Prepare for the 5G Era with 5G Ready Data Centers

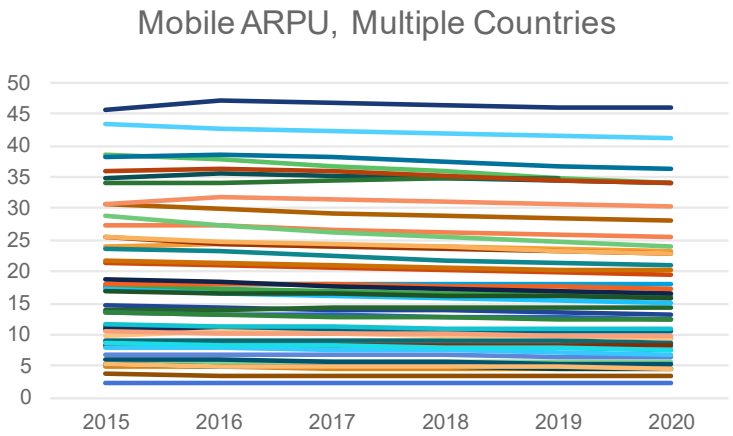
Guy Brunsdon, Director, Product Management
Sonu Khandelwal, Technical Marketing Engineer

Agenda

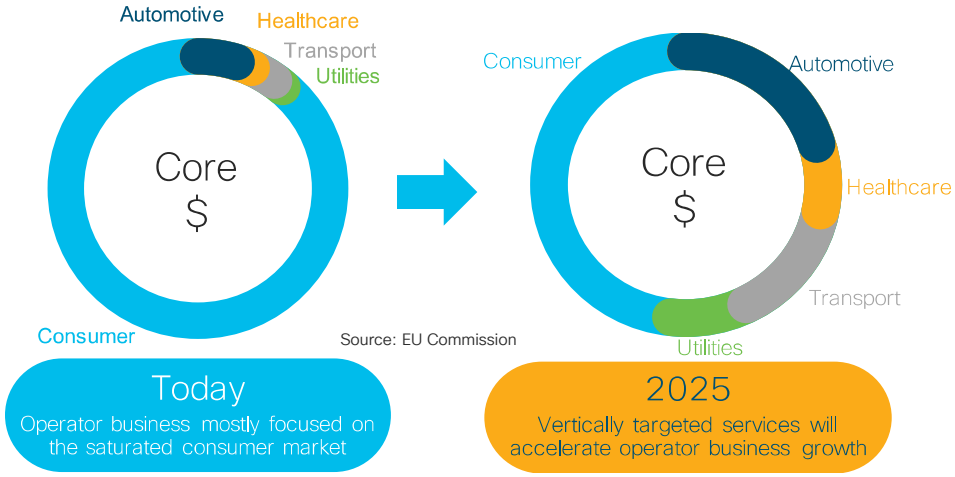
- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
- 5G ready DC solution with Nexus 9000
- Monitoring and Compliance for Telco DC
- Network Insights for Telco DC

© 2019 Cisco and/or its affiliates. All rights reserved.

Customer Experience is Taking Centre Stage



Consumer ARPUs are Declining or Flat



B2B or B2B2x Market Has Future Growth

Low Latency for better QOE and to Enable New Applications, Customer Experience Transformation

© 2019 Cisco and/or its affiliates. All rights reserved.

Service Edge Transformation

The Service delivery architecture is evolving as the Service Edge functions are undergoing the following transformations:

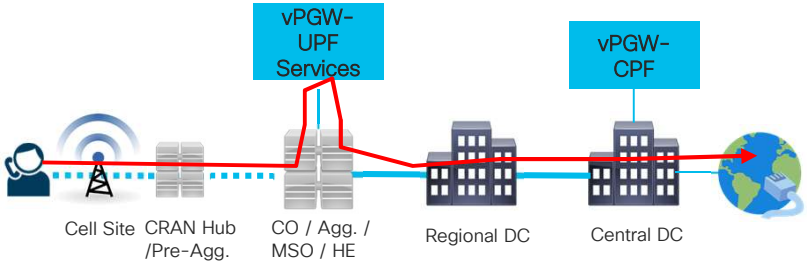
Virtualization

Decomposition

Placement

Centralized, Appliance Based Mobile Gateway

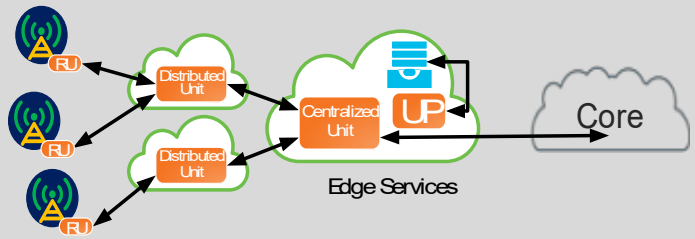
Distributed, Virtualized, Decomposed Mobile Gateway



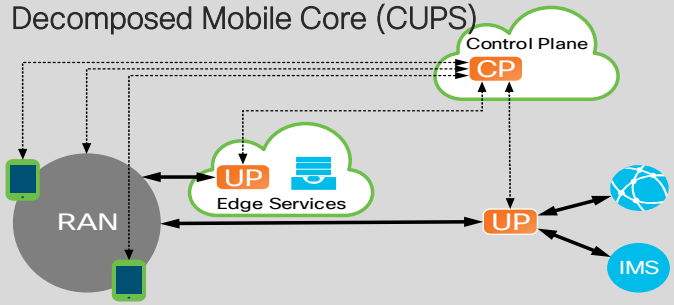
© 2019 Cisco and/or its affiliates. All rights reserved.

SP Infrastructure Use Cases for Edge

(Open) Virtualized RAN

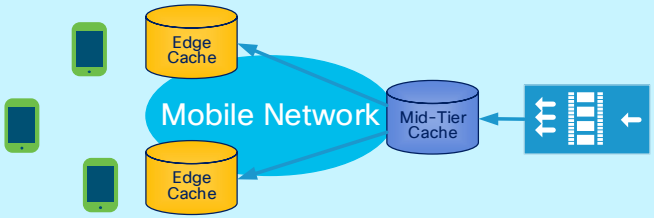


Decomposed Mobile Core (CUPS)

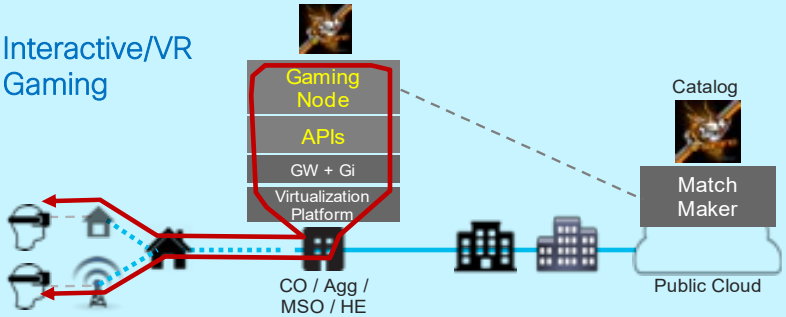


Operator Branded or Business to Business (B2B) Use Cases for Edge

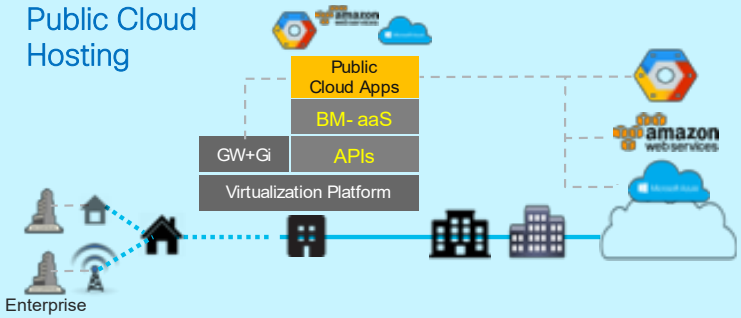
Edge CDN for (Mobile) Video



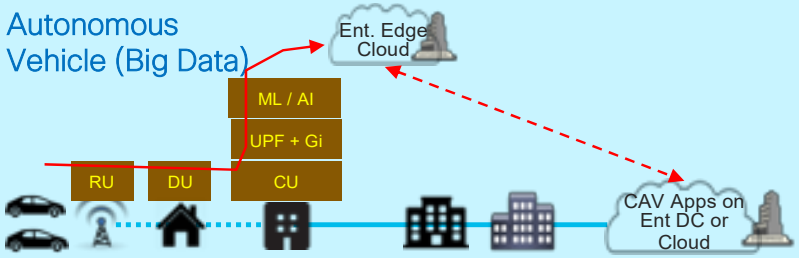
Interactive/VR Gaming



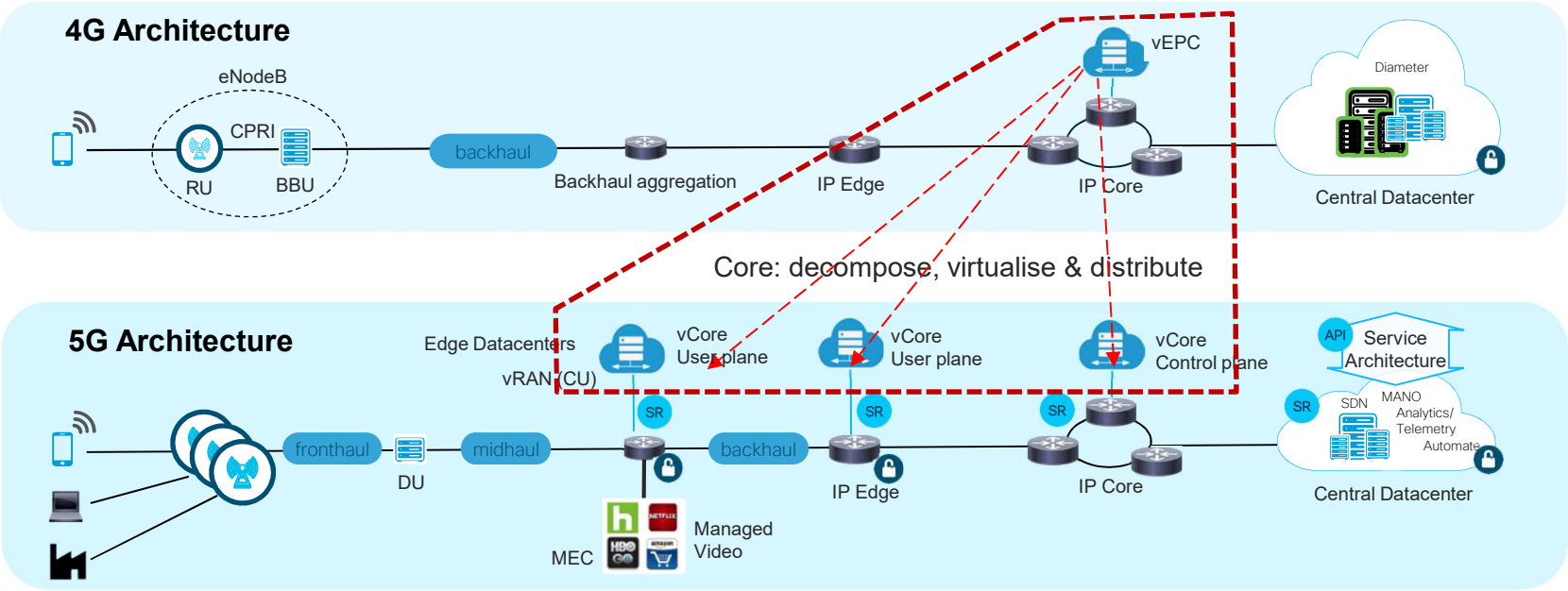
Public Cloud Hosting



Connected Autonomous Vehicle (Big Data)



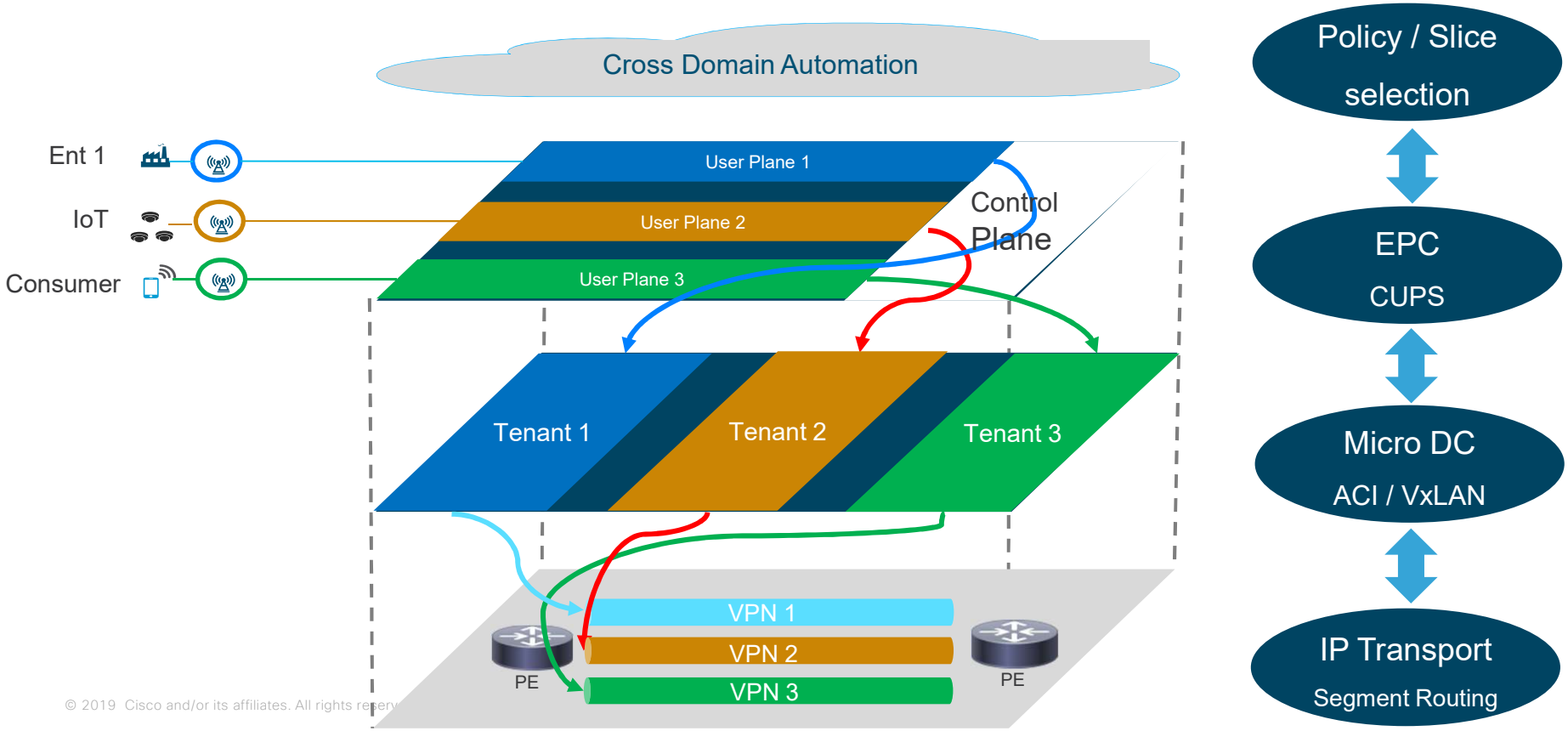
5G Architecture Evolution



- Virtual Packet Core is the #1 workload for NFVi today
- Distribution of the User Plane the only way to meet 5G low latency requirements

© 2019 Cisco and/or its affiliates. All rights reserved.

Slicing and 5G Services



© 2019 Cisco and/or its affiliates. All rights reserv

Impact of 5G on Telco Datacenter Fabric

Multi-Site	• Multiple locations with lesser footprint (1 / 2 pairs in edge DC) • Multiple Central/Regional DC with ACI fabrics.
Automation	• 5G Slice calls for end to end automation, need SDN to integrated with MANO as well as virtualization domains like K8, Openstack.
Service Chaining	• As U-Plane goes out, services will move along and we would need to chain different APN's to different services.
Analytics	• 5G calls for end to end slicing with slice management, we need DC to stream real time telemetry data outside.
Virtualization	• Platform to host distributed workloads (VM, Containers)

© 2019 Cisco and/or its affiliates. All rights reserved.

Agenda

- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
- 5G ready DC solution with Nexus 9000
- Monitoring and Compliance for Telco DC
- Network Insights for Telco DC

© 2019 Cisco and/or its affiliates. All rights reserved.

Distributed Telco DC challenges

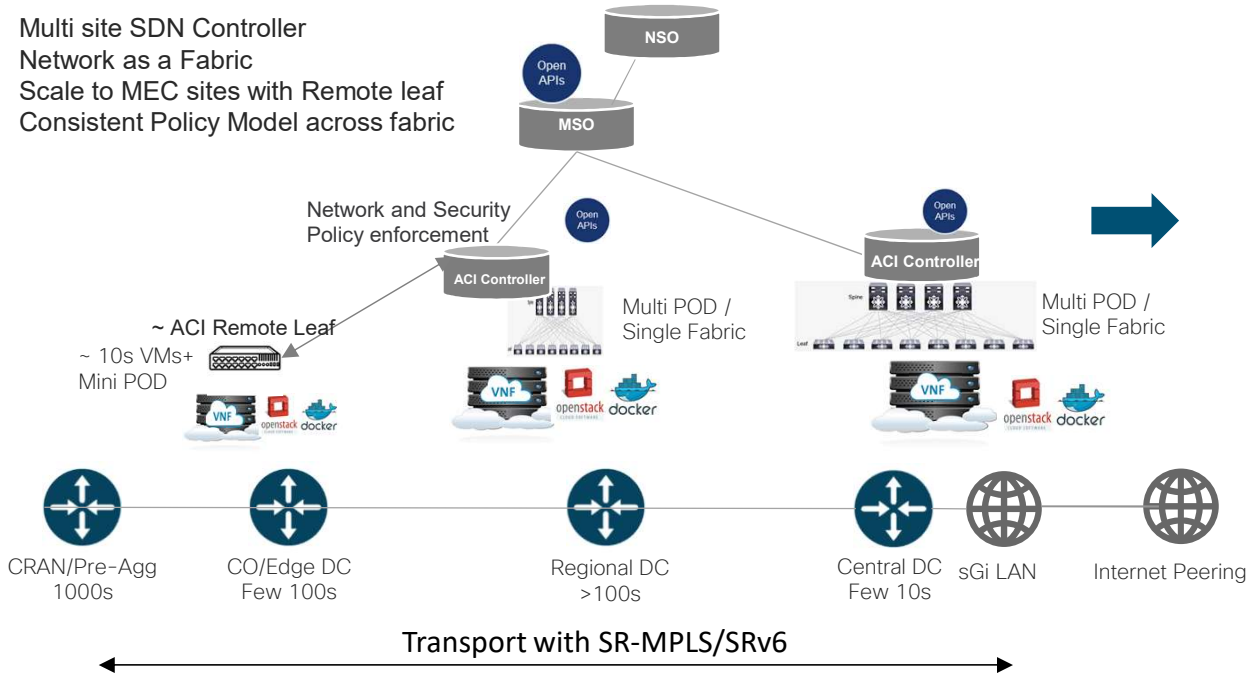
Lifecycle Management	• Scaling 100s-1,000s sites
Service Chaining	• Complex operations, requires granular visibility
Automation	• Seamless inter-working w/ Transport SDN
Availability	• No central point of failure

© 2019 Cisco and/or its affiliates. All rights reserved.

ACI Architecture For Distributed Telco Cloud

Distributed Edge DC Fabric

Multi site SDN Controller
Network as a Fabric
Scale to MEC sites with Remote leaf
Consistent Policy Model across fabric



Analytics and Assurance

- Streaming Telemetry and Analytics: Visibility and Performance
- Network Service Assurance: Simulation and validation

SDN Fabric Management

- Driven by virtualization
- Fabric Automation
- Ops tools for lifecycle management
- Policy driven with Service Chaining
- SDN-ACI & SR-MPLS Integration for NaaS

Cloud Management

- Workload Management across clouds
  - Openstack
  - Kubernetes
- Virtual Network Connectivity across clouds

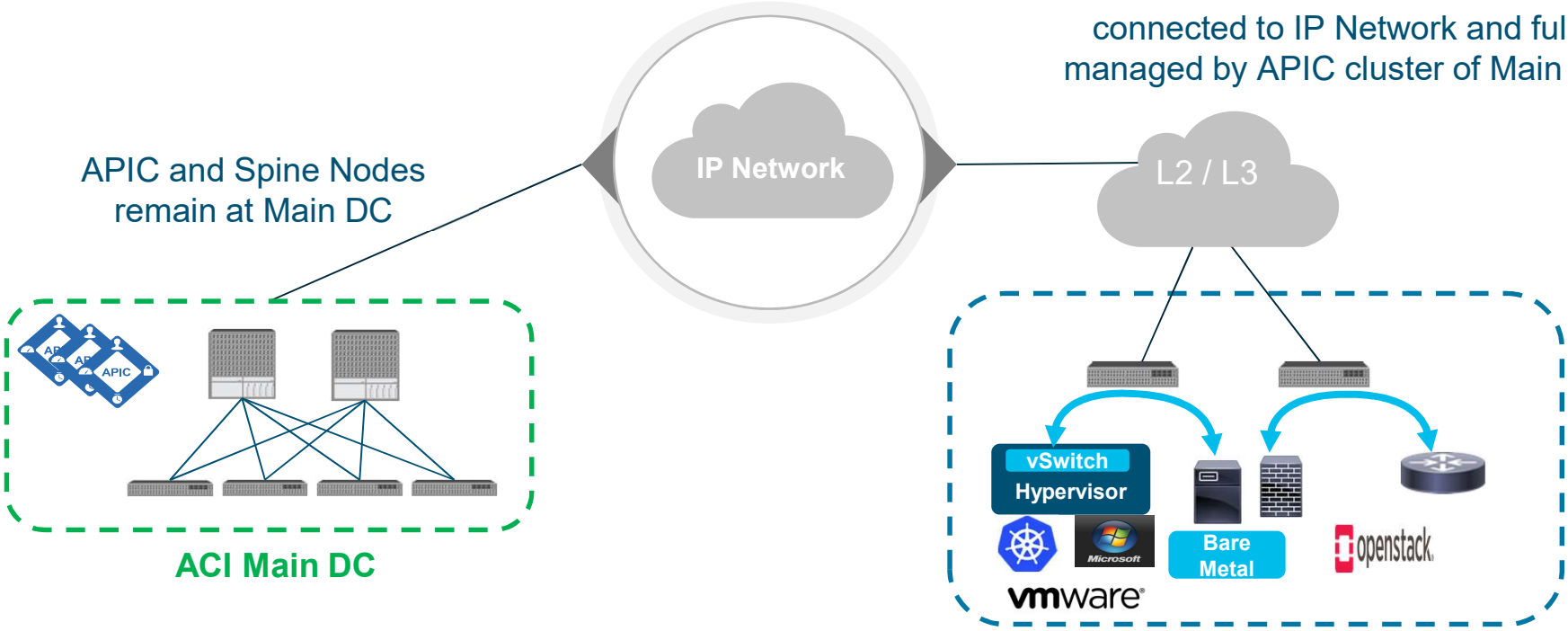
© 2019 Cisco and/or its affiliates. All rights reserved.

MSO- Multisite Orchestrator
NSO- Network Service Orchestrator

Architecture Overview

Remote Location contains Nexus 9300 connected to IP Network and fully managed by APIC cluster of Main DC

APIC and Spine Nodes remain at Main DC



ACI Main DC

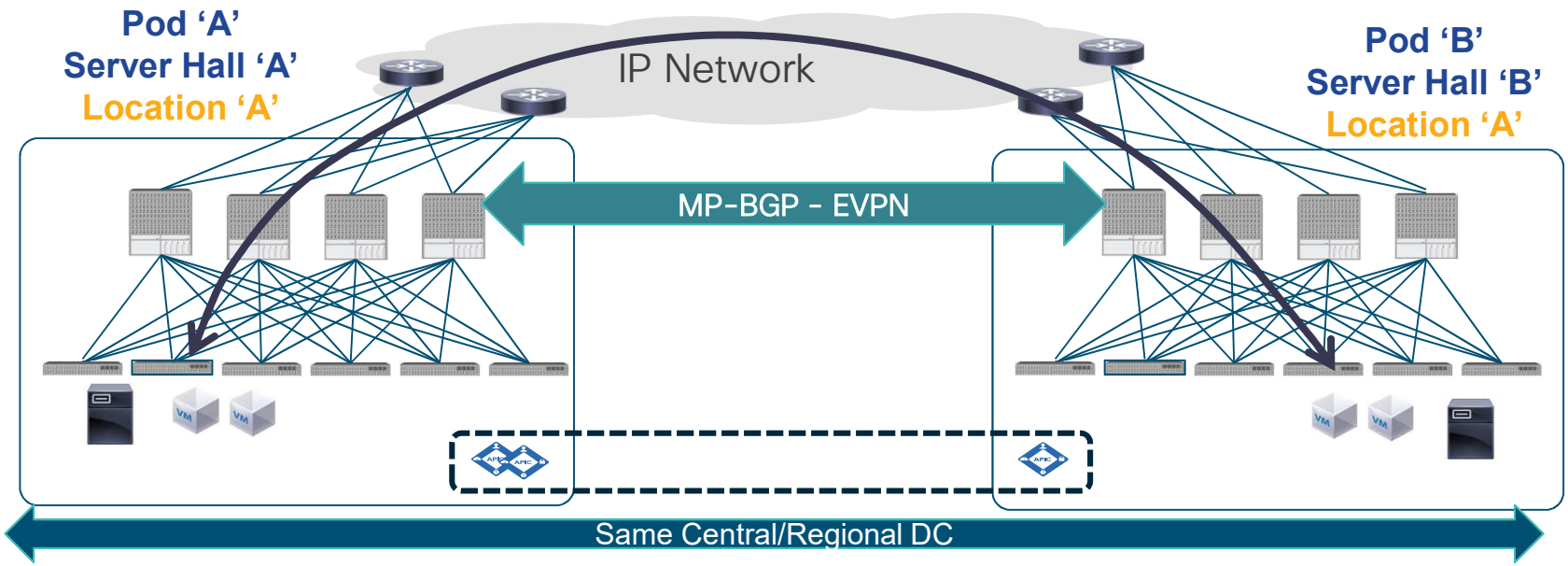
Remote Location

Local Traffic forwarding between endpoints

© 2019 Cisco and/or its affiliates. All rights reserved.

ACI Multi-Pod

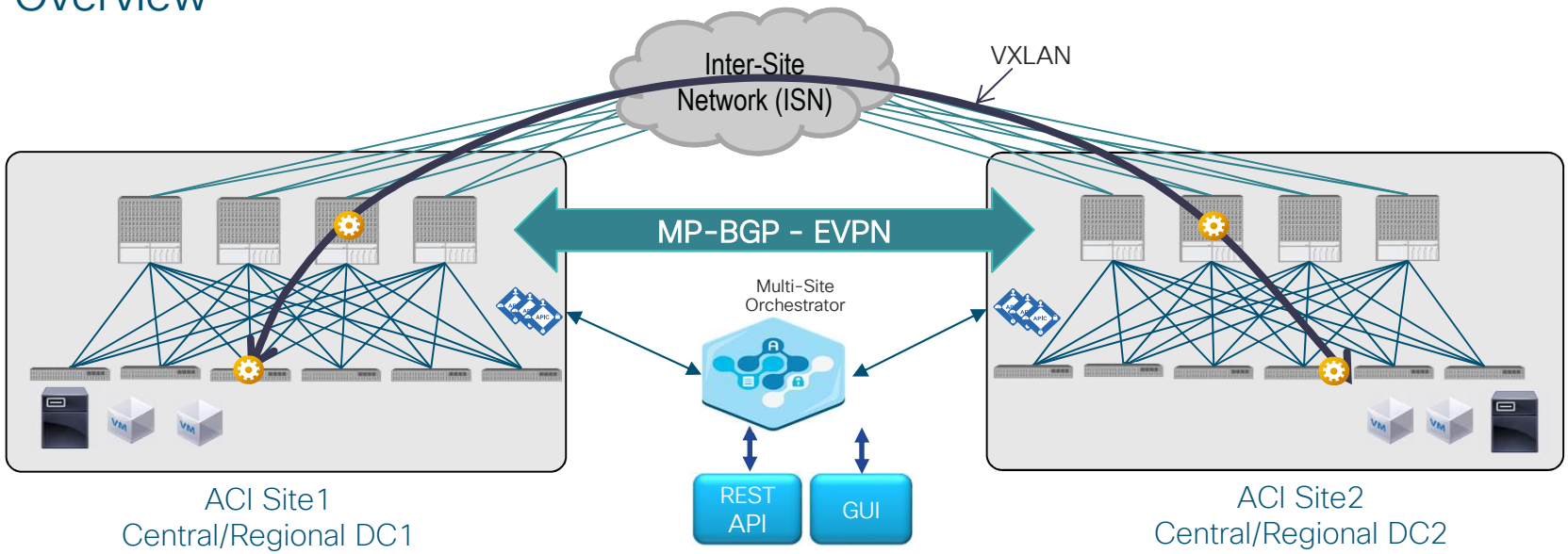
Single Telco DC Campus with multiple server halls



- ✓ Managed by a single APIC Cluster
- ✓ Single Management and Policy Domain
- ✓ End-to-end policy enforcement
- ✓ Control plane fault isolation

© 2019 Cisco and/or its affiliates. All rights reserved.

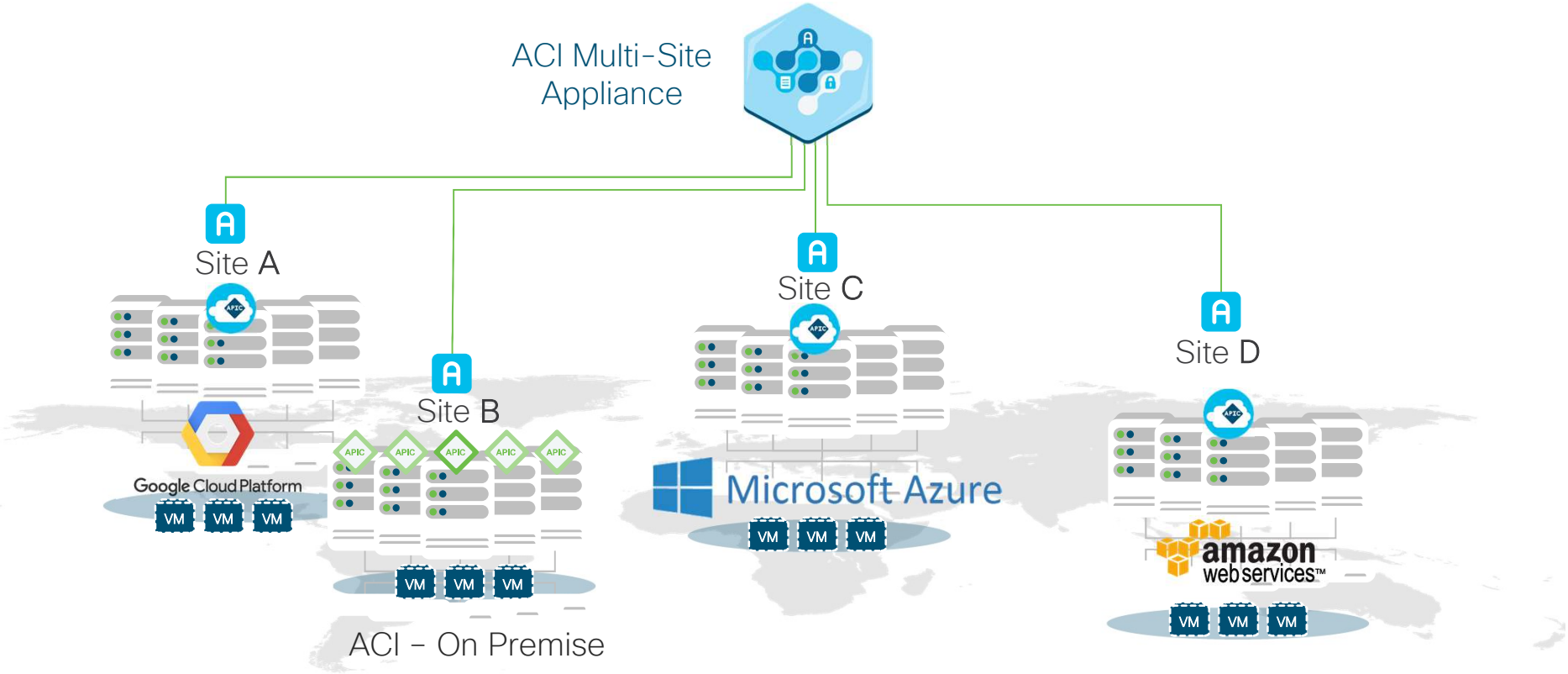
ACI Multi-Site
Overview



- ✓ Separate ACI Fabrics with independent APIC clusters
- ✓ No latency limitation between Fabrics
- ✓ End-to-end policy definition and enforcement
- ✓ MP-BGP EVPN control plane between sites
- ✓ Data Plane VXLAN encapsulation across sites

© 2019 Cisco and/or its affiliates. All rights reserved.

ACI Extensions To Multi-Cloud

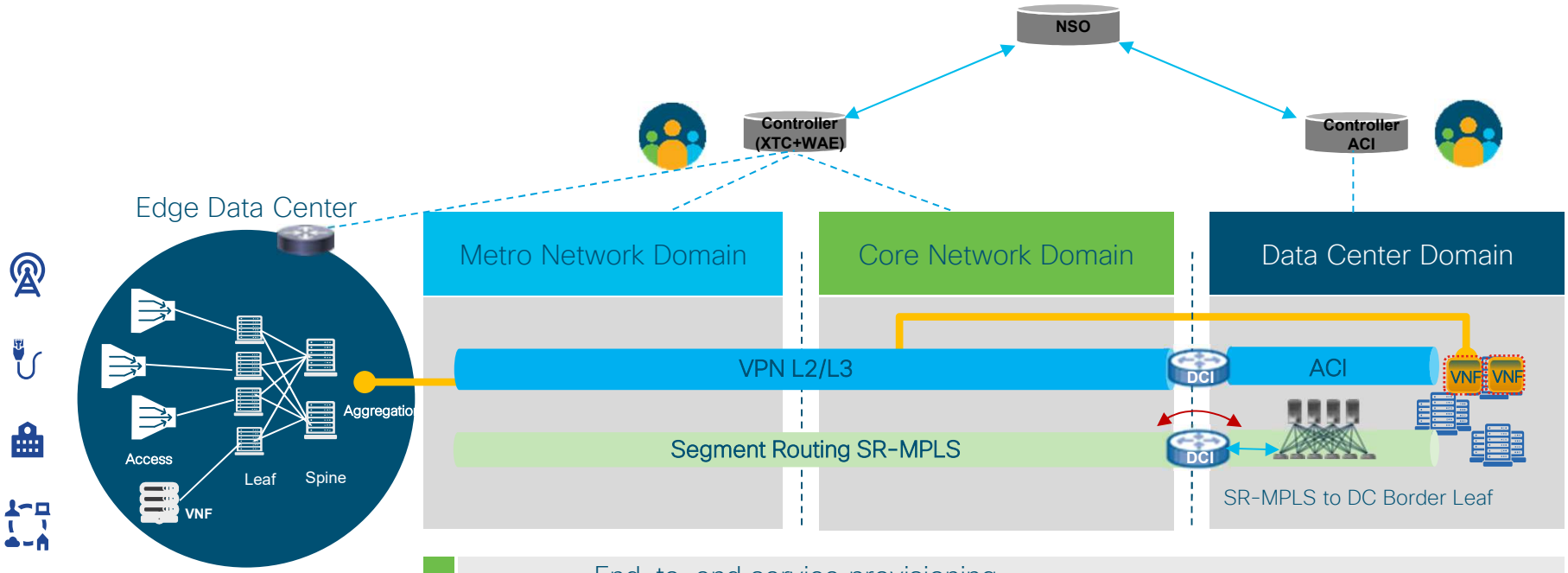


- Consistent Network and Policy across clouds
- Seamless Workload Migration
- Single Point of Orchestration
- Secure Automated Connectivity

© 2019 Cisco and/or its affiliates. All rights reserved. Cisco Public

Service aware Interworking between DC and Transport Domain

Future



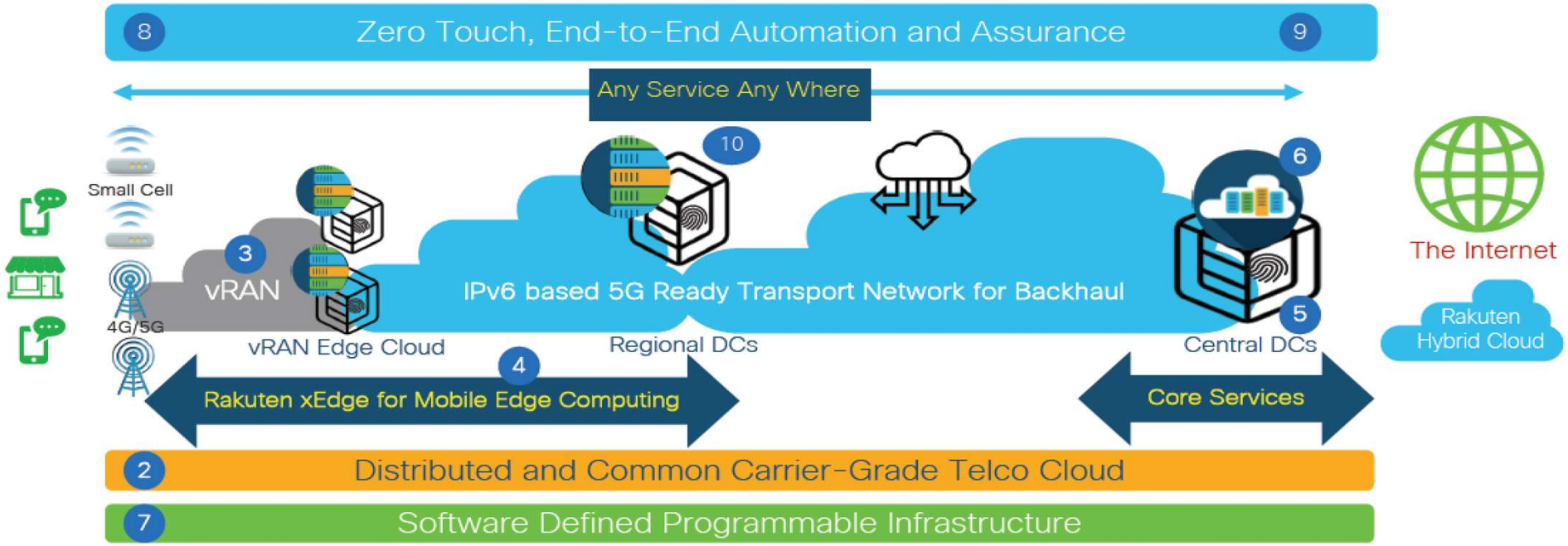
End-to-end service provisioning

- Service aware provisioning of transport and DC domain
- Using technologies like SR-MPLS and EVPN for seamless integration between Datacenter and Transport
- End to end service provisioning with NSO

© 2019 Cisco and/or its affiliates.

Better Customer Experience : End to End Differential Service

Rakuten End-to-End Architecture Foundation



https://www.cisco.com/c/dam/en/us/solutions/service-provider/mobile-internet/pdfs/reimagining-mobile-network-white-paper.pdf

© 2019 Cisco and/or its affiliates. All rights reserved.

Service chaining with ACI

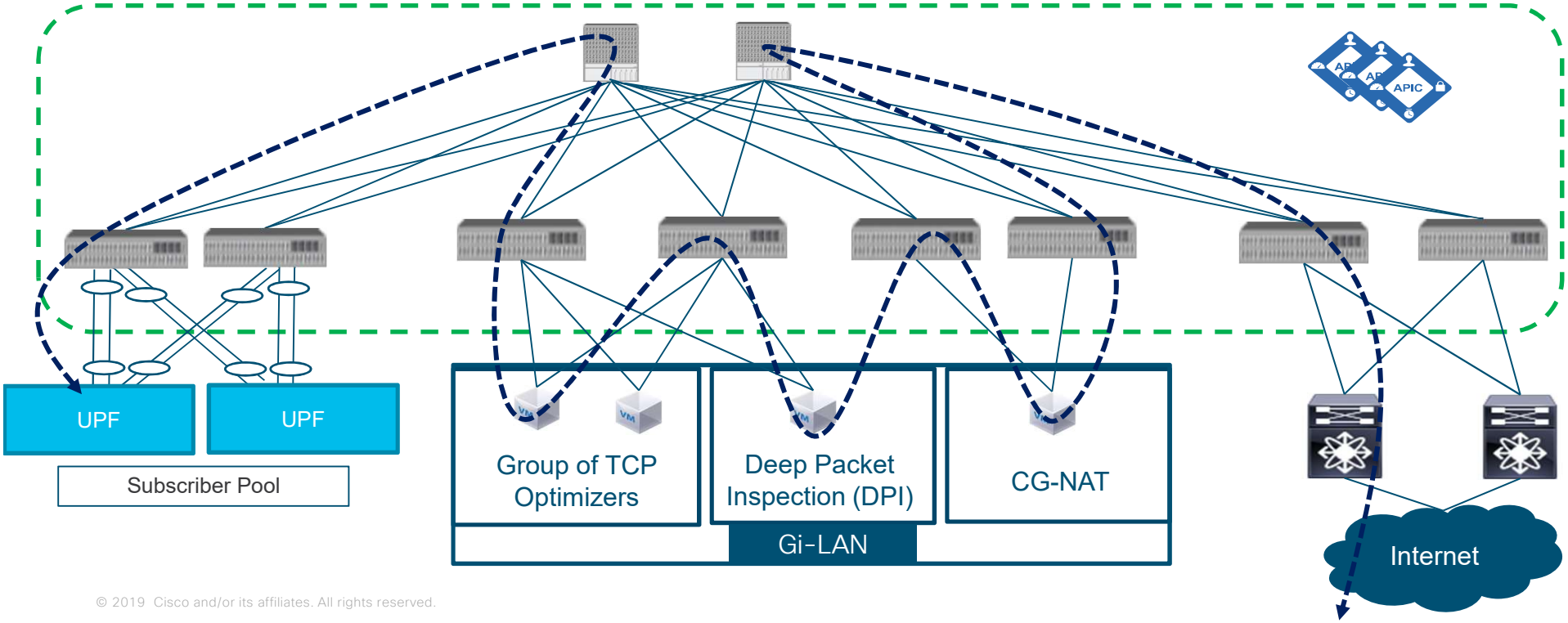
Challenges of Service chaining

Multiple devices In service chain	• Telco DC needs to support multiple type of devices such as TCP optimizers, Deep Packet inspection, CG-NAT
Complex Configuration	• Traditionally configuration is done device by device using complex routing and PBR configuration, it needs to be simplified
Load balancing	• Devices such as TCP optimizers needs fabric to provide load-balancing capabilities
Scale out configuration	• Traditional PBR based configuration is static, it needs to be dynamic and fabric should provide capability to add capacity on demand
Different type of devices in service chain	• Services devices could be L1, L2 or L3 • Services devices could be VM, containers or Bare-Metal

© 2019 Cisco and/or its affiliates. All rights reserved.

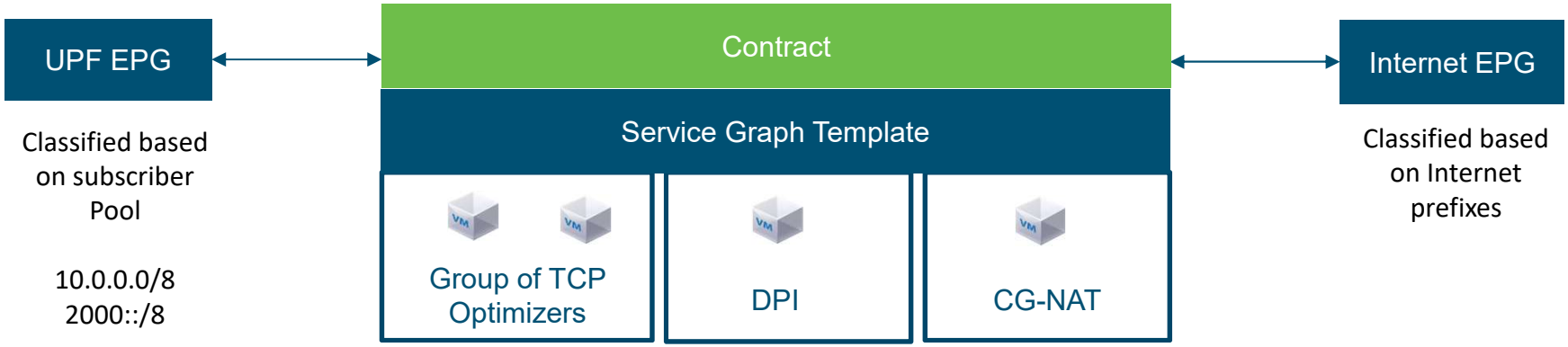
Multi-Node Service chaining in Telco DC

Service chaining for any type of workload – L1, L2, L3 or VM, bare-metal of containers



© 2019 Cisco and/or its affiliates. All rights reserved.

Logical ACI Construct for service chaining

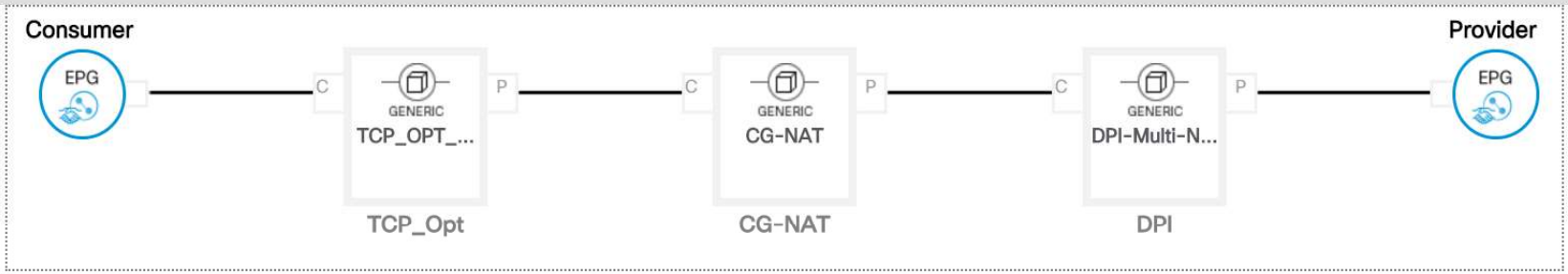


© 2019 Cisco and/or its affiliates. All rights reserved.

Simplified Configuration

L4-L7 Service Graph Template - service-chaining

Topology Policy Faults



TCP_OPT_Group Information

Route Redirect: true

CG-NAT Information

Route Redirect: true

DPI-Multi-Node Information

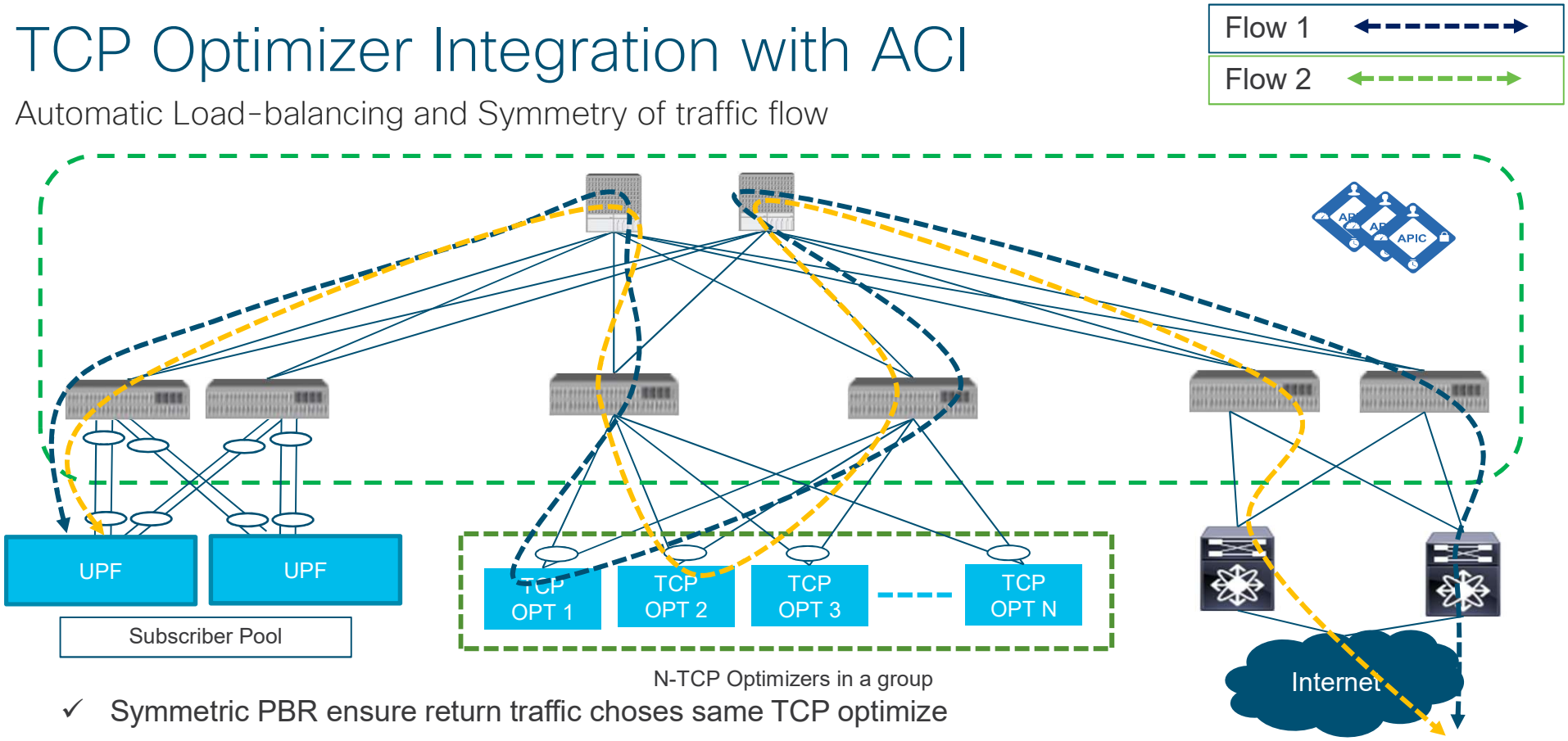
Route Redirect: true

© 2019 Cisco and/or its affiliates. All rights reserved.

Integration with TCP Optimizer

TCP Optimizer Integration with ACI

Automatic Load-balancing and Symmetry of traffic flow

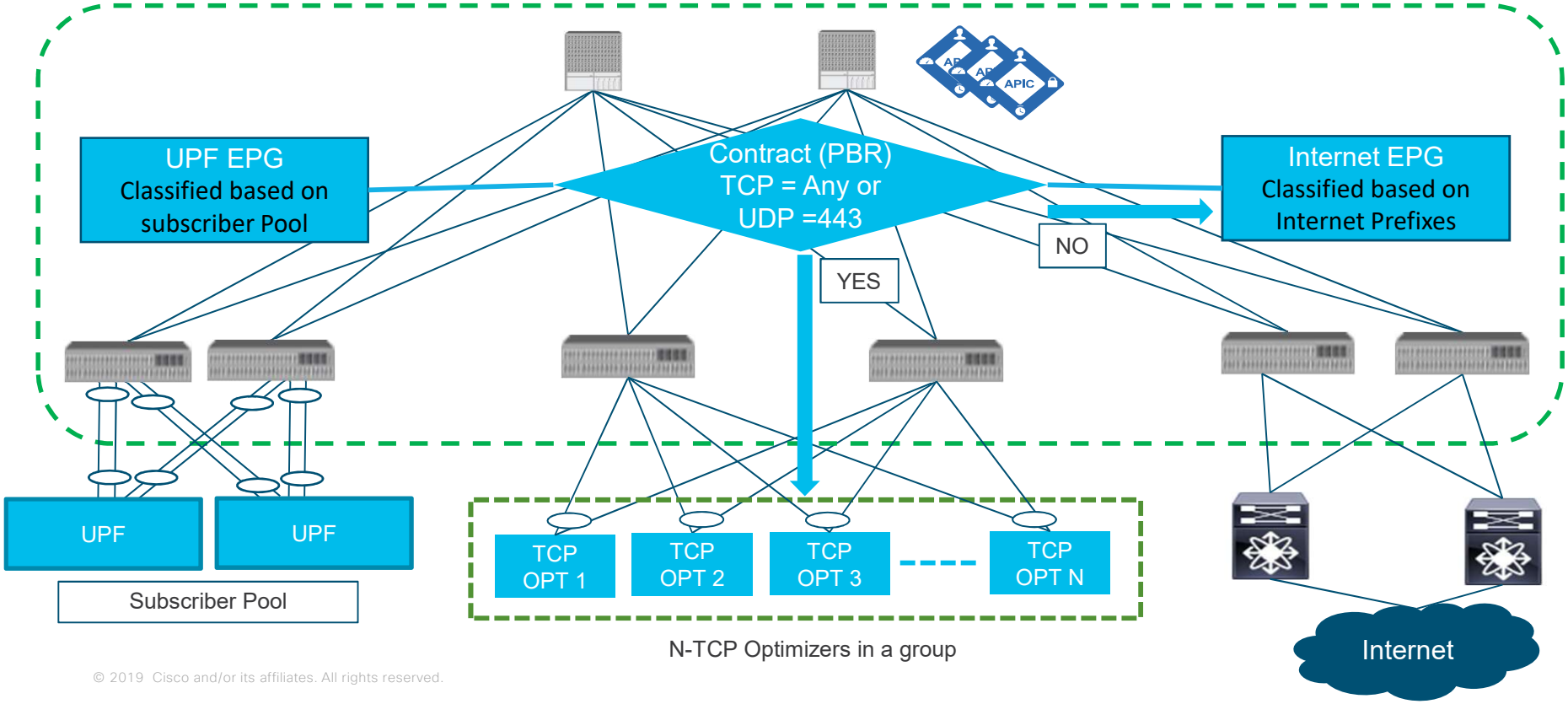


- ✓ Symmetric PBR ensure return traffic choses same TCP optimize
- ✓ Automatic load-balancing of traffic across different TCP optimizers based on forwarding table hash (Source IP, Destination IP, Source Port, Destination Port)

© 2019 Cisco and/or its affiliates. All rights reserved.

TCP Optimizer Integration with ACI

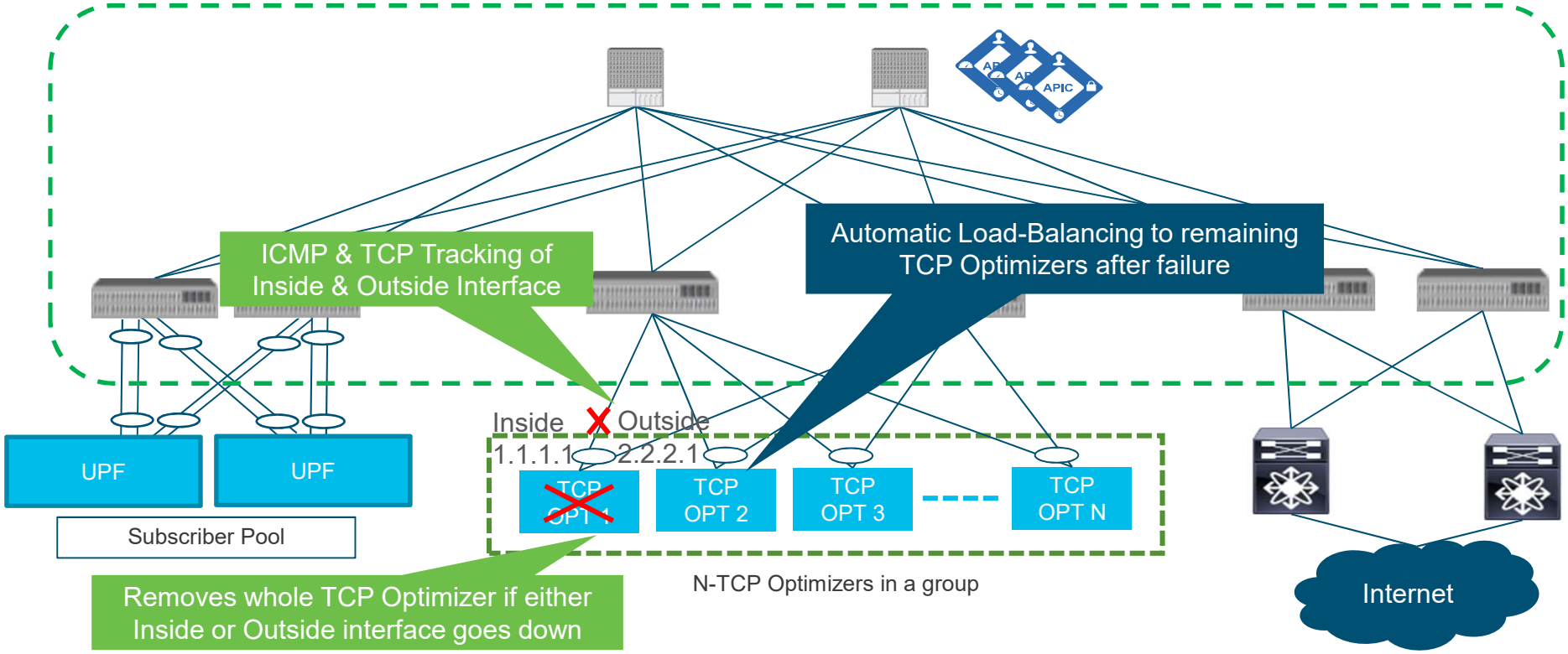
Simplified Configuration



© 2019 Cisco and/or its affiliates. All rights reserved.

TCP Optimizer Integration with ACI

Tracking TCP Optimizer Liveliness

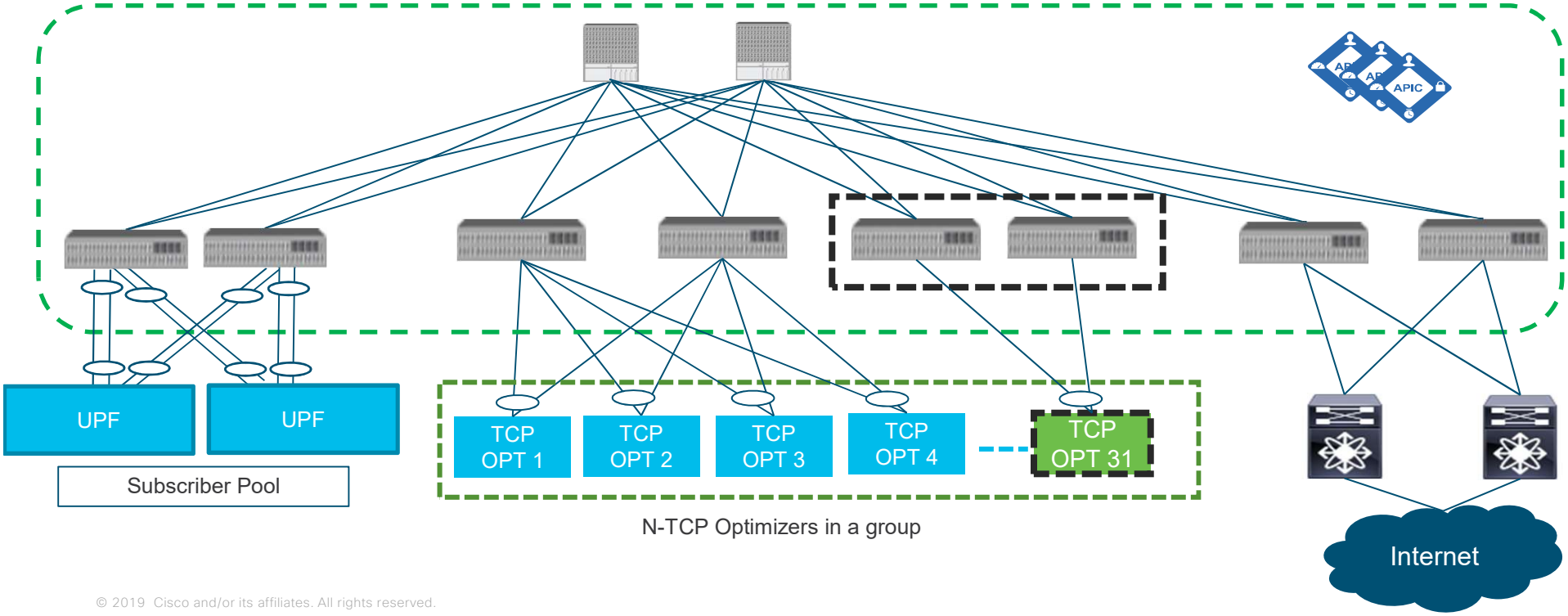


© 2019 Cisco and/or its affiliates. All rights reserved.

TCP Optimizer Integration with ACI

Simplified expansion

New TCP optimizers can be added anywhere in fabric



© 2019 Cisco and/or its affiliates. All rights reserved.

Large SP customer

Subscriber

150Mn->400Mn

Data Capacity

1.5EB -> 6.5EB per Month

Services Offered

- Unlimited voice calls
- Low data prices
- Unlimited home grown multi-media content
- Many more home grown application planned

Challenges

- Extremely aggressive timelines
- Brownfield environment

© 2019 Cisco and/or its affiliates. All rights reserved.

Large Telco DC deployment with ACI

Policy Intent at Scale

20+ ACI fabrics deployed for vEPC

2000+ ACI nodes

400Tbps data capacity trending to 1.2Pbps

Time to value

Earlier 1 DC Fabric in 3 Weeks; Now 3 DC Fabric in 1 week with ACI

40+ New Telco DC deployed in less than 3 months

Agility

High performance resilient SDN fabric for NFVi project

ACI Service Chain for their Gi-LAN services

Visibility & Control

Operations benefit from hardware telemetry and visibility

Software upgrade now completed in couple of days without impact to services

© 2019 Cisco and/or its affiliates. All rights reserved.

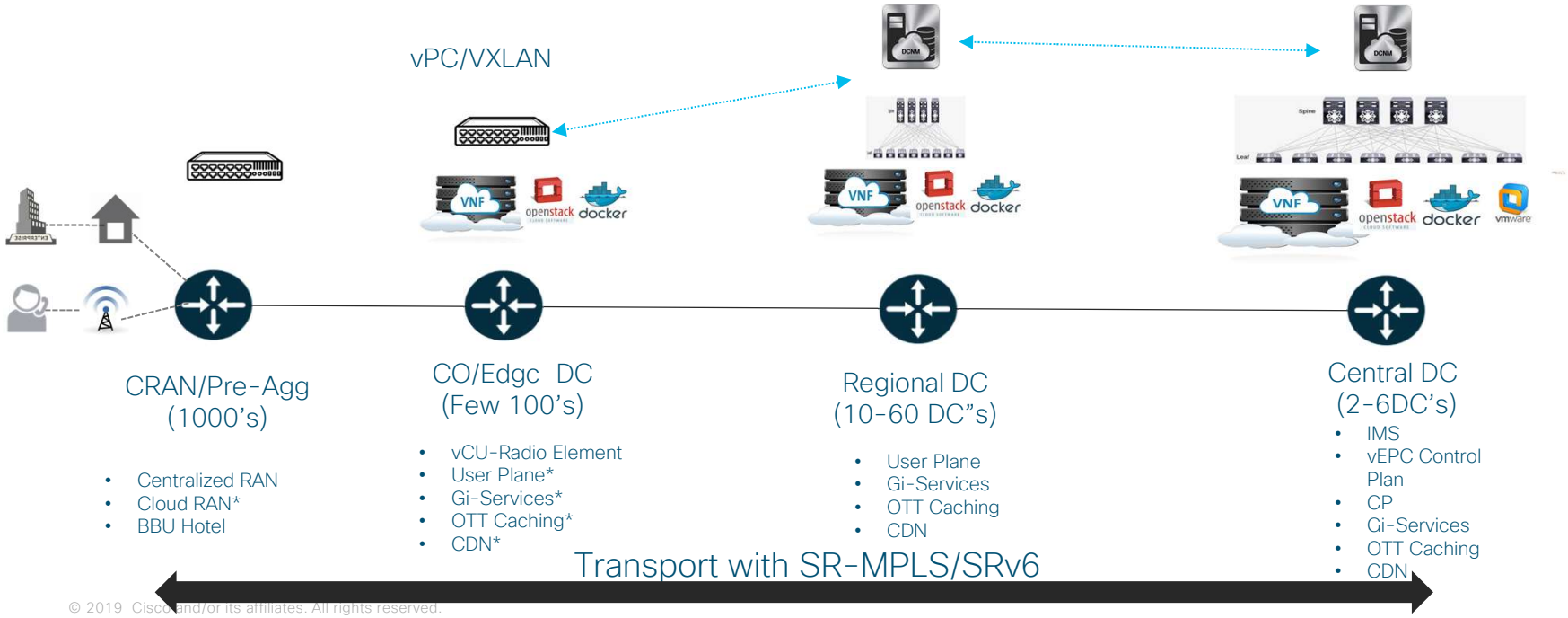
Agenda

- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
- 5G ready DC solution with Nexus 9000
- Monitoring and Compliance for Telco DC
- Network Insights for Telco DC

© 2019 Cisco and/or its affiliates. All rights reserved.

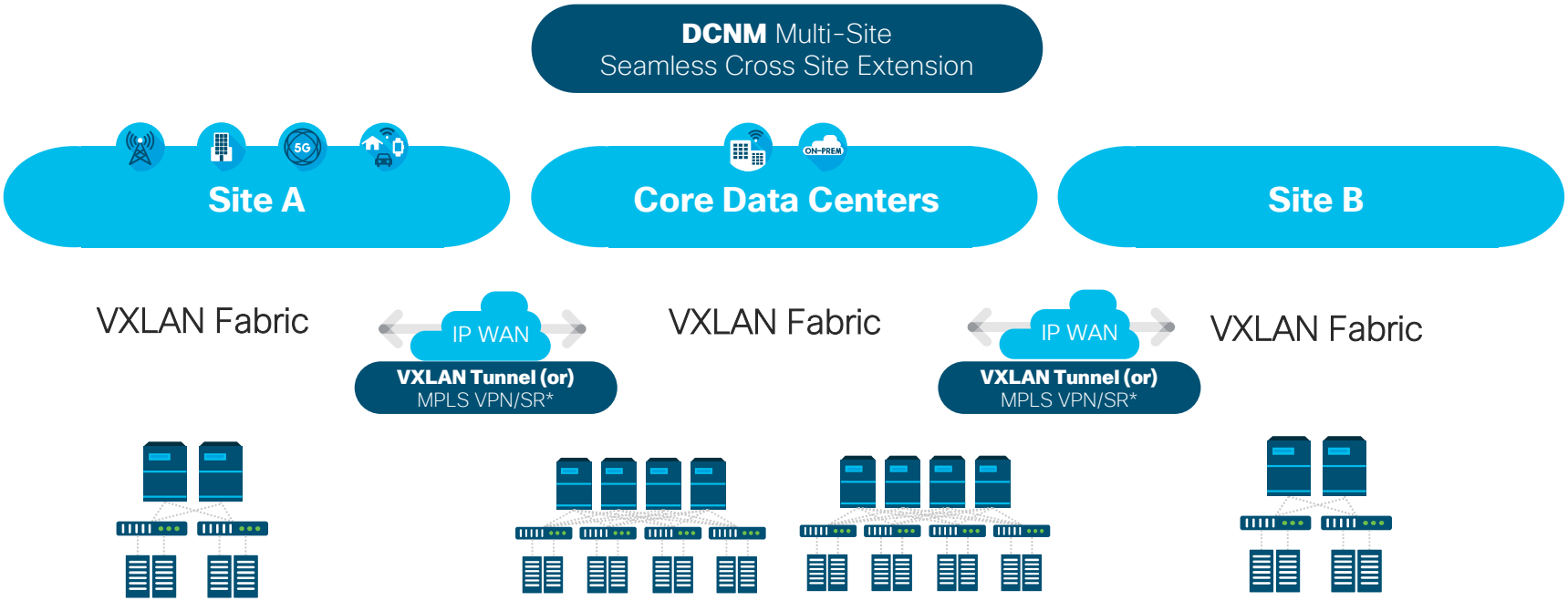
N9K NX-OS Solution for SP DC

- N9K VXLAN fabric solution
- VXLAN SR-MPLS handoff
- DCNM for automation and management



© 2019 Cisco and/or its affiliates. All rights reserved.

VXLAN Multi-Site



Fault Isolation | **Pervasive Mobility** | **Elastically Scalable**

© 2019 Cisco and/or its affiliates. All rights reserved.

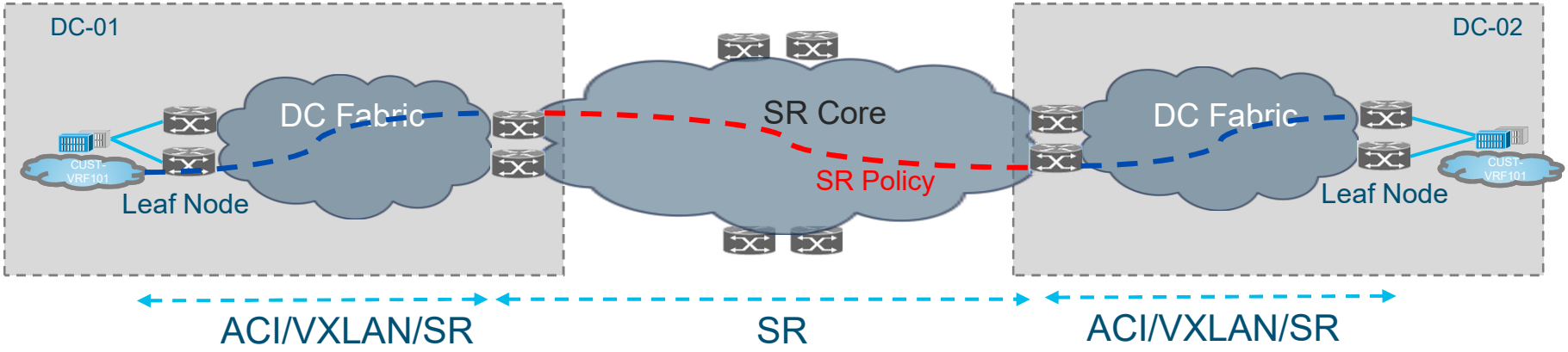
DCNM-Automation and Life Cycle Management

- DCNM zero touch provisioning
- DCNM manage remote switches
- DCNM scale
- DCNM Multi-Site Manager

© 2019 Cisco and/or its affiliates. All rights reserved.

N9K VXLAN to SR-MPLS Handoff

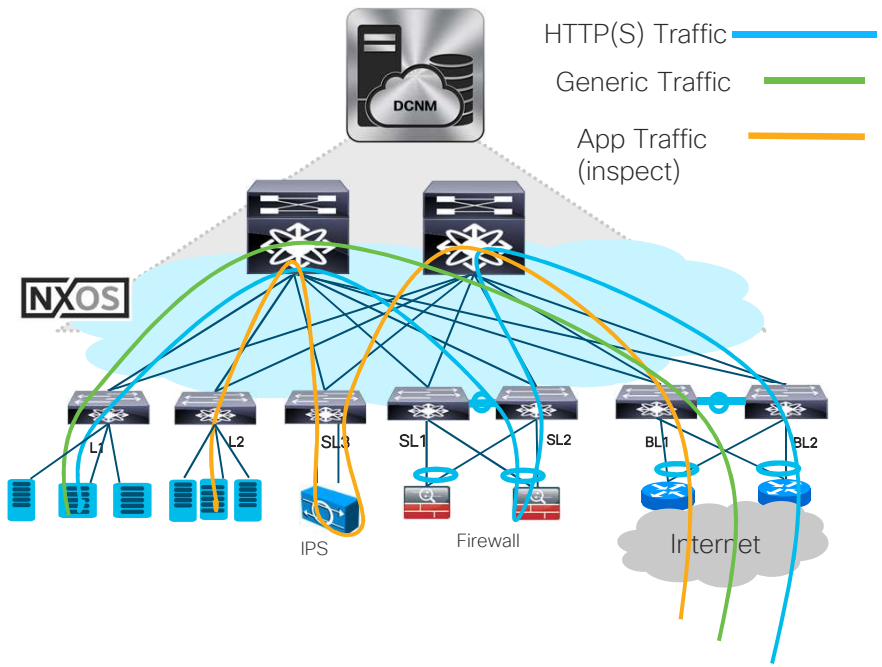
Seamless integration between DC and WAN



Simplifying Integration between Datacenter and WAN

© 2019 Cisco and/or its affiliates. All rights reserved.

N9K Elastic Service Redirection



- Granular Traffic Filtering, Redirection and Distribution
- Simplify Service Node (FW/LB/IPS, etc.) insertion/deletion
- Automatic handling of service node-failures
- Service automation, traffic flow statistics and health monitoring

Cost Savings

Cisco and/or its affiliates. All rights reserved.

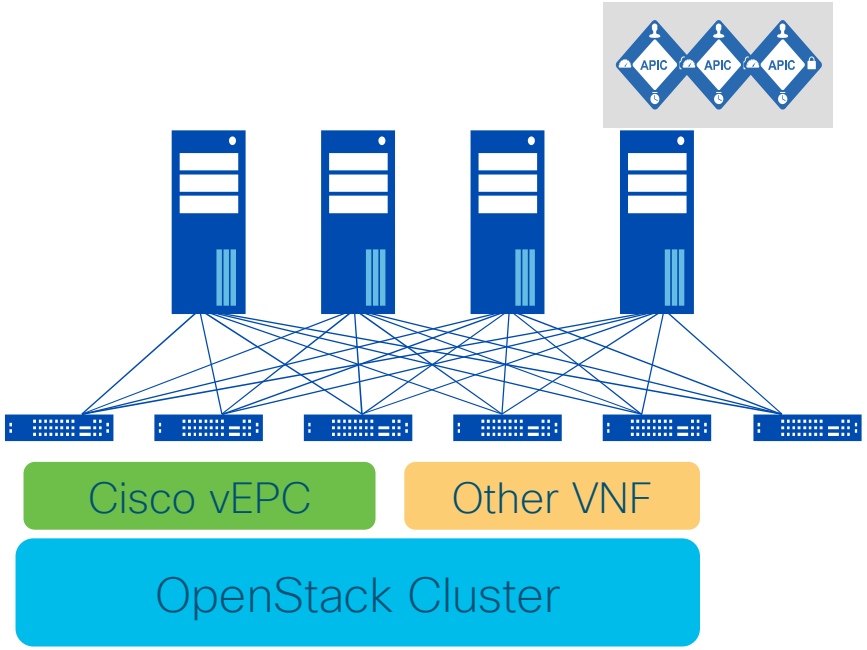
Simplify Operations

Scalability

KT 5G telco DC Powered by ACI

- Nexus 9000 running in ACI mode power KT 5G telco cloud
- Nexus 9000 running in NX-OS as core switch connects telco cloud to other parts of DC and WAN
- Cisco mobile packet core with CUPS
- Cisco core routing with SR-MPLS
- Press release

  https://newsroom.cisco.com/press-release-content?type=webcontent&articleId=1969039



© 2019 Cisco and/or its affiliates. All rights reserved.

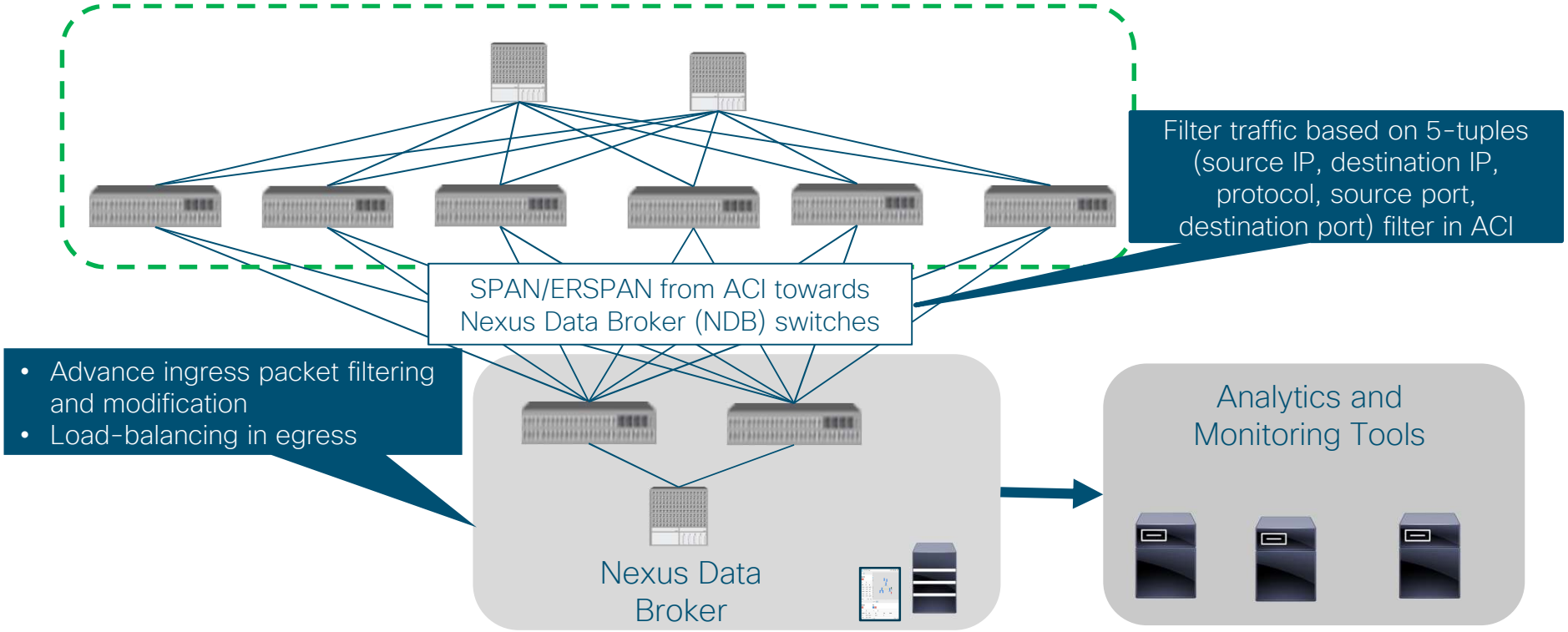
Agenda

- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
  - Automation
  - Distributed DC
  - Service chaining
- 5G ready DC solution with Nexus 9000
- Monitoring and Compliance for Telco DC
- Network Insights for Telco DC

© 2019 Cisco and/or its affiliates. All rights reserved.

TAP/SPAN for monitoring/compliance

Solution for both ACI and Standalone



© 2019 Cisco and/or its affiliates. All rights reserved.

Agenda

- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
  - Automation
  - Distributed DC
  - Service chaining
- 5G ready DC solution with Nexus 9000
- Monitoring and Compliance for Telco DC
- Network Insights for Telco DC

© 2019 Cisco and/or its affiliates. All rights reserved.

Network Insights Applications

Apps

Network Insights Resources

Network Insights Advisor

Platform

DCNM

App Hosting Framework
App Store

APIC

App Hosting Framework
App Store

Data collection and ingestion

Data correlation and analysis

Data visualization and action

Visibility
Learn from your network and recognize anomalies

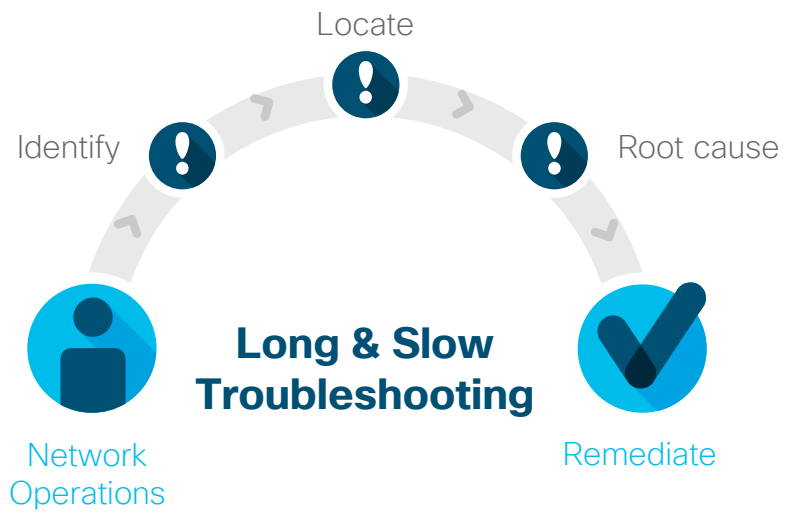
Insights
See problems before your end users do

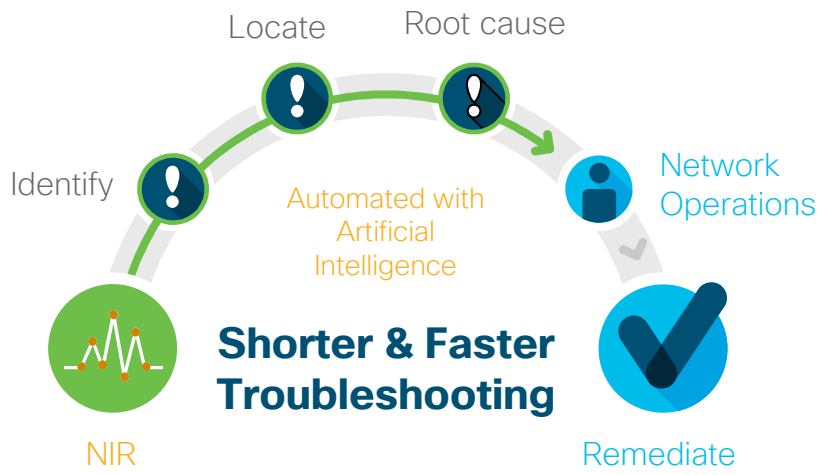
Proactive Troubleshooting
Find root cause faster with granular details

© 2019 Cisco and/or its affiliates. All rights reserved.

Network Insights Resource App

Shorten Time to Remediation for Troubleshooting



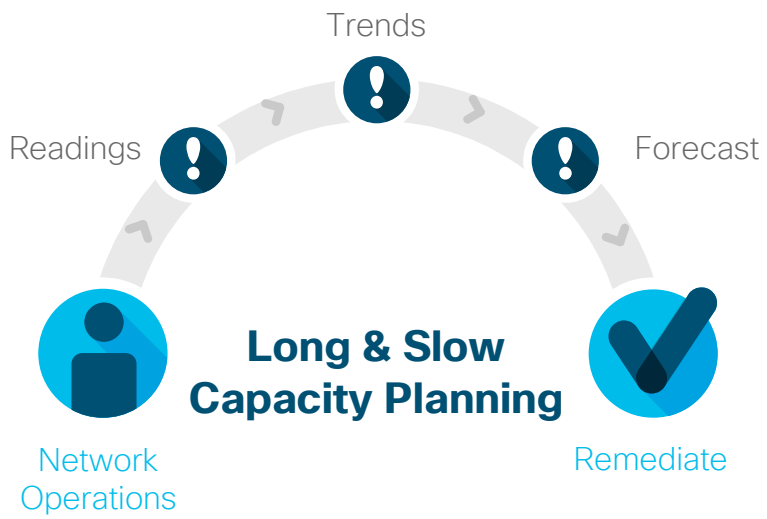


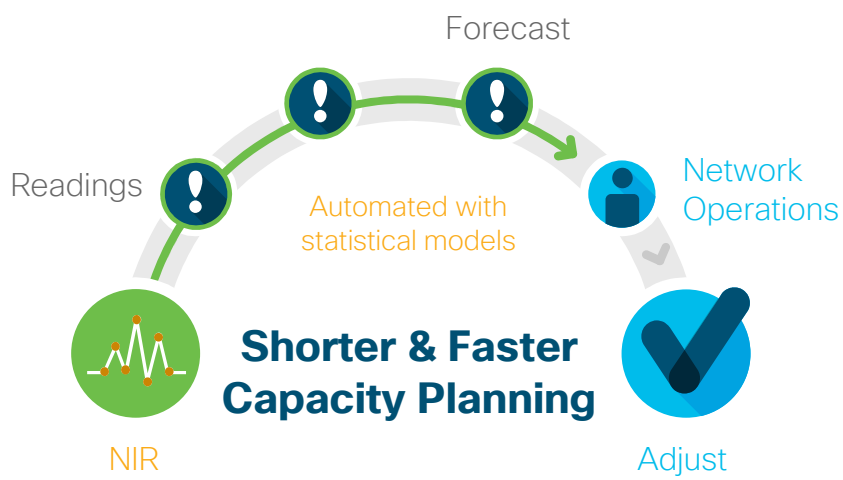
Network Insights: **Resource Analysis**

Packet drops | Latency | Reachability | Routing | Micro Bursts

Network Insights Resource App

Increase Speed and Agility for Capacity Planning

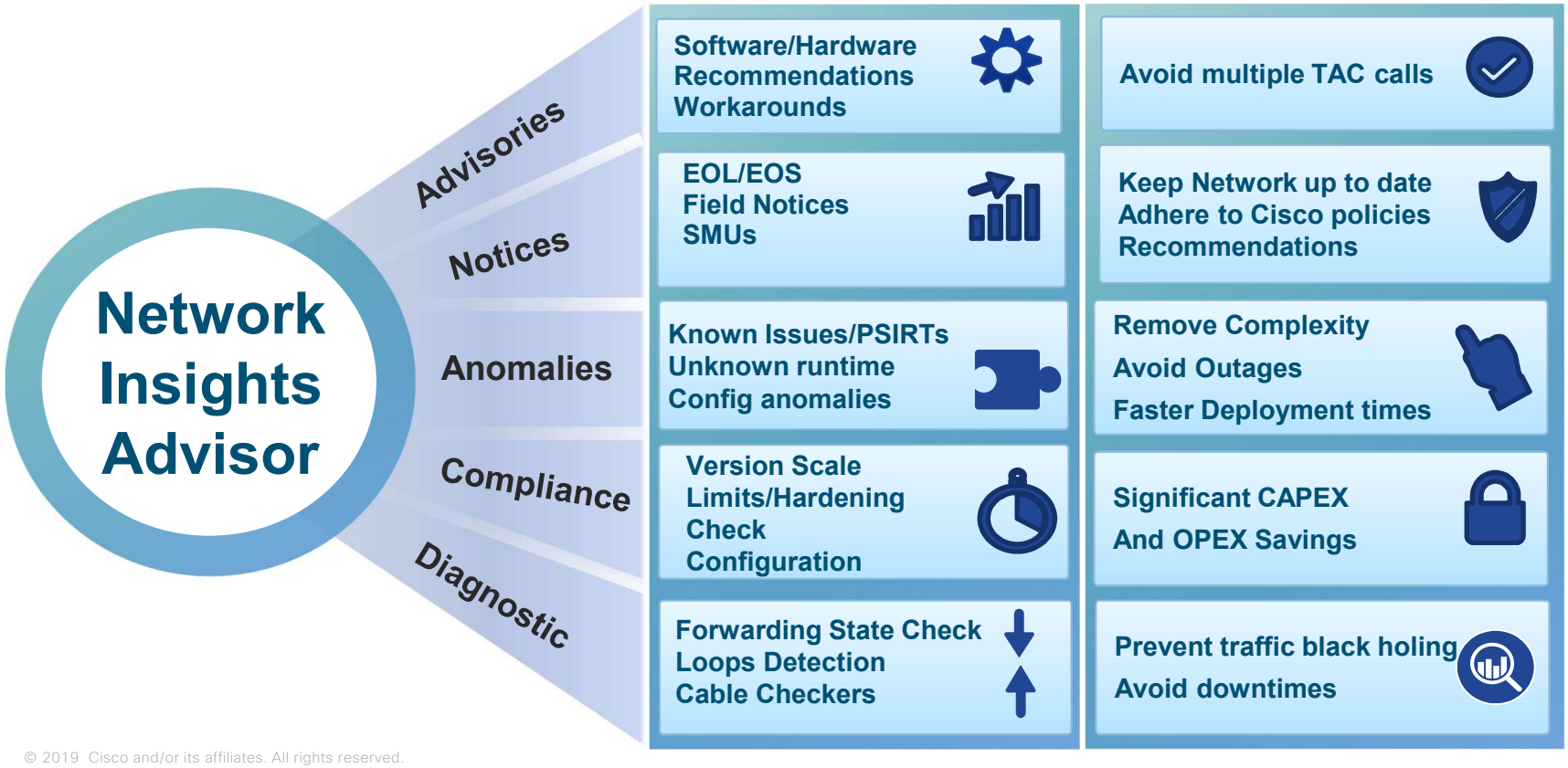




Network Insights: **Resource Analysis**

Bandwidth | Ports | TCAM | Scale limits

Network Insights-Advisor



© 2019 Cisco and/or its affiliates. All rights reserved.

Conclusion

Conclusion

- 5G deployments will create multiple highly distributed DC's
- Automation, Lifecycle Management, and Analytics will be key aspects
- ACI and DCNM with N9K provides solution to these challenges

© 2019 Cisco and/or its affiliates. All rights reserved.

CISCO