

The background features a vibrant, abstract design with a color gradient from dark blue on the left to bright yellow and white on the right. The design consists of overlapping, wavy horizontal bands and a radial pattern of lines emanating from a bright white point on the right side, creating a sense of motion and energy.

CISCO *Live!*

Let's go



The bridge to possible

Automate Service Provisioning, Optimization and Assurance with SDN Controller

Cisco Crosswork Network Automation

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Operational Dilemma



Challenges

- Increasing Infrastructure Complexity and Scale
- Proliferation of services and traffic types
- Multiple tools, fragmented observability
- Lack of Cohesive Automation framework and tools
- Limited in-house software expertise

Automation is Key to drive Operational Agility

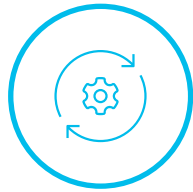
A faint, stylized illustration of a city skyline with various skyscrapers in shades of blue and grey, serving as a background for the lower half of the slide.

Agility is Essential in Operationalizing
Mass-infrastructure Networks

Agenda

- Why Automation is Critical?
- Demands of Next-Generation Automation Solution
- Introduction to Crosswork Network Controller (CNC)
- Exploring Opportunities for Automation
 - Visualization, Provisioning, Optimization, Assurance
- Maximizing Automation benefits for Next-Generation Networks
 - Segment Routing, 5G transport Slicing, Routed Optical Networking (RON)
- Conclusion

Why Automation is Critical?



Deliver services at
machine speed with
repeatable quality

81%

Reduction in
time to launch
new services



Make quicker, smarter
planning and operations
decisions

55%

Reduction in
operating
expenses



Bridge and synchronize
business and IT
processes

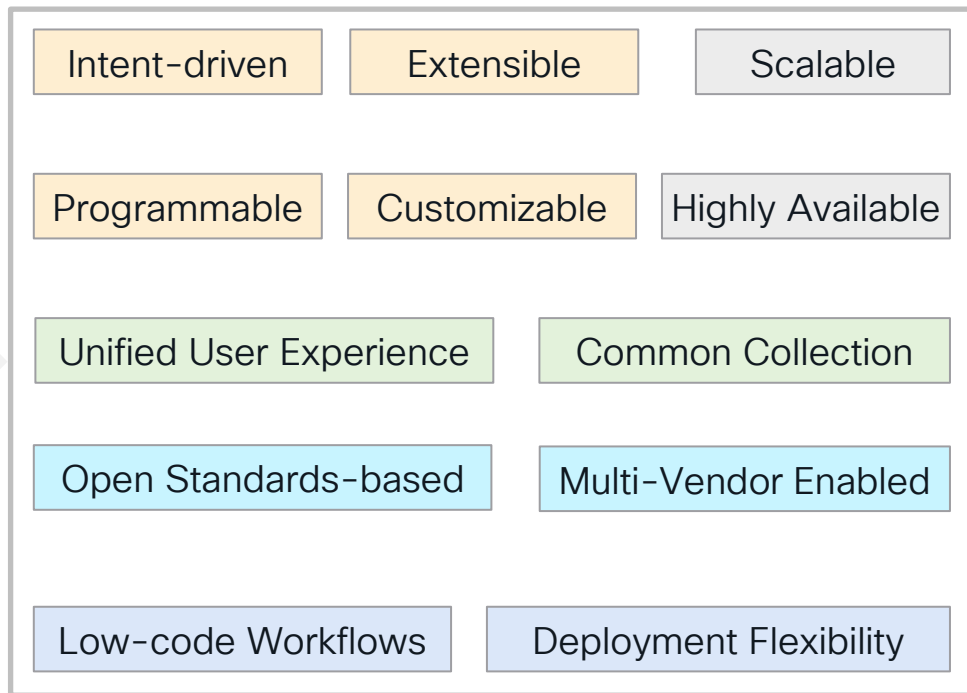
47%

Increase in
new services
revenue

Demands of Next-Generation Automation Solution

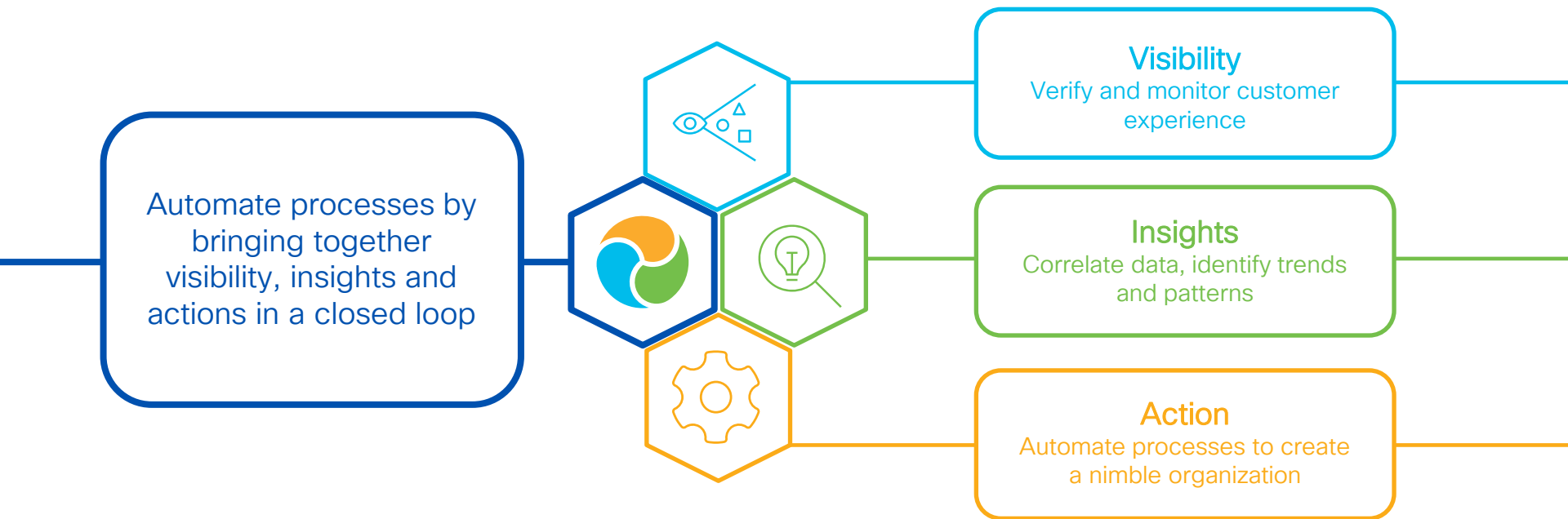
Challenges

- Increasing Infrastructure Complexity and Scale
- Proliferation of services and traffic types
- Multiple tools, fragmented observability
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- Limited in-house software expertise



Focus on Outcome-driven Automation

Crosswork Network Automation Pillars



Cisco Crosswork Network Controller (CNC)

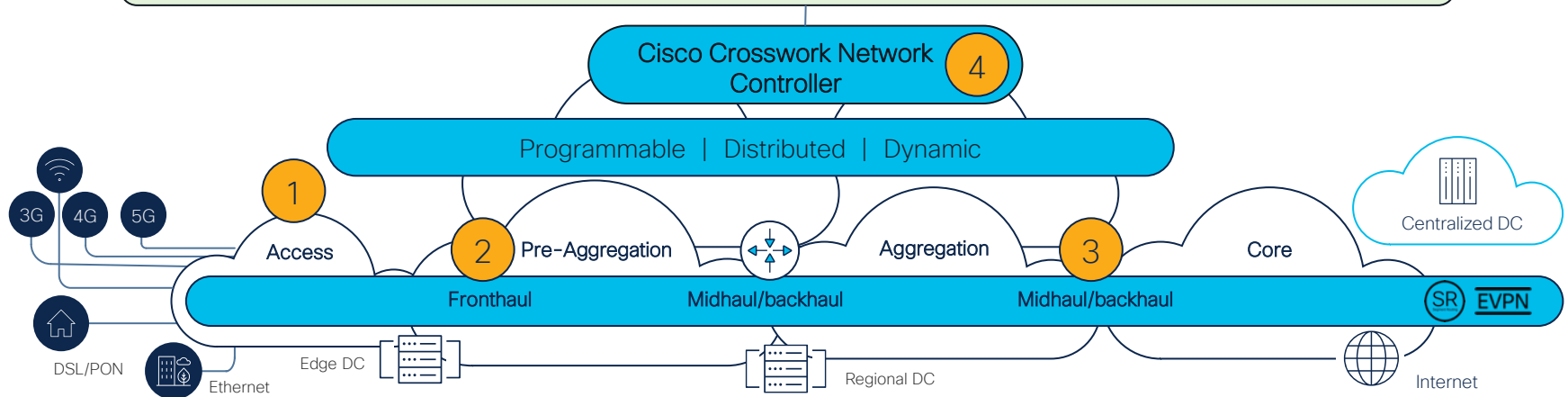
Simplify operational lifecycle - Converged SDN transport automation

Challenges

- 1 Time-consuming service provisioning
- 2 BW swings, over capacity
- 3 Congestions and service impacting conditions
- 4 Siloed, ineffective tools (high OpEx)

Outcomes

- + Intent-based automated provisioning
- + Dynamic BW management
- + Closed loop automation
- + Turnkey solution - Across lifecycle



Integrated Service and Device Management

OSS/BSS and/or Hierarchical Controller

↕ REST/RESTCONF Model-based



Crosswork Network Controller

Service and transport provisioning



- YANG service models
- 170+ multivendor devices supported in addition to Netconf

- Transport Slice, L2VPN, L3VPN, SR-TE, SRv6, RSVP-TE, Tree-SID and more
- Programmable to support new services and devices

Visualization



- Service, network, and device views
- End-to-end dynamic path and policy view

- Traffic engineering dashboard
- Flexible algorithm

- Transport slices and slice catalog
- Inventory, fault, performance



Element
Management



Dynamic traffic
engineering



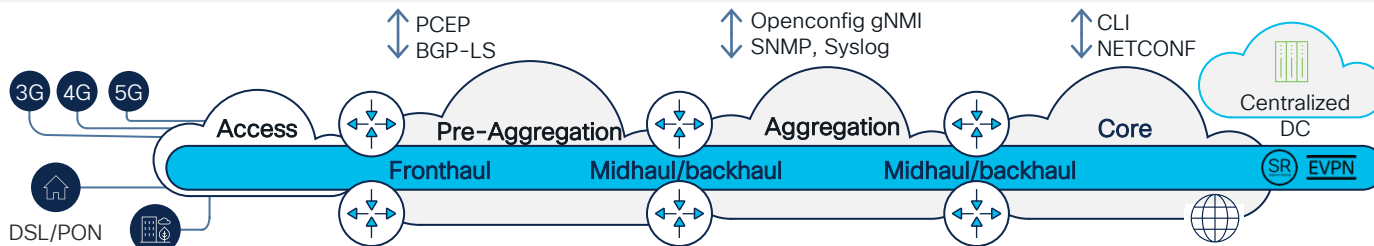
Service assurance

Embedded probes

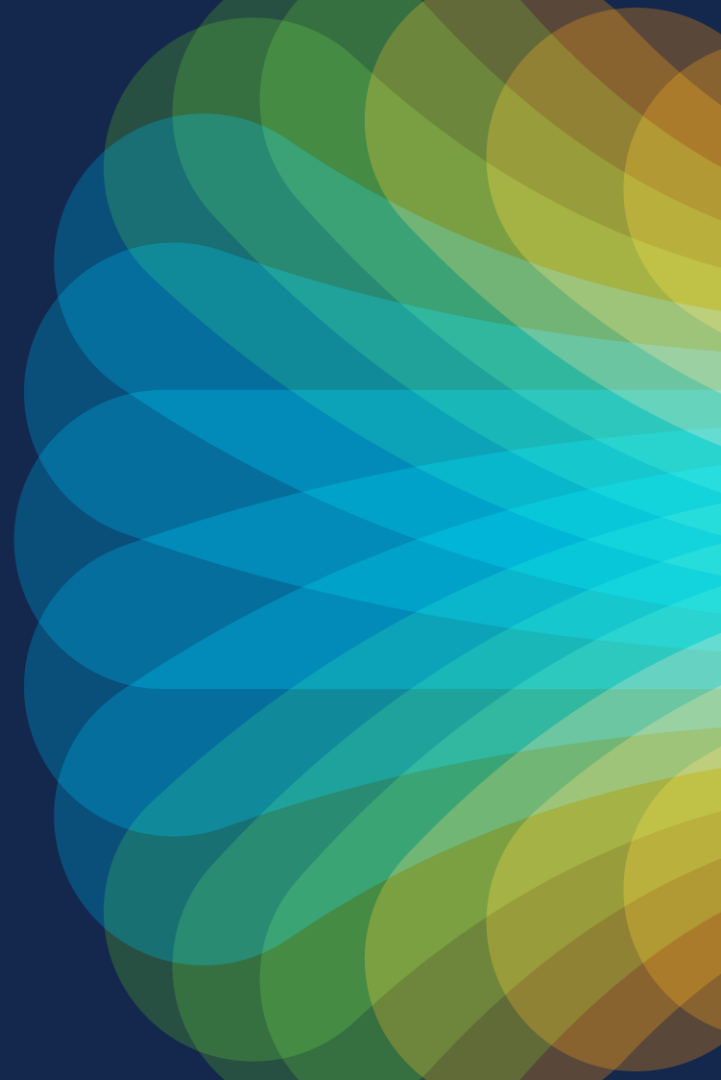
External probes



Closed-loop
automation

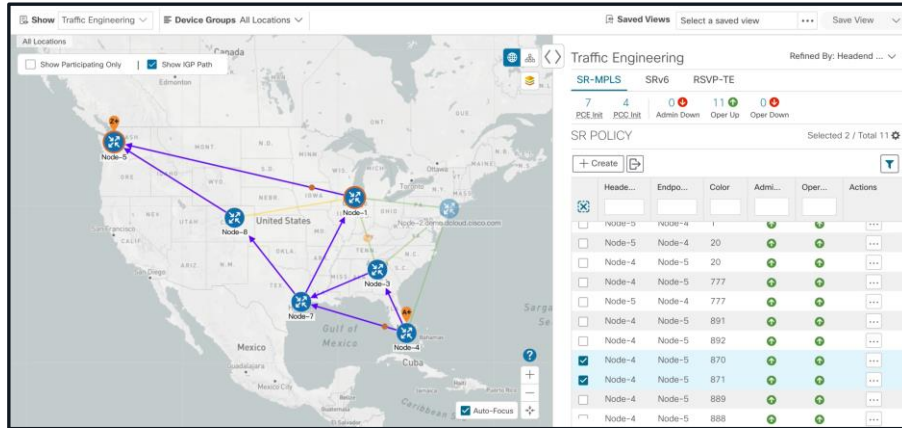


Exploring Opportunities for Automation



Real-Time Network Visualization

Visibility, Insights and Action



Visibility is Paramount

Challenges:

- Real-time visibility – End-to-end view of transport network

Solution:

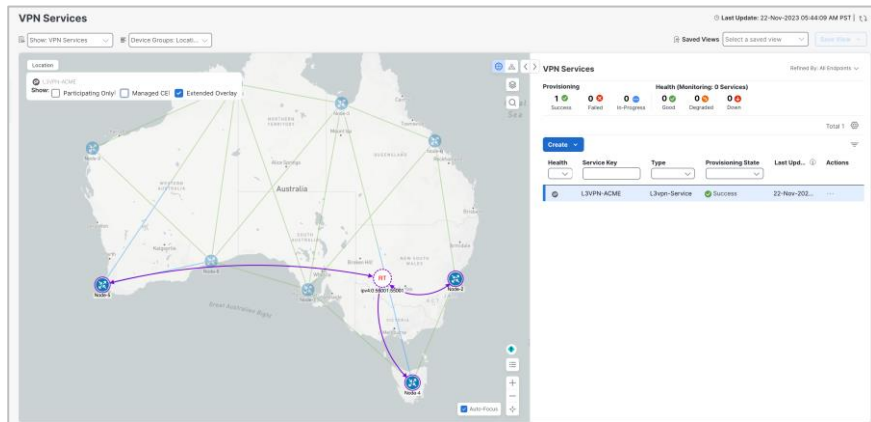
- Discovery of network via BGP-LS
- Real time visualization of topology, services, policies and history of changes, link congestion, latency, etc.
- Real time automatic detection of topology changes.

Outcome:

- Automatic topology discovery with real time information
- Accurate real time view into the network with details of intent, traffic engineering constraints
- Rapid detection of anomalies improving operational efficiency

Service & Transport Provisioning

Intent-based Automation



SR Policy SLA Objectives and Constraints

Objective: Latency/IGP/TE Metric Minimization

Constraints: Affinities, Disjoint Paths, Bandwidth



Rapid Time-To-Value

Challenges:

- Cumbersome and time-consuming service provisioning
- Missing transport and service context linkage and visibility, satisfy service specific performance objectives, such as low latency

Solution:

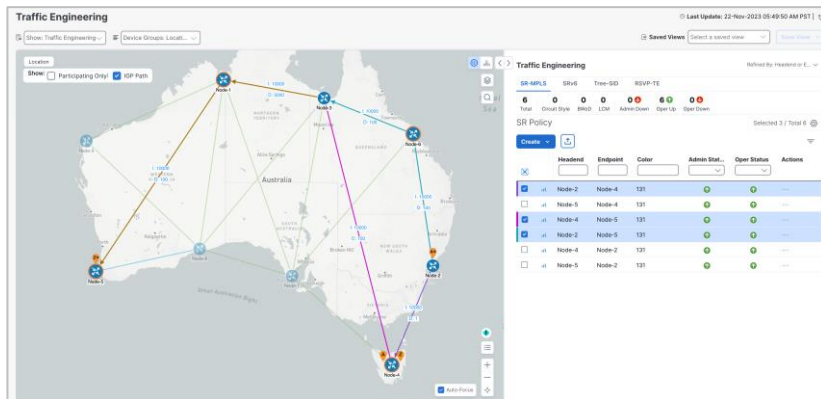
- Intent-based automated provisioning
- Customizable service intent with explicit SLA definitions
- Service Topology Visualization with actionable operational context (Health, Path changes, etc)

Outcome:

- Rapid Time to Value with provisioning reduced from weeks to minutes

Real-time Network Optimization

Closed loop Automation



SR Policy SLA Objectives and Constraints

Objective	Latency/IGP/TE Metric Minimization
Constraints	Affinities, Disjoint Paths, Bandwidth



Preserved Service Intent

Challenges:

- Manual re-optimization based on network changes is not scalable and poses risk to target SLAs

Solution:

- Define policy intent once
- Automatically detect topology changes
- Real-time re-computation of paths in violation of 'optimization metric' aka intent
- Optimized path is automatically provisioned

Outcome:

- Preserved service policy Intent and associated SLAs
- Enhanced operational agility with real time action
- Optimal utilization of network capacity

SR Circuit Style Provisioning and Visualization

Maximize the benefits of unified Segment Routing infrastructure

Challenges:

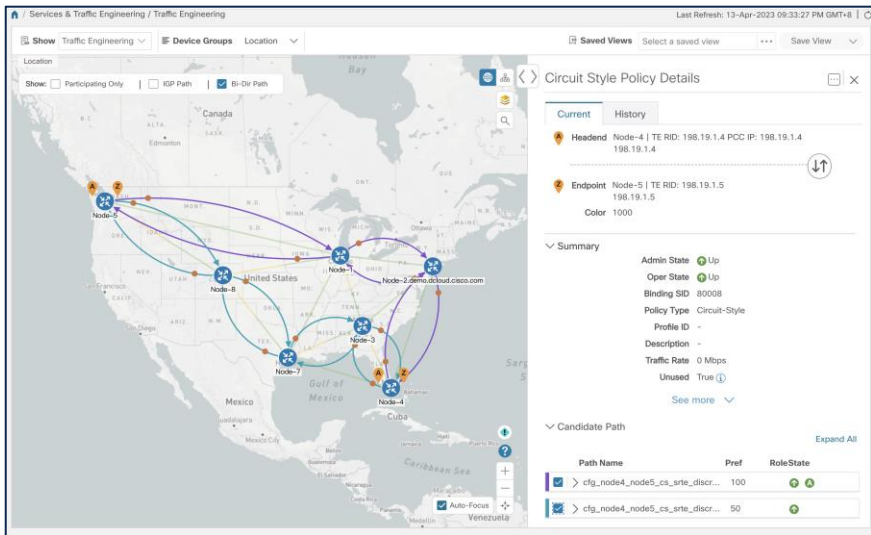
- Deliver services with bandwidth reservation and path protection over Segment Routing
- Leverage the Segment Routing infrastructure to carry any kind of services including OTN, TDM, PLE

Solution:

- Pre-book some bandwidth in the network to be used by these Circuit-Style policies
- Use the SDN Controller for bandwidth bookkeeping and path computation
- Use the SDN Controller to compute bi-directional, co-routed paths with path protection (under 50ms)

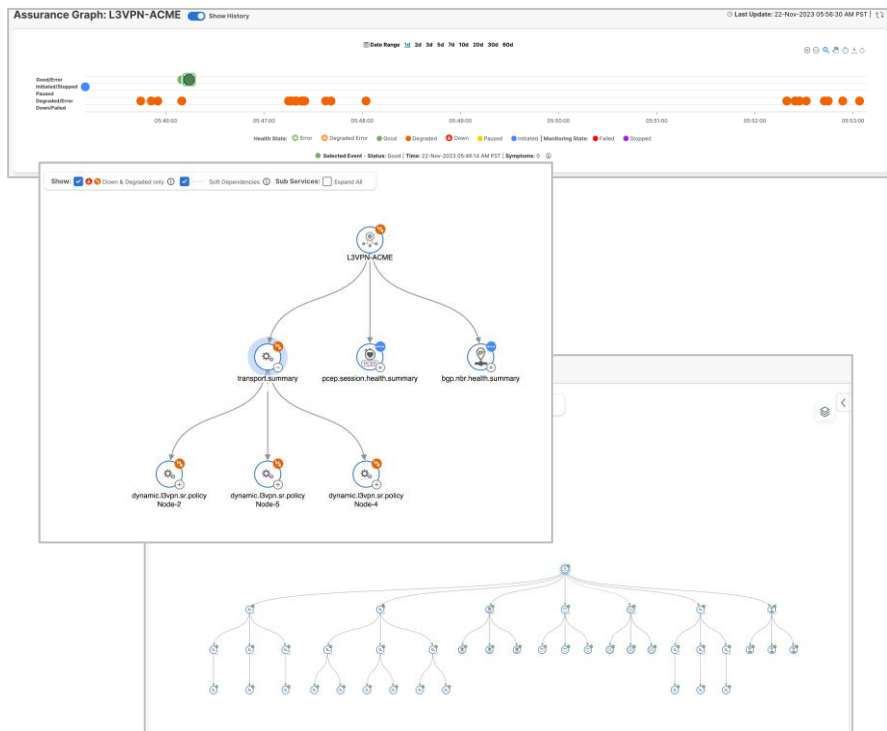
Outcome:

- One unified Segment Routing infrastructure can be used to carry any kind of services, including the most demanding one



Service Assurance

Enhanced end-user experience with expedited troubleshooting



Challenges:

- Decoupled Service Provisioning and monitoring
- Disconnect between customer service experience and network health

Solution:

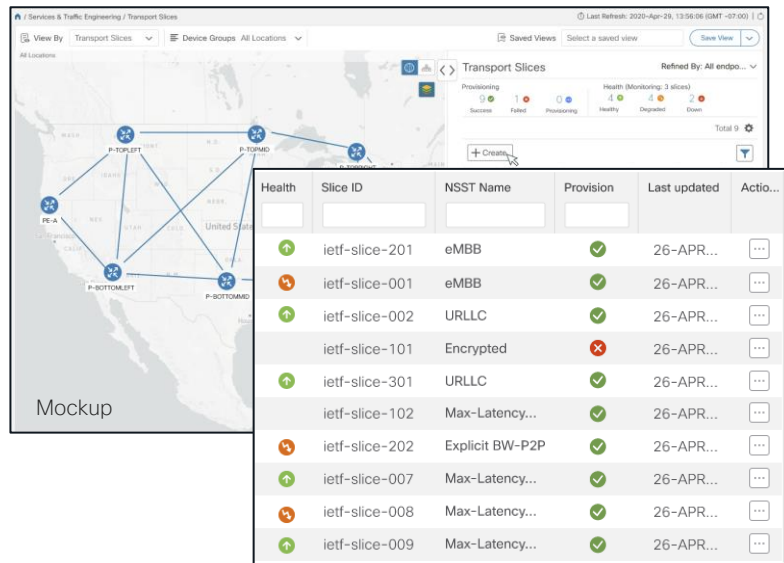
- End-to-end service health monitoring
- Proactive causality models
- Linkage between service and underlying components

Outcome:

- Reduction in Time to Detect service issues and remediation
- Improved user experience and operator productivity

Transport Slicing Automation

Simplify Slice Lifecycle Management



Challenges

- Automation of slice lifecycle functions
- Ensure delivery of distinct SLA/SLO requirements

Solution

- Service catalog with templates for common slice types
- Utilize existing CNC capabilities: Provisioning, Monitoring, Traffic engineering and closed loop optimization
L2VPN/L3VPN, SR TE, SRv6, FlexAlgo
- Leverage Circuit-Style Capabilities for bandwidth reservations
- SLA monitoring with QoS* and End-to-End network measurements
- Open, standards-based NBI (IETF slide YANG model)

Outcome

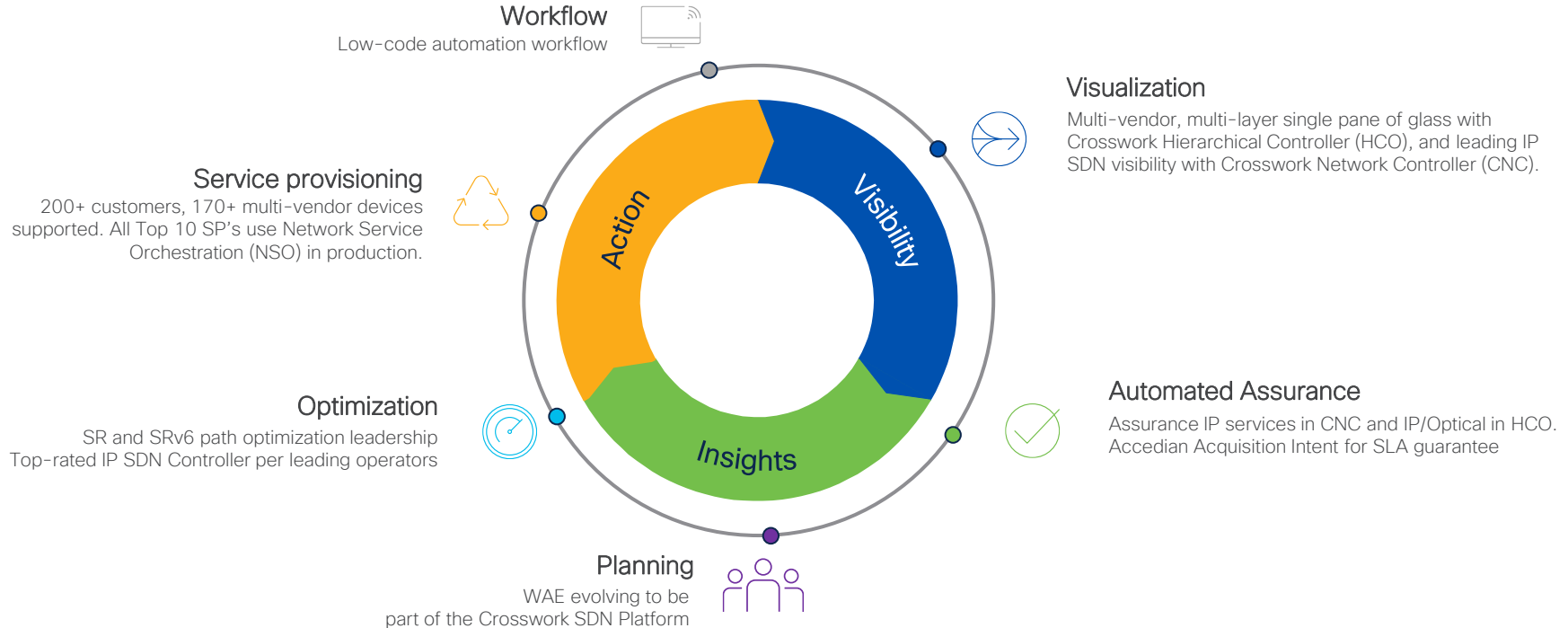
- Simplified deployment of 5G services with designated SLA
- New revenue stream can be enabled via Differentiated service offering

*In Planning

Demo: Operational Benefits of Automation

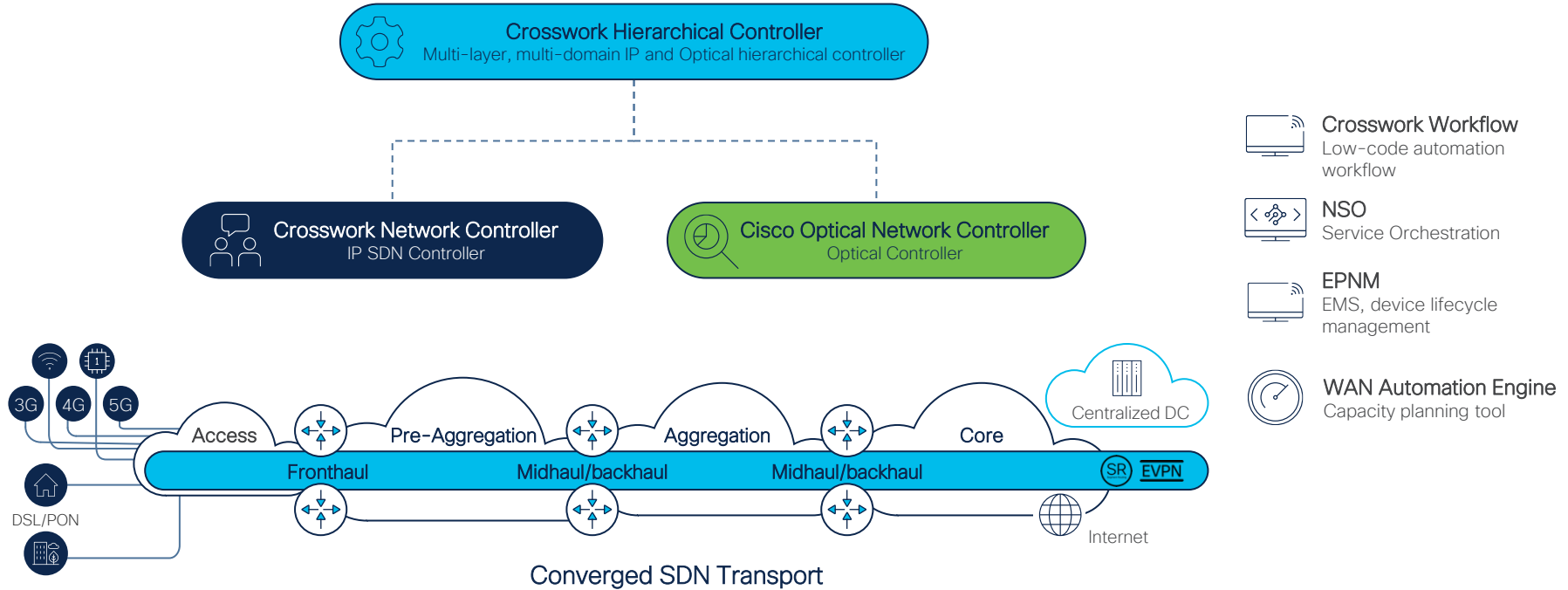
Operationalizing Mass-Infrastructure Networks

Foundation for closed-loop automation and zero-touch networks



Cisco Crosswork Automation Portfolio

Operationalizing Mass-infrastructure Networks



Maximizing Automation Benefits for Next-Generation Networks

Common Challenges

- Deployment simplicity
- Visibility
- Actionable health monitoring
- Expedited remediation
- Resource usage optimization
- Migration to next generation technologies

SR-MPLS/SRv6: Unlocking the Benefits

SR/SRv6 Unlocked with Crosswork Automation

SR/SRv6 Innovations

Service Creation
at Hyper Scale



SRv6 Network Visualization

Real-time Low Latency path

Advanced Traffic
Engineering (TE)



Disjoint Paths

Color Affinity

Centralized Path
Compute (PCE)



Intent-based Automated Steering

IGP Flexible Algorithms

Enhanced OAM &
Telemetry



Intent-based Network Slicing

Service Awareness + Infrastructure Visibility

Simplicity and Automation

Automated Service & Transport
Provisioning

TE with Simplicity and Scale

Granular TE control and SLAs

Operational Simplification

Improved service health and
End-user Experience

Migration to SRv6 from MPLS underlay

Cisco Crosswork Network Automation

Design SRv6 network topology

Introduce a new SRv6 RR

- Enable IPv6 Routing
- SRv6 on first set of PEs
- SRv6 on the rest of the PEs

Remove MPLS from the network

Post migration network checks

Design and Plan

Prepare

Operate and Optimize



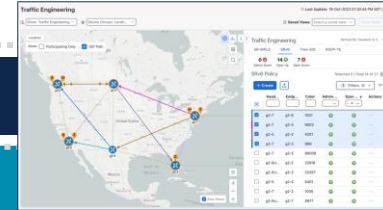
WAE



NSO/CWM



Crosswork Network Controller



Migration to SRv6 from MPLS underlay

Phase 1

Existing IPv4 Network

MPLS underlay/BGP services

- Step 1: Enable IPv6 routing
- Step 2: Introduce new RR for SRv6

Phase 2

SRv6 on first set of PEs

- SRv6 PEs advertise VPN services to both RRs (dual connected PEs)
- Use BGP best-path selection to prefer SRv6 or MPLS

Phase 3

SRv6 on remaining PEs

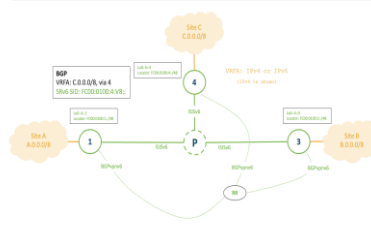
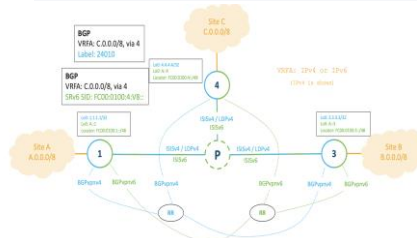
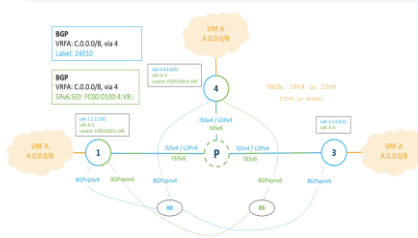
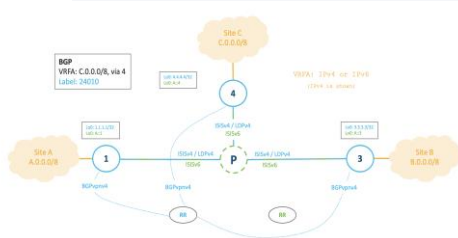
- All PEs advertise VPN services to both RRs (dual connected PEs)
- Use BGP best-path selection to prefer SRv6 or MPLS

Phase 4

Remove MPLS

- Left with IPv6 (or SRv6) underlay and SRv6 BGP service

Today's CNC demo



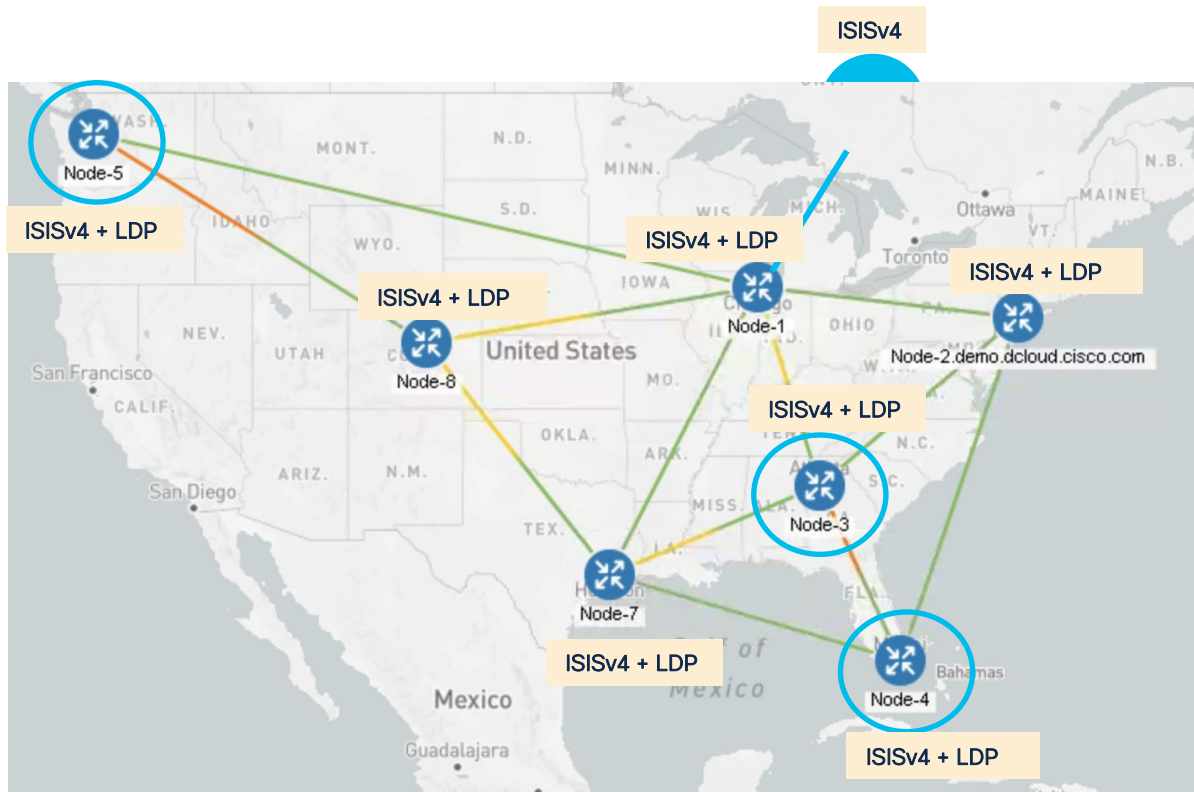
Demo: Simplify Migration to SRv6

CISCO *Live!*



L3VPN – MPLS LDP to SRv6 Migration

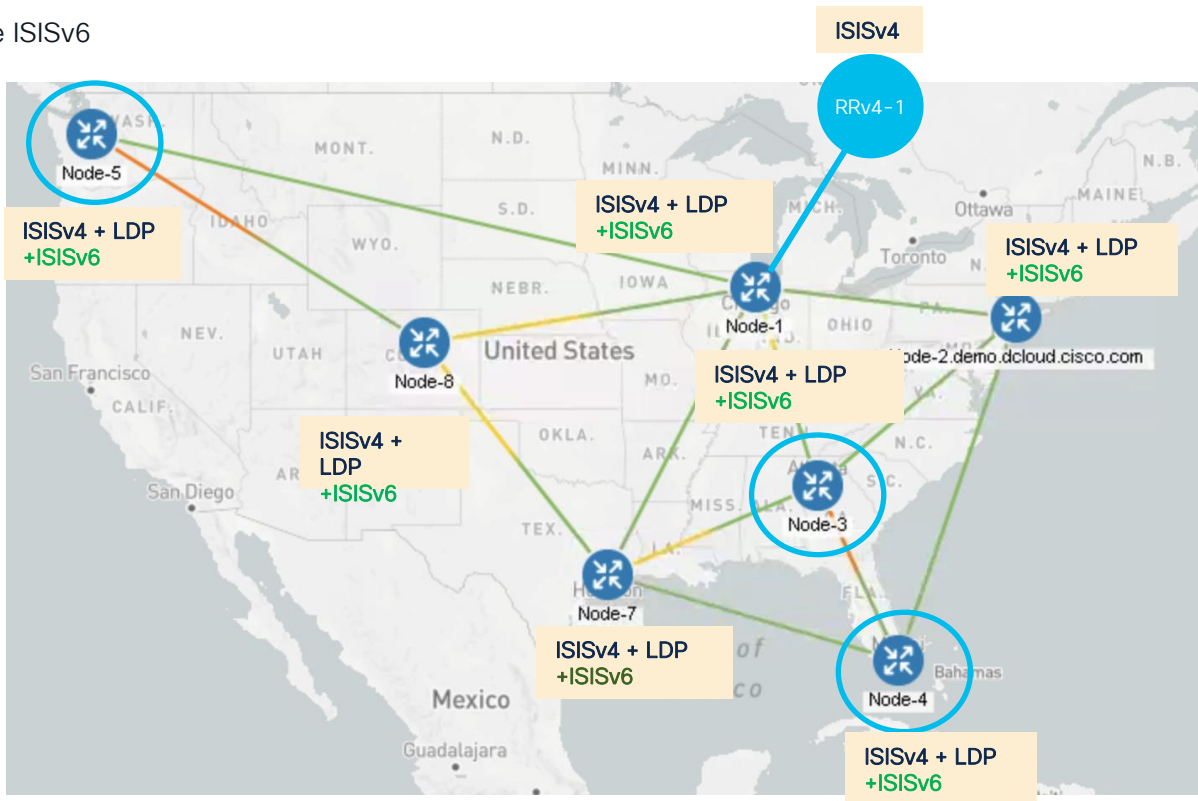
VRF:VPN-201
MPLS VRF



L3VPN – MPLS LDP to SRv6 Migration

Step1: Enable ISISv6

VRF:VPN-201
MPLS VRF



Node5

```
interface Loopback 0
  ipv6 address fcdd:dd00:305::1/128
  no shutdown
  exit
interface GigabitEthernet 0/0/0/0
  ipv6 enable
  no shutdown
  exit
router isis 1
  address-family ipv6 unicast
  metric-style wide
  router-id Loopback0
  advertise link attributes
  exit
interface GigabitEthernet0/0/0/0
  circuit-type level-2-only
  point-to-point
  address-family ipv6 unicast
  metric 100
  exit
  exit
interface Loopback0
  passive
  address-family ipv6 unicast
  exit
  exit
  exit
  !
  !
```

L3VPN – MPLS LDP to SRv6 Migration – CNC

Device Details

Step1: Enable ISISv6



Device Details

[Details](#) [Links](#) [Alarms](#) [Inventory](#)

Summary

Host Name	Node-5
Alarms	❌ 1 ⚠️ 3
Reachability	✅ Reachable
IP Address	198.19.1.5
Geo Location	Latitude 47.603832, Longitude -122.330062
Device Type	🌐 Router
Device Group	Location > All Locations > Unassigned Devices
Product Type	Cisco IOS XRv 9000 Router
Connect To Device	🔑 SSH IPv4
Last Update	26-May-2023 03:49:19 PM PDT

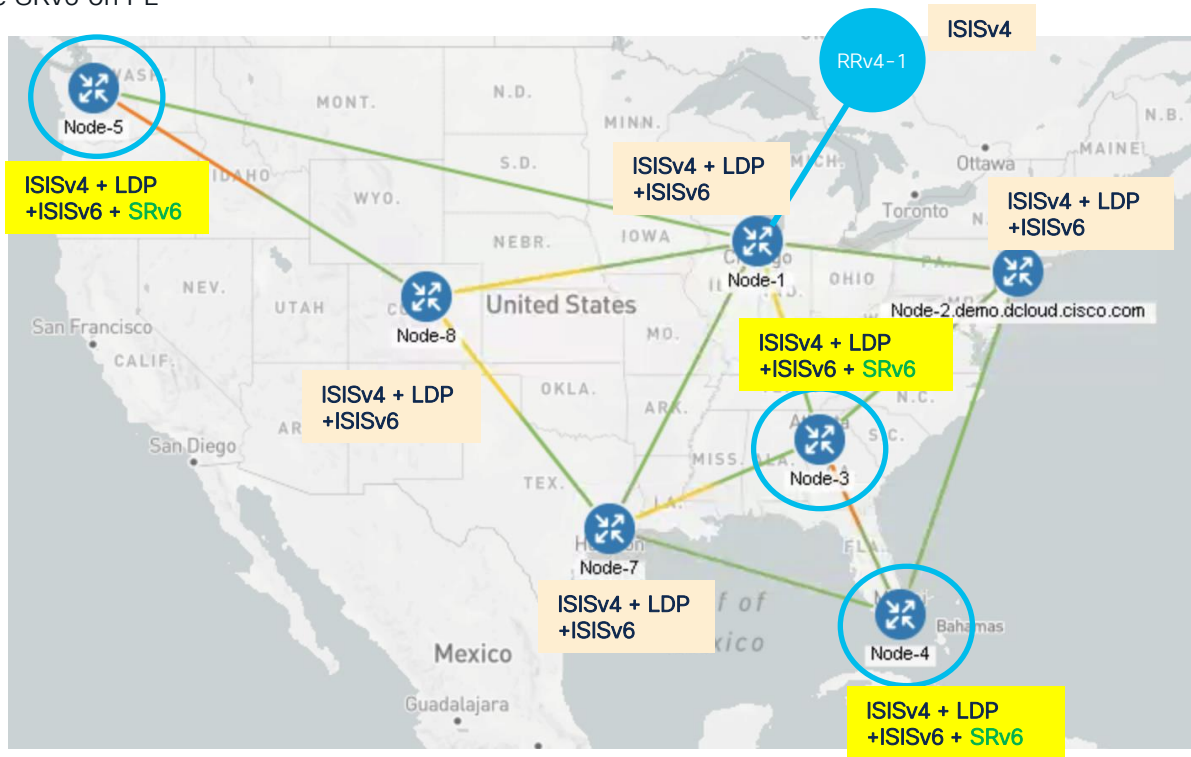
Routing

TE Router ID	198.19.1.5
IPv6 Router ID	fcdd:dd00:305::1
ISIS System ID	0010.0100.0005 Level-2
ASN	65000

L3VPN – MPLS LDP to SRv6 Migration

Step2: Enable SRv6 on PE

VRF:VPN-201
MPLS VRF



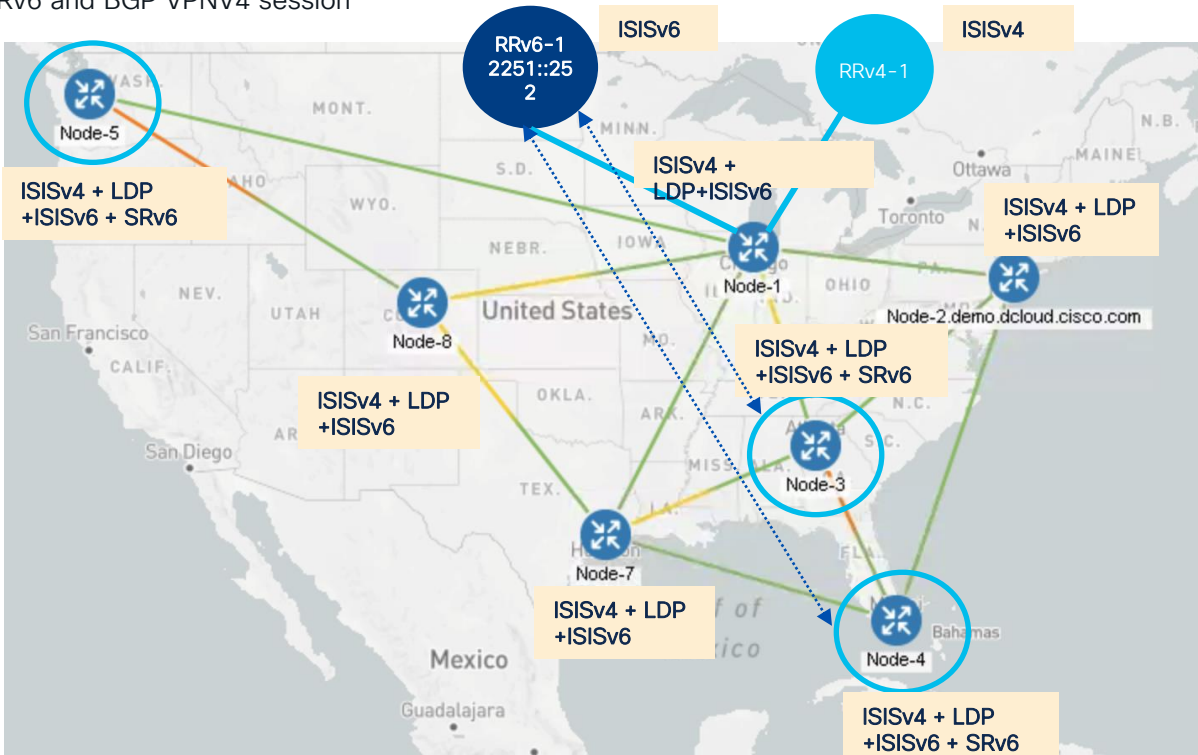
Node5

```
router isis 1
address-family ipv6 unicast
segment-routing sr6
locator loc_be
exit
exit
exit
exit
segment-routing
sr6
encapsulation
source-address fcdd:dd00:305::1
!
locators
locator loc_be
micro-segment behavior
unode psp-usd
prefix fcdd:dd00:305::/48
!
!
!
!
!
```

L3VPN – MPLS LDP to SRv6 Migration

Step3: Add RRv6 and BGP VPNV4 session

VRF:VPN-201
MPLS VRF



Node 5

```
router bgp 65000
neighbor 2251::252
remote-as 65000
update-source Loopback0
address-family vpnv4 unicast
route-policy vpn-transport out
encapsulation-type srv6
exit
exit
exit
```

L3VPN – MPLS LDP to SRv6 Migration

Step4: Enable Dual connected VRF, MPLS preferred on SRv6 PE's

VRF:VPN-201
MPLS VRF
Dual Connected

Configured Data

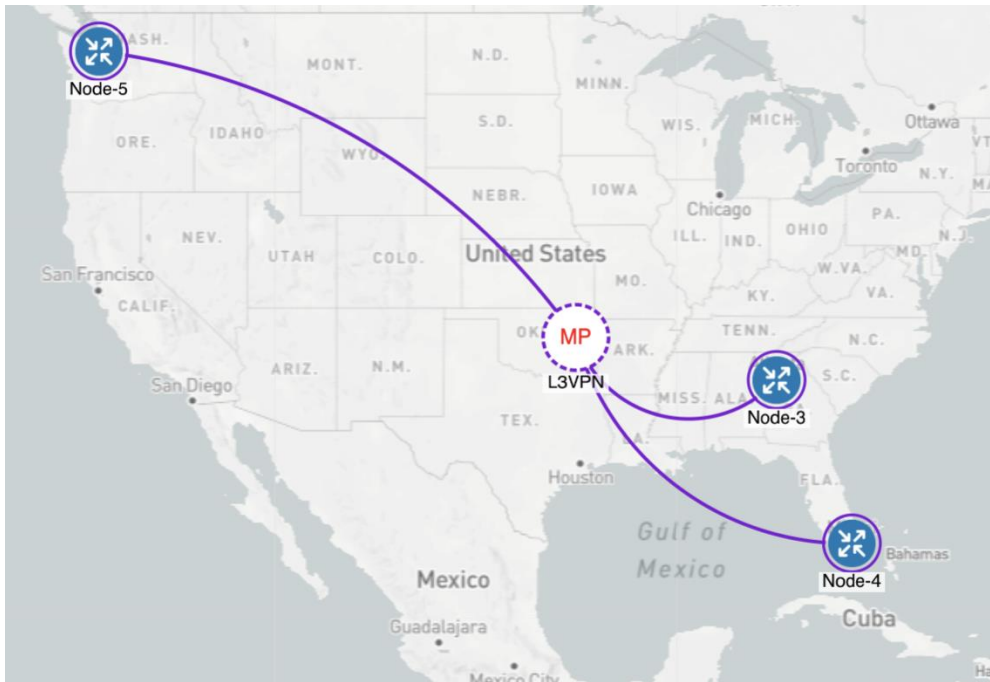
```
object ietf-l3vpn-ntw:l3vpn-ntw>vpn-services>vpn-service>0>vpn-nodes>vpn-node>0>vpn-  
network-accesses>vpn-network-access>  
▼ object {1}  
  ▼ ietf-l3vpn-ntw:l3vpn-ntw {1}  
    ▼ vpn-services {1}  
      ▼ vpn-service [1]  
        ▼ 0 {6}  
          vpn-id : vpn-201  
          vpn-service-topology : ietf-vpn-common:any-to-any  
          ▼ vpn-instance-profiles {1}  
            ▼ vpn-instance-profile [1]  
              ▼ 0 {2}  
                profile-id : default  
                ▼ cisco-l3vpn-ntw:srv6 {1}  
                  ▼ address-family [1]  
                    ▼ 0 {2}  
                      name : ietf-vpn-common:ipv4  
                      locator-name : loc_be
```

```
▼ vpn-nodes {1}  
  ▼ vpn-node [3]  
    ▼ 0 {4}  
      vpn-node-id : Node-3  
      ▼ active-vpn-instance-profiles {1}  
        ▼ vpn-instance-profile [1]  
          ▼ 0 {2}  
            profile-id : default  
            ► address-family [2]  
          ▼ vpn-network-accesses {1}  
            ► vpn-network-access [1]  
          ▼ cisco-l3vpn-ntw:custom-template [1]  
            ▼ 0 {2}  
              name : CT-BGP-VRF-MPLS-ALLOC  
              ▼ variable [2]  
                ▼ 0 {2}  
                  name : ASN  
                  value : 65000  
                ▼ 1 {2}  
                  name : VRF  
                  value : vpn-201
```

L3VPN – MPLS LDP to SRv6 Migration

Step4: Enable Dual connected VRF, MPLS preferred on SRv6 PE's

VRF:VPN-201
MPLS VRF
Dual Connected



Node5

```
router bgp 65000
vrf vpn-201
address-family ipv4 unicast
mpls alloc enable
segment-routing srv6
locator loc_be
!
```

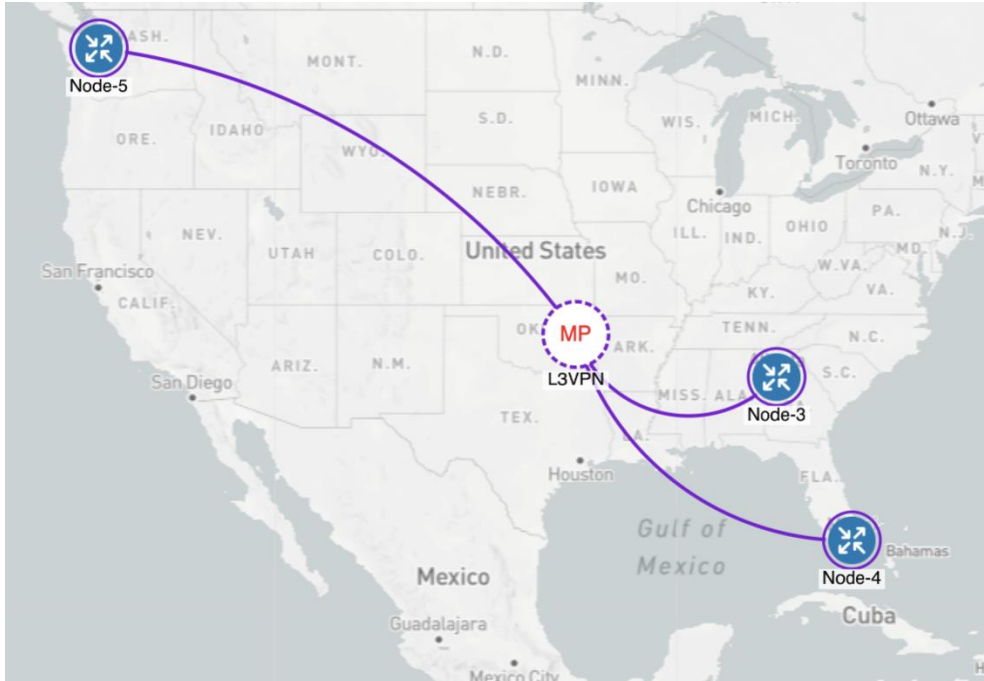
Verification : Prefixes are learned from both RR RR-1 / MPLS is best path

```
1 RP/0/RP0/CPU0:Node-5#sh bgp vpnv4 unicast
2 Thu Jun 1 17:51:44.499 UTC
3 BGP router identifier 198.19.1.5, local AS number 65000
4 BGP generic scan interval 60 secs
5 Non-stop routing is enabled
6 BGP table state: Active
7 Table ID: 0x0
8 BGP main routing table version 46
9 BGP NSR Initial initsync version 1 (Reached)
10 BGP NSR/ISSU Sync-Group versions 0/0
11 BGP scan interval 60 secs
12
13 Status codes: s suppressed, d damped, h history, * valid, > best
14                 i - internal, r RIB-failure, S stale, N Nexthop-discard
15 Origin codes: i - IGP, e - EGP, ? - incomplete
16   Network          Next Hop              Metric LocPrf Weight Path
17 Route Distinguisher: 198.19.1.3:0
18 Route Distinguisher Version: 46
19 *>i30.1.3.0/24      198.19.1.3                0      100      0 ?
20 * i                 fcdd:dd00:303::1          0      100      0 ?
21
22 Route Distinguisher: 198.19.1.4:0
23 Route Distinguisher Version: 45
24 *>i30.1.4.0/24      198.19.1.4                0      100      0 ?
25 * i                 fcdd:dd00:304::1          0      100      0 ?
26
27 Route Distinguisher: 198.19.1.5:0 (default for vrf vpn-201)
28 Route Distinguisher Version: 44
29 *>i30.1.3.0/24      198.19.1.3                0      100      0 ?
30 *>i30.1.4.0/24      198.19.1.4                0      100      0 ?
31 *> 30.1.5.0/24      0.0.0.0                   0              32768 ?
32
33 Processed 5 prefixes, 7 paths
```

L3VPN – MPLS LDP to SRv6 Migration

Step 5: Use SRv6 between the Dual Connected PEs

VRF:VPN-201
MPLS VRF
Dual Connected



Node5

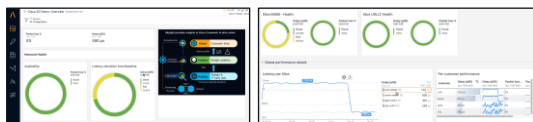
```
route-policy vpn-transport
  apply vpn-201-transport
  pass
end-policy
!
route-policy vpn-201-transport
  if extcommunity rt matches-any
    (201:201) then
      set local-preference 150
    endif
  end-policy
!
```

Verification : Prefixes are learned from both RR RR-2 / SRv6 is best path

```
1 RP/0/RP0/CPU0:Node-5#sh bgp vpnv4 unicast
2 Thu Jun 1 17:57:13.246 UTC
3 BGP router identifier 198.19.1.5, local AS number 65000
4 BGP generic scan interval 60 secs
5 Non-stop routing is enabled
6 BGP table state: Active
7 Table ID: 0x0
8 BGP main routing table version 50
9 BGP NSR Initial initsync version 1 (Reached)
10 BGP NSR/ISSU Sync-Group versions 0/0
11 BGP scan interval 60 secs
12
13 Status codes: s suppressed, d damped, h history, * valid, > best
14                 i - internal, r RIB-failure, S stale, N Nexthop-discard
15 Origin codes: i - IGP, e - EGP, ? - incomplete
16   Network          Next Hop          Metric LocPrf Weight Path
17 Route Distinguisher: 198.19.1.3:0
18 Route Distinguisher Version: 49
19 * i30.1.3.0/24      198.19.1.3              0    100      0 ?
20 *>i                 fcdd:dd00:303::1        0    150      0 ?
21
22 Route Distinguisher: 198.19.1.4:0
23 Route Distinguisher Version: 47
24 * i30.1.4.0/24      198.19.1.4              0    100      0 ?
25 *>i                 fcdd:dd00:304::1        0    150      0 ?
26
27 Route Distinguisher: 198.19.1.5:0 (default for vrf vpn-201)
28 Route Distinguisher Version: 50
29 *>i30.1.3.0/24      fcdd:dd00:303::1        0    150      0 ?
30
31 *>i30.1.4.0/24      fcdd:dd00:304::1        0    150      0 ?
32
33 *> 30.1.5.0/24      0.0.0.0                  0    32768 ?
34
35 Processed 5 prefixes, 7 paths
```

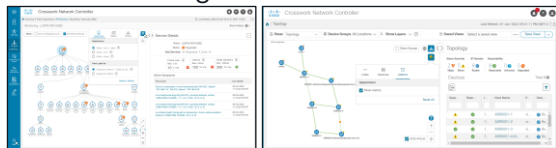
5G: Transport Slicing Automation

5G Transport Network Slicing Automation



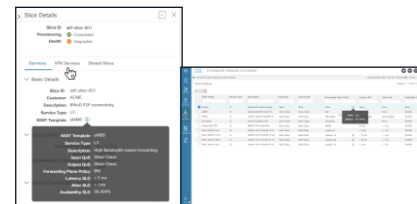
Transport slice SLA

- Proactive SLA monitoring per Slice
- SLA breach notification/reporting
- Service Centric approach to monitoring
- Slice intent to infra telemetry tie
- Active probing with infrastructure monitoring correlation



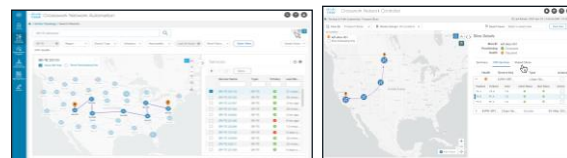
Transport slice optimization

- Optimize slice based on service intent
- Path computation per slice based on SLA



Transport slice orchestration

- Intent-based slice definition
- Abstracted Slice model based on IETF model



Transport slice visualization

- Overlay maps
- Slice details: Type, Template, VPNs, Transport



Transport Network Slice Lifecycle

Cisco Crosswork Network Automation

Define new network slice types based on target service definitions

Identify
SLO-SLE
Templates
for different
type of
services

Provision Slice Service based SLO- SLE Templates on PE Nodes

Slice
Optimization
to meet SLA
requirements

End to End Monitoring of Network Service with reporting

Design

Plan

Prepare

Operate and Optimize



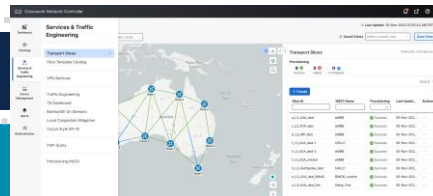
CNC



CNC



CNC integrated with Accedian



Slice Template Catalog

NSST Name	Description	QoS				Forwarding Plane			Actions
		L2 Input QoS	L2 Output QoS	L3 Input QoS	L3 Output QoS	Forwarding Plane Policy	Policy Type	Customizati...	
BWOD_1G	BW on Demand wit...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...	BWOD_1G	as-blueprint	true	...
BWOD_500M	BW on Demand wit...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...	BWOD_500M	as-blueprint	true	...
BWOD_custom	BW on Demand wit...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...	BWOD_custom	as-blueprint	true	...
DSCP_Flow	For L3 Slices: DSC...			per-flow-test	Egress-LowLate...	DSCP_Flow	as-is	false	...
Delay_10ms	Highest BW under ...	ingress_COS5	Egress-LowLate...	ingress_COS5	Egress-LowLate...	eMBB_10ms	as-is	false	...
Delay_7ms	Highest BW under ...	ingress_COS5	Egress-LowLate...	ingress_COS5	Egress-LowLate...	eMBB_7ms	as-is	false	...
Disjoint_North	High Bandwidth DL...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...	Disjoint_North	as-is	false	...
Disjoint_South	High Bandwidth DL...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...	Disjoint_South	as-is	false	...
ENCRYPT	Encrypted path onl...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...	ENCRYPT	as-is	false	...
Gold	High Priority Servi...	ingress_COS5	Egress-LowLate...	ingress_COS5	Egress-LowLate...			false	...
Silver	Medium Priority Se...	ingress_COS1	Egress-High_Bw...	ingress_COS1	Egress-High_Bw...			false	...
URLLC	Flex-Algo based Lo...	ingress_COS5	Egress-LowLate...	ingress_COS5	Egress-LowLate...	URLLC	as-is	false	...
URLLC_PM	Flex-Algo based Lo...	ingress_COS5	Egress-LowLate...	ingress_COS5	Egress-LowLate...	URLLC	as-blueprint	false	...

- User-defined slice templates
 - Template Name
 - Description
 - Input/Output QoS
 - Forwarding plane policy
 - Allow for BWoD customizations
 - Service Assurance parameters
- Templates can be created through GUI or API
- Path forwarding policies can be shared across multiple Slice Instances

Visualizing Slices with Crosswork Network Controller

Slice list with Intent
and provisioning
state

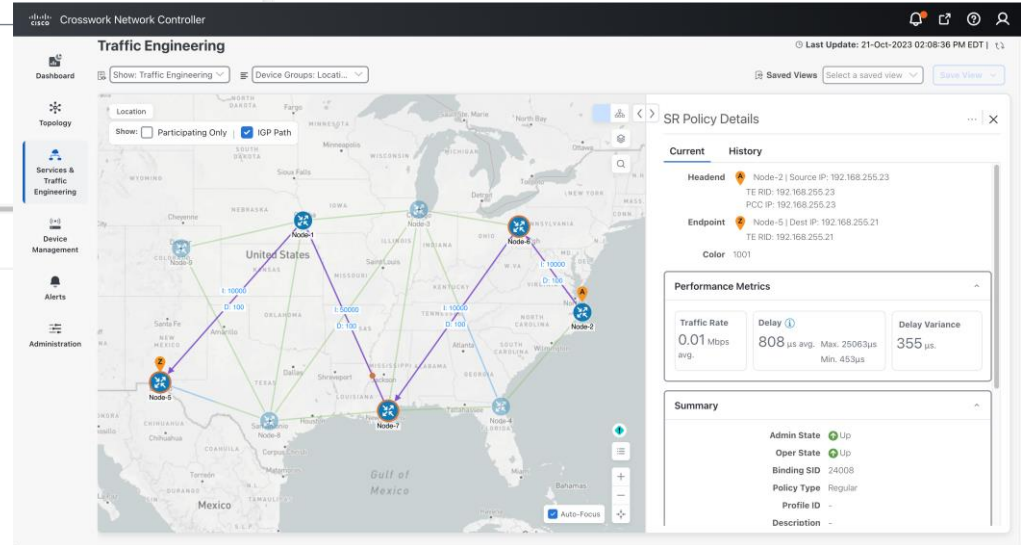
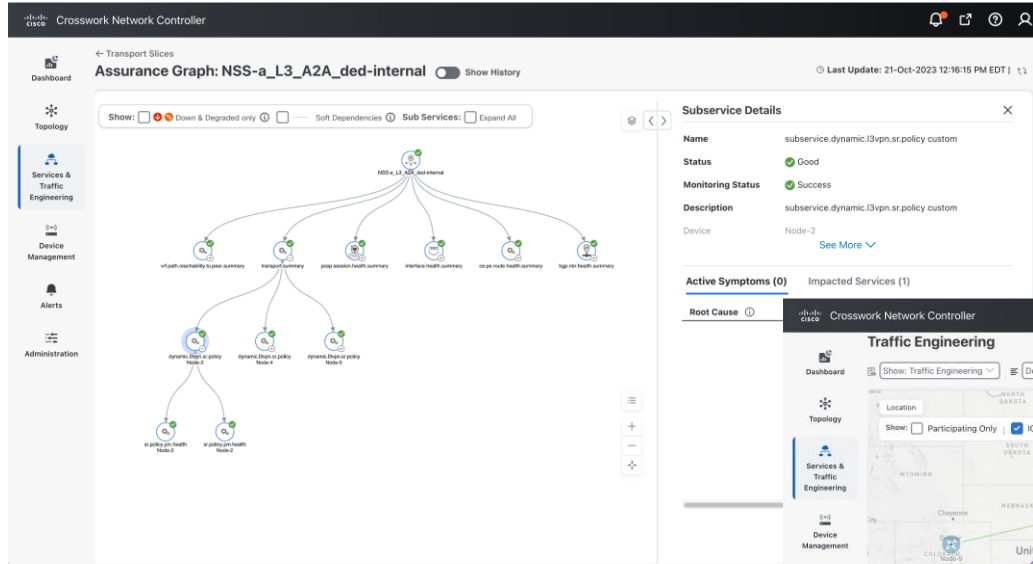
The screenshot shows the Cisco Crosswork Network Controller interface. The sidebar on the left contains navigation options: Dashboard, Topology, Services & Traffic Engineering (highlighted), Device Management, Alerts, and Administration. The 'Services & Traffic Engineering' section is expanded, showing 'Transport Slices' (highlighted with a green dashed circle), 'Slice Template Catalog', 'VPN Services', 'Traffic Engineering', 'TE Dashboard', 'Bandwidth On Demand', 'Local Congestion Mitigation', 'Circuit Style SR-TE', 'Path Query', and 'Provisioning (NSO)'. The main content area displays a map of Australia with network nodes and connections. A table titled 'Transport Slices' is shown on the right, listing various slices with their provisioning status. The table has columns for Slice ID, NSST Name, Provisioning, Last Update, and Actions. The provisioning status is indicated by a green checkmark for Success, a red X for Failed, and a blue circle for In-Progress. The table shows 8 successful slices, 0 failed, and 0 in-progress.

Slice ID	NSST Name	Provisioning	Last Update	Actions
e_L5_A2A_ded	eMBB	Success	29-Nov-20...	...
c_L2_P2P_ded	eMBB	Success	30-Nov-20...	...
f_L3_A2A_de...	URLLC	Success	30-Nov-20...	...
f_L3_A2A_de...	eMBB	Success	30-Nov-20...	...
f_L3_A2A_sh...	eMBB	Success	30-Nov-20...	...
h_L3_HubSp...	URLLC	Success	30-Nov-20...	...
n_L3_A2A_d...	BWOD_custom	Success	30-Nov-20...	...
r_L3_A2A_de...	Disjoint_South	Success	30-Nov-20...	...

New menu for
Slice Instances
and Template
Catalog

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Slice Assurance and Performance Insights



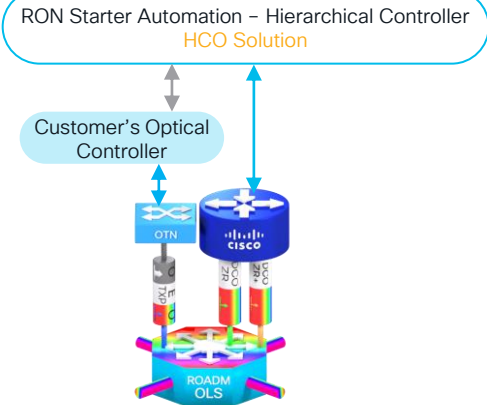
Routed Optical Networks (RON)



Architectural Transition with Crosswork Automation

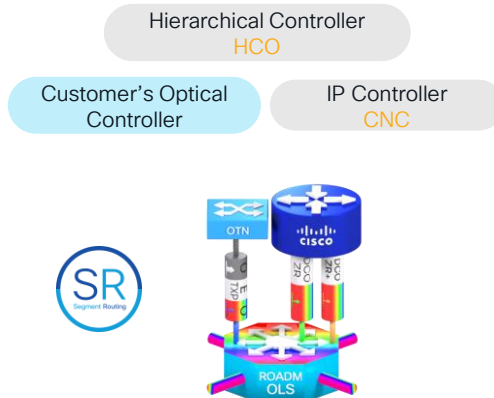
Customer adoption Stage 1 Integrating Transponders

- Introduce RON Starter Automation (Cisco-only Routers with ZR/ZR+)
- HCO-based Solution for ZR/ZR+ & Optical OLS
 - Single Pane of Glass Visualization
 - E2E Optical Circuit Assurance
 - E2E Optical Circuit Provisioning



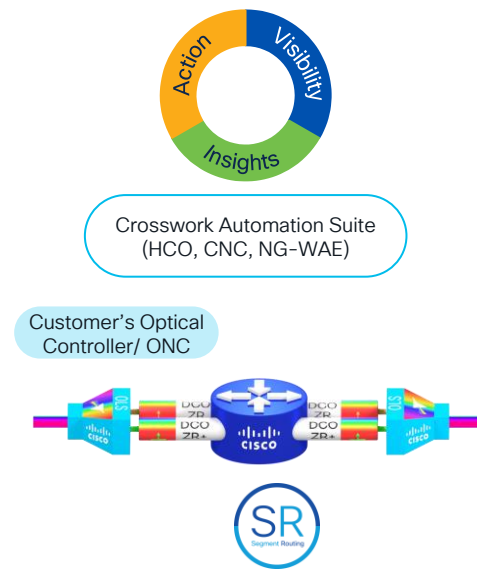
Customer adoption Stage 2 RON SDN Transition → SR Control Plane

- Introduce CNC to HCO
- Leverage RON Automation Essentials Bundle
- SDN Transformation to SR(v6) Control Plane
- CNC IP Path Optimization & Orchestration
- PLE Bandwidth Reservation
- CNC EMS in Q2CY24 for Element Management



Customer adoption Stage 3 Complete RON Transformation

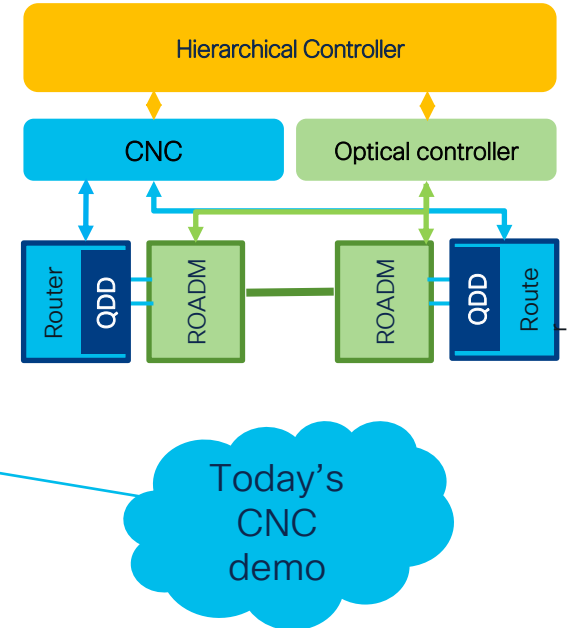
- Complete lifecycle across including Planning
- (+CONC for Cisco Optical)



** will be integrated in CNC

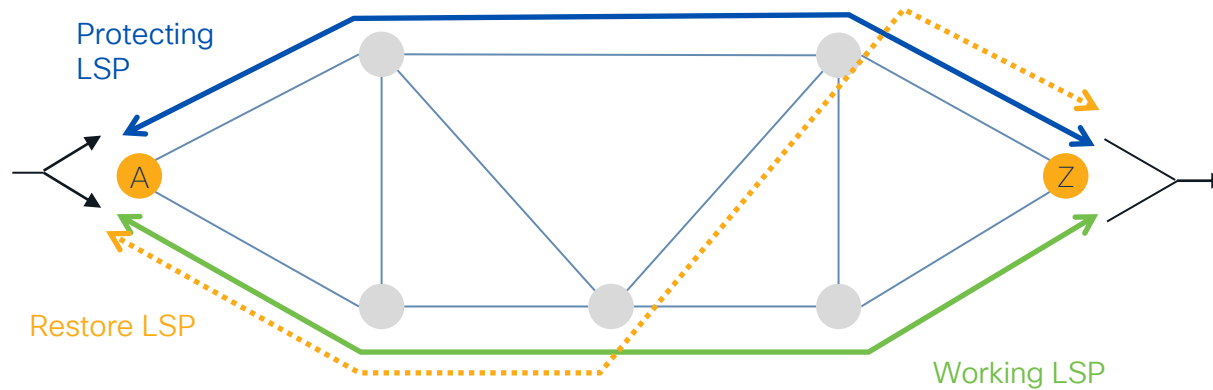
Maximizing Automation Benefits in RON

- Wavelength Provisioning ✓
- Optical Circuit Assurance and Troubleshooting ✓
- Multilayer Visualization & History View ✓
- Management and Verification of optical to IP connections ✓
- SR/ SRv6 Control Plane SDN Automation ✓
- IP Element Management & IP SDN Path Optimization ✓
- IP Service Assurance & Service Orchestration ✓
- Private Line Emulation Automation (SR-CS bandwidth reservation, provisioning, assurance) ✓



Demo: Automating PLE lifecycle

What is Private Line Emulation aka PLE

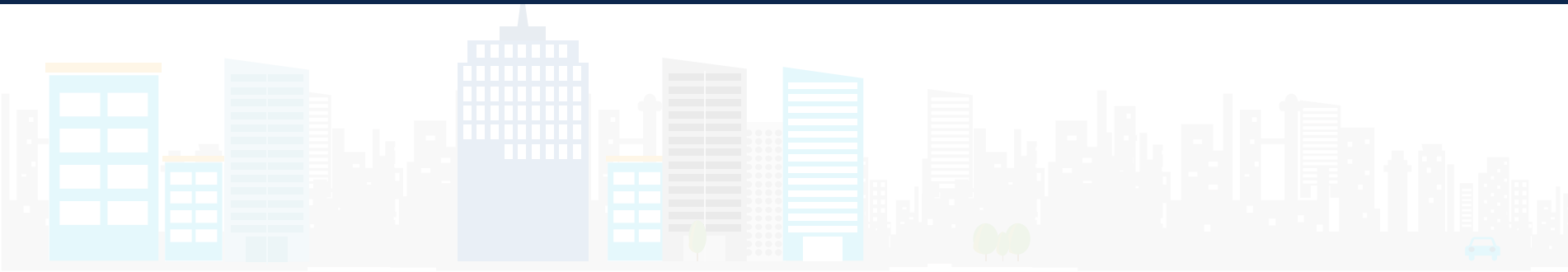


Sub-wavelength / Private Line services	Dedicated E-Line	Switched E-Line
PLE • Bit transparent and respectful of sync (DCR) • Multiprotocol (Sonet/SDH, OTN, FC, Eth)	EVP-VPWS • Ethernet only • No special HW required	
Circuit-style SR (CS-SR) • Guaranteed bandwidth • persistent, co-routed, bi-directional paths • 1:1 End-to-end path protection and restoration		SR • Scale and simplicity

Automation Outcomes and Benefits

Agility is Essential in Operationalizing Mass-infrastructure Networks

Automation is Key to drive Operational Agility



Automation Outcomes and Benefits

Agility is Essential in Operationalizing Mass-infrastructure Networks

Accelerate Time
To Market



- Rapid Service, transport and slice provisioning
- Reinforced differentiation with granular TE control and SLAs
- Faster introduction of new services with model-based approach

Improve Service
Delivery



- Preserved service policy intent and SLAs
- Effective mitigation of network congestion
- Optimal utilization of network resource with real-time optimization

Boost Operational
Agility



- Automated changes minimizing configuration errors
- Abstraction of complexity in a heterogenous environment
- Enhanced productivity with unified UI and workflows

Crosswork Network Automation Related Sessions

- Design, Deploy and Manage Transport Slices using SDN Controller and Assurance - BRKSPG-2263
- Managing and operating Segment Routing based networks with Cisco SDN solution - TECOPS-2582
- Automated Assurance for Premium Service Quality of Experiences Across Mass Scale Infrastructures - PSOSP-1725
- Reduce Resolution Time with a Service-Centric Approach to Troubleshooting - BRKSPG-2474
- Crosswork Network Controller on AWS - DEVNET-2213
- Network Planning and the Evolution of WAE - BRKOPS-1643



The bridge to possible

Thank you

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The background of the slide is a vibrant, abstract graphic. It features a large, stylized cloud on the left side, composed of overlapping, semi-transparent shapes in shades of red, orange, and yellow. To the right of the cloud, a bright, multi-colored sunburst or starburst pattern radiates from a central point, with rays extending towards the right edge of the frame. The colors in the sunburst transition through a spectrum from blue and purple on the left to yellow and orange on the right. The overall effect is energetic and modern.

cisco *Live!*

Let's go