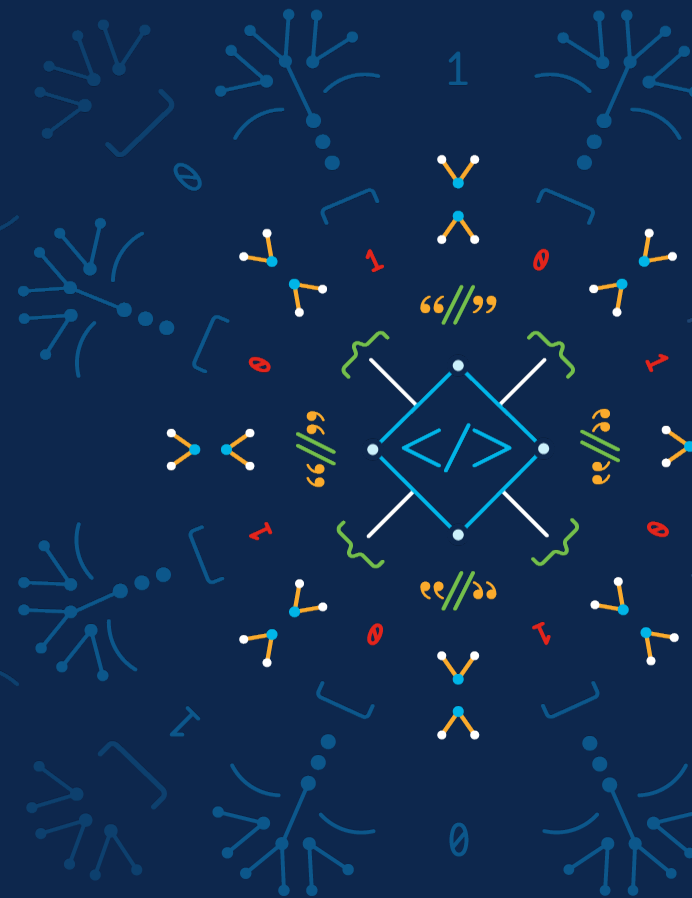


# CX Best Practices for Crosswork Network Controller Deployments

Mark Culverhouse (mculverh@cisco.com)  
CX Principal Architect (CCIE RS/SP #38099)  
10<sup>th</sup> May 2022

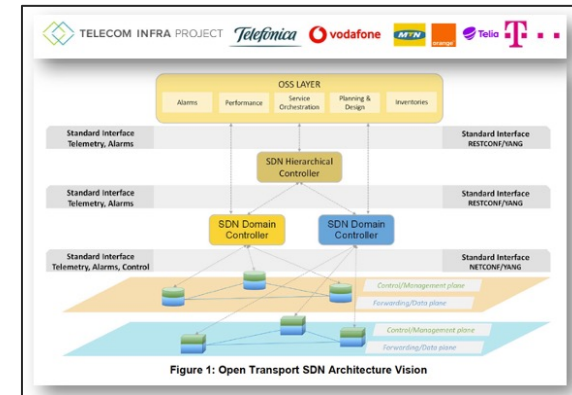
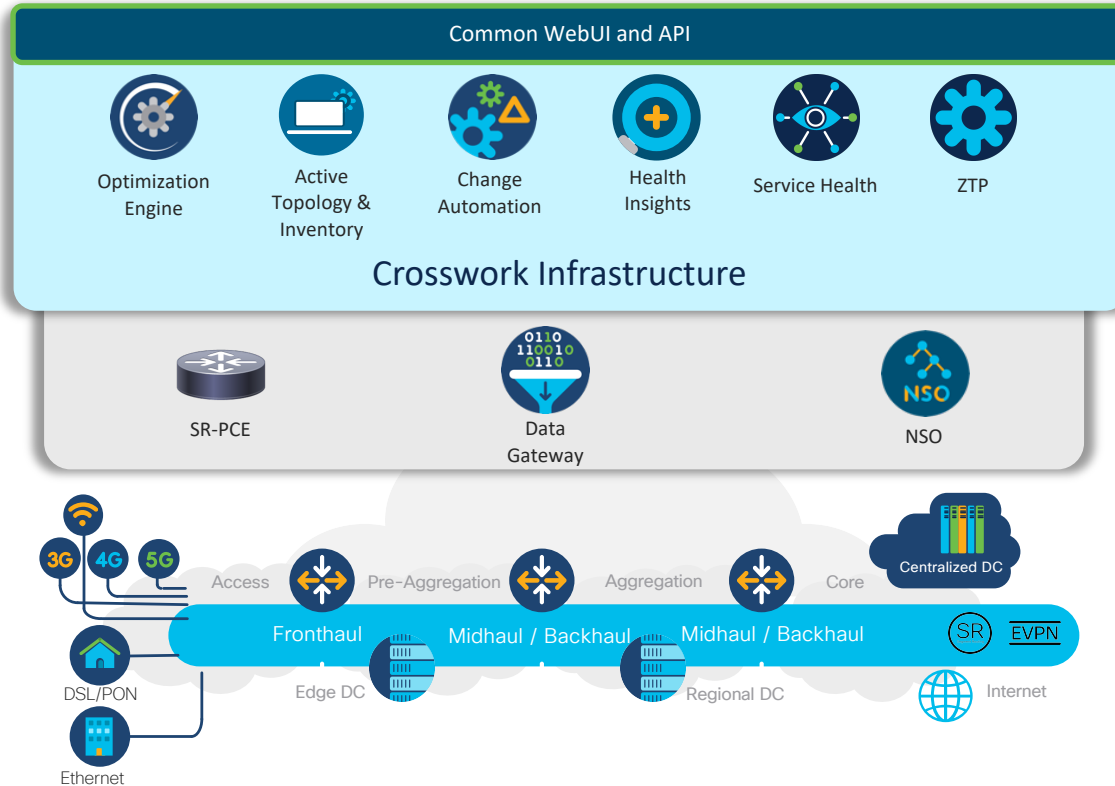


# Agenda

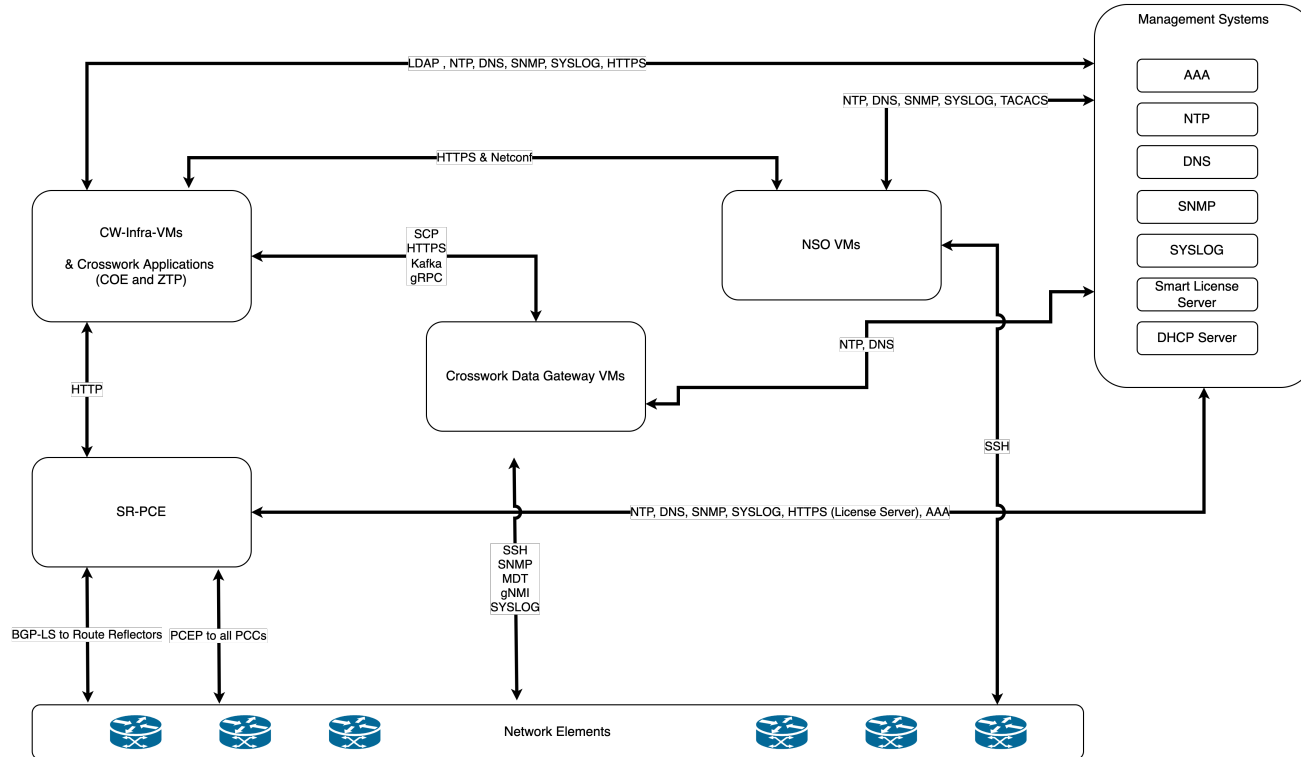
- CNC Recap / Overview
- Planning a CNC Deployment
- A Few Best Practices
- Out of the Box vs Customisations
- Conclusions

# CNC Recap / Overview

# Crosswork Network Controller Architecture

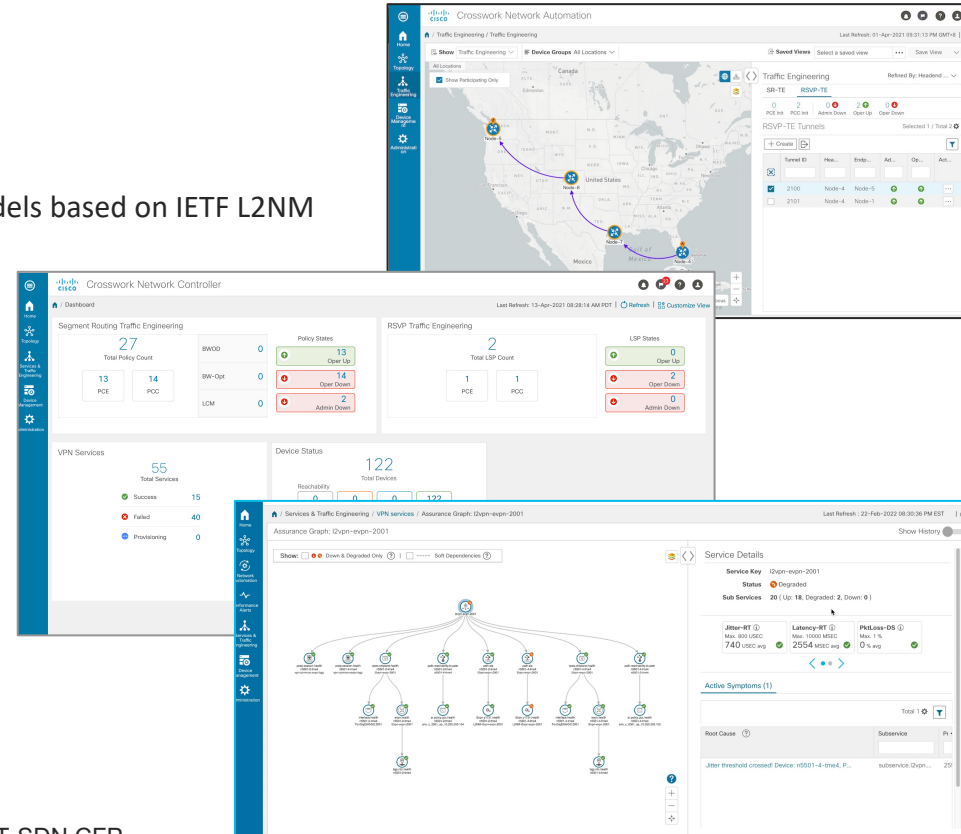


# Crosswork Network Controller Architecture



# Crosswork Network Controller Functionality

- Standards-first and pre-integrated
- Topology auto-discovery and visualisation
- FlexAlgo Visualisation
- Service Provisioning and visualization (Example service models based on IETF L2NM and L3NM) \*
- Transport Policy Provisioning (SR-MPLS, SRv6, RSVP-TE) \*
- Closed-Loop Optimisation
- Local Congestion Mitigation
- Zero Touch Provisioning
- Service Health monitoring and Troubleshooting
- Programmable closed-loop automation
- SR path visualisation
- And more ...



*So how do we achieve  
success?*

*.... Find the sweet spot in between ocean-  
boiling and useless*

A word cloud featuring various terms related to network operations and strategy. The words are arranged in a non-uniform, overlapping manner. The colors used are green, blue, red, orange, and dark blue. The sizes of the words vary, with 'Operations', 'Integrations', 'Prioritisation', 'Strategic Goals', 'Network Evolution', and 'Network Design' being the largest. Other terms include 'Vision, Strategy, Execution', 'Measure of Success', 'Release Management', 'Team Structure', 'IT Infrastructure', 'Legacy', 'Simplification', 'Standardisation', 'ROI', 'Security Response', 'MVP', 'Greenfield / Brownfield', 'Professional Services', 'Environments', 'CICD', 'Cross-org Collab', 'Network Elements', 'New Skillsets', 'Stake-holder management', and 'Resilience'.

Vision, Strategy, Execution

Measure of Success

Operations

Release Management

Integrations

Team Structure

Legacy

Simplification

IT Infrastructure

Prioritisation

Standardisation

ROI

Security Response

MVP

Greenfield / Brownfield

Strategic Goals

Professional Services

Network Evolution

Environments

CICD

Cross-org Collab

Network Elements

New Skillsets

Stake-holder management

Resilience

Network Design



# Define your MVP

- Easy to say, harder to achieve
- Spoiler: It will include platform design, test and deployment
- Simplify and Minimise integrations
- Use Case #1: Topology auto-discovery
- Consider your SR-PCE and BGP-LS design
- Spare a thought for NED choice (CLI vs Netconf)
- Mgmt / Control / Dataplane testing
- Avoid moving targets
- Objective: CNC in Production
- Typically Read-Only will provide significant value and insight

# Some MVP Best Practices

- **Identify Environments:** Prepare compute
- **Prepare the Network:** Identify MVP NEs, Credentials, delay measurement / distribution, minimise NE SW versions. Smart Licensing. Firewall rules.
- **Topology collection:** Deploy hierarchical reflection of BGP-LS throughout the network to reduce SR-PCE peerings
- **SR-PCE design:** Consider regional distribution. Typically network-side of DC firewalls. Organically deploy PCEP sessions as required.
- **CDG design:** Determine # of NEs, KPIs per NE, collection cadence, resilience objectives
- **Validate and Explore the discovered topology:** Verify before moving towards optimisations
- **Remove “Nice-to-haves” from critical-path**
- **Only look forward whenever possible**

# Beyond the MVP

- Formalise Use Case pipeline
- Team Structure (based on Use Cases)
- Environments
  - Dev / Integration / Staging / PreProd / Prod
- SW Dev Pipelines
- CNC Release Management
- Alignment with Network Evolution
  - Inform / Influence upcoming NE testing
  - Collaboration between Network Eng. And Automation team is essential.
- Solution Evolution
  - Scale, Operator personas, Integrations



# Use Case Definition Template

Title:	NB Integrations: System(s) / Function / Interfaces
Description:	SB Integrations: NEs / Protocol(s) / Interfaces
End User Experience:	Assumptions/Limitations:
Personas:	Possible Extensions (out of immediate scope):
CNC Components:	Scale:
Upgrade to CNC [components]?:	Related Use Case(s):
Network Domain(s):	Effort Estimate:
Network Element(s) HW & SW Versions:	ROI:
Customer Value:	



# Environment Descriptions (non-exhaustive)

	Dev Test	Integration	Prod-Staging	Pre-Production	Production
<b>Purpose</b>	<ul style="list-style-type: none"> <li>Build &amp; unit test code</li> <li>NE feature test</li> </ul>	<ul style="list-style-type: none"> <li>First integration point of all components</li> </ul>	<ul style="list-style-type: none"> <li>Solution Acceptance Testing</li> <li>MOP / Upgrade Testing</li> </ul>	<ul style="list-style-type: none"> <li>Production-mirror</li> <li>Issue reproduction</li> </ul>	<ul style="list-style-type: none"> <li>Erm, Production service ...</li> </ul>
<b>Lab / Resources</b>	<ul style="list-style-type: none"> <li>Local to developer / tester</li> <li>Local virtualised NEs if possible</li> <li>No Scale, Perf or HA</li> </ul>	<ul style="list-style-type: none"> <li><u>Should</u> have all solution components</li> <li>HA instances</li> <li>Representative NEs</li> <li>NEs are unlikely to be exclusively for CNC</li> </ul>	<ul style="list-style-type: none"> <li><u>Must</u> have all solution components and OSS/BSS</li> <li>NEs tightly administered</li> </ul>	<ul style="list-style-type: none"> <li>Must have all solution components deployed in alignment to Prod</li> </ul>	N/A
<b>Change Control</b>	<ul style="list-style-type: none"> <li>Individual</li> </ul>	<ul style="list-style-type: none"> <li>Scrum Master</li> </ul>	<ul style="list-style-type: none"> <li>Release Manager</li> </ul>	<ul style="list-style-type: none"> <li>Release Manager</li> </ul>	<ul style="list-style-type: none"> <li>CAB</li> </ul>

Extend, adjust, collapse as per individual constraints.



# Out of the box features

	Relevant Components	Development Required	Comments
<b>Topology auto-discovery and visualisation</b>	Active Topology, SR-PCE, CDG	None	NED type required for device onboarding
<b>Service Provisioning (L2VPN, L3VPN)</b>	Active Topology, NSO	Example FPs require customization / localisation	Challenge the status quo. Strive for standardization
<b>Transport Policy Provisioning (SR-MPLS, SRv6, RSVP-TE)</b>	Optimisation Engine, SR-PCE, NSO	CFP provides out of the box capabilities. Customisation required for 3 <sup>rd</sup> party devices	PCE-initiated Policy provisioning does not leverage NSO, hence zero development required for PCE-init.
<b>Closed-Loop Optimisation</b>	Optimisation Engine, SR-PCE, CDG	None	Real-time reaction to network topology events to re-optimize transport policy paths
<b>Local Congestion Mitigation</b>	Optimisation Engine, SR-PCE, CDG	None	Tactical deployment of TE policies to avoid congestion
<b>Zero Touch Provisioning</b>	ZTP	Potentially small amount of device boot scripting	Integration with external DHCP server required
<b>Service Health</b>	Service Health, NSO, CDG	Heuristic Package development required (low-code solution)	

# NSO Transport SDN CFP Details

- SR-TE Core Function Pack
  - SR-MPLS ODN Policy
  - SR-MPLS Dynamic and Explicit Policy
  - SRv6 TE ODN Policy
  - SRv6 TE Policy
- Example Function Packs (Provided for Cisco CX or Customer extension)
  - Implementation of IETF draft L2NM VPN service
  - Implementation of IETF draft L3NM VPN service
  - Implementation of IETF draft RSVP-TE LSP
    - Dynamic and Explicit LSP
    - Local and PCE-delegated
  - Y.1731 for L2VPN services



# Conclusions

- CNC provides a rich set of Transport SDN functionalities and Use Cases both out of the box and for customisation
- Planning is the key to success
  - Divide, iterate and conquer
  - Don't boil the ocean
  - Remain focused on what's important
- Don't overlook the importance of Network Engineering knowledge, the transport network is evolving
- Challenge the status quo



# Related Sessions this week

- The future of automated network and service assurance – Accedian Skylight & CNC
  - Henrik Nydell, May 12<sup>th</sup> 9:15
- NSO & Crosswork Health Insights
  - Dimitris Vlassopoulos, May 10<sup>th</sup> 13:30 (Time machine required ... )
- CNC Non-Cisco device Integration
  - Michael Maddern, May 11<sup>th</sup> 14:45
- CNC Service Customisation
  - Sujay Murthy, Krishnan Thirukonda, May 11<sup>th</sup> 16:15

# Call to Action

Come and find me, tell me if you agree, disagree,  
what would make your deployment easier / quicker  
/ better



The bridge to possible