



Possibilities

#CiscoLive

Design 5G Ready Distributed Telco DC with Cisco ACI

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DGTL-BRKSPM-2009

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Session Objectives



At the end of the session, the participants should be able to:

- Understand key requirements for data center fabric in 5G context.
- An approach using ACI how can we address these requirements.

Initial assumption:

- The audience already has knowledge of ACI concepts (Tenant, VRF, BD, EPG, L3Out, etc.)

Out of Scope:

- This session is not about 5G Packet Core and 5G NR.

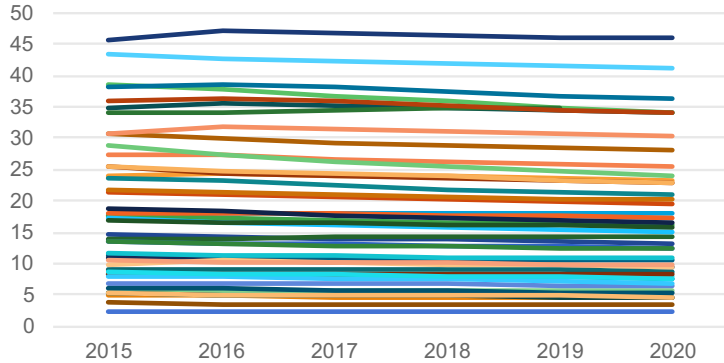


Agenda

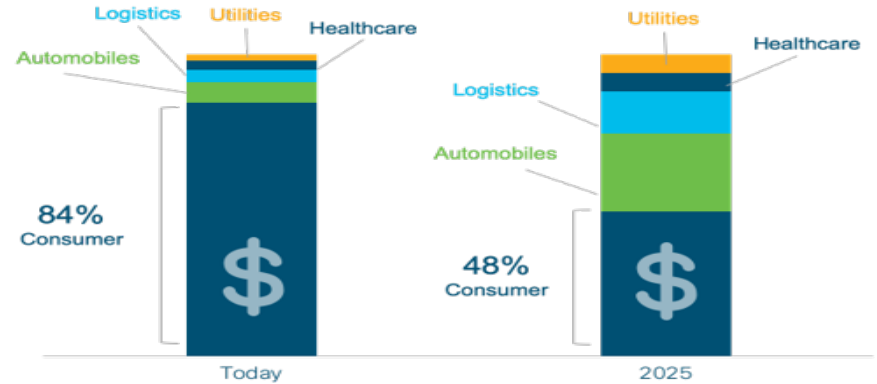
- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
 - Distributed DC with SR/MPLS handoff
 - Automation
 - EPC deployment
 - Service chaining
 - Security & Compliance
 - Operations
- Customer examples
- Conclusion

Customer Experience is Taking Centre Stage

Mobile ARPU, Multiple Countries

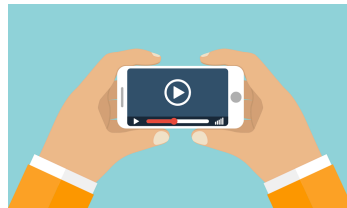


Consumer ARPUs are Declining or Flat

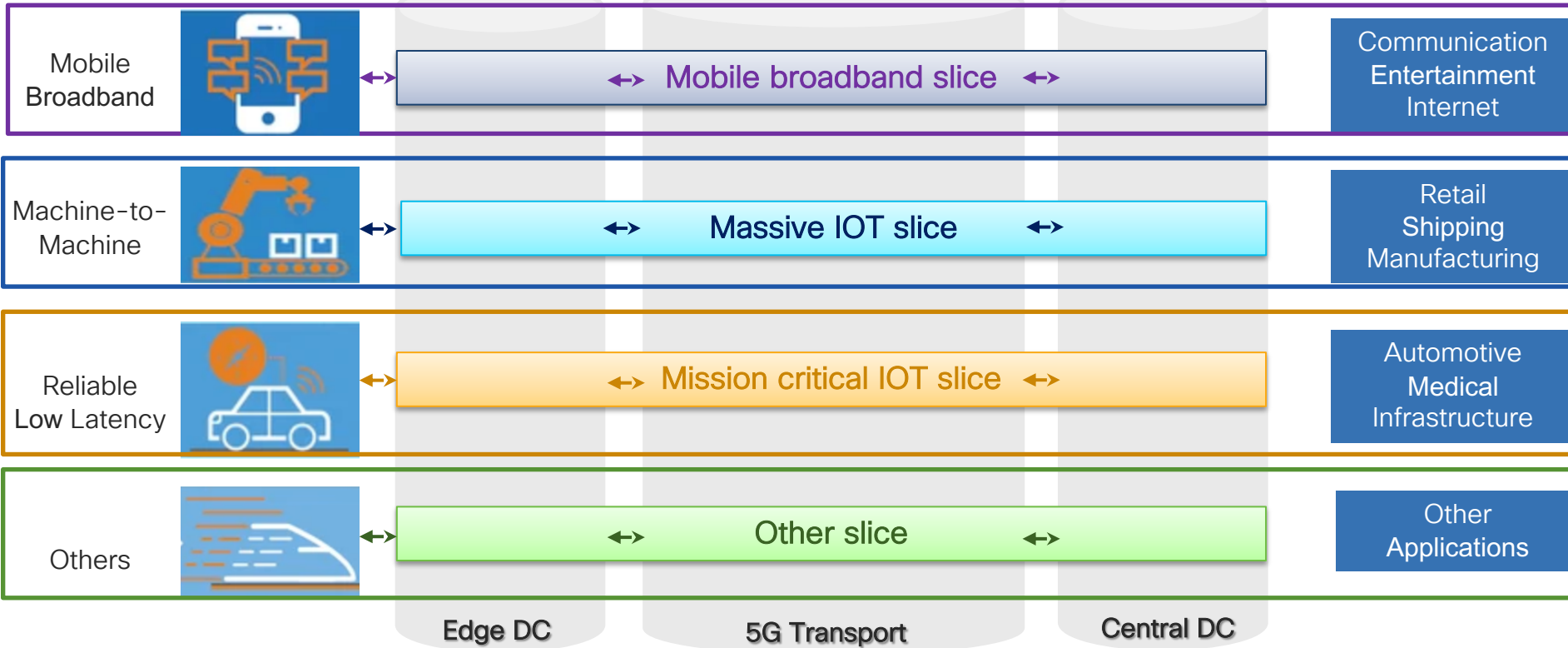


B2B or B2B2x Market Has Future Growth

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



Service Monetization

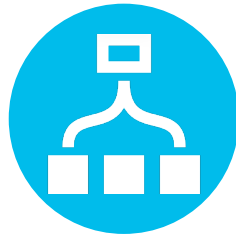


Service Edge Transformation

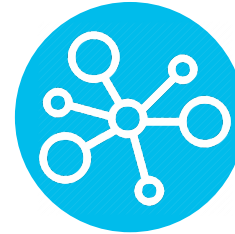
The Service delivery architecture is evolving as the Service Edge functions are undergoing the following transformations:



Virtualization



Decomposition

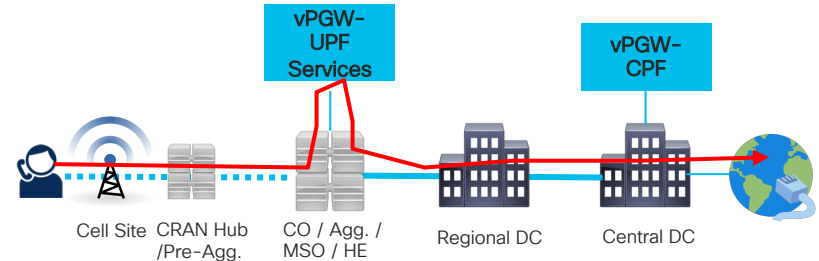


Placement

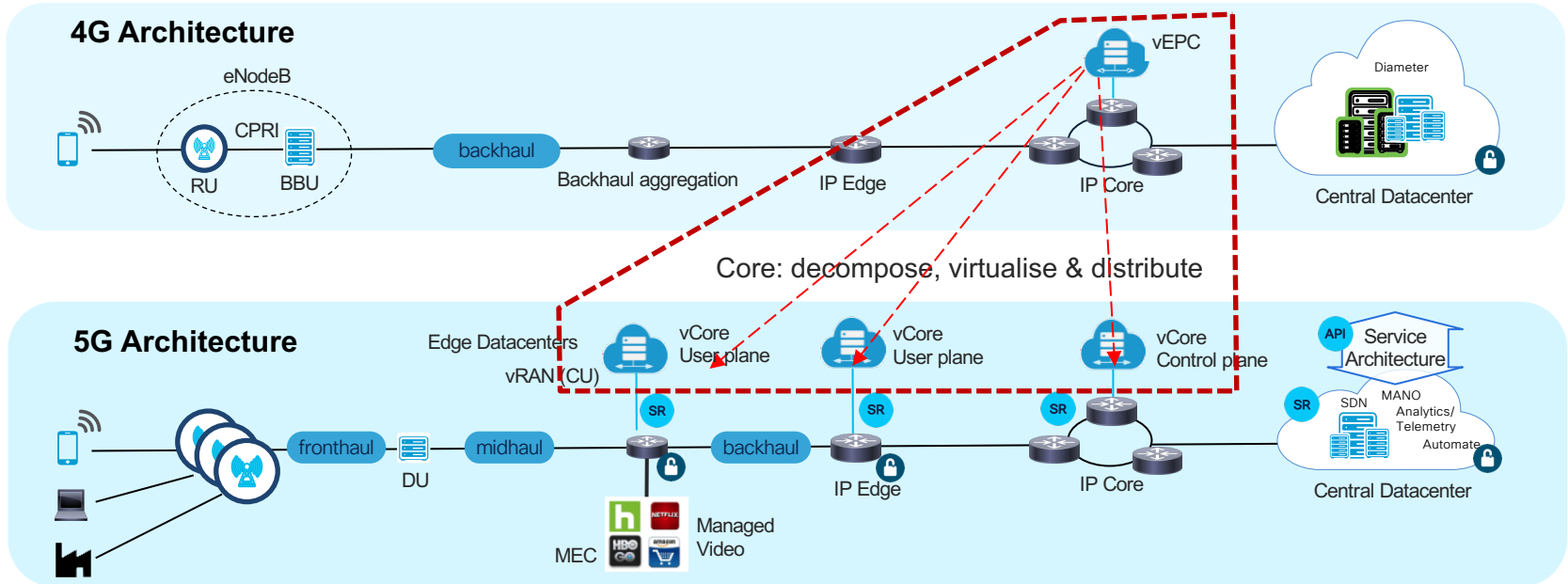
Centralized, Appliance Based Mobile Gateway



Distributed, Virtualized, Decomposed Mobile Gateway



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

Impact of 5G on Telco Datacenter Fabric

Distributed DC

- 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.

ACI Architecture For Distributed Telco Cloud

Distributed Edge DC Fabric

Scale to MEC sites with Remote leaf

SDN Fabric Management

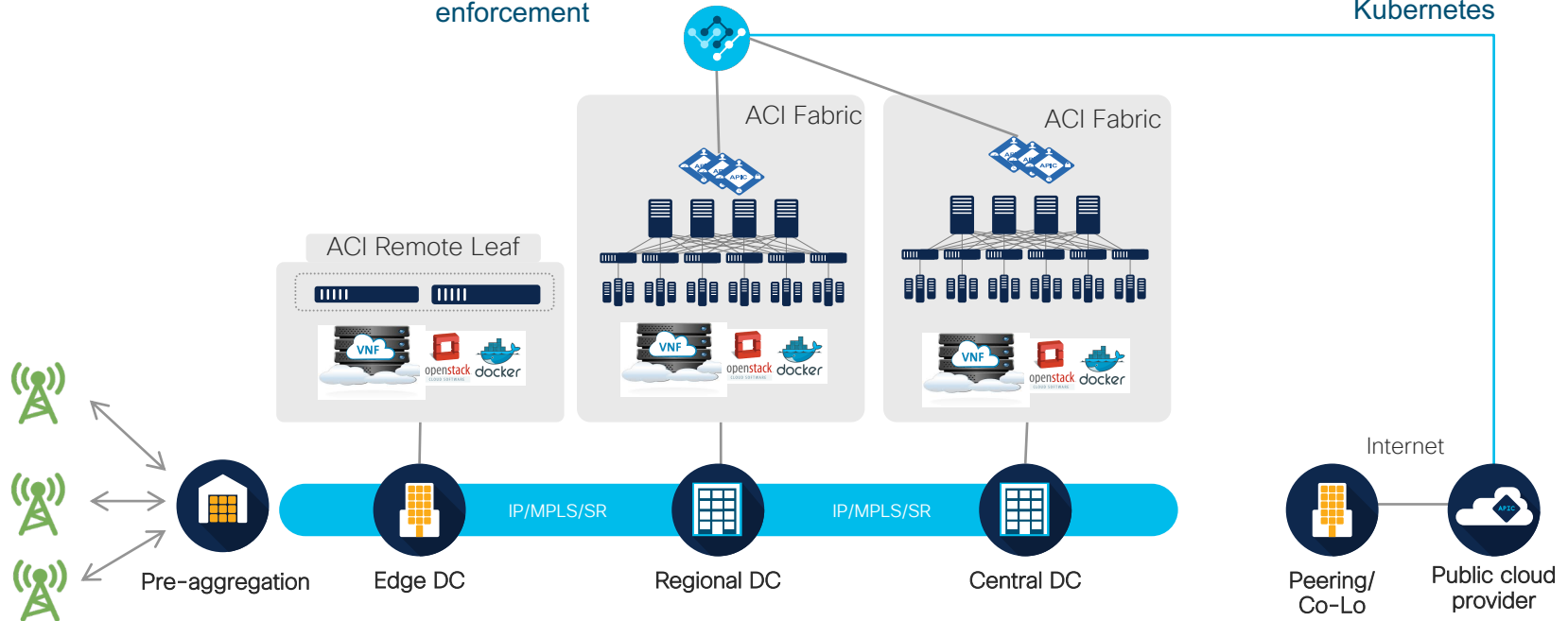
Fabric Automation with Network & Security Policy enforcement

Analytics and Assurance

Visibility, Performance and Network Service Assurance

Cloud Management

Workload Management across clouds with Openstack, Kubernetes

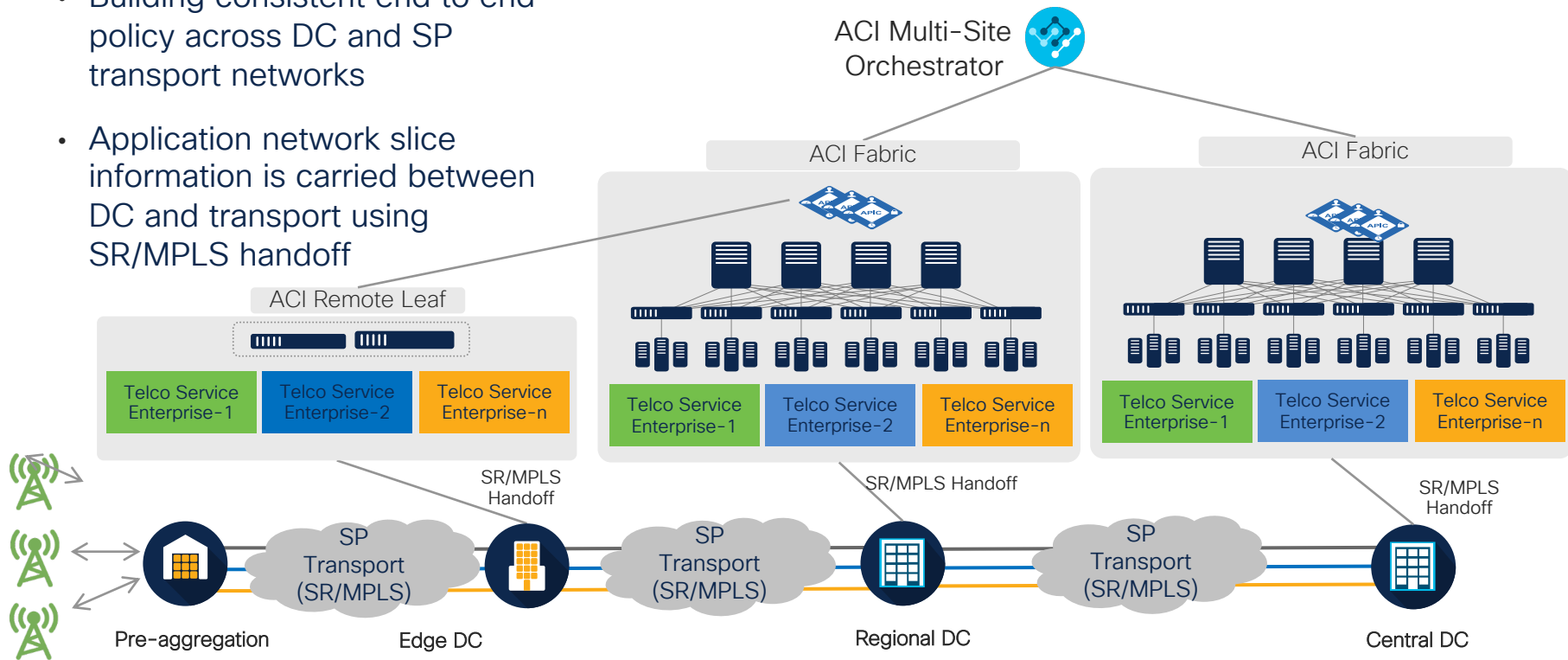


Agenda

- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
 - Distributed DC with SR/MPLS handoff
 - Automation
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ACI Distributed DC with SR/MPLS handoff

- Building consistent end to end policy across DC and SP transport networks
- Application network slice information is carried between DC and transport using SR/MPLS handoff



Hardware and Software support



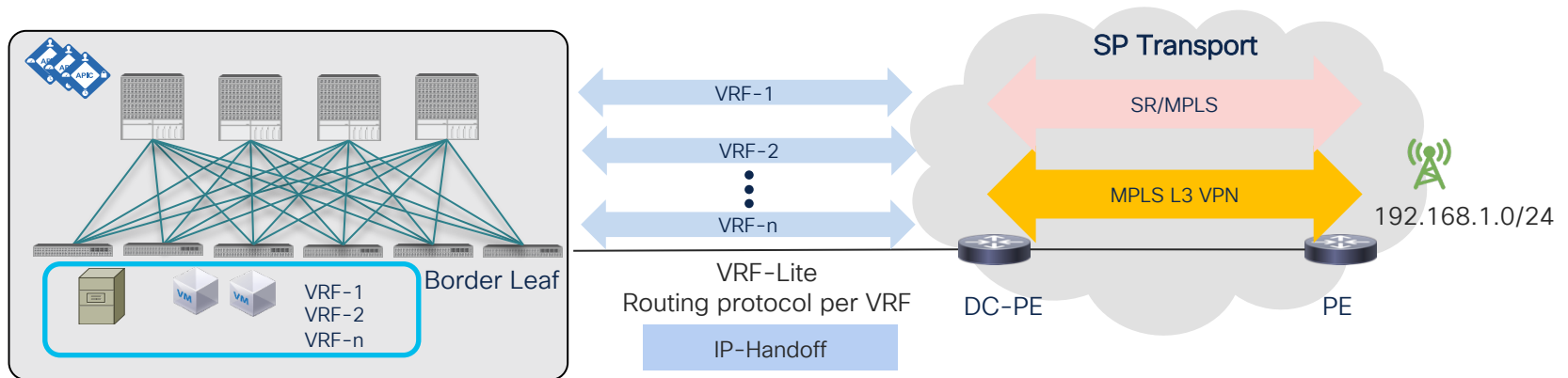
- Leaf models: FX, FX2, GX
- Spine models: EX LC, FX LC, 9332, 9364 and GX
- **Validated** DC Edge Router: NCS5500, NCS540/560 or ASR9K
- **Validated** Software release: XR 7.0.1, 7.0.2, 7.1.1



ACI SR/MPLS handoff Use-Cases

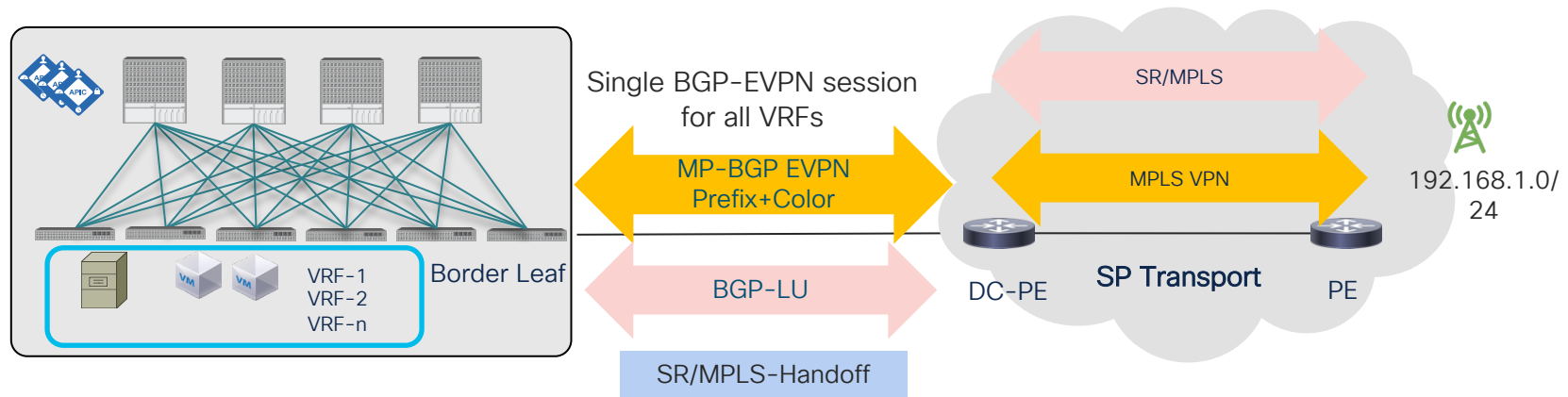
ACI to DC-PE handoff without SR/MPLS handoff

- ACI Border Leaf (BL) to DC-PE connectivity using VRF-Lite
- Interface and routing protocol session per VRF between BL and DC-PE
- **Automation of configuration and scalability are key challenges in this solution**



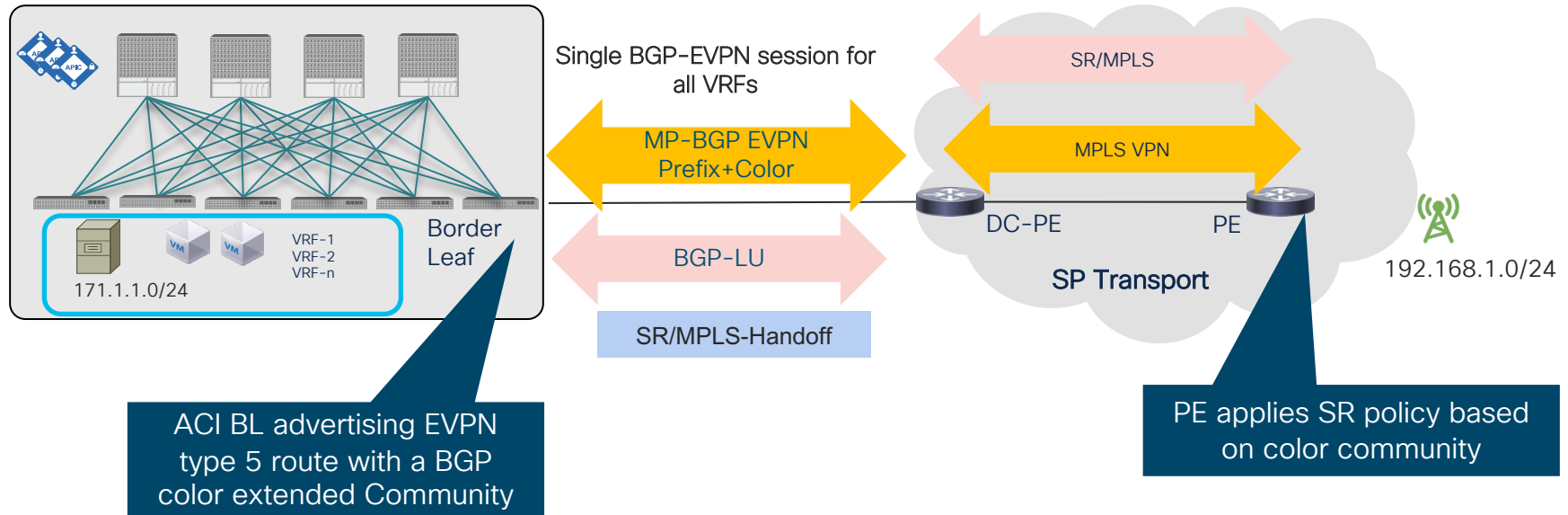
ACI handoff to DC-PE using SR/MPLS handoff

- Single control plane and data plane session instead of per VRF control plane and data plane session
- Addresses automation and scalability challenges of VRF-lite solution.



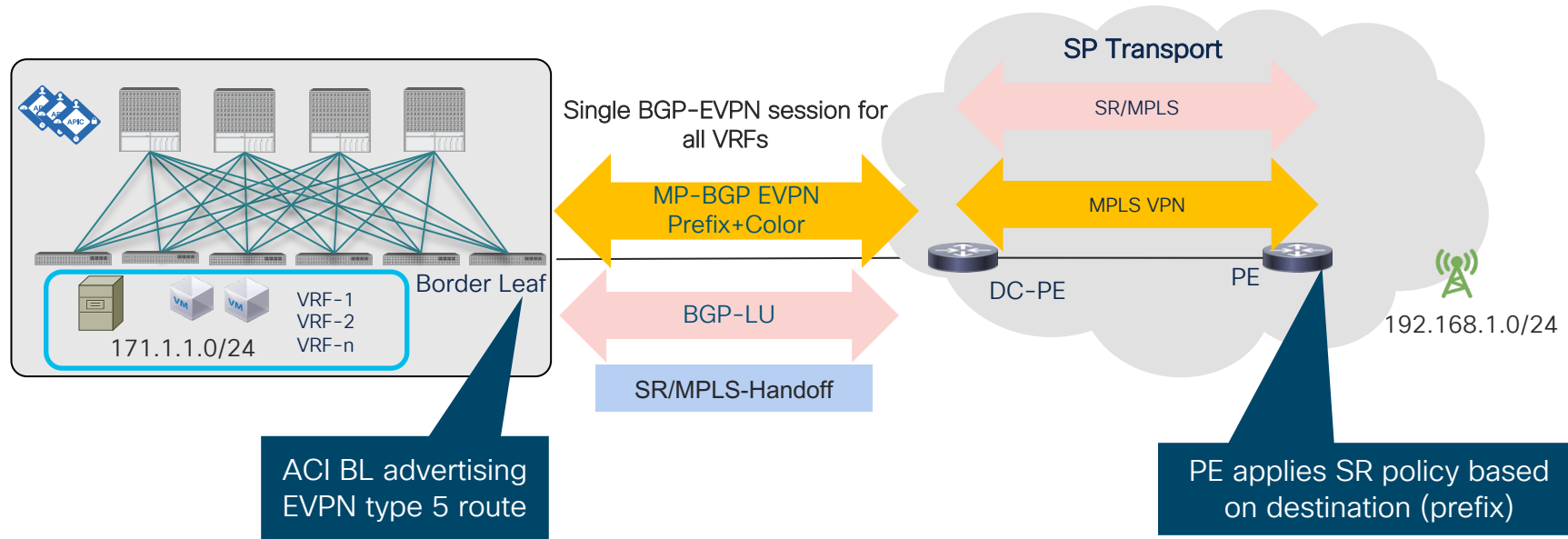
SR policy in transport using color community

- Advertise color community for a prefix from ACI BL, and use it on PE to define a SR policy in transport



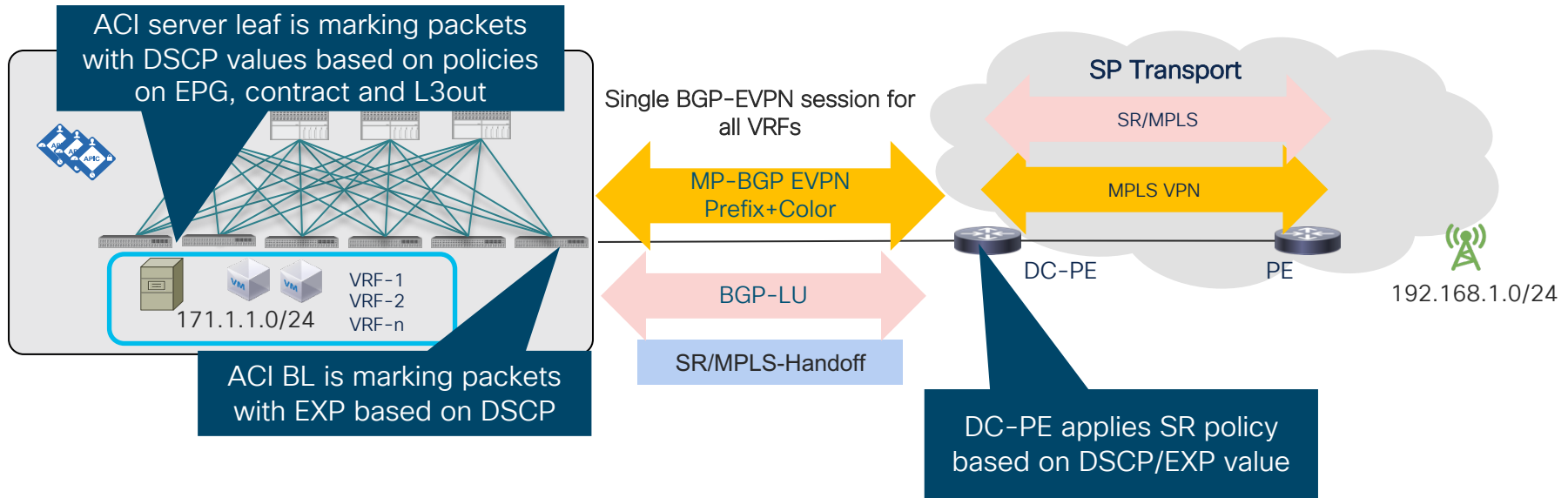
SR Policy in transport using destination prefix

- Advertise EVPN type 5 prefix from ACI BL, and map it on PE to define a SR path in transport
- Recommendation to use color community to reduce configuration on PE. Destination prefix based SR policy can be used when color community is not supported.



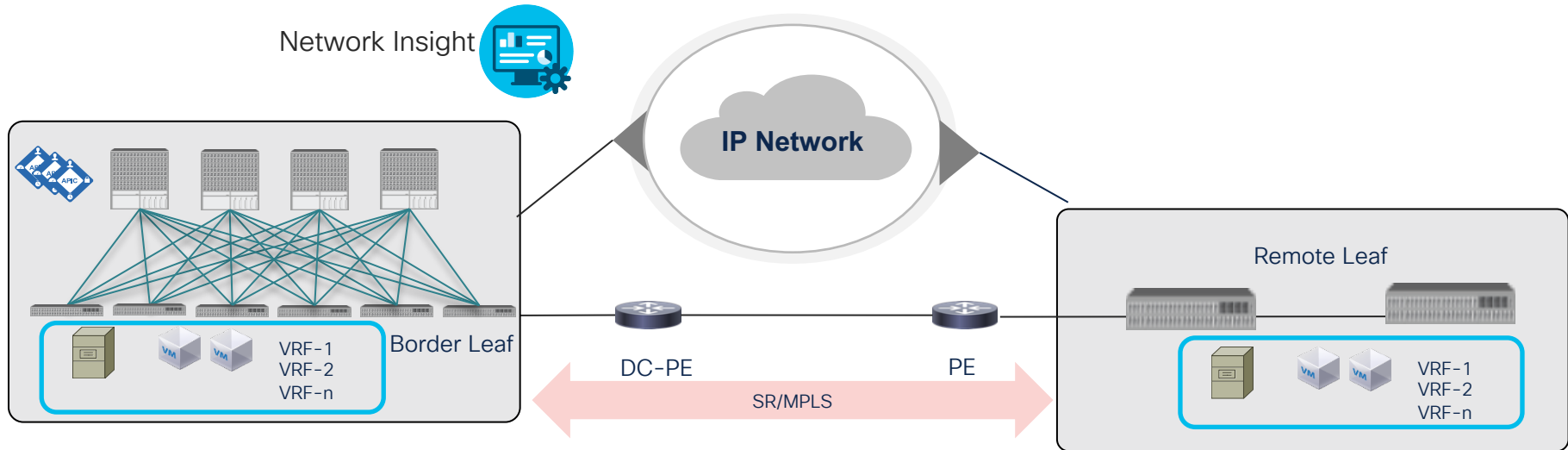
Per-Flow automated Steering in transport


- ACI BL can mark packets going to transport network with DSCP/EXP values
- DC-PE to define SR policy in transport based on DSCP/EXP values from ACI BL



Monitoring with SR/MPLS handoff

- ACI to SR/MPLS handoff allows the transport team to monitor the DCs to DC flows using existing monitoring tools since these tools can monitor native IP/SR/MPLS packets, but not VXLAN packets
- SR/MPLS Packet stats, VRF stats to be available in APIC
- Network insights (NIR) for troubleshooting, stats history, and monitor flows (Roadmap)

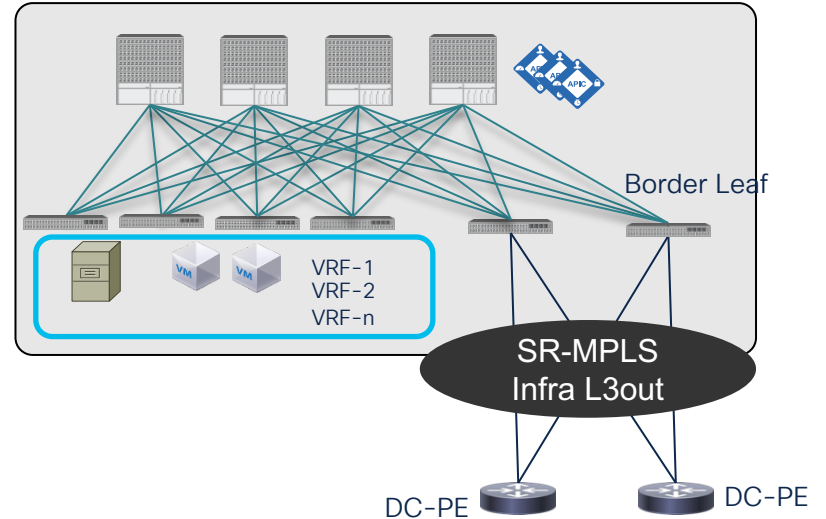




ACI SR-MPLS Implementation and Configuration

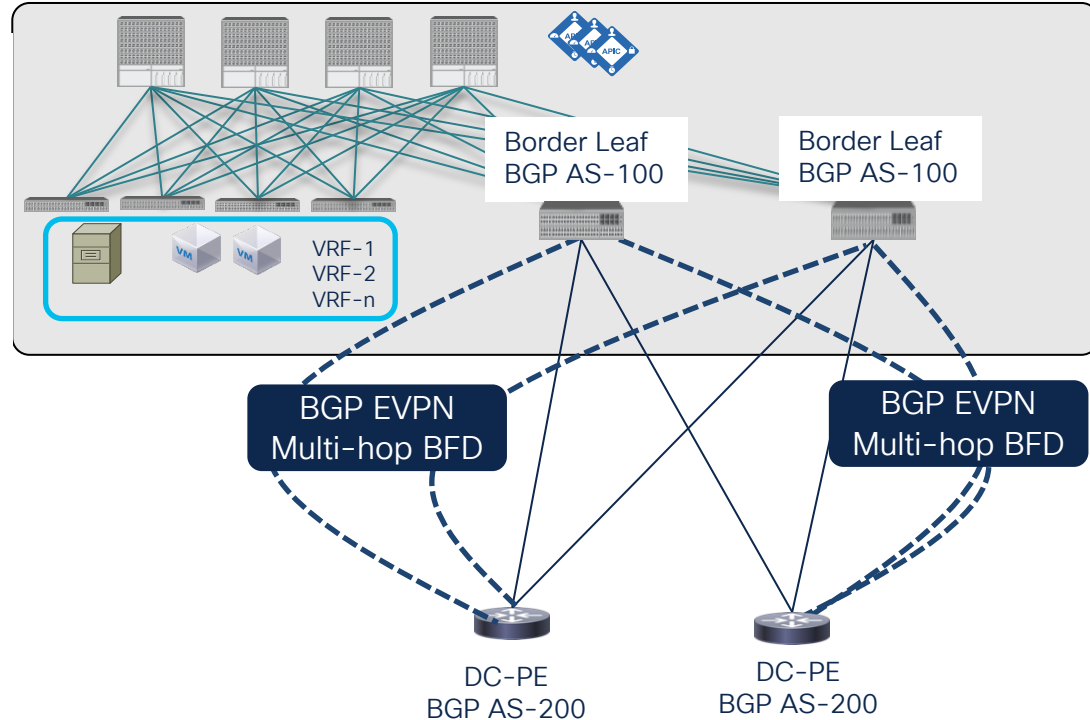
ACI SR-MPLS Infra L3out

- SR-MPLS Infra L3out is configured in Infra Tenant on Border Leaf to setup underlay BGP Labeled unicast (BGP-LU) and overlay BGP-EVPN sessions
- Each Pod, RL pair and site is configured with separate SR-MPLS Infra L3out.



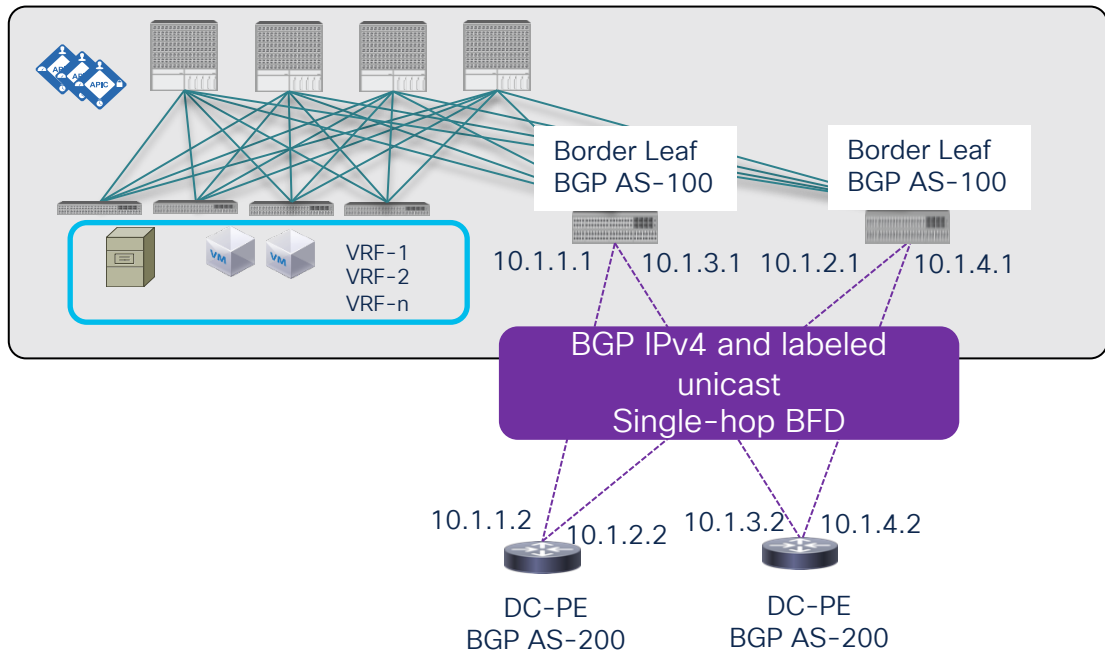
BGP EVPN session between ACI BL and DC-PE

- BGP EVPN session advertises VPN prefixes, VPN label, and BGP communities including color community
- Multi-hop BFD EVPN session is required to detect the failure of BGP session faster and provide better convergence. Minimum supported BFD timer is 250msec, and minimum detect multiplier is 3.



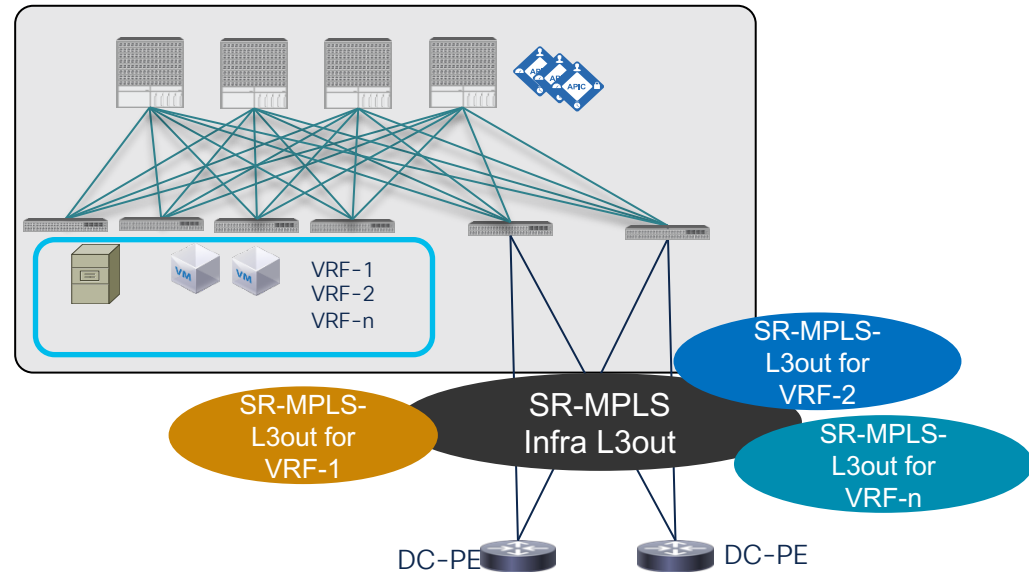
Underlay BGP sessions between ACI BL and next-hop router

- Per interface eBGP IPv4 and labeled unicast address-family between ACI BL and directly connected router.
- BGP labeled unicast address family will automatically advertise SR/MPLS label for loopback
- Single hop BFD session is faster detect soft failures. Minimum supported BFD timer is 50msec, and minimum detect multiplier is 3



ACI SR-MPLS VRF L3out

- Each VRF that needs to be extended towards SR MPLS transport needs to be configured with SR-MPLS VRF L3out and be associated to SR-MPLS-Infra L3out
- Import and export route-map can be configured to
 - apply route-policies based on prefixes and/or communities
 - Advertise prefixes into SR network
 - filter prefixes from SR network
- External EPG with subnet needs to be configured on user L3 out for
 - Security policies (contract)
 - PBR policies
 - Route leaking between VRFs



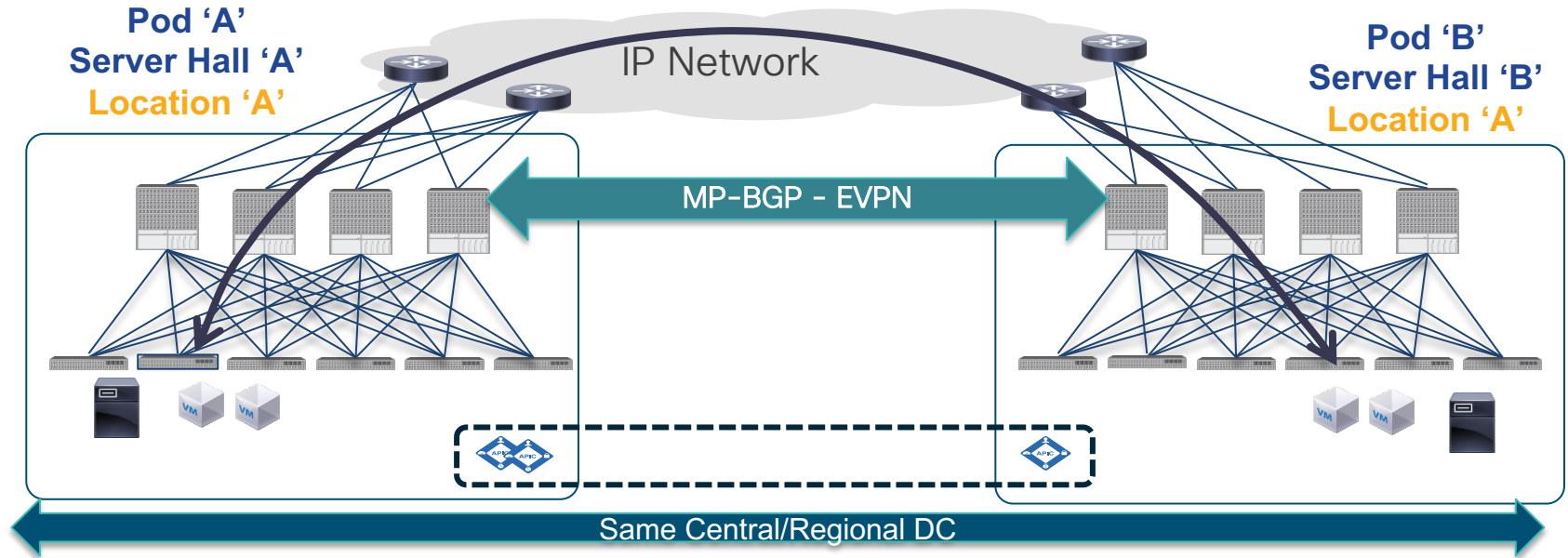


ACI Distributed DC

ACI Multi-Pod

ACI Multi-Pod

Single Telco DC Campus with multiple server halls



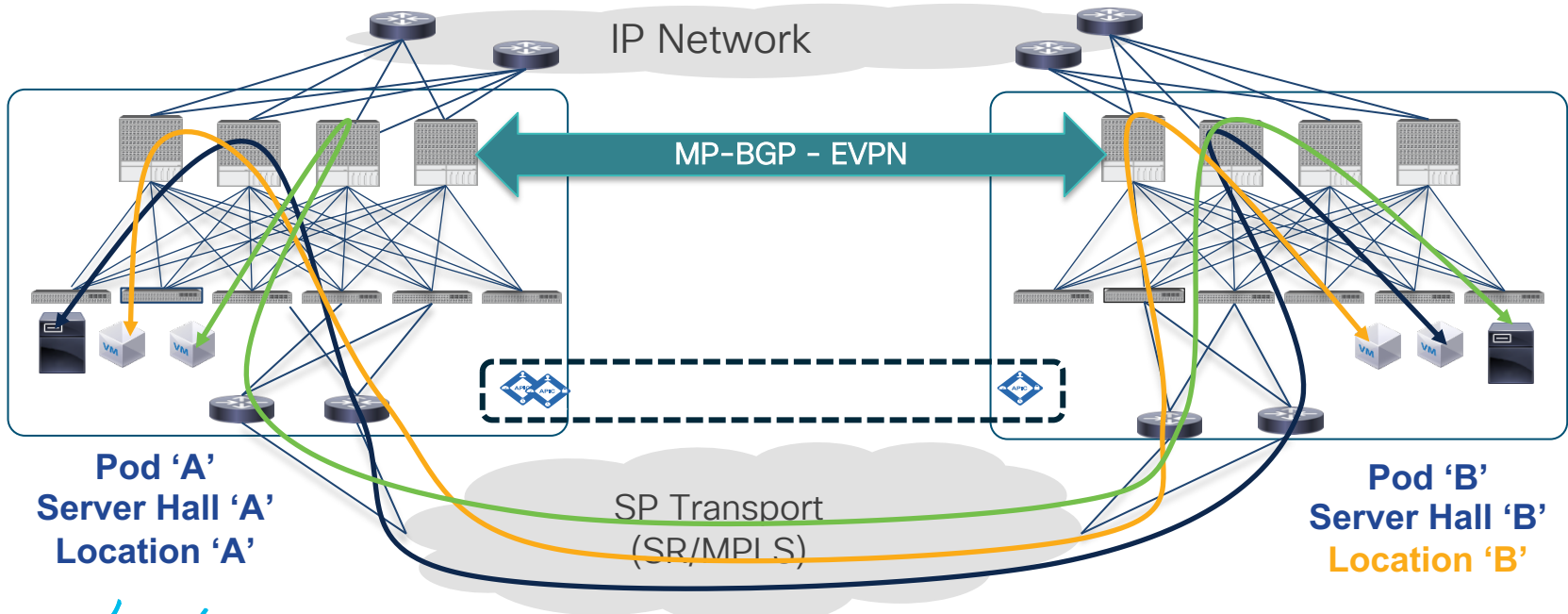
- ✓ Managed by a single APIC Cluster
- ✓ Single Management and Policy Domain

- ✓ End-to-end policy enforcement
- ✓ Control plane fault isolation

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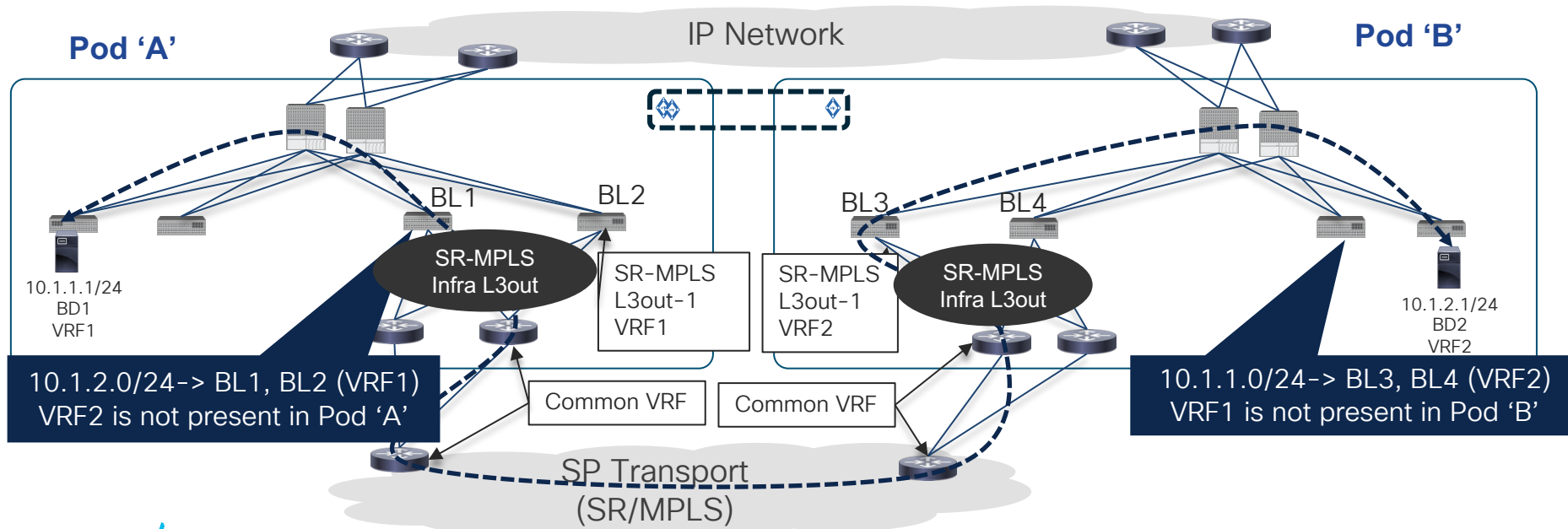
ACI Multi-Pod with SR/MPLS handoff

- ✓ ACI Multi-Pod solution is only used for management of multiple Pods in this scenario
- ✓ Traffic between Pod is forwarded through WAN and not through IPN



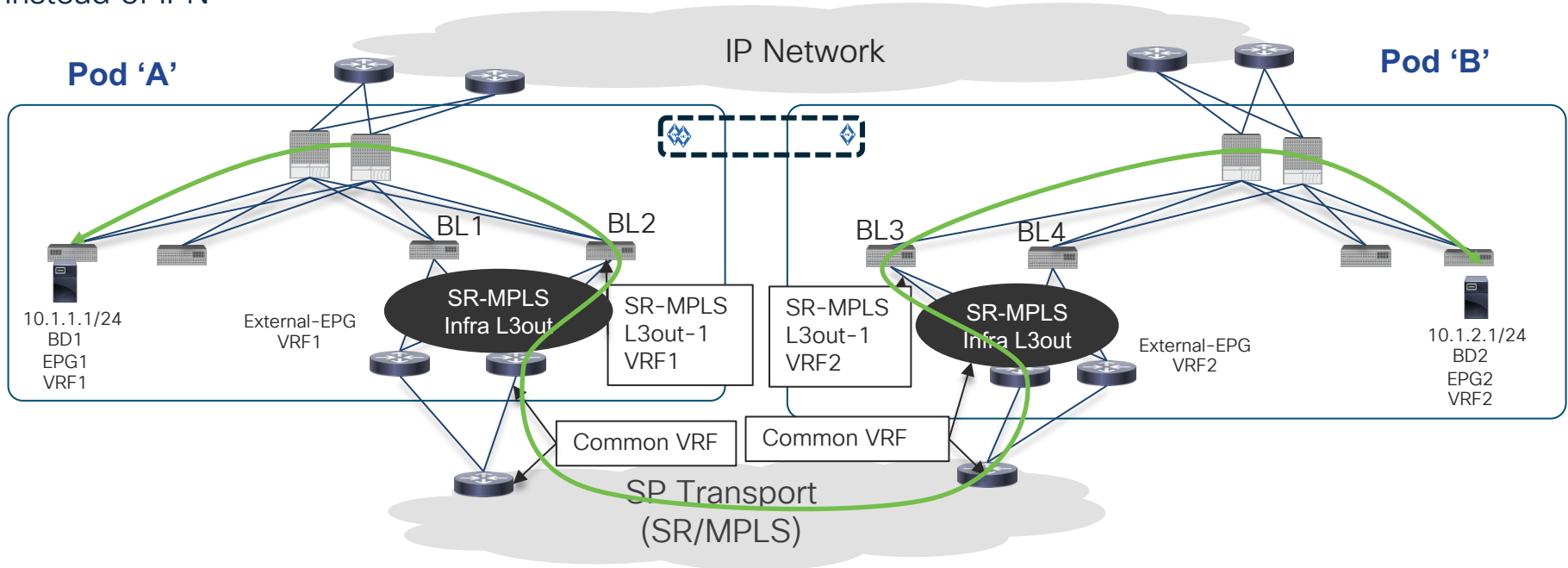
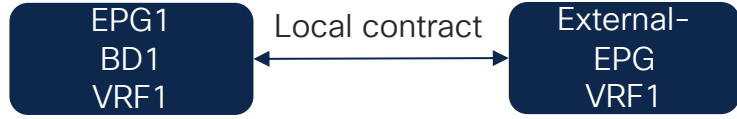
ACI Multi-Pod config with SR/MPLS handoff

- Different VRFs in each Pod is mapped to common VRF in the WAN
- Since each Pod has different VRF, communication between Pod will happen through WAN
- Each Pod must have different Infra MPLS L3out.



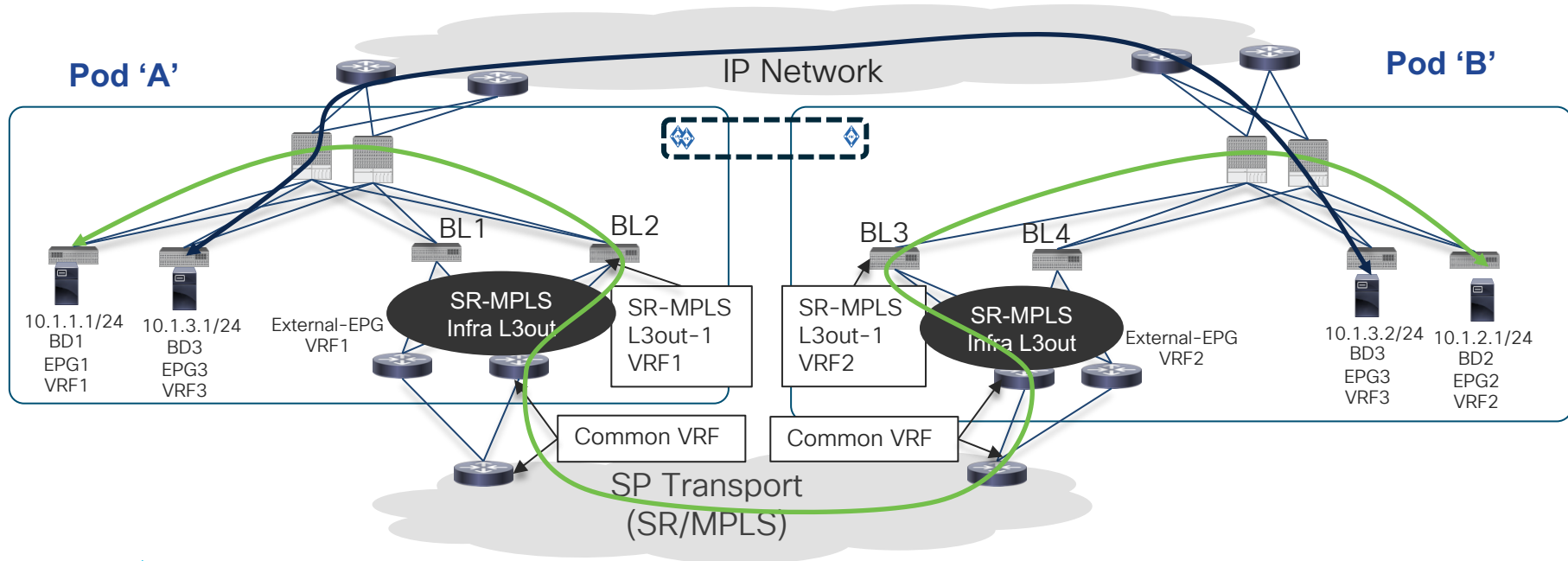
Contract within VRF for traffic through SR/MPLS

Local Contract within same VRF will avoid inter-VRF prefix leaking across Pods. This will force traffic to take SR/MPLS path instead of IPN



IPN or SR/MPLS path selection per VRF

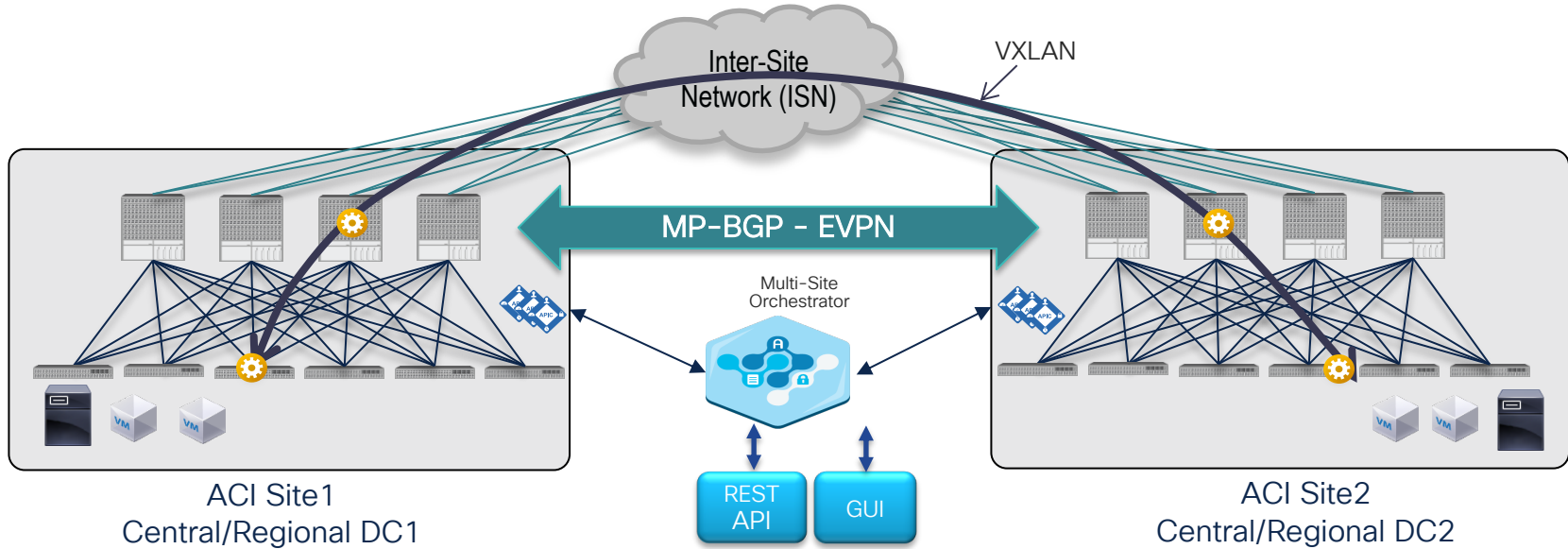
- Customer can select SR/MPLS or IPN path per VRF
- Communication between VRF1 and VRF2 is happening via SR/MPLS since these are not stretched
- Communication within VRF3 is happening via IPN





ACI Multi-Site

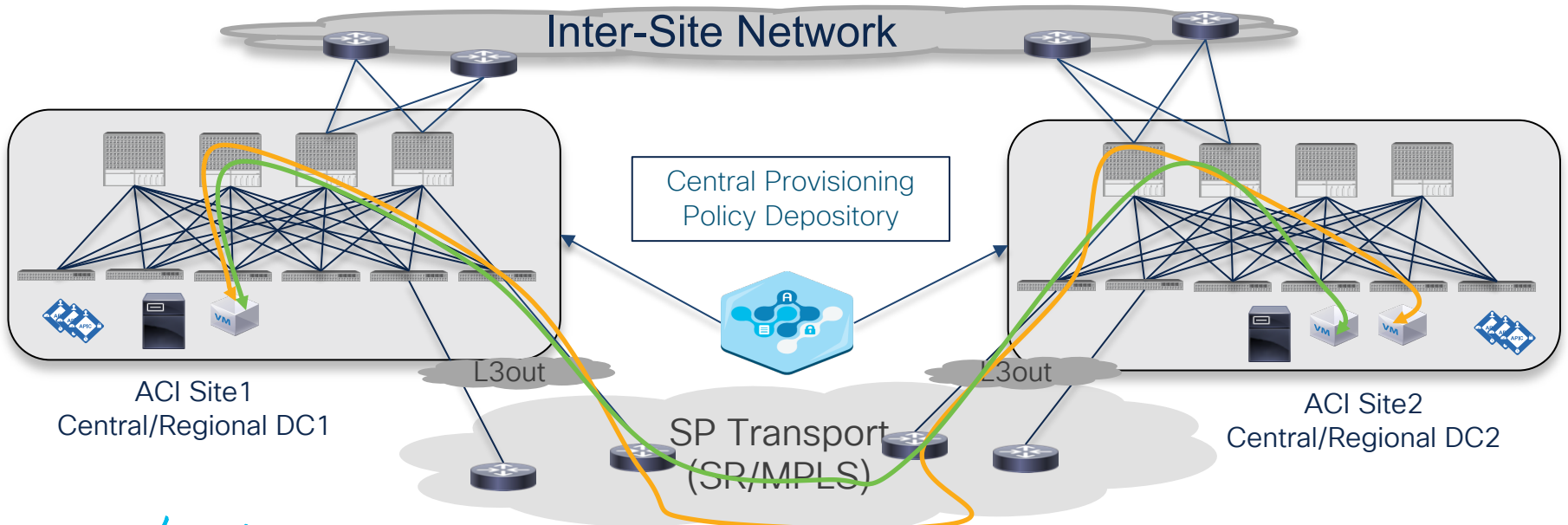
ACI Multi-Site



- ✓ Separate ACI Fabrics with independent APIC clusters
- ✓ End-to-end policy definition and enforcement
- ✓ MP-BGP EVPN control plane between sites
- ✓ Data Plane VXLAN encapsulation across sites

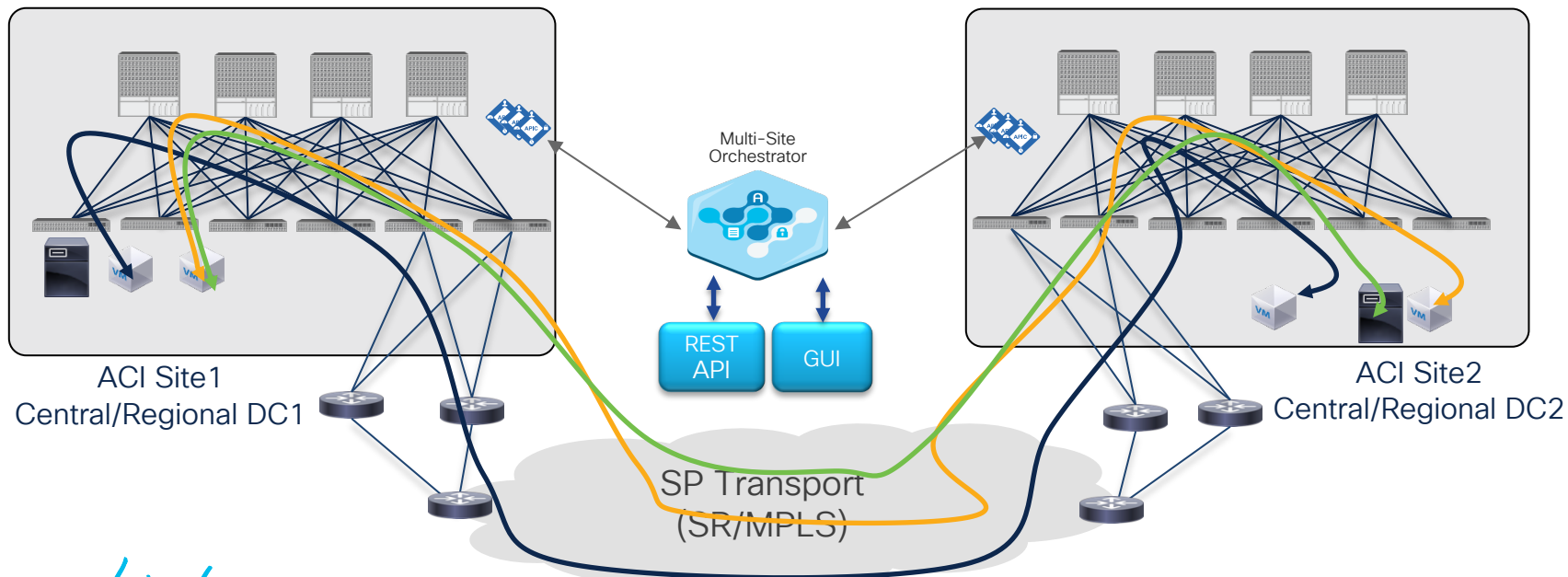
ACI Multisite with SR/MPLS handoff

- For communication via SR/MPLS path, different VRFs must be configured on ACI sites, and there should not be any route leaking across VRFs
- Customer can select SR/MPLS or ISN path per VRF



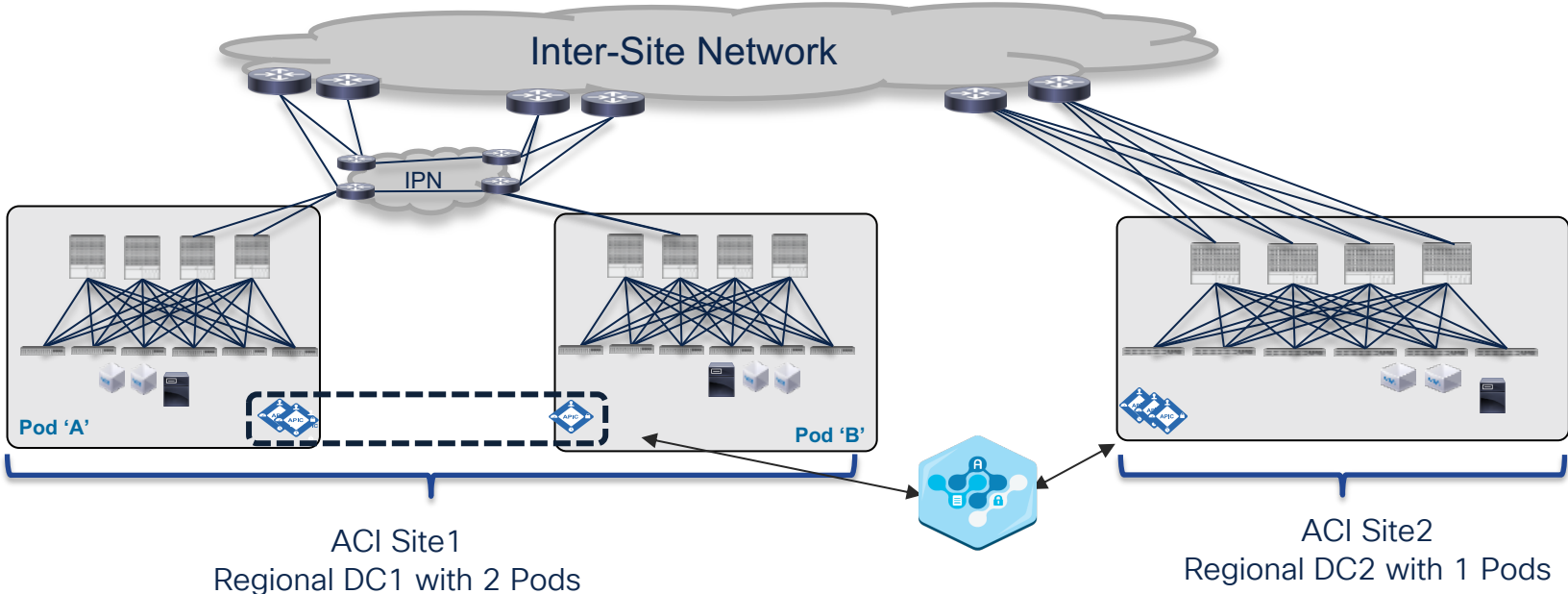
ACI Multisite without ISN

- ✓ Traffic between ACI site is forwarded through WAN
- ✓ No need for ISN if stretching of objects across sites is not required
- ✓ Multi-site Orchestrator is pushing policy configuration across sites



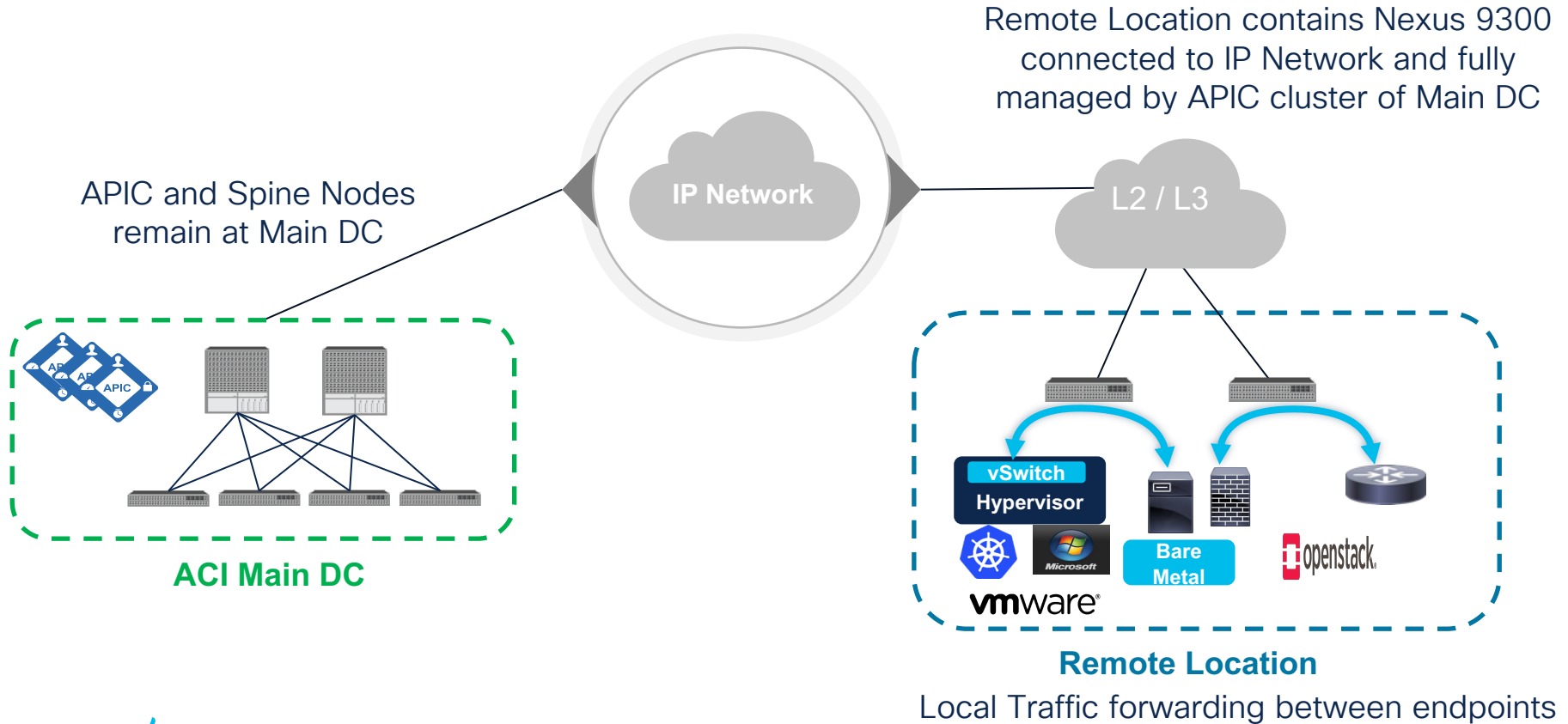
ACI Multi-site with Multi-Pod

Mix of Central/Regional DC deployment with ACI Multi-Pod and Multi-Site



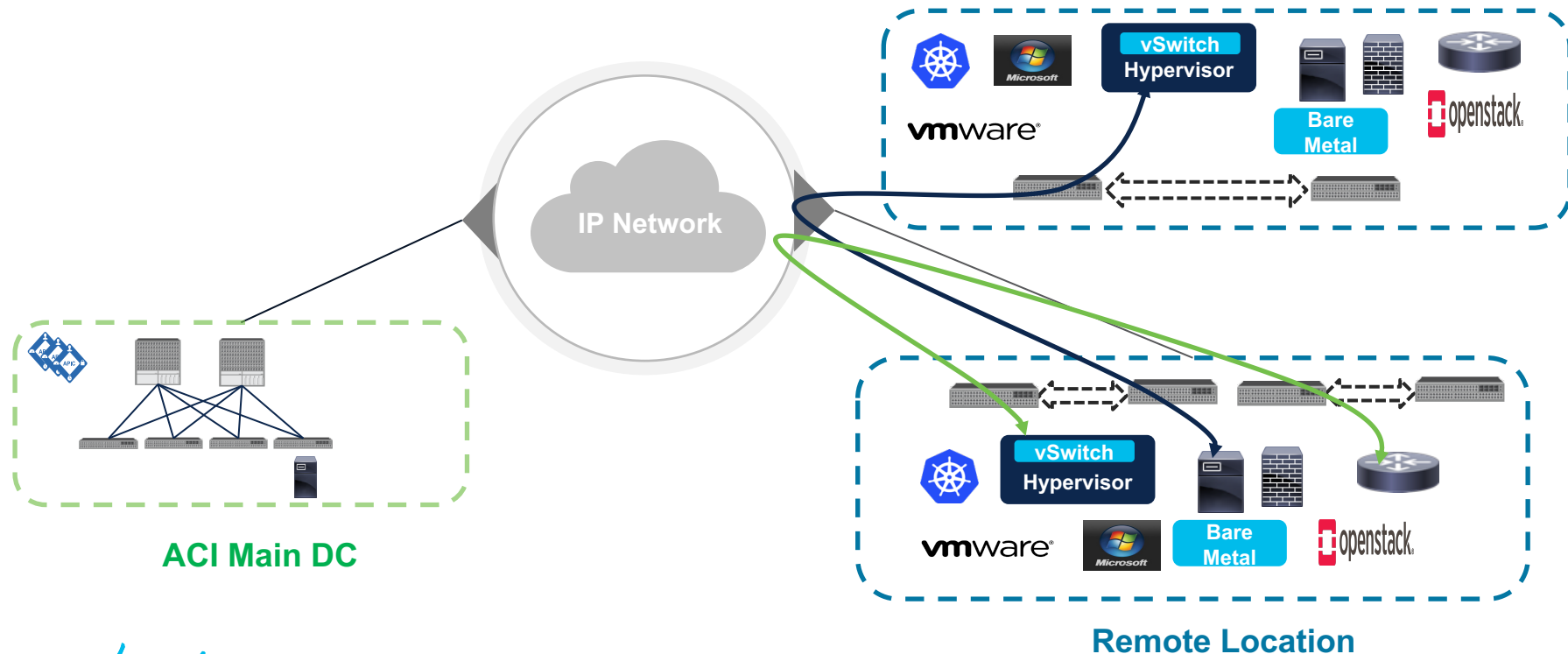
Remote Leaf

Architecture Overview



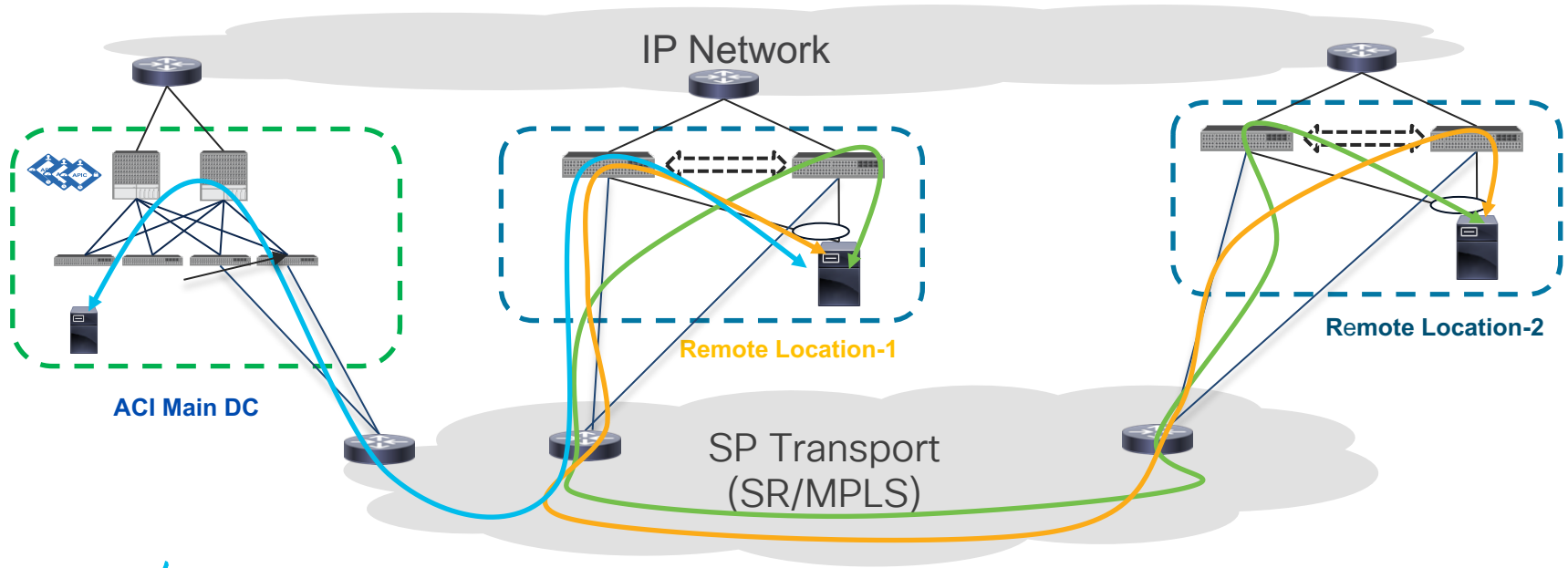
Remote Leaf Architecture evolution

Traffic between Remote leaf switches is directly forwarded



Remote Leaf with SR/MPLS handoff

- For communication via SR/MPLS path, different VRFs must be configured on ACI Pods and Remote Leaf pairs, and there should not be any route leaking across VRFs.
- Customer can select SR/MPLS or IPN path per VRF

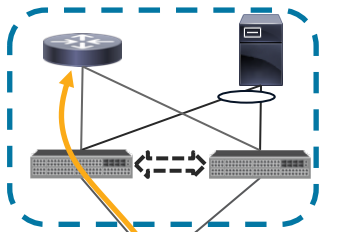




Failure handling with Remote Leaf

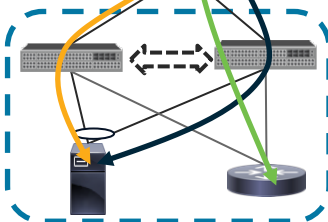
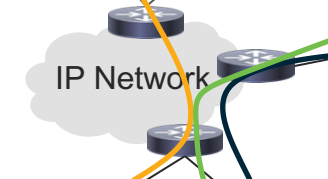
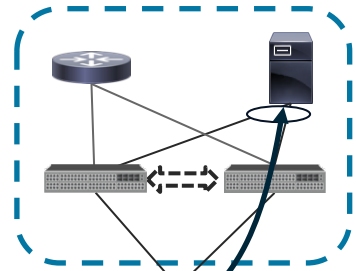
ACI Main DC Pod failure with Multi-Pod Pod

Remote Location-2 Pod1

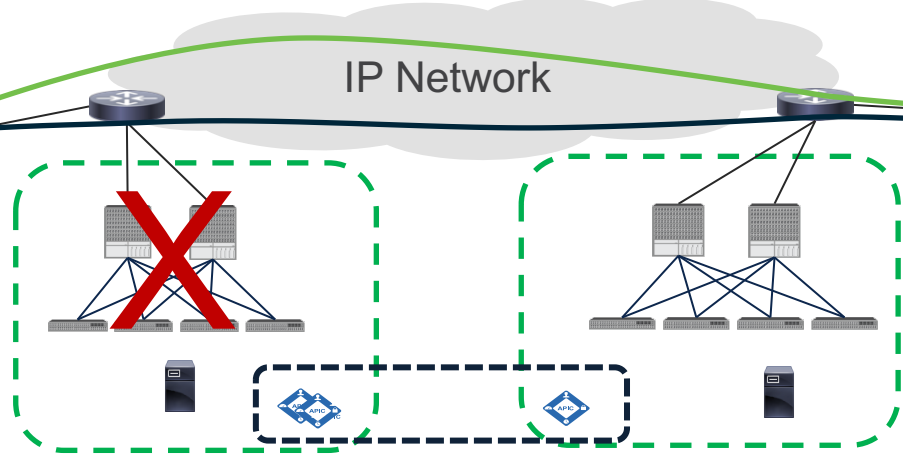


- ✓ All traffic from RL to other Pods and RL within and across Pod will continue to work. Traffic will flow through alternate available Pod.
- ✓ RL can use alternate Pod's spine for BGP and COPP connection.

Remote Location-2 Pod2



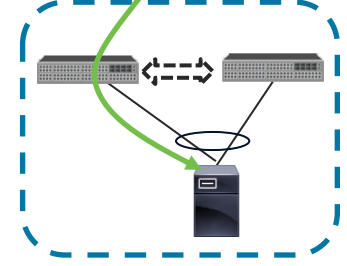
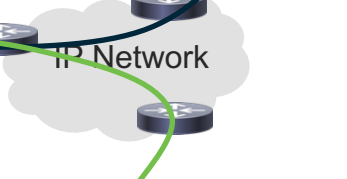
Remote Location Pod1



ACI Main DC Pod1

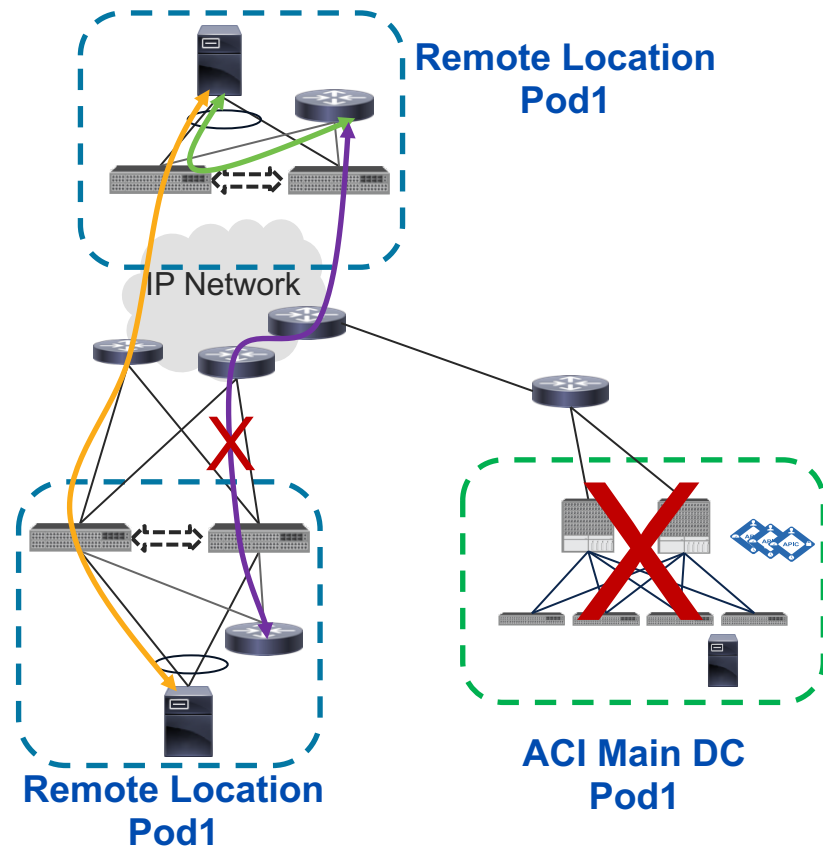
ACI Main DC Pod2

All Pods are part of the same ACI Fabric (APIC Domain)



Remote Location-1 Pod2

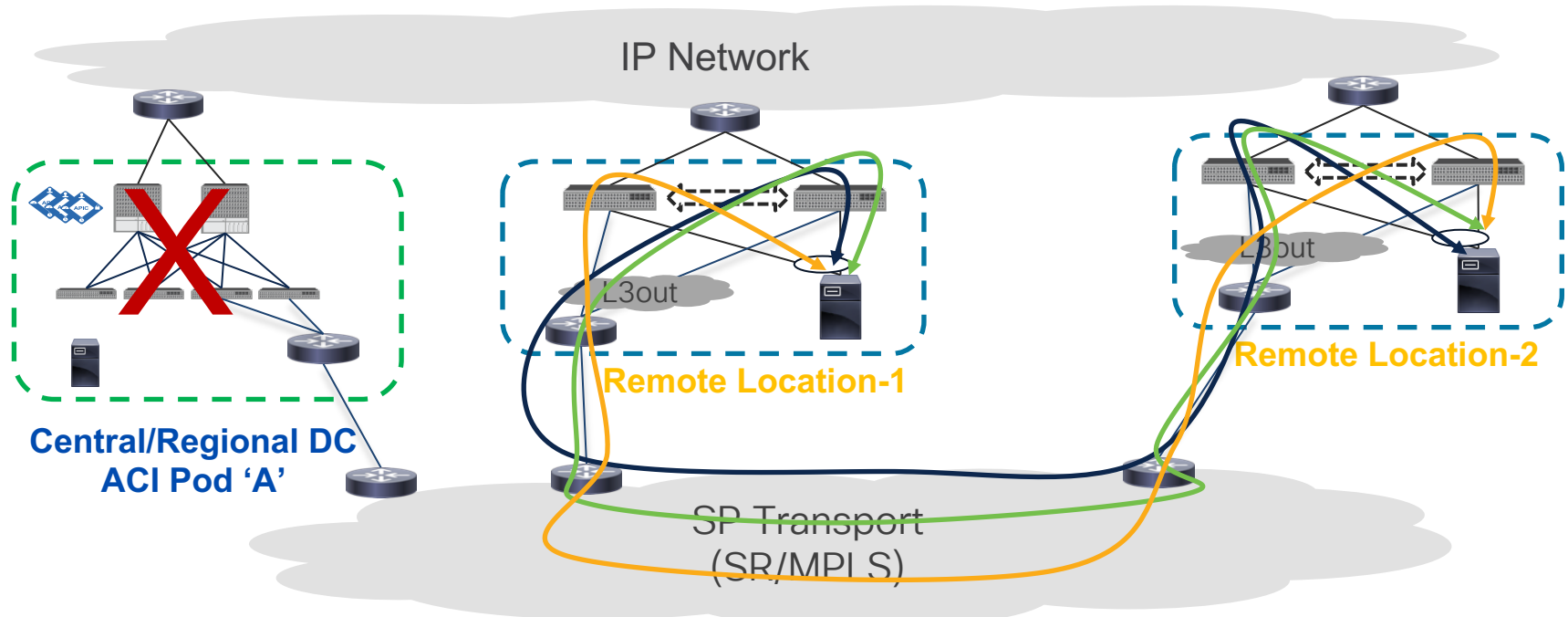
ACI Main DC Pod failure with Single Pod



- ✓ Local traffic within Remote location should continue to work for existing and new EPs
- ✓ Existing learnt EP to EP communication should work fine between RL pairs
- ✓ Existing learnt remote EP may timeout if there is no communication and this may break communications to those remote EPs
- ✓ New EP information across two RL pairs can't be synced since Spine is down.
- ✓ BGP RR session from RL to Spine will be down, hence RL to RL communication for external prefixes will be down
- ✓ Customers who needs full HA for spine failures should use ACI Multi-Pod architecture

ACI Main DC Pod failure with Local L3out

Since communication was locally happening through local L3out, failure of ACI main DC pod doesn't impact the traffic between Remote Locations





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Components of Automation

Fabric Bring up

- VXLAN underlay configuration
 - Interfaces configuration between Leaf & Spine
 - IGP configuration
- VXLAN configuration

Infra Provisioning

- Access interfaces policies
 - vPC, PC, L2, L3, VLAN, LACP, CDP, LLDP etc.
- Fabric policies
 - SPAN, NTP, PTP, Out-of-band
 - AAA, security, RBAC

Policy Automation

- Tenant, EPG, BD, Contract, VMM domain etc.

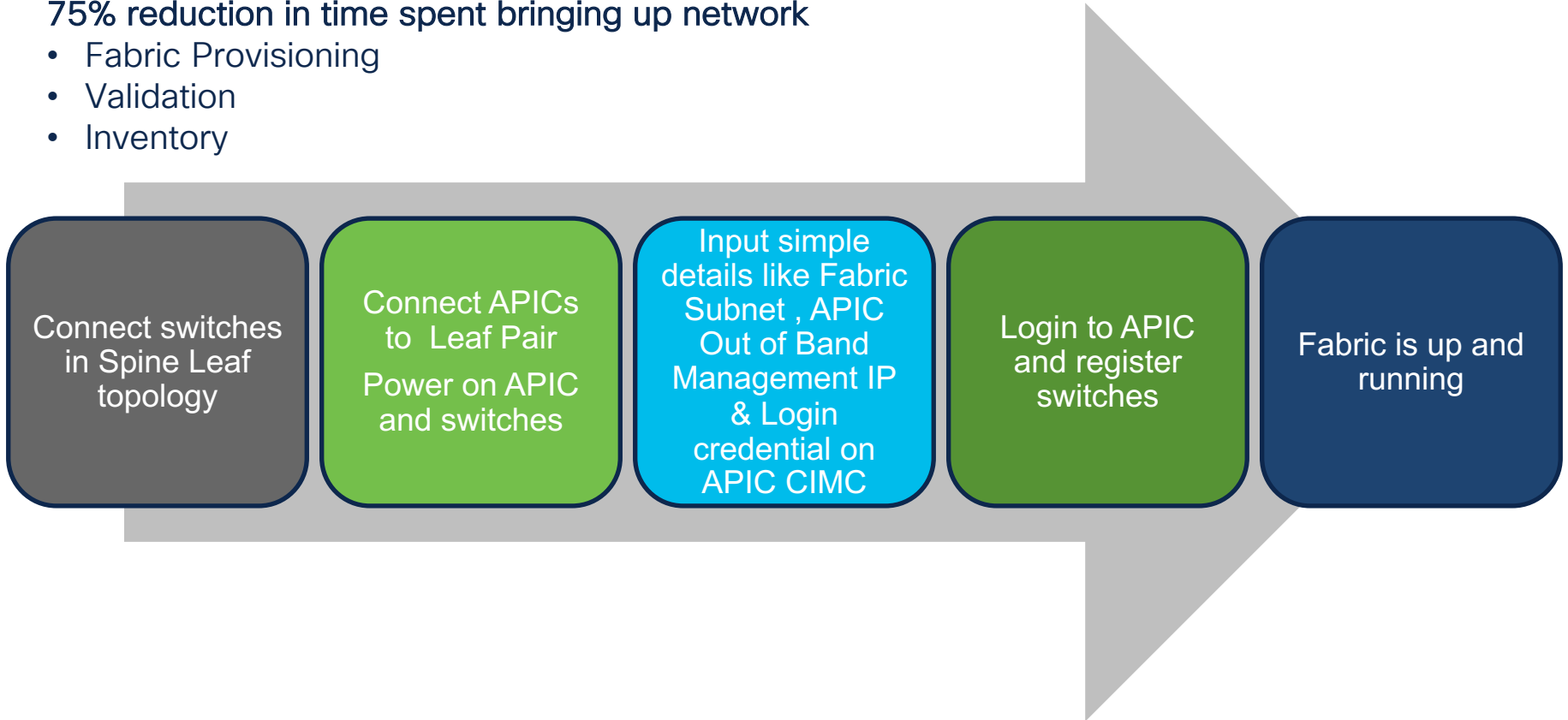


Fabric bring up

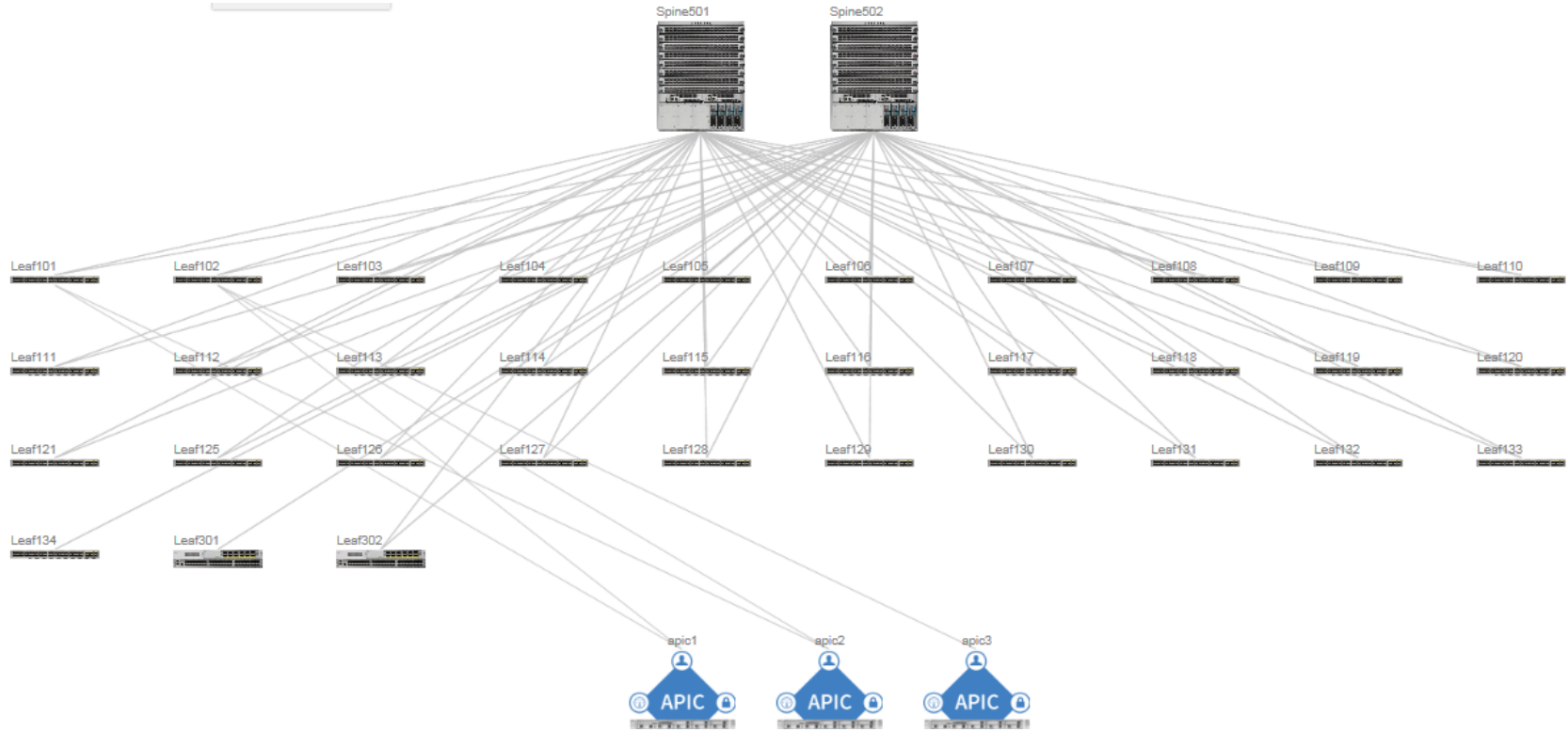
Fabric Bring up

75% reduction in time spent bringing up network

- Fabric Provisioning
- Validation
- Inventory



Topology View

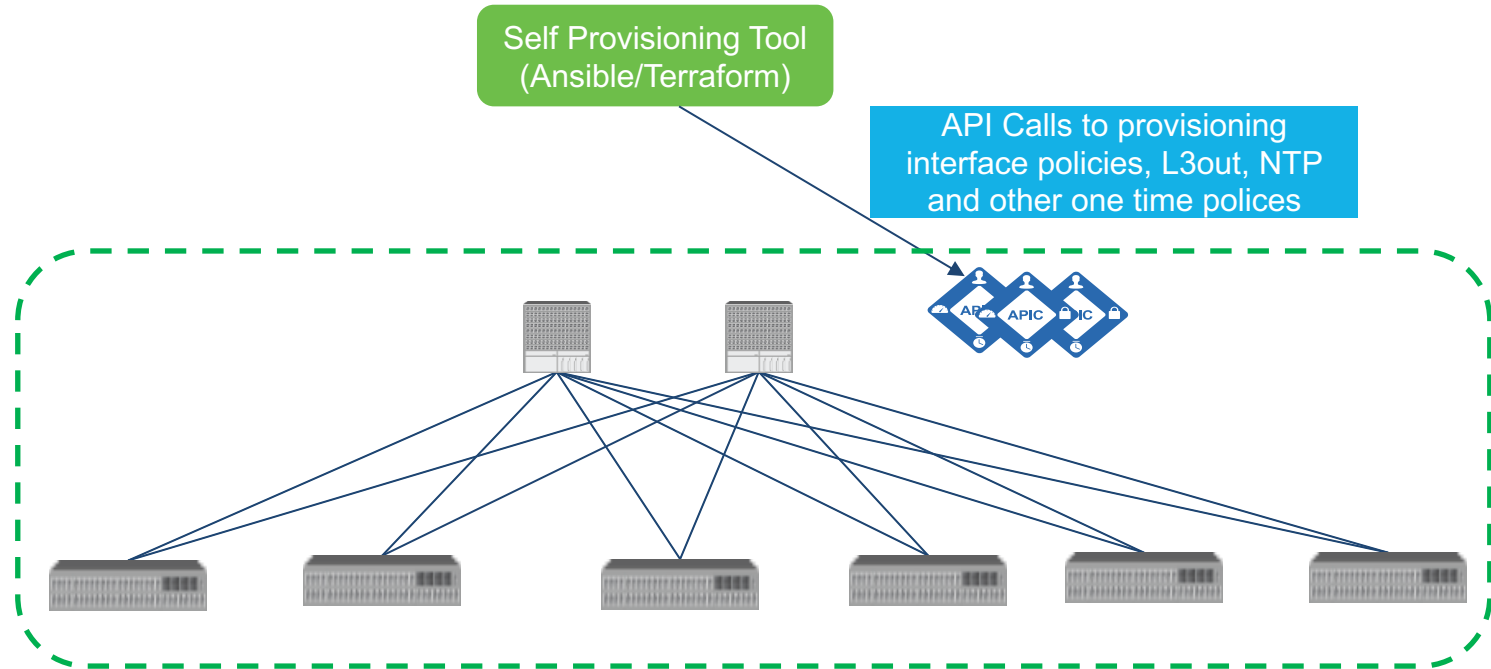




Infra & Policy automation

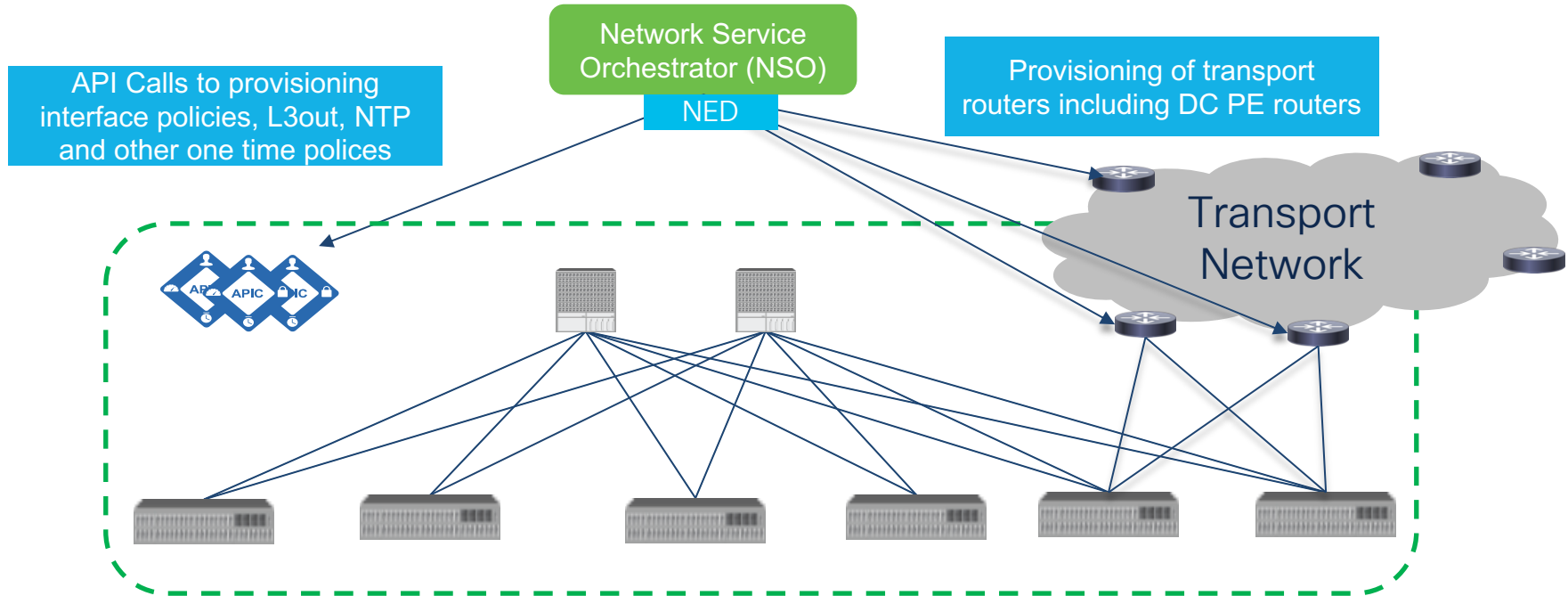
Self developed tool to automate ACI fabric

Self developed Provisioning tool for pushing one time fabric policies as an alternative to UI based configuration



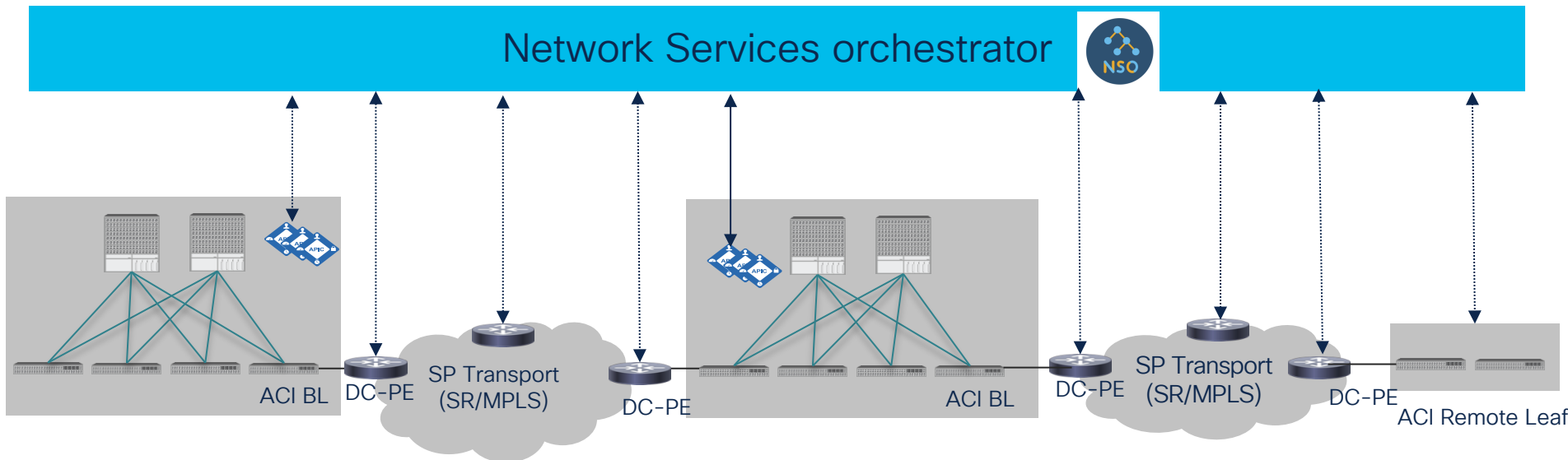
NSO to provision cross-domain automation

Customer can use Network Service Orchestrator to provision both ACI and transport network. This is an alternative option to automate ACI apart from GUI and API based configuration through self developed tool/Ansible/Terraform tools



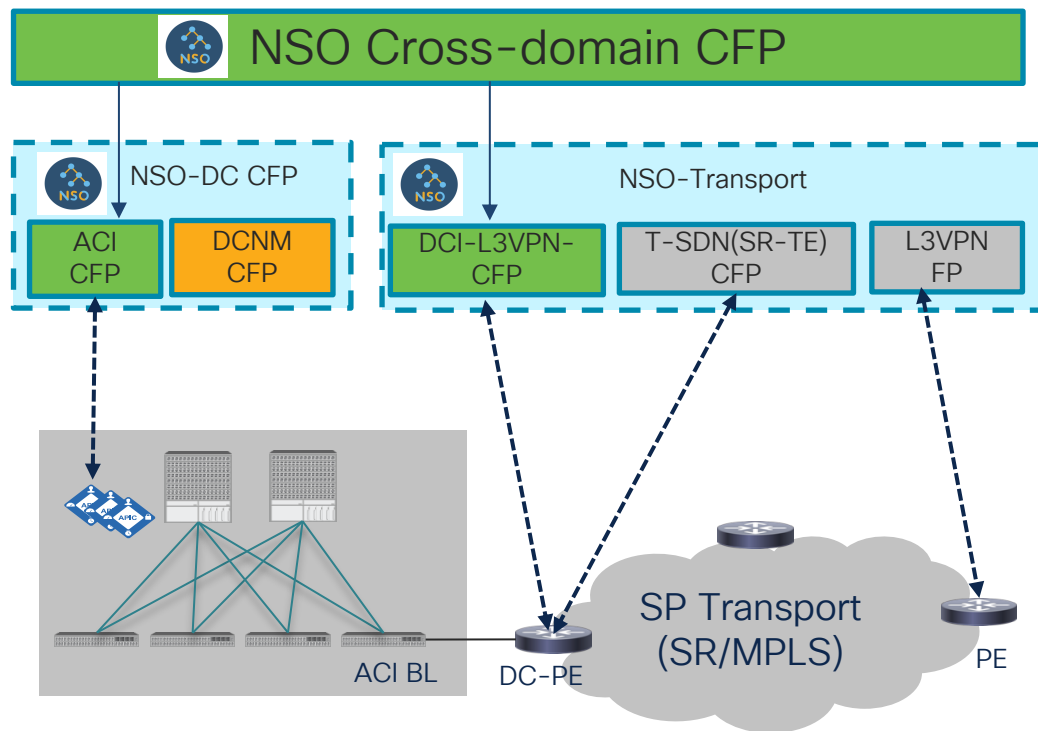
NSO DC & cross-domain CFP

- Multi-Domain Orchestration across Transport and DC
- Telco DC provisioning, and DC handoff provisioning for both IP and SR handoff
- Support of multiple ACI Fabrics, Multi-Pod & RL



NSO Cross-domain core function Pack

- Cross-domain CFP to provision DC to transport handoff for both IP and SR handoff using ACI CFP and DCI-L3VPN-CFP
- Multi-NSO support for each domain
- Support of Multiple ACI Fabrics from single NSO



Software versions

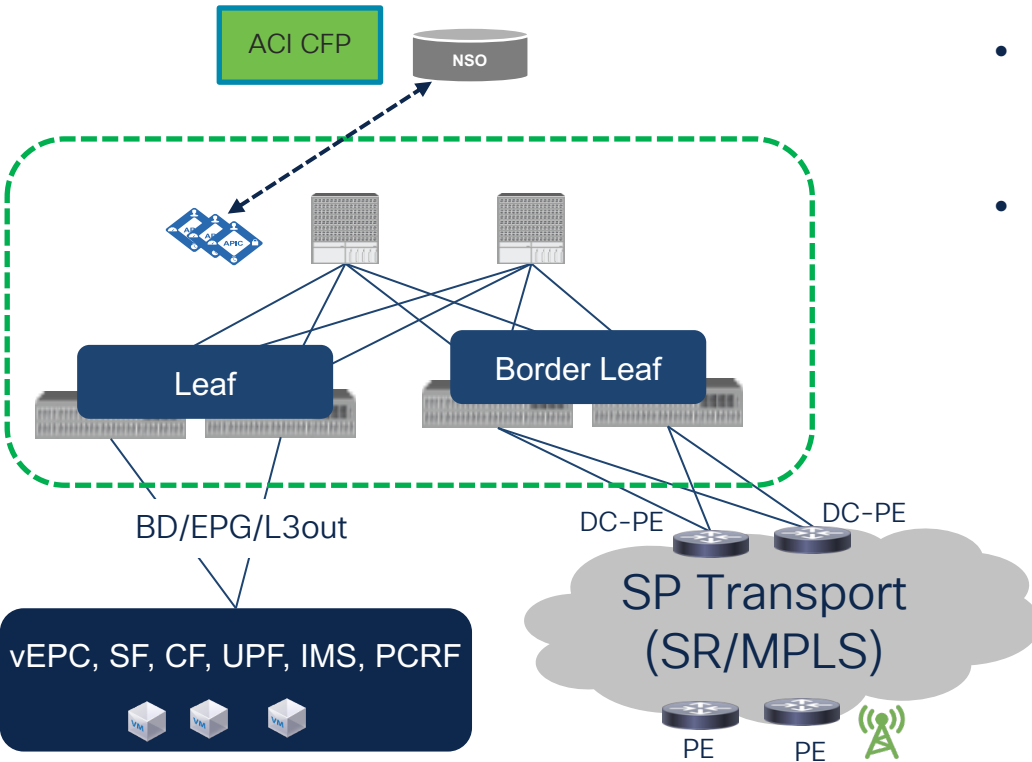


For Your
Reference

- IP Handoff - ACI 4.2.x
- SR Handoff - ACI 5.0.x
- IOS XR - 7.0.2
- CNC (SR-TE) CFP 1.1

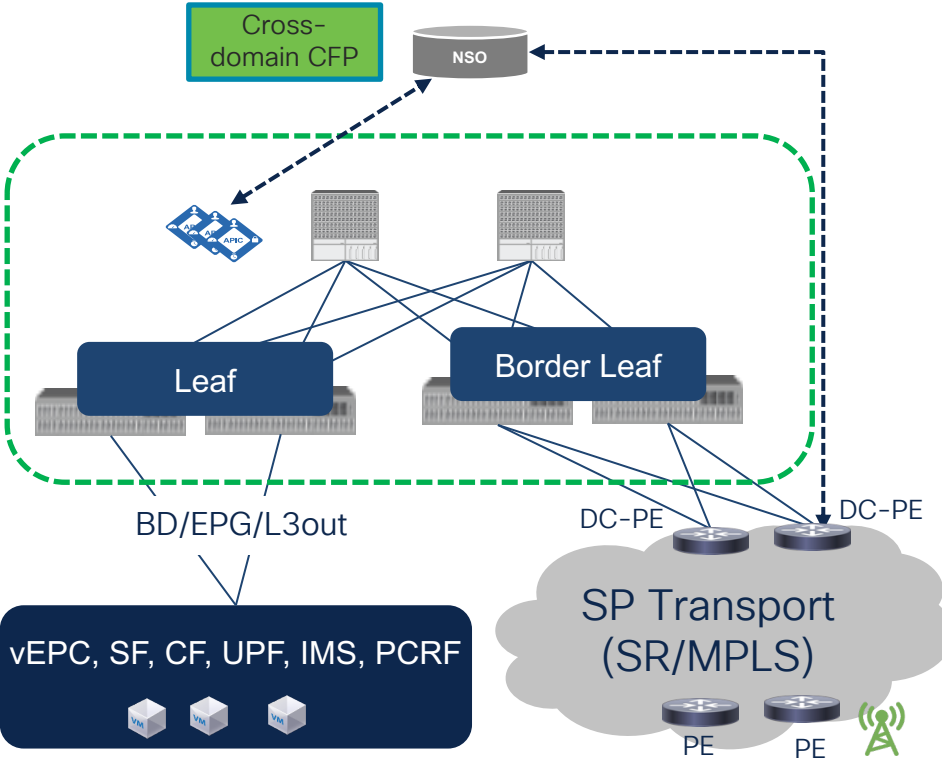
ACI CFP use-case

Telco cloud deployment



- NSO to push ACI policies to bring up 4G/5G services
- NSO will automate following in DC fabric
 - Interface, VLANs policies
 - Tenant, EPG, BD, VRF, contracts
 - Routing (BGP, static route) route-map
 - Service chaining (PBR)
 - QOS

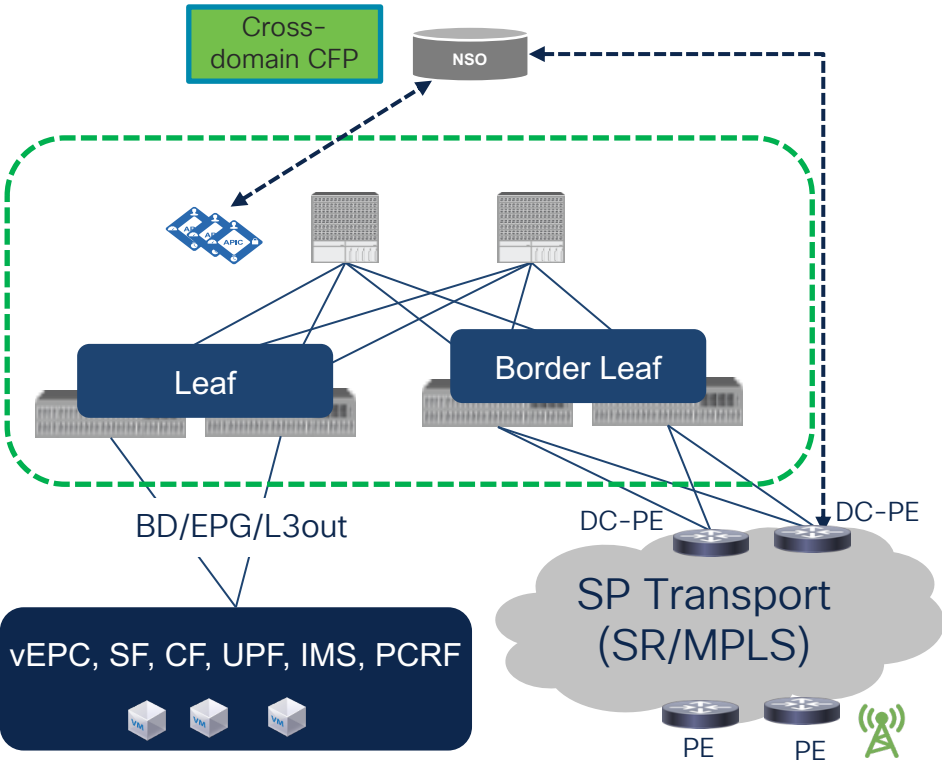
Cross-domain core function pack (IP handoff)



- NSO will automate following on ACI BL and DC-PE
 - VRF, RT, RD, VPN
 - Physical/logical interface
 - VLAN
 - IP address management for interfaces between DC-PE and ACI BL
 - Routing (BGP, static route)
 - BFD
 - Routing policies
- Map prefixes, **DSCP*** to SR policies on DC-PE

* To be supported in IOS XR

Cross-domain core function pack (SR handoff)

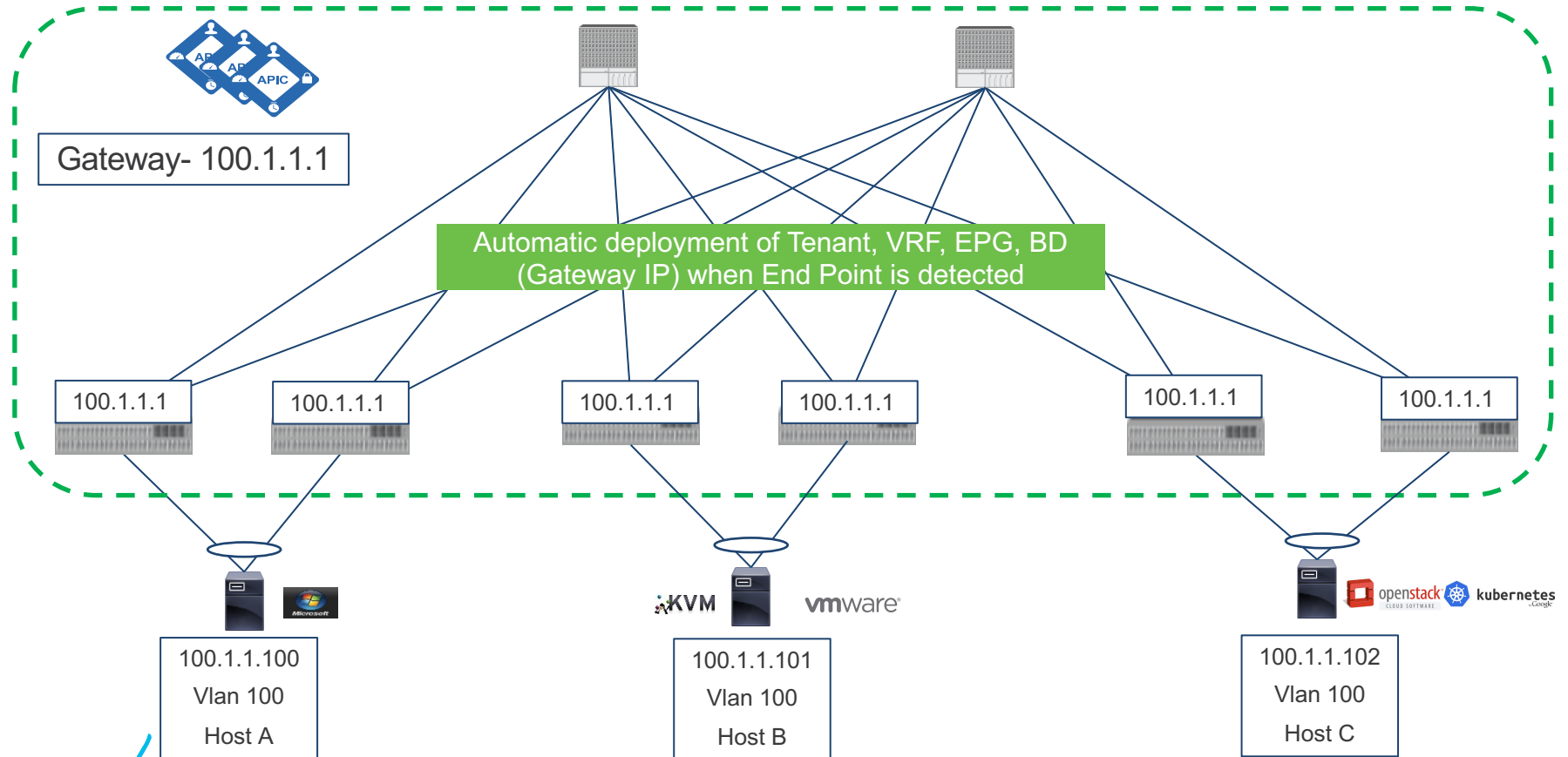


- NSO to automate following configuration on ACI BL and DC-PE

- VRF, RT, RD, VPN
- BFD
- MPLS QOS policies
- BGP EVPN and labeled unicast session
- Routing policies such as BGP color community
- SR/MPLS QOS policies

- RT Translation from EVPN to L3VPN on DC-PE
- Map BGP color-community, prefixes, **DSCP/EXP*** to SR policies on DC-PE

Automation with VMM domain integration



Visibility with VMM domain integration

System Tenants Fabric **Virtual Networking** L4-L7 Services Admin Operations Apps Integrations

Inventory

Quick Start

- VMM Domains
 - Microsoft
 - OpenStack
 - Red Hat
 - VMware
 - DVS
 - Controllers
 - vcenter
 - Hypervisors
 - 172.31.187.160
 - Virtual Machines
 - vmnic0
 - vmnic1
 - vmnic2
 - vmnic3
 - 172.31.187.162
 - DVS - DVS
 - Portgroups
 - DC-PE-Port-0-vlan-503

Portgroup - DC-PE-Port-0-vlan-503

General Faults History

Properties

Name: DC-PE-Port-0-vlan-503
 Port Encap (or Secondary VLAN for Micro-Seg): vlan-503

| Virtual Network Adapters: | VM Name | Name | State | MAC | IP Addresses |
|---------------------------|---------|-------------------|-------|-------------------|--------------|
| | DC-PE | Network adapter 4 | Up | 00:50:56:A5:AF:57 | 0.0.0.0 |

Page 1 of 1 Objects Per Page: 15 Displaying Objects 1 - 1 Of 1

| Management Network Adapters: | Server Name | Name | State | MAC | IP Address |
|---|-------------|------|-------|-----|------------|
| No items have been found.
Select Actions to create a new item. | | | | | |

System **Tenants** Fabric Virtual Networking L4-L7 Services Admin Operations Apps Integrations

ALL TENANTS | Add Tenant | Tenant Search: name or descr | common | vEPC | SR-MPLS | infra | NSO-tenant

vEPC

Quick Start

- vEPC
 - Application Profiles
 - Finance-application-profile
 - IMS
 - Application EPGs
 - FCOE-EPG
 - Vlan-100

EPG - Vlan-100

Summary Policy **Operational** Stats Health Faults History

Client End-Points Configured Access Policies Contracts Controller End-Points Deployed Leaves

Healthy

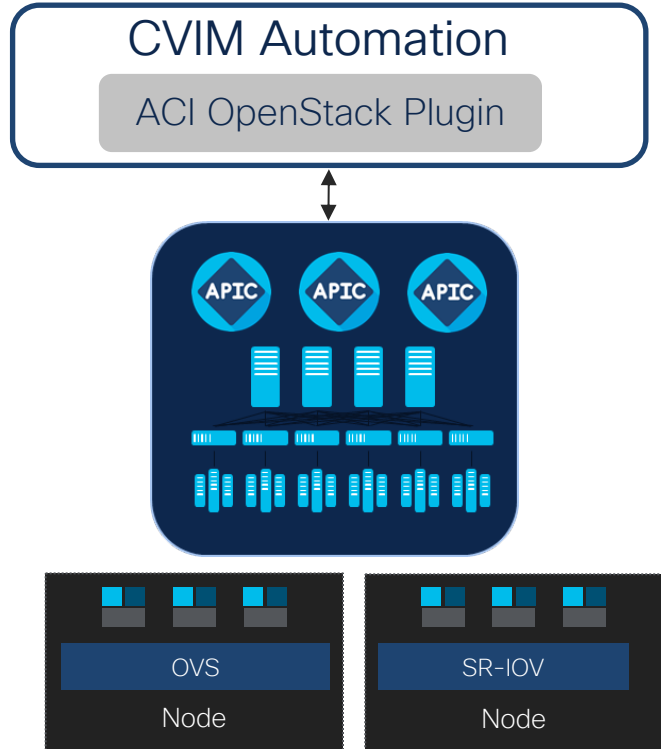
| End Point | MAC | IP | Learning Source | Hosting Server | Reportin
Controlle
Name | Interface | Encap |
|-------------|-------------------|------------|-----------------|----------------|--------------------------------|---|-----------|
| IMS-Vlan100 | 00:50:56:A5:0D:C9 | 10.1.1.100 | learned
vmm | 172.31.187.160 | vcenter | Pod-1/Node-101-102/vPC-E1_2 (learned,vmm) | vlan-1070 |

ACI and CVIM integration

ACI 4.2

CVIM 3.4.6
(Aug'2020)

Enable Seamless NFV Automation with Cisco SDN Data Center and Cisco VIM



Automated provisioning of ACI policies based on location of VNFs



VMM Domain Integration with APIC
NFV Ready: SR-IOV and OVS



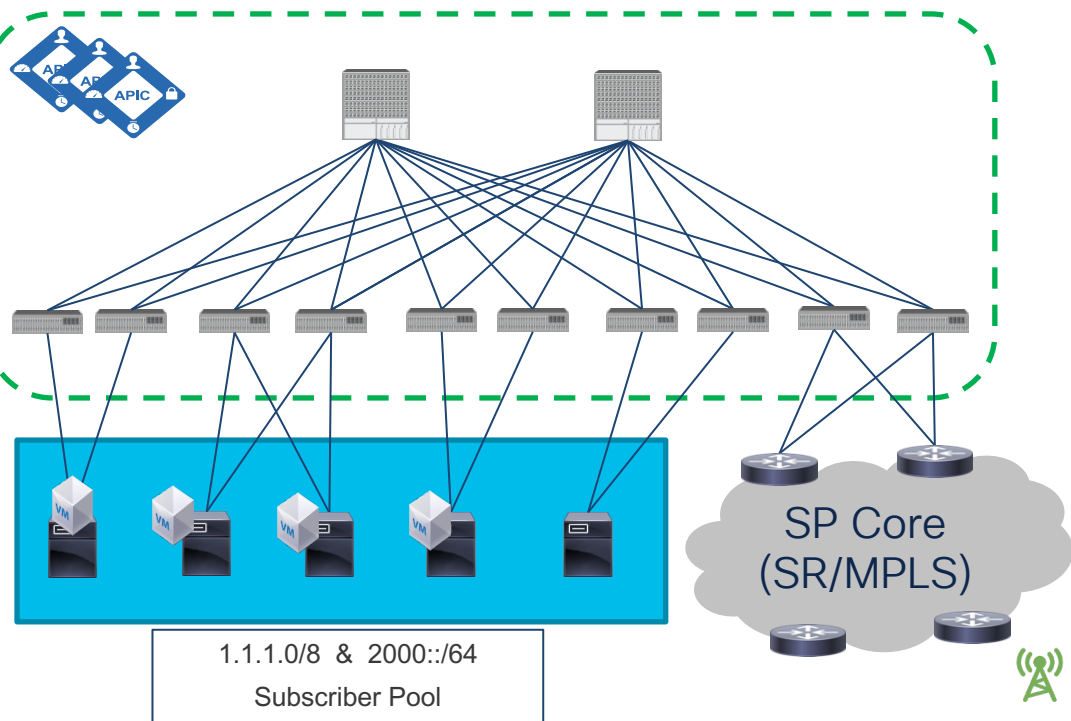
Visibility: VNF location, Hypervisor location, Live statistics in APIC per Hypervisor, VNF and health metrics



Agenda

- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
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 - Automation
 - EPC deployment
 - Service chaining
 - Security & Compliance
 - Operations
- Customer examples
- Conclusion

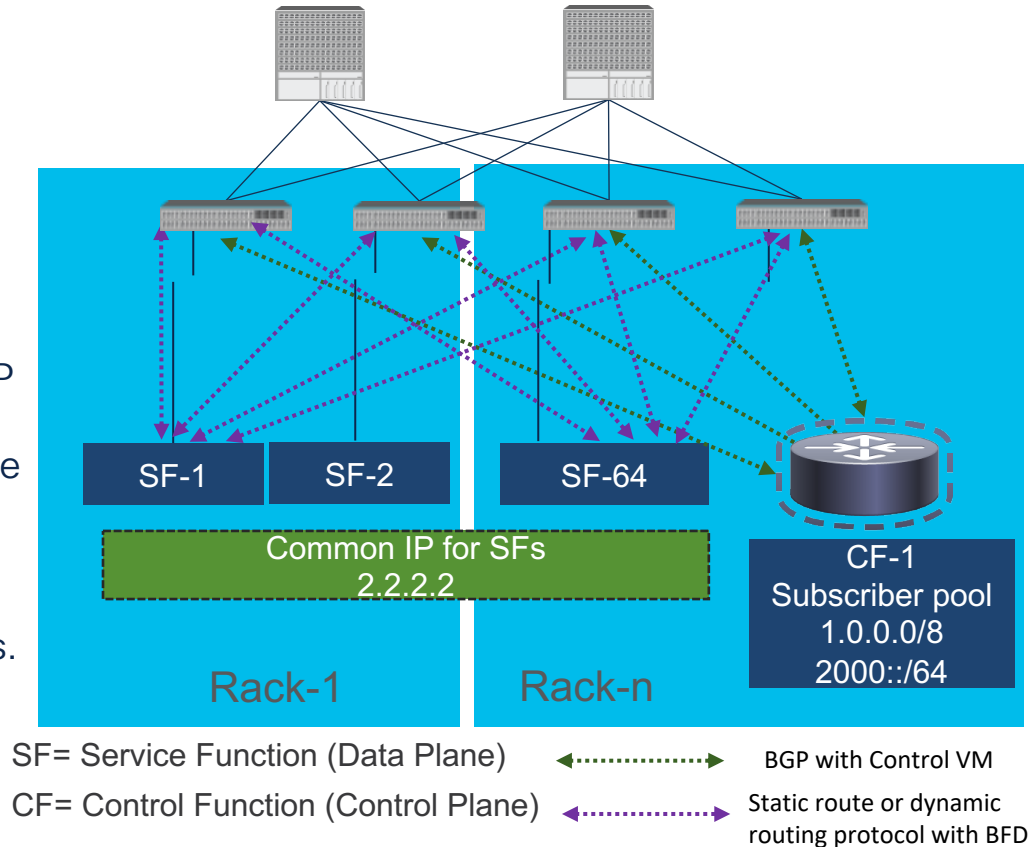
vEPC characteristics



- vEPC VNF's distributed across many Rack, Leafs
- Flexibility to deploy VNF's based on capacity in Rack's, Servers etc.
- Ability to move VNF within fabric
- VNFs uses routing protocol with fabric to advertise subscriber pool
- Wide ECMP/load-balancing

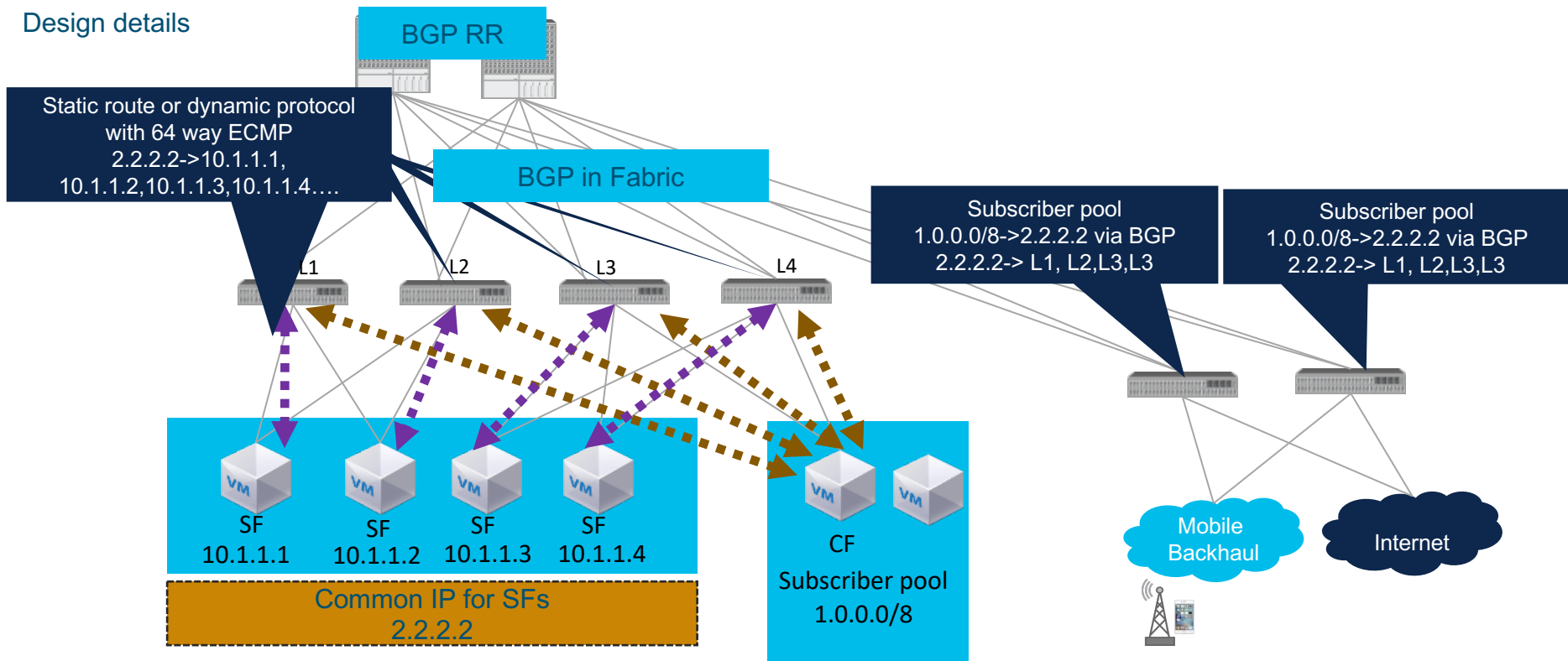
Cisco vEPC design with ACI

- vEPC functionality is divided across service functions (SF) and control functions (CF).
- CF advertises subscriber pool information through BGP with the common next-hop of user-plane VNFs (SF)
- All the use-plane VNFs are sharing a common IP
- ACI leaf switches are configured with static route or dynamic routing protocol for provide reachability to common IP of SF
- 64-way ECMP from ACI Leaf to SF across racks.
- BFD is used between SF and ACI Leaf for resiliency



vEPC design with ACI

Design details



SF= Service Function (Data Plane)

CF= Control Function (Control Plane)



BGP with Control VM

Static route or dynamic routing protocol with BFD

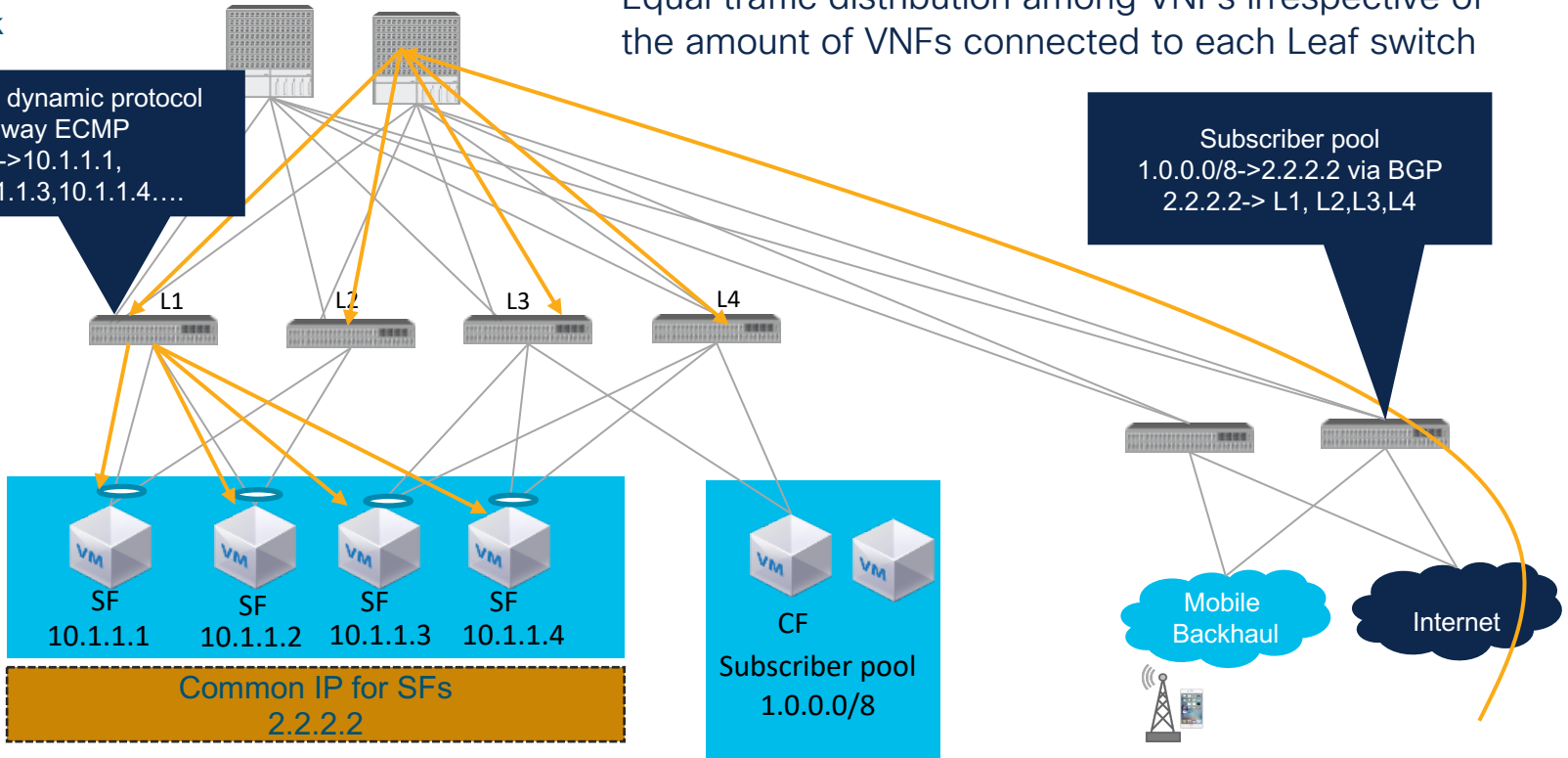
vEPC design with ACI

Packet walk

Static route or dynamic protocol with 64 way ECMP
2.2.2.2->10.1.1.1,
10.1.1.2,10.1.1.3,10.1.1.4....

Equal traffic distribution among VNFs irrespective of the amount of VNFs connected to each Leaf switch

Subscriber pool
1.0.0.0/8->2.2.2.2 via BGP
2.2.2.2-> L1, L2,L3,L4



SF= Service Function (Data Plane)

CF= Control Function (Control Plane)

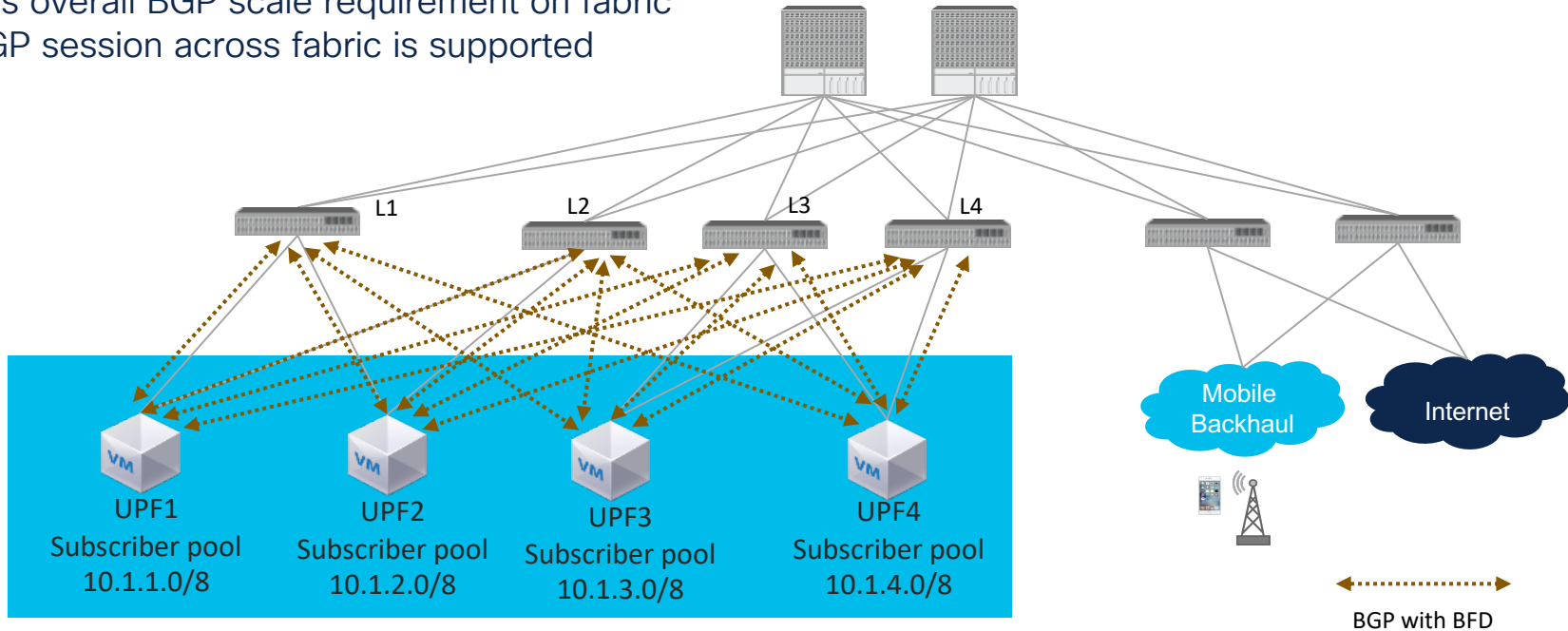


BGP with Control VM

Static route or dynamic routing protocol with BFD

vEPC design with BGP from UPF with ACI

- ✓ 4G CUPS deployment for UPF
- ✓ Redundant and resilient design with BGP & BFD from each switch to SF
- ✓ Flexible Architecture, where UPF can be instantiated anywhere
- ✓ Each UPF is running BGP from UPF to all ACI leaf connected to vEPC cluster
- ✓ Increases overall BGP scale requirement on fabric
- ✓ 3000 BGP session across fabric is supported



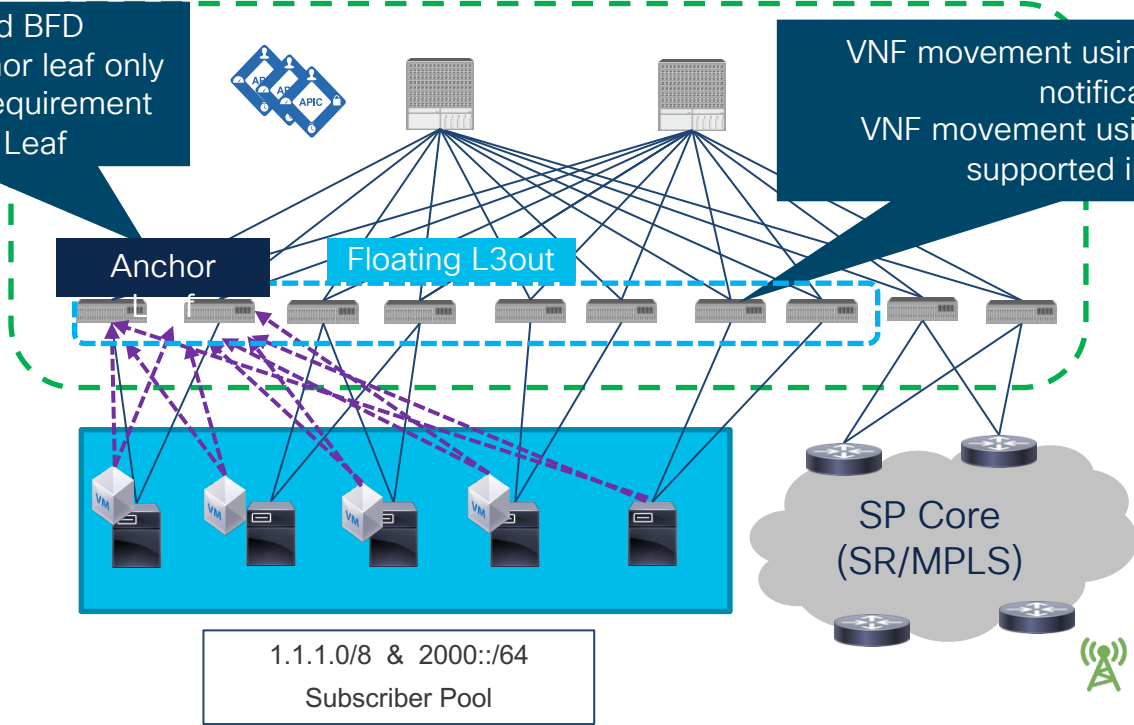


vEPC design with Floating L3out

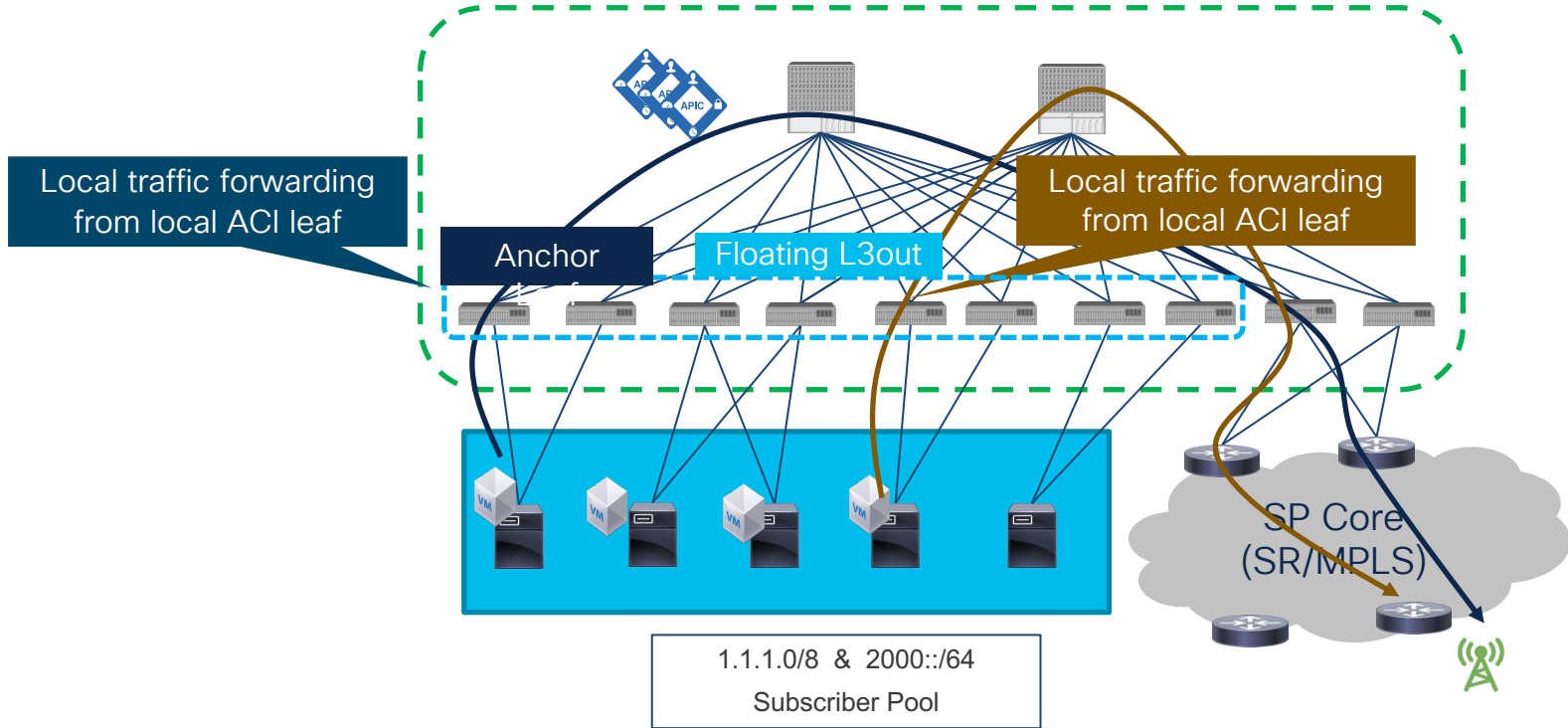
vEPC design with Floating L3out

Routing (BGP) and BFD neighborship with anchor leaf only to reduce scalability requirement on VNF and ACI Leaf

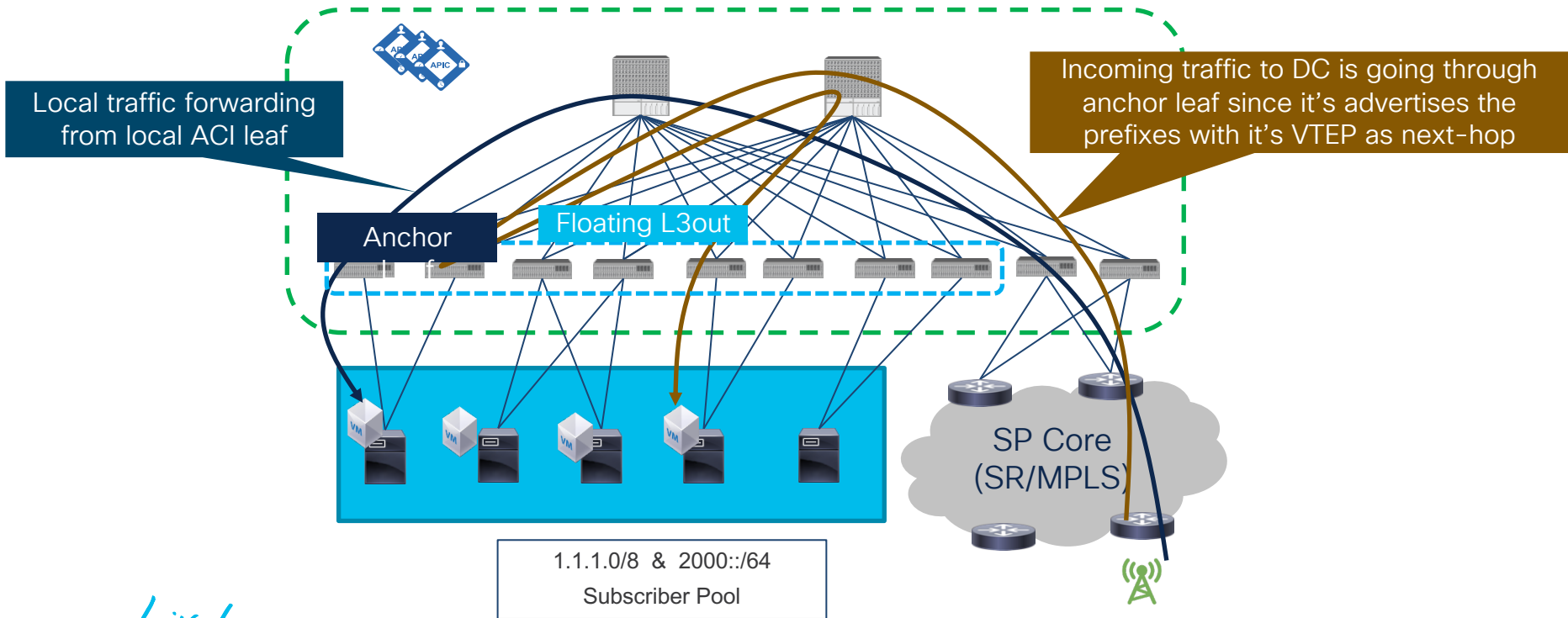
VNF movement using VM attachment notification
VNF movement using ARP/GARP is supported in ACI 5.0



Outgoing Traffic from DC with Floating L3out



Traffic forwarding outside to DC with Floating L3out



Local traffic forwarding from local ACI leaf

Incoming traffic to DC is going through anchor leaf since it's advertises the prefixes with it's VTEP as next-hop

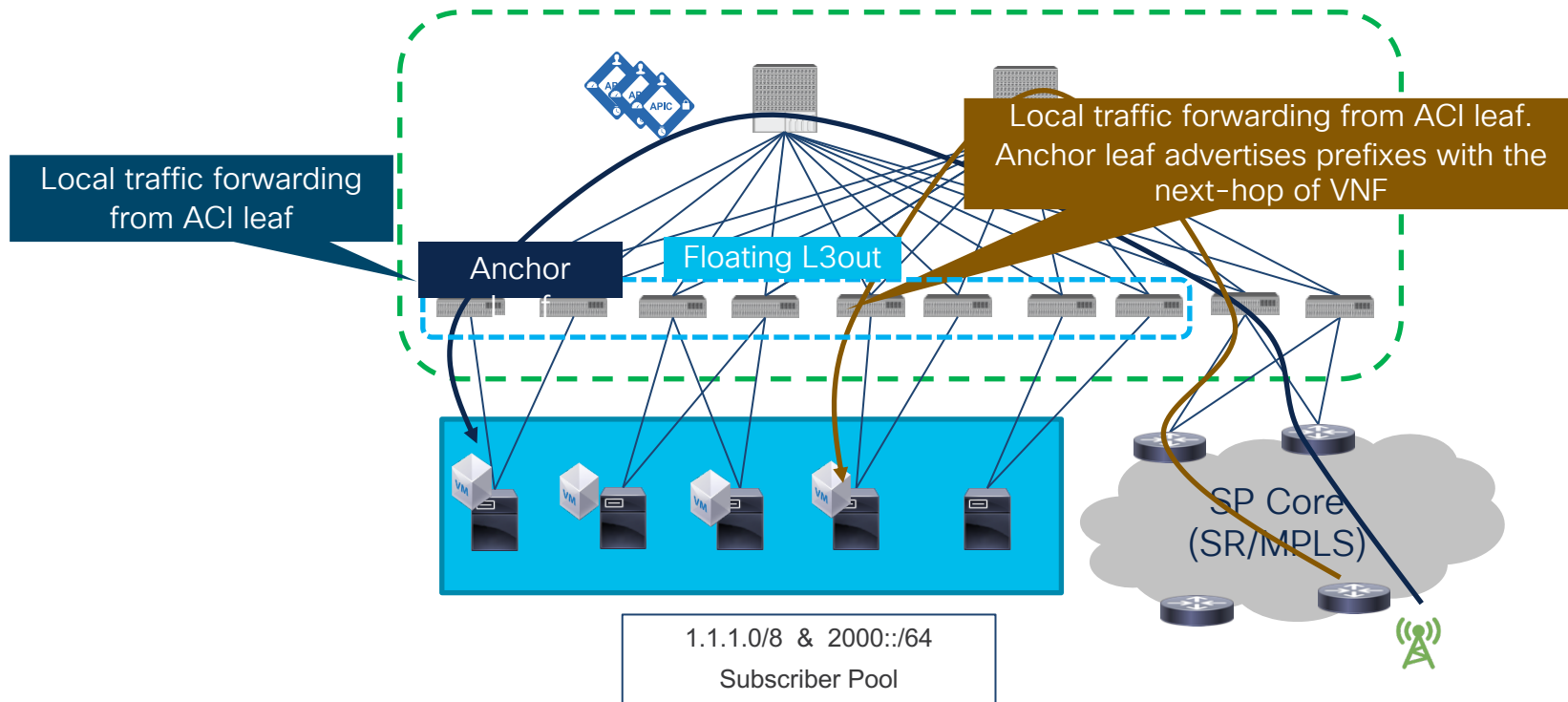
Anchor

Floating L3out

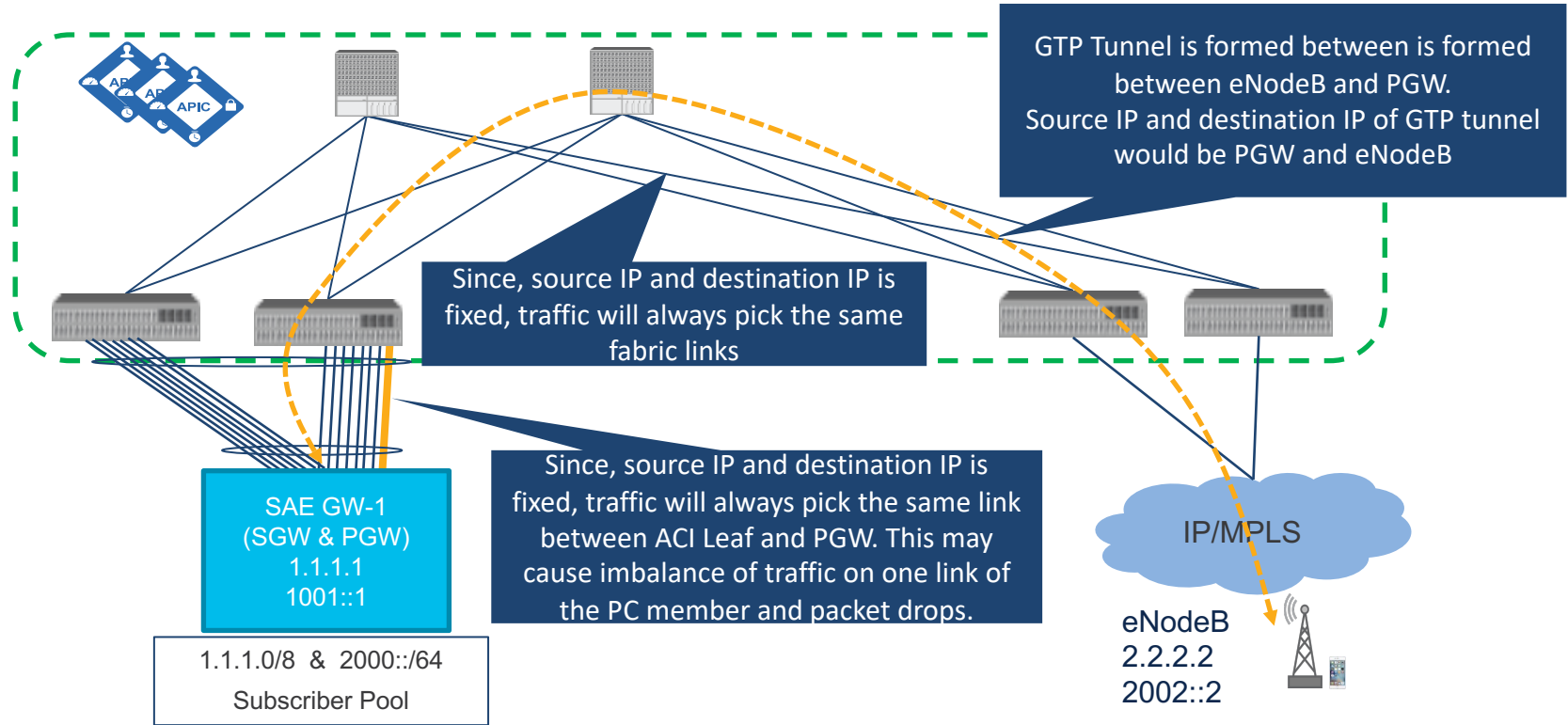
1.1.1.0/8 & 2000::/64
Subscriber Pool

SP Core (SR/MPLS)

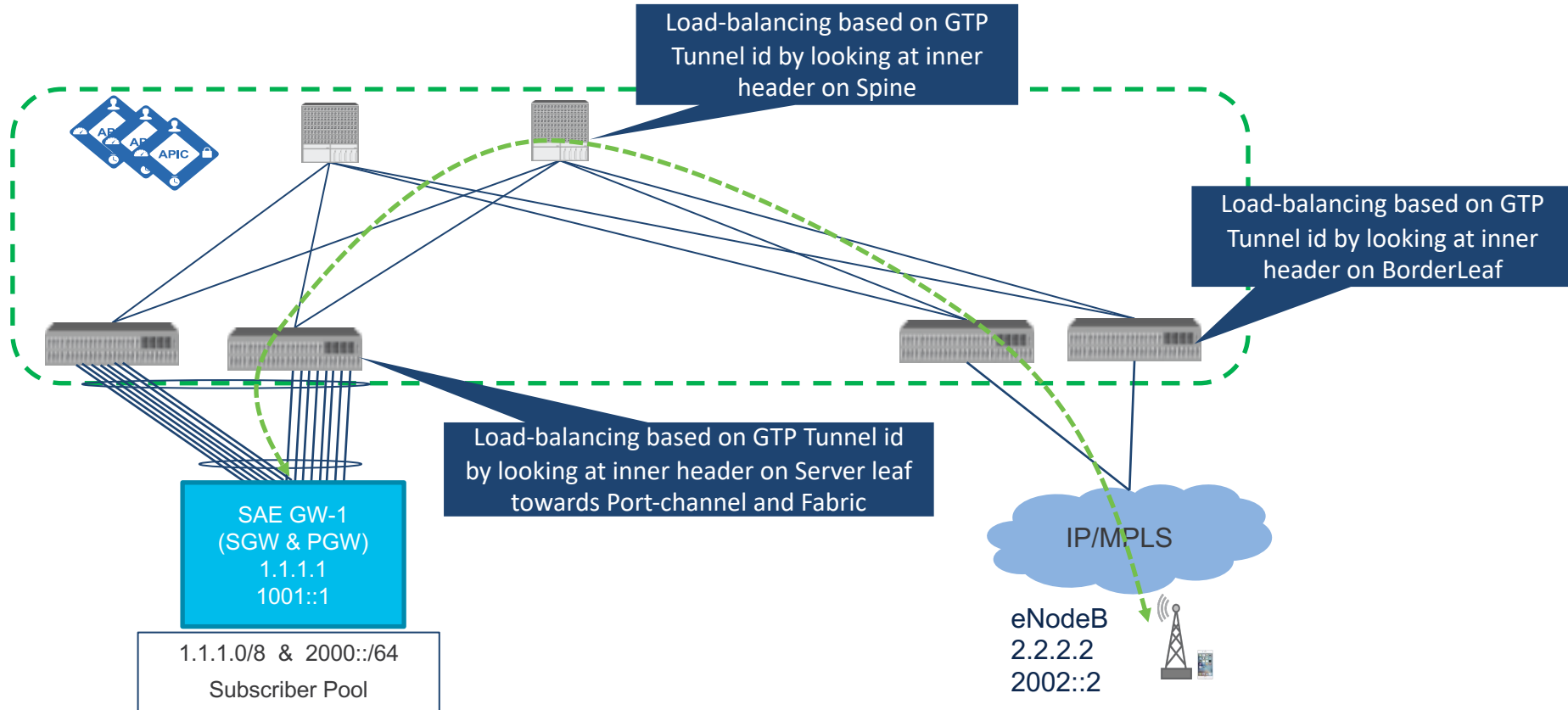
Incoming Traffic to DC with Floating L3out



Load-balancing without GTP based load balancing



GTP based load balancing

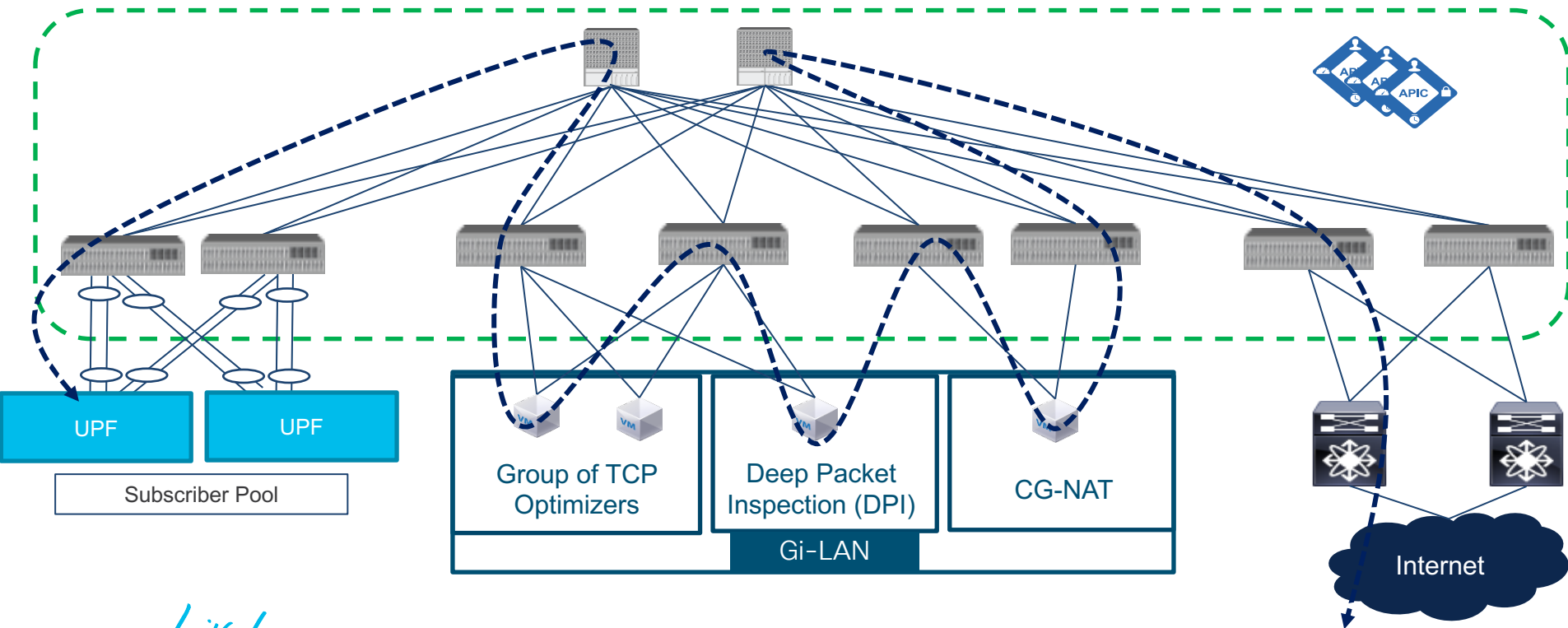




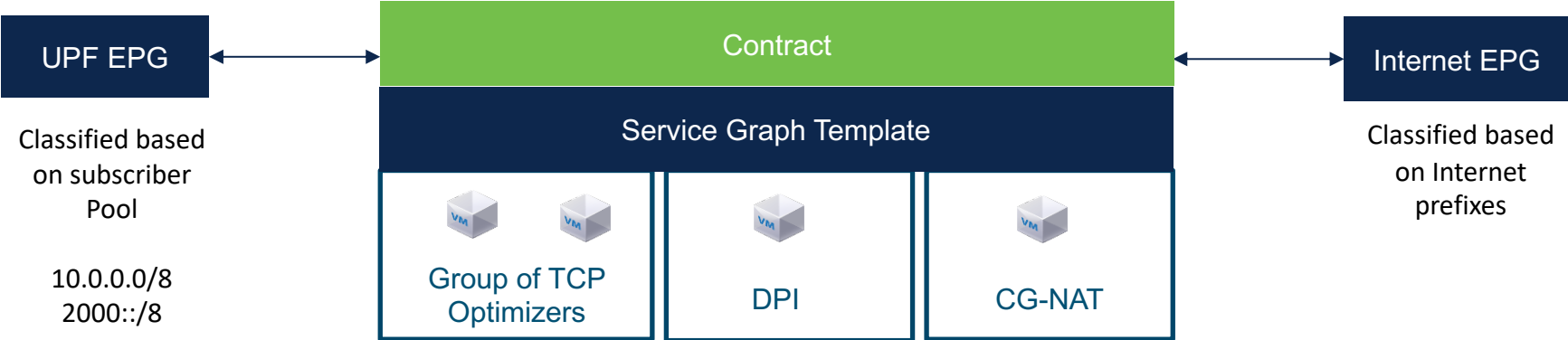
Agenda

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 - Security & Compliance
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Multi-Node Service chaining in Telco DC



Logical ACI Construct for service chaining



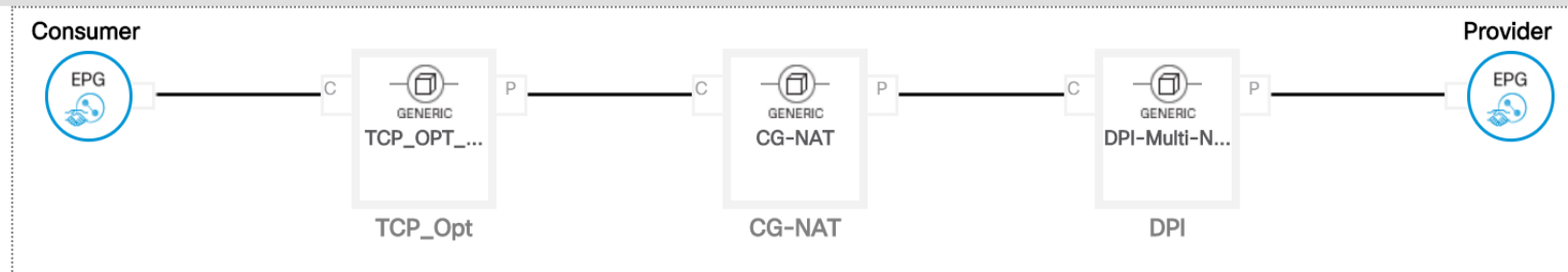
Simplified Configuration

L4-L7 Service Graph Template - service-chaining

Topology

Policy

Faults



TCP_OPT_Group Information

Route Redirect: true

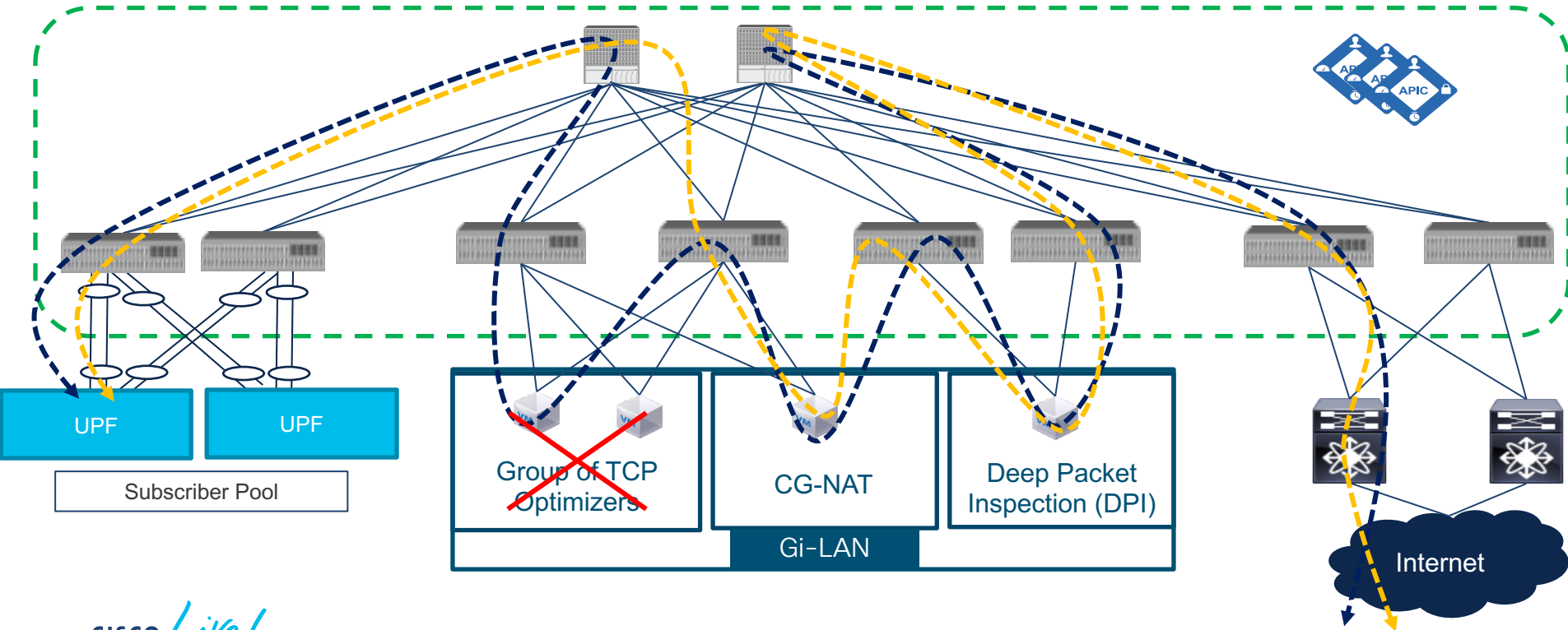
CG-NAT Information

Route Redirect: true

DPI-Multi-Node Information

Route Redirect: true

PBR Bypass a node

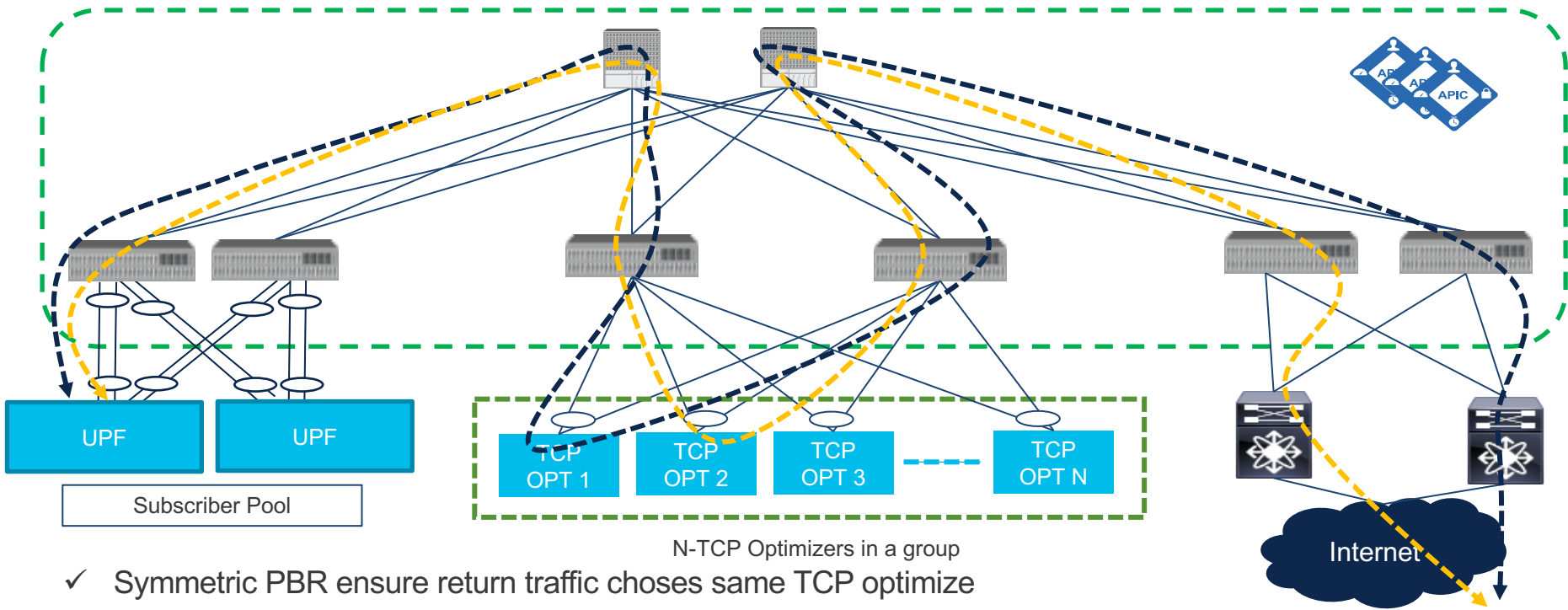
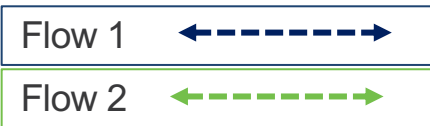




Fabric as Load-balancer

TCP Optimizer Integration with ACI

Automatic Load-balancing and Symmetry of traffic flow

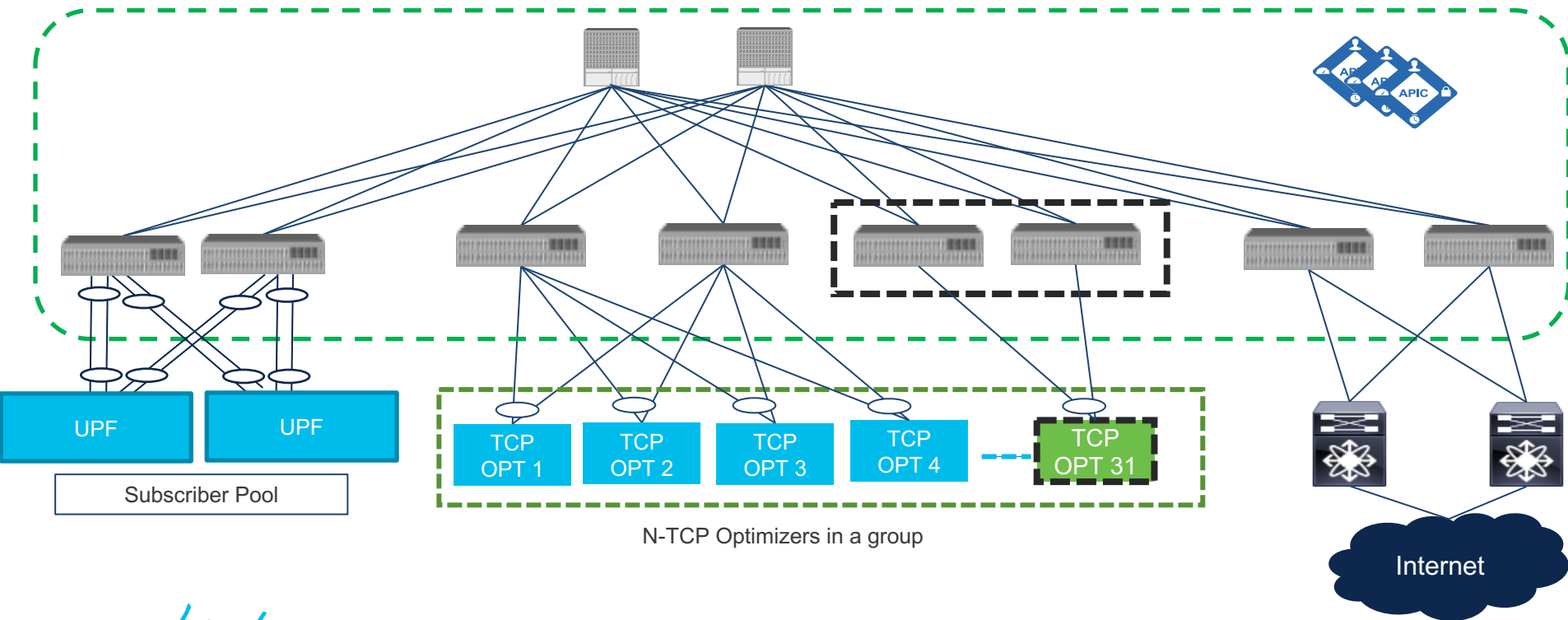


- ✓ Symmetric PBR ensure return traffic chooses same TCP optimizer
- ✓ Automatic load-balancing of traffic across different TCP optimizers based on forwarding table hash (Source IP, Destination IP, Source Port, Destination Port)

TCP Optimizer Integration with ACI

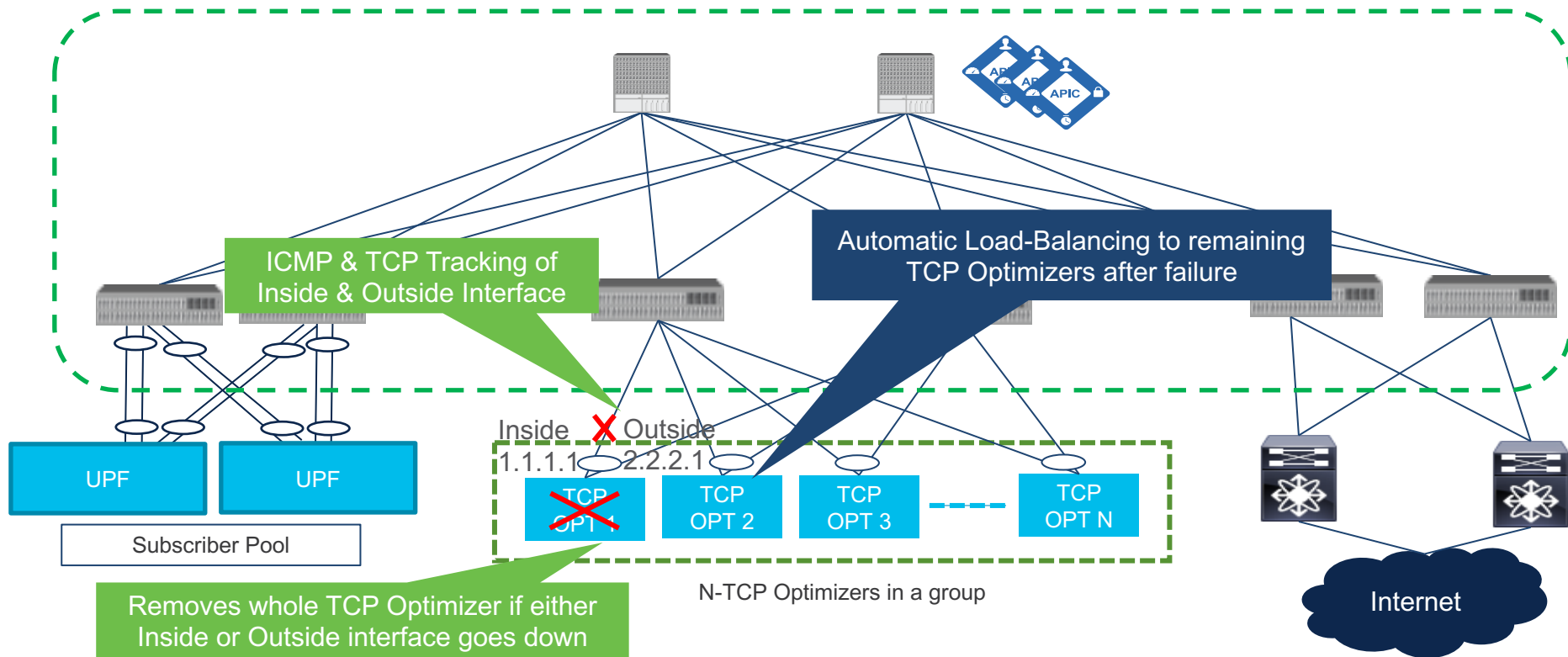
Simplified expansion

New TCP optimizers can be added anywhere in fabric



TCP Optimizer Integration with ACI

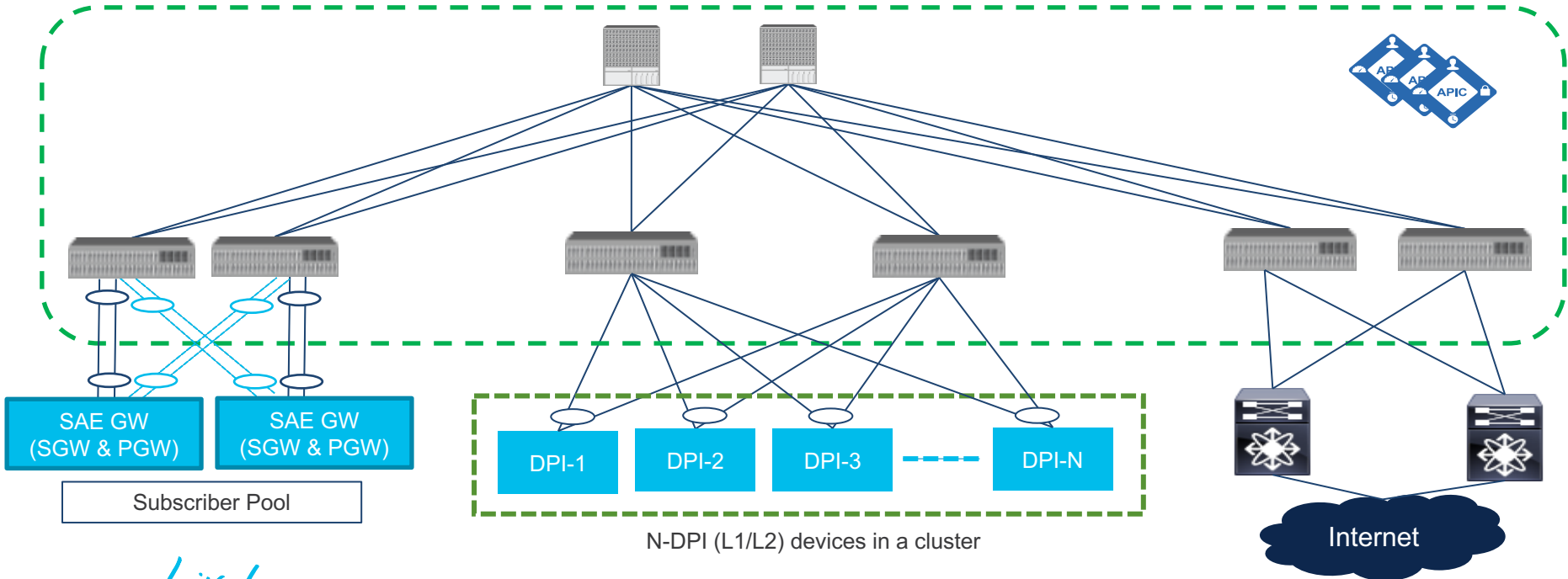
Tracking TCP Optimizer Liveliness



L1/L2 active/active device cluster

L1/L2 active/standby nodes are supported from ACI 4.0


ACI 5.0 allows multiple L1/L2 active/active devices in a cluster



Service chain visibility through app

Provides topology diagram, service chain configuration and IP reachability between source and destination

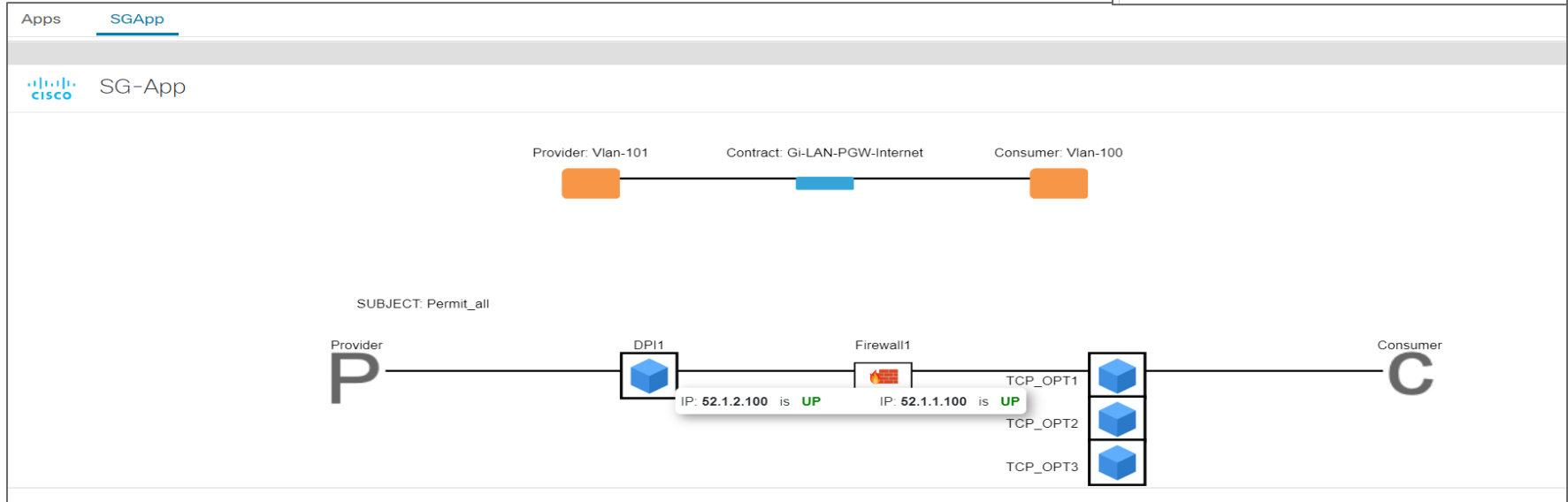
Apps SGApp

 SG-App

Enter Source IP

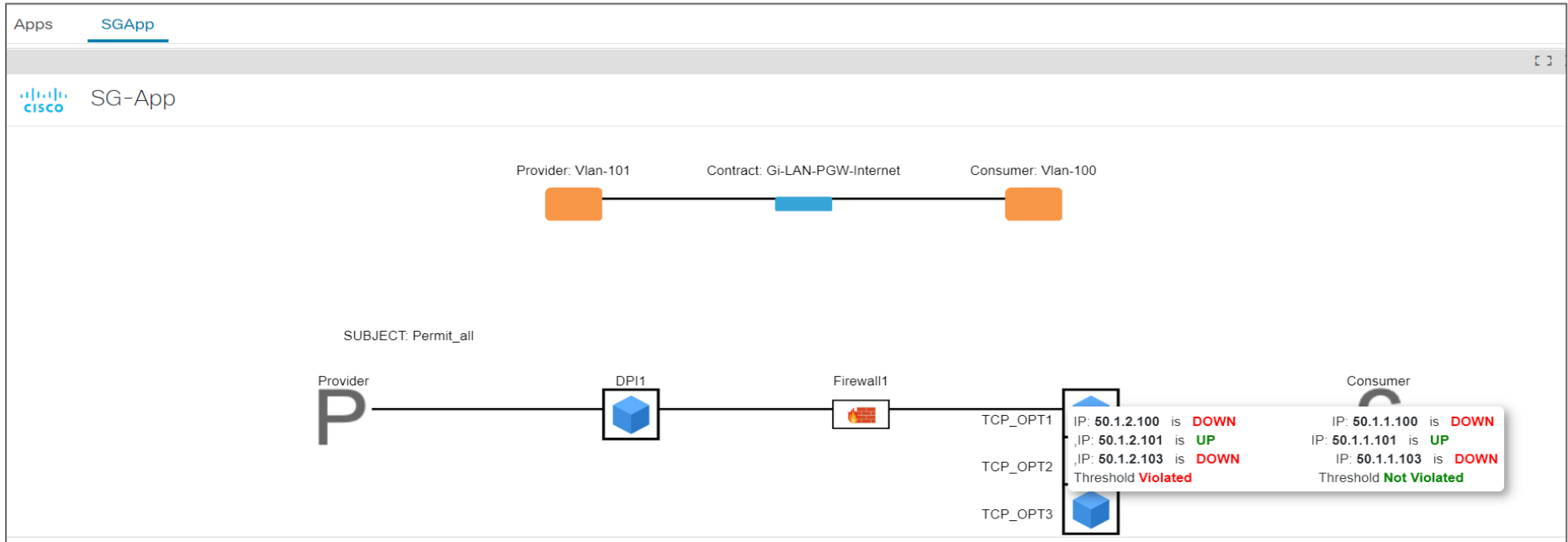
Enter Destination IP

Enter Refresh



Service chain visibility through app

State of fabric level load-balancing





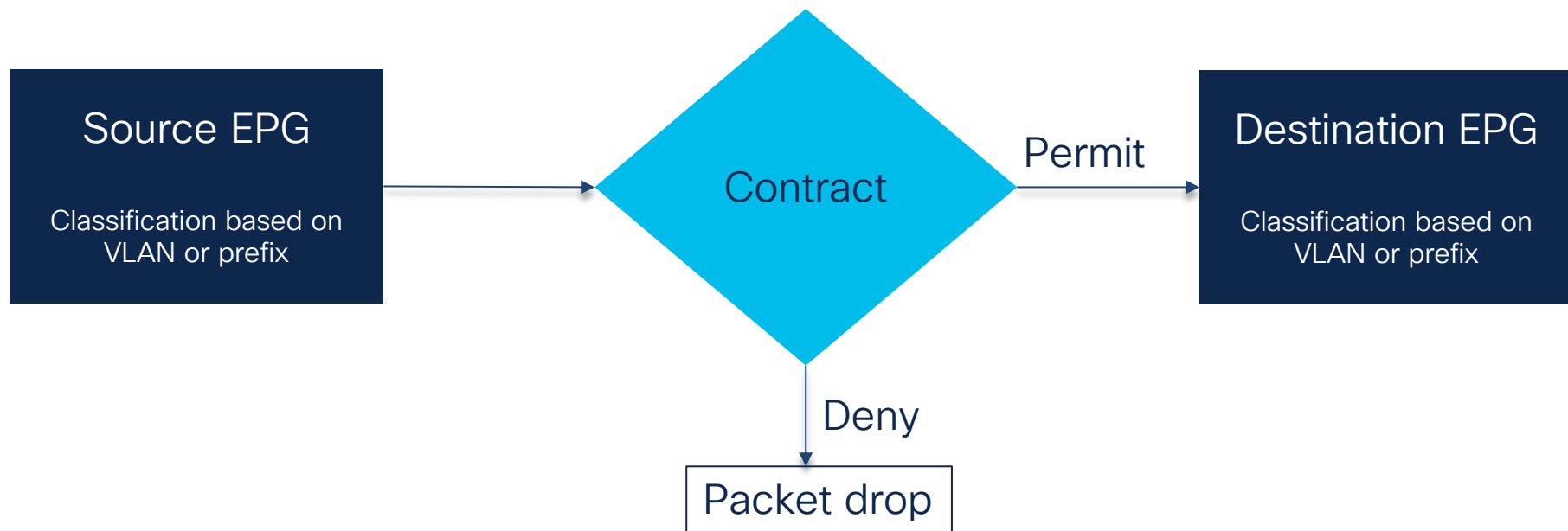
Agenda

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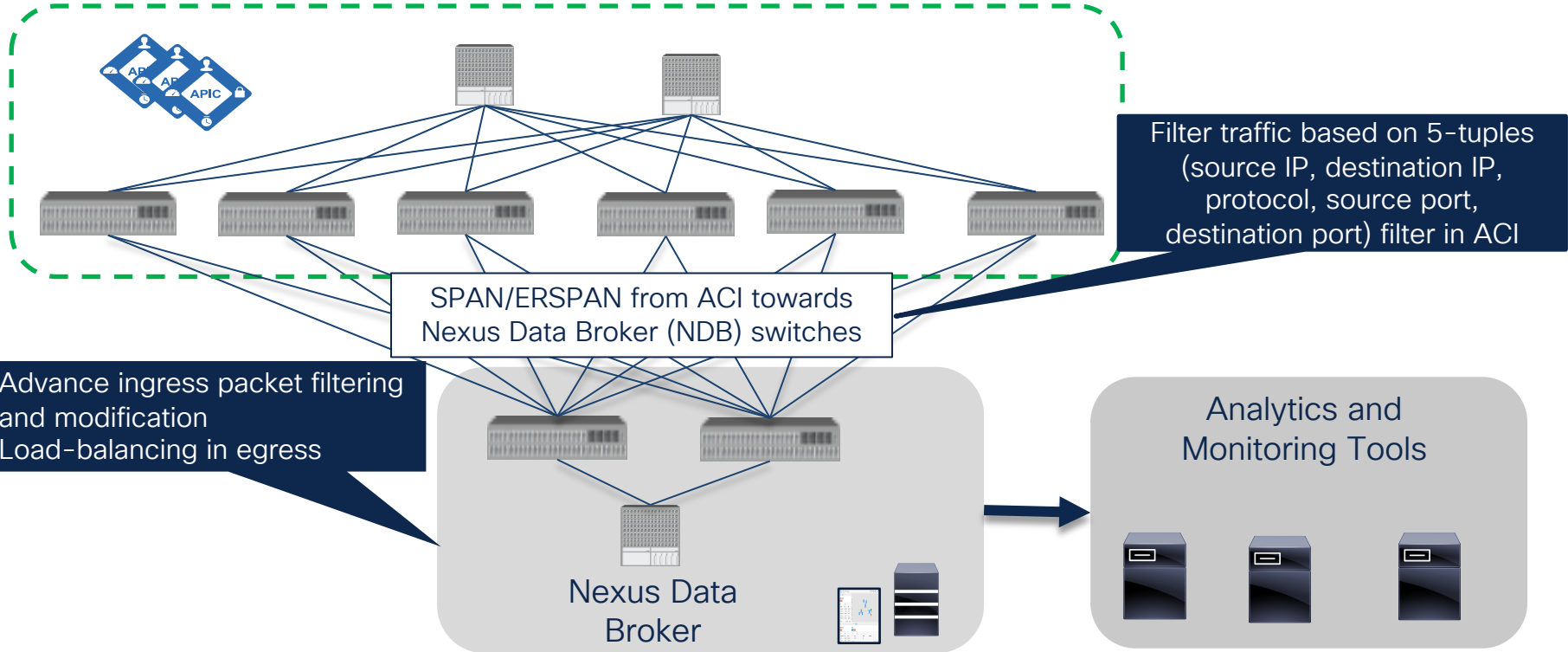
Contracts for communication between EPGs

No communication is allowed without contract

Default action is deny, only with explicit permit condition packets are forwarded



TAP/SPAN for monitoring/compliance



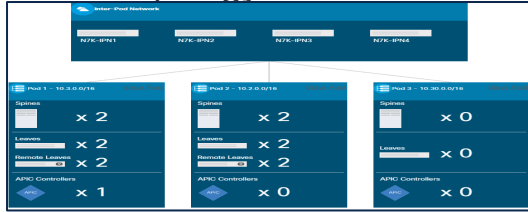


Agenda

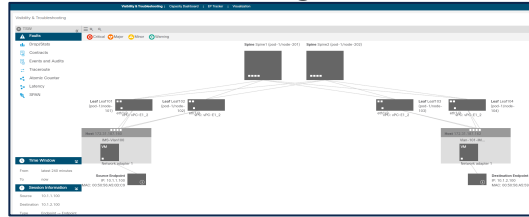
- Impact of 5G on Telco DC
- 5G ready DC solution with ACI
 - Distributed DC with SR/MPLS handoff
 - Automation
 - EPC deployment
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 - Security & Compliance
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Operations Tools

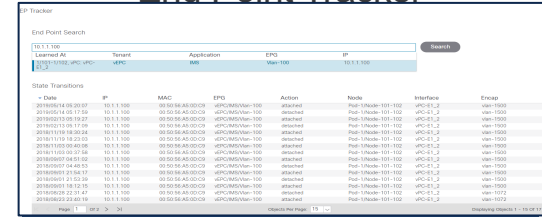
Topology Dashboard



Troubleshooting Wizard



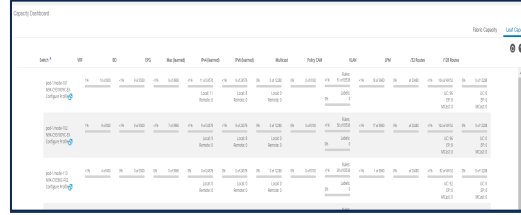
End Point Tracker



Faults



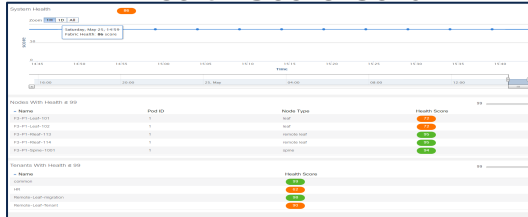
Capacity Dashboard



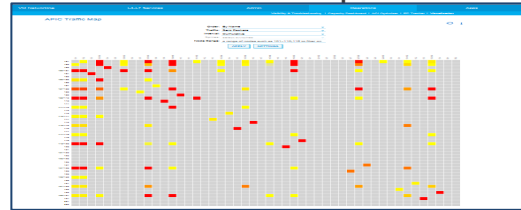
Link Statistics



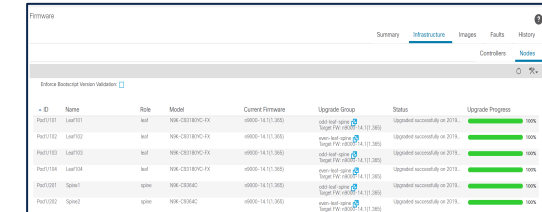
Health Score Card



Traffic Map



Upgrade/Downgrade



Troubleshooting with Health Score Card

Drill Down from Dashboard



APIC

System

Tenants

Fabric

Virtual Networking

L4-L7 Services

Admin

Operations

Apps

Integrations

QuickStart

Dashboard

Controllers

System Settings

Smart Licensing

Faults

Config Zones

Events

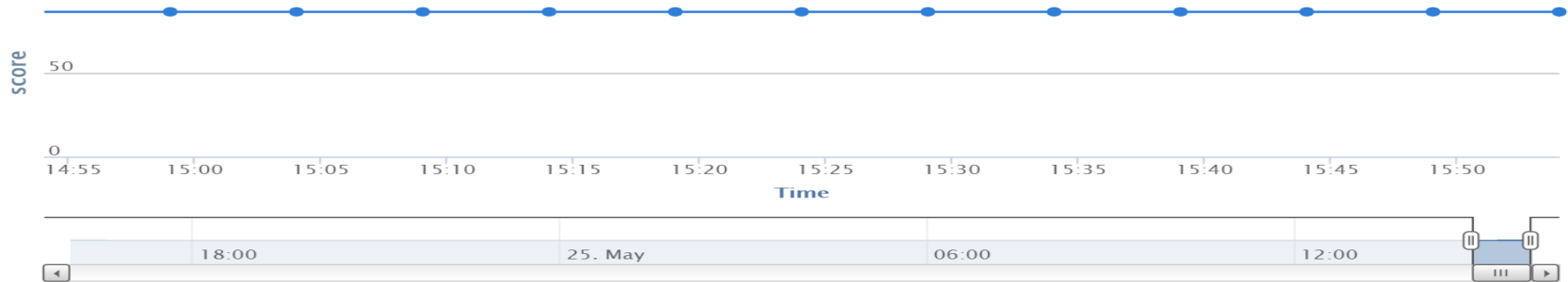
Audit Log

Active S

System Health

86

Zoom 1H 1D All



Nodes With Health \leq 99

99

| Name | Pod ID | Node Type | Health Score |
|-----------------|--------|-------------|--------------|
| F3-P1-Leaf-101 | 1 | leaf | 72 |
| F3-P1-Leaf-102 | 1 | leaf | 72 |
| F3-P1-Rleaf-113 | 1 | remote leaf | 95 |



Troubleshooting with Health Score Card

The diagram illustrates the Health Score Card for a system, showing a hierarchical view of components and their health scores. The components are:

- System:** Health Score 72 (Critical)
- Chassis:** Health Score 72 (Critical)
- Line Module Slot 1:** Health Score 72 (Critical)
- Power Supply Slot 1:** Health Score 98 (Good)
- Layer 1 Physical Interface (eth1/2):** Health Score 46 (Critical)
- Access Port 1/2:** Health Score 0 (Critical)
- Access Port 1/3:** Health Score 0 (Critical)
- Physical Interface phys:** Health Score 0 (Critical)

The 'Show Faults' panel displays the following information:

- Severity:** Critical (0)
- Acked:** 0
- Cause:** interface-physical...
- Creation Time:** 2019-05-13T16:42:2...
- Affected Object:** topology/pod-1/node-102/sys/phys-[eth1/2]/phys
- Description:** Port is down, reason being stpAbsent(connected), used by EPG on node 102 of fabric ACI Fabric3 with hostname F3-P1-Leaf-102
- Code:** F05...
- Last Transition:** 2019-05-13T16:44:4...
- Lifecycle:** Raised

Troubleshooting Wizard



APIC

admin



System Tenants Fabric Virtual Networking L4-L7 Services Admin **Operations** Apps Integrations

Visibility & Troubleshooting | Capacity Dashboard | EP Tracker | Visualization

Visibility & Troubleshooting

TSW

Faults

Drop/Stats

Contracts

Events and Audits

Traceroute

Time Window

From latest 240 minutes

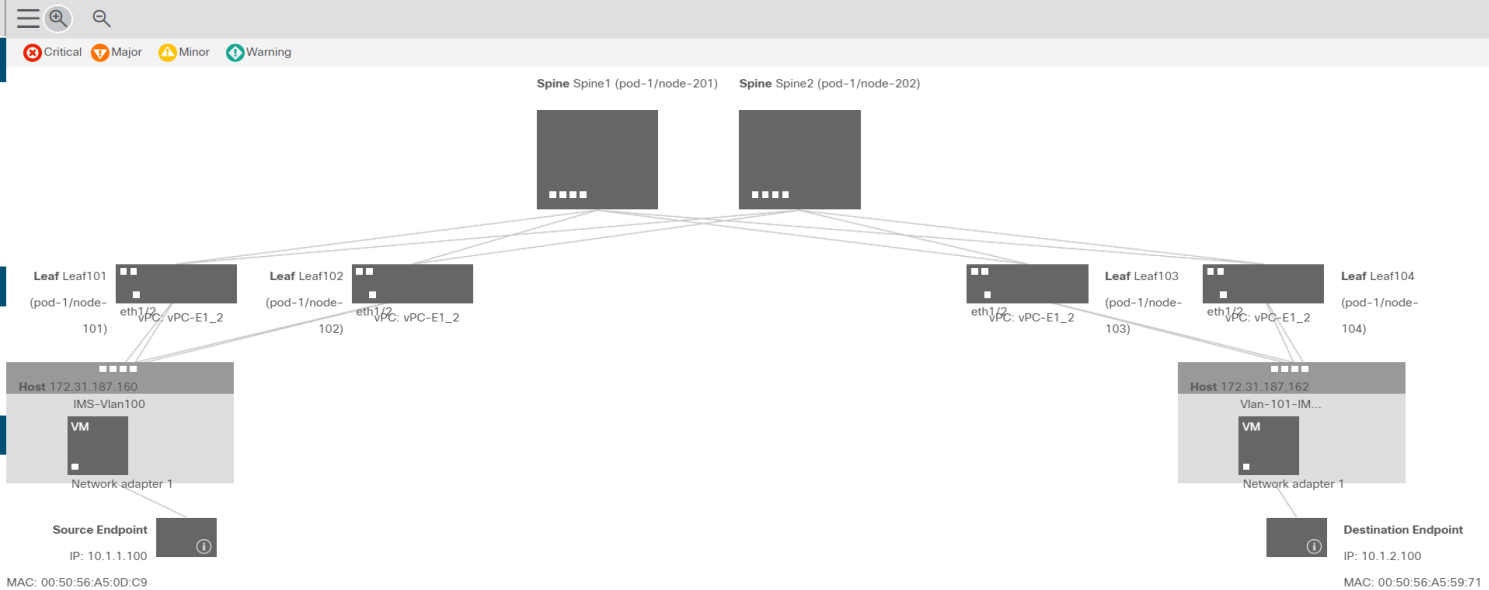
To now

Session Information

Source 10.1.1.100

Destination 10.1.2.100

Type Endpoint → Endpoint



Packet capture on APIC controller

- ✓ Easy to SPAN packets to APIC without dedicated server
- ✓ Packet policer to limit the number of packets sent to APIC

- ✓ Requires in band connectivity
- ✓ 10 PCAP files of 1MB each to limit the usage of APIC

The screenshot displays the Cisco APIC Operations console. The top navigation bar includes System, Tenants, Fabric, Virtual Networking, L4-L7 Services, Admin, Operations (selected), Apps, and Integrations. Below this is a secondary navigation bar with Visibility & Troubleshooting (selected), Capacity Dashboard, EP Tracker, and Visualization.

The main content area is titled "Visibility & Troubleshooting" and contains a "TSW" (Troubleshooting Wizard) section with a search bar and a list of diagnostic tools: Faults, Drop/Stats, Contracts, Events and Audits, Traceroute, Atomic Counter, and Latency. The "SPAN" tool is highlighted in the left sidebar.

The network diagram shows two leaf switches, Leaf Leaf101 and Leaf Leaf102, connected to a host (Host 172.31.187.160) and a VM (VM). The host is connected to the leaf switches via vPC-E1_2. The VM is connected to the host via Network-adapter 1. The source endpoint is identified as IP: 10.1.1.100 and MAC: 00:50:56:A5:0D:C9.

The "SPAN - Bidirectional ERSPAN" configuration window is open, showing the following settings:

- ERSPAN Source: Unchecked (interface not selected).
- ERSPAN Destination: APIC (selected).
- Destination Type: EPG, APIC, Host via APIC, Predefined Destination Group.
- Source IP Prefix: 10.1.1.0/24.
- Flow ID: (empty).
- Preferred Version: (dropdown menu).
- Create Time: 2019-05-28T20:23:25.
- PCAP File Download: [pcap_00001_20190528202325.pcap](#).

Simple Return Merchandise Authorization (RMA)

Decommission the old switch by removing the controller

Register the new switch by provide same Node ID and Node Name

Old Leaf

The screenshot shows the Cisco APIC interface. The 'Inventory' tab is selected, and a tree view on the left shows 'Pod 1' > 'Leaf101 (Node-101)'. A context menu is open over 'Leaf101', with the 'Remove From Controller' option highlighted by a blue box.

New Leaf

The screenshot shows the Cisco APIC 'Nodes Pending Registration' page. A table lists one node with the following details:

| Serial Number | Pod ID | Node ID | RL TEP Pool | Name | Role |
|---------------|--------|---------|-------------|------|------|
| FDO2216064G | 1 | 0 | 0 | | leaf |

A 'Register' dialog box is open, showing the following fields:

- Serial Number: FDO2216064G
- Pod ID: 1
- Node ID: 101 (circled in blue)
- RL TEP Pool: 0
- Role: leaf
- Node Name: Leaf101 (circled in blue)
- Rack Name: select

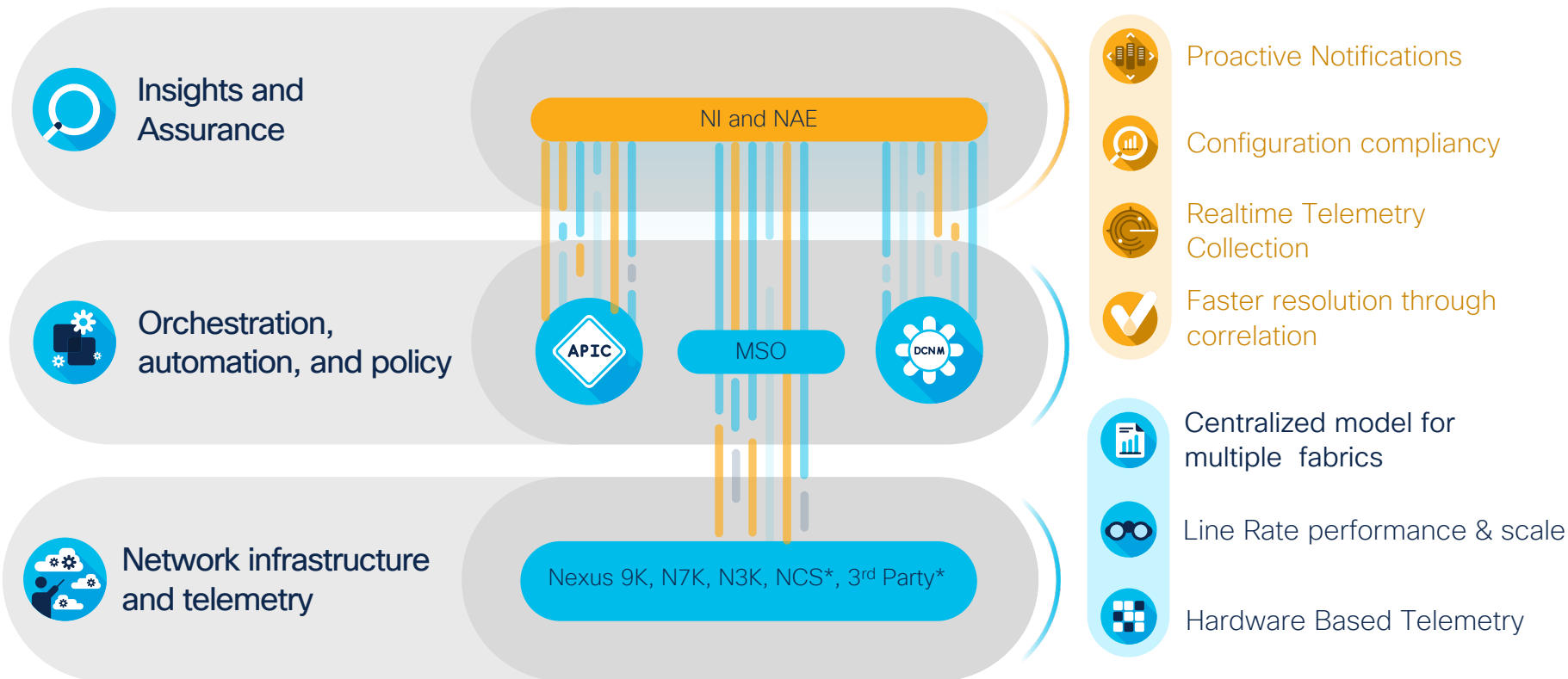
Buttons for 'Cancel' and 'Register' are visible at the bottom of the dialog.

Upgrade enhancements

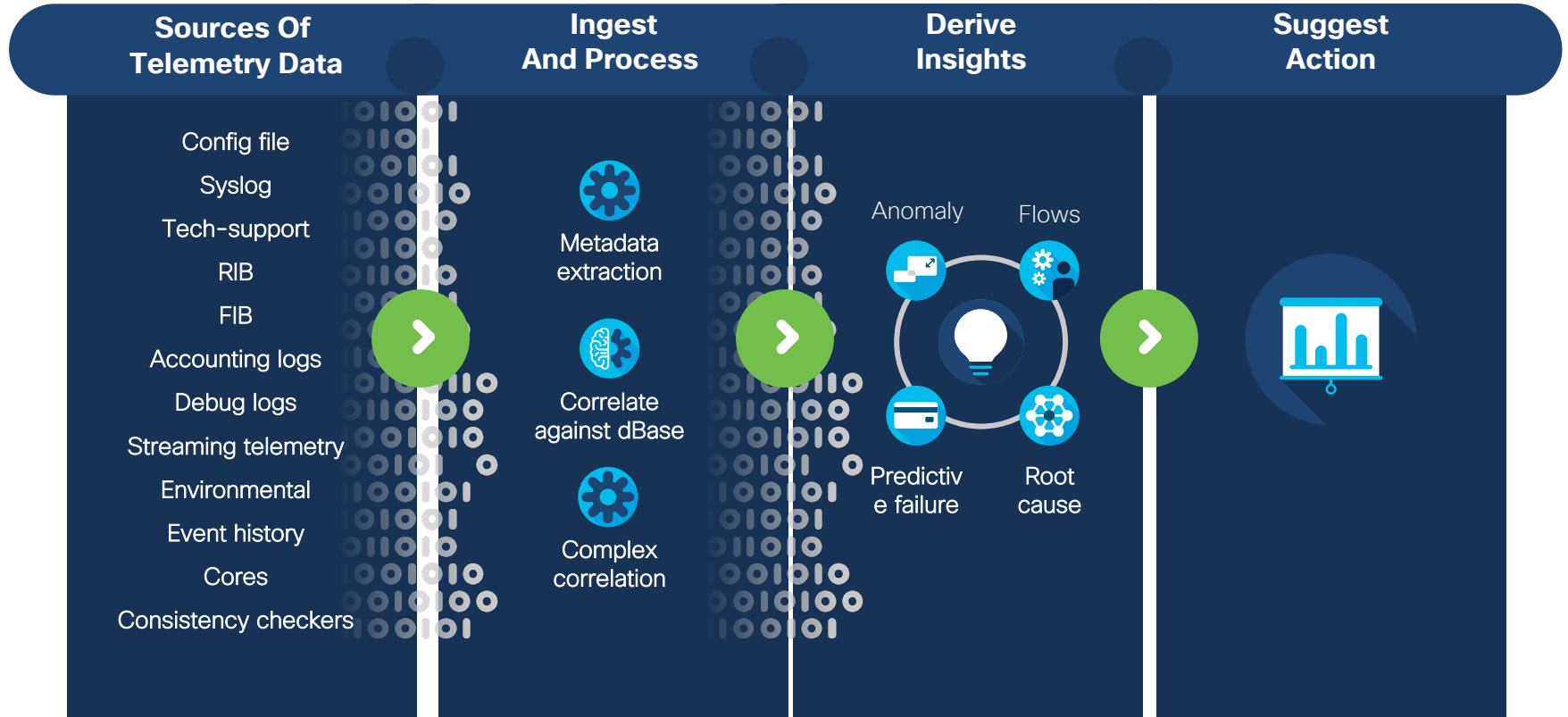
- Completely new UI for the entire upgrade flow
- Backend improvements to reduce time required for upgrades.
 - Switch image pre-download
 - APIC downloads the switch image to leaf and spine switches prior to the actual upgrade
- Unlimited number of switch nodes are upgraded at the same time by default
 - Prior to 5.0, the default was 20.
- More detailed APIC upgrade percentages
- Parallel upgrade across Multi-Pod

The screenshot shows the APIC (SR-MPLS) Admin interface. The top navigation bar includes System, Tenants, Fabric, Virtual Networking, L4-L7 Services, Admin (selected), Operations, Apps, and Integrations. Below this is a secondary navigation bar with AAA, Schedulers, Historical Record Policies, Firmware (Beta), Firmware, External Data Collectors, Config Rollbacks, Import/Export, and Downloads. The main content area is divided into two sections: System and Nodes. The System section shows 'Firmware Updates Overview' with a 'Complete' status, 'Firmware' version 5.0(0.264e) and catalog-70.7(0), and 'Storage' usage at 67%. The Nodes section shows 'Firmware Update Policies' with 'Ready to Install (1)', 'Physical Nodes by Firmware' with a total of 6 nodes highlighted in a green circle, and 'All Nodes by Role' showing 4 Leaf nodes and 2 Spine nodes.

Network Insights and Assurance



Network insights architecture

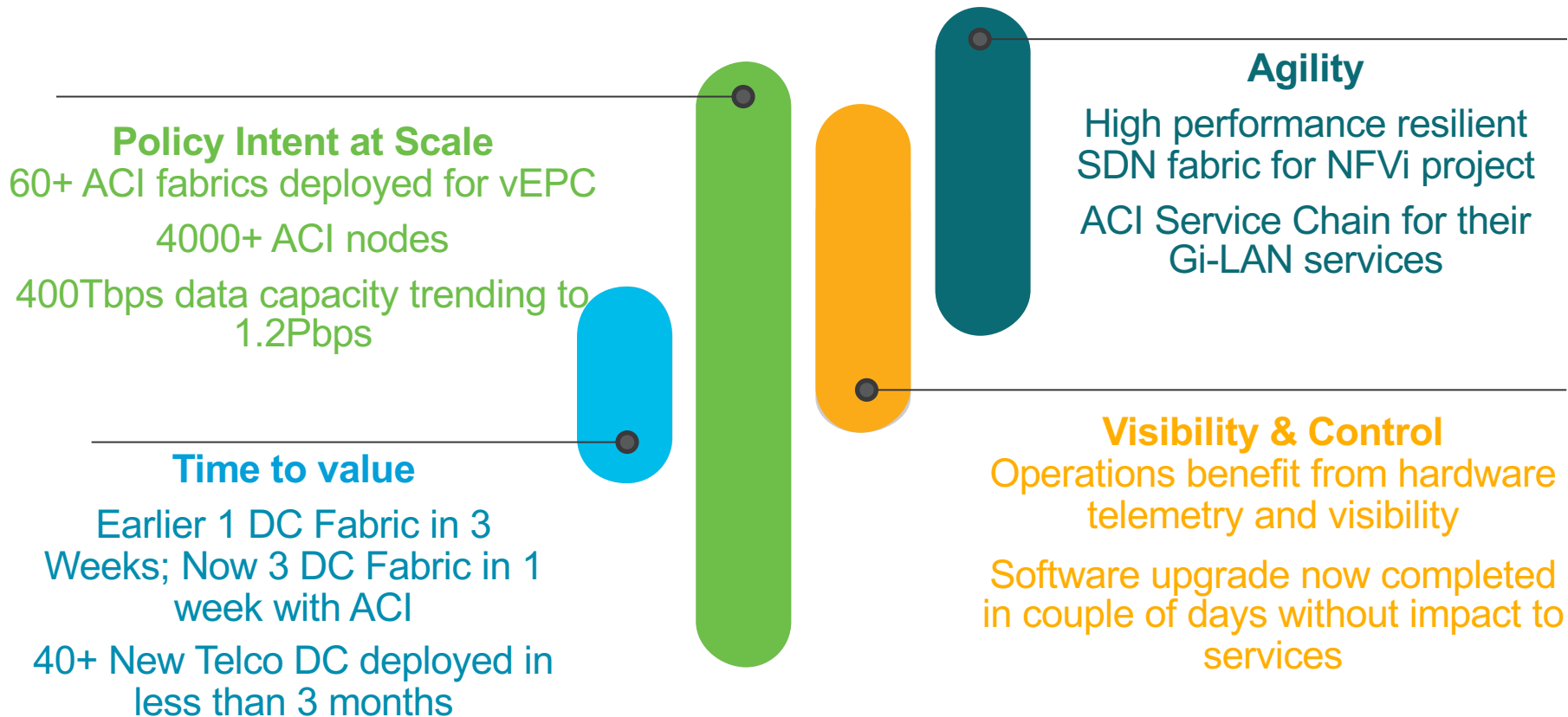




Agenda

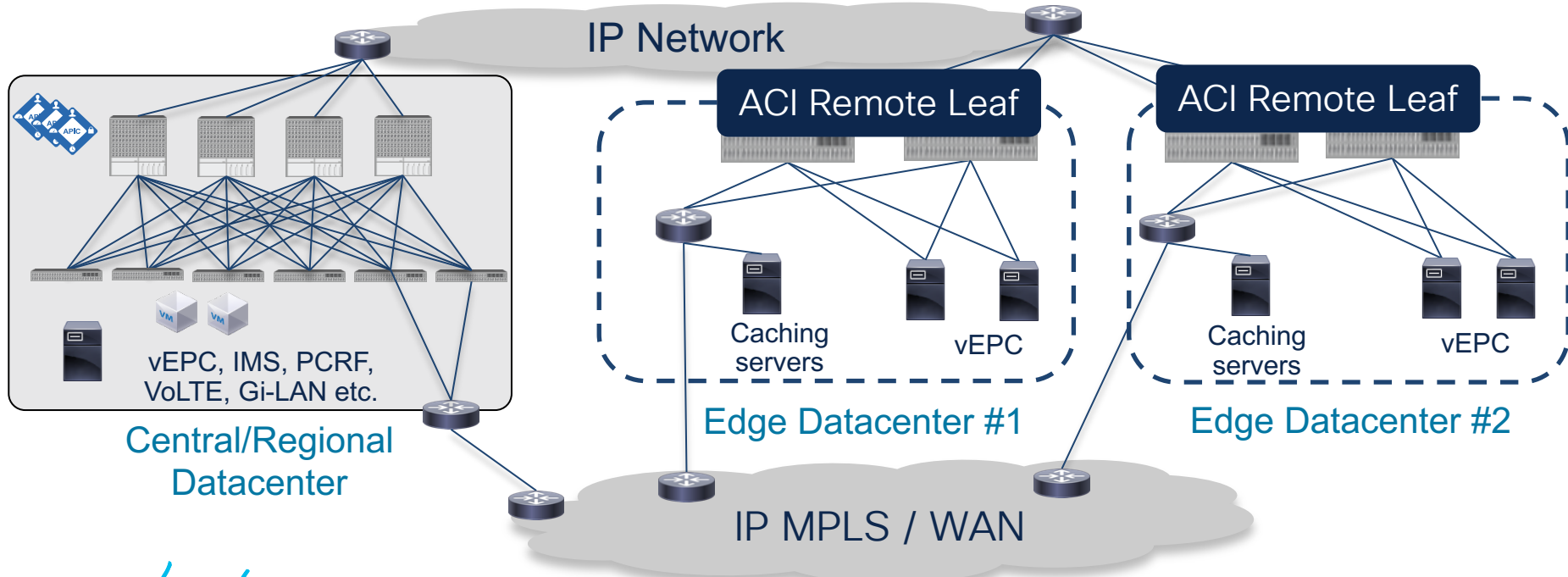
- Impact of 5G on Telco DC
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Large Telco DC deployment with ACI



Service Provider in Asia

- ✓ vEPC and Caching is deployed at Edge DC
- ✓ vEPC is connected to Remote Leaf
- ✓ APIC controller at Central site is managing Remote leaf deployed at Edge DC





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Conclusion

- 5G deployments will create multiple highly distributed DC's.
- Automation, Lifecycle Management, and Analytics will be key aspects.
- With ACI we do have an option to meet some of these challenges.

Related documents

- Demo: ACI to SR/MPLS Handoff
<https://www.youtube.com/watch?v=i3VrgXMLzfc>
- Simplifying Service Enablement in Telco Data Centers using Cisco ACI
<https://youtu.be/KxebKVIKe60>
- Demo: Multi-node Service Chaining in Telecom Data Centers Made Simple
<https://youtu.be/VeWbOI31UIM>
- Demo: How to Simplify the Expansion of Services in Telco Data Centers
<https://youtu.be/9fhmEC9at9g>
- ACI in Telco DC whitepaper
<https://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c11-740717.html>
- More about ACI
<https://www.cisco.com/c/en/us/solutions/data-center-virtualization/application-centric-infrastructure/index.html#~resources>

SPM Sessions – June Release

| Session ID | Session Title | Availability |
|----------------------|--|-------------------|
| DGTL-
BRKSPM-2010 | Applying Security in a 5G World | June 18th
2020 |
| DGTL-
BRKSPM-2013 | Next-Generation Mobile Enterprise: 5G, Private LTE, and Wifi 6 | June 18th
2020 |
| DGTL-
BRKSPM-2071 | 5G Technology Updates | June 18th
2020 |

SPM Sessions – July Release

| Session ID | Session Title | Availability |
|----------------------|--|-------------------|
| DGTL-
BRKSPM-2001 | Accelerate Mobility deployment with Cisco Cloud Services Stack | July 15th
2020 |
| DGTL-
BRKSPM-2009 | Design 5G Ready Distributed Telco DC with Cisco ACI | July 15th
2020 |
| DGTL-
BRKSPM-2016 | 5G network with SD-WAN for Enterprise Customers | July 15th
2020 |
| DGTL-
BRKSPM-2020 | 5G Mobile Edge Computing | July 15th
2020 |
| DGTL-
BRKSPM-2129 | Deploying 5G and LTE for Enterprise and IoT | July 15th
2020 |
| DGTL-
BRKSPM-2950 | Rakuten Mobile: All in the Cloud from RAN to Core | July 15th
2020 |

SPM Sessions – September Release

| Session ID | Session Title | Availability |
|----------------------|---|--------------|
| DGTL-
BRKSPM-2002 | 5G CICD with Continuous Deployment & Automation Framework | Sep 9th 2020 |
| DGTL-
BRKSPM-2015 | Telco Cloud: your secret to a faster, smarter 5G network | Sep 9th 2020 |
| DGTL-
BRKSPM-2021 | 5G Enterprise Core Design in Industry Verticals | Sep 9th 2020 |
| DGTL-
BRKSPM-2023 | Sprint Scalable Cloud with Cisco VIM | Sep 9th 2020 |
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BRKSPM-2784 | 5G Cloud Native Deployment With Cisco VIM | Sep 9th 2020 |

Thank you

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Possibilities

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