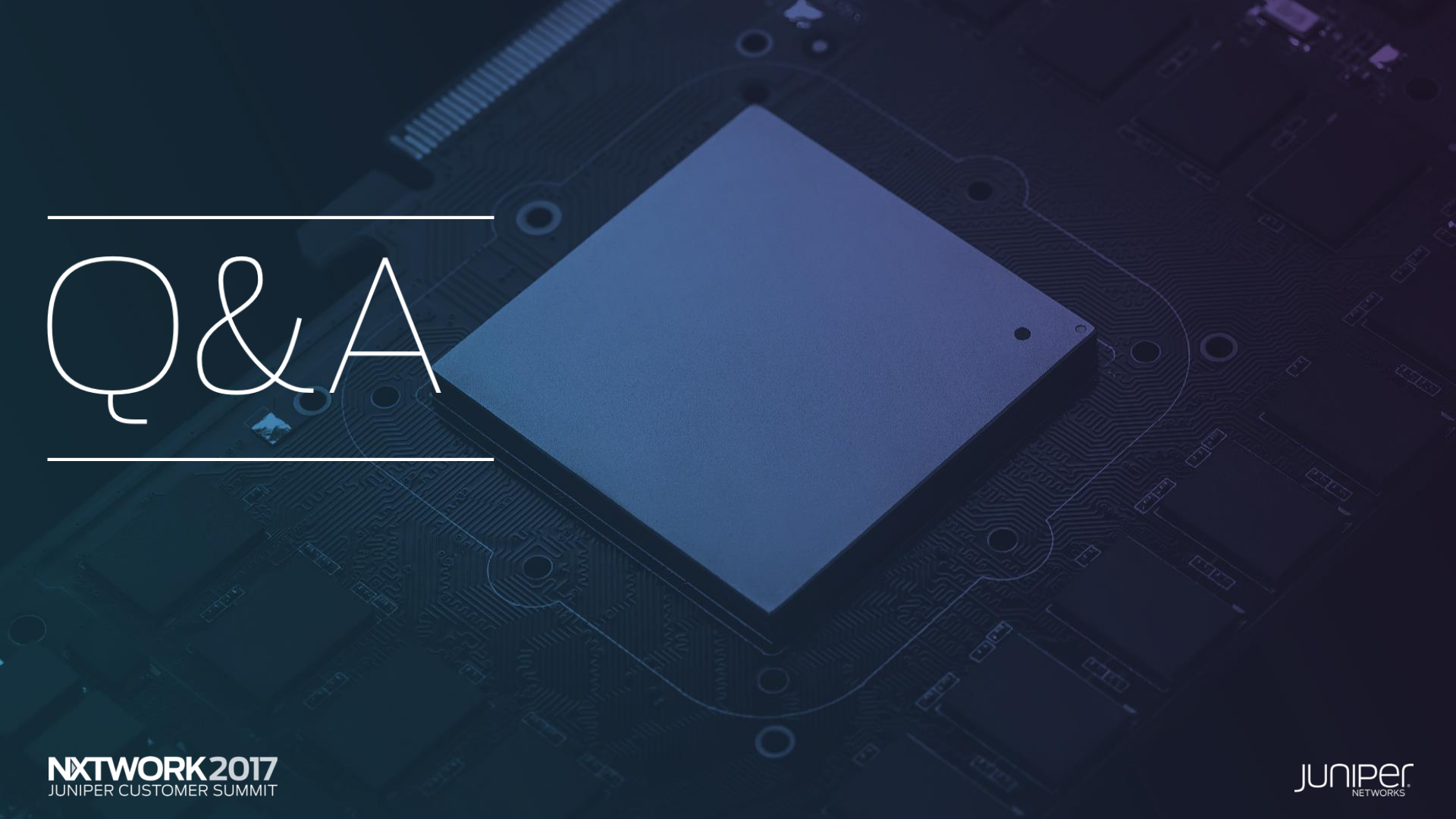
Summary


The
FUTURE
MACHINE LEARNING
BIG DATA
INTERNET OF THINGS
DIGITAL COHESION
AUTOMATION
SECURITY
is here.
BUILD MORE THAN A NETWORK.™
NXTWORK 2017
JUNIPER CUSTOMER SUMMIT

Cloud Grade Networking with Business Continuity



Seamless Architectural Transformation in All Domains


Q&A


Thank you