



The bridge to possible

Chrosswork Hierarchical Controller

Cross layer-vendor-domain Automation

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Agenda

- Introduction
- Defining a Hierarchical Controller
- Compliant with Industry Standards
- Introducing HCO
- Differentiation
- Conclusion
- Short Demo

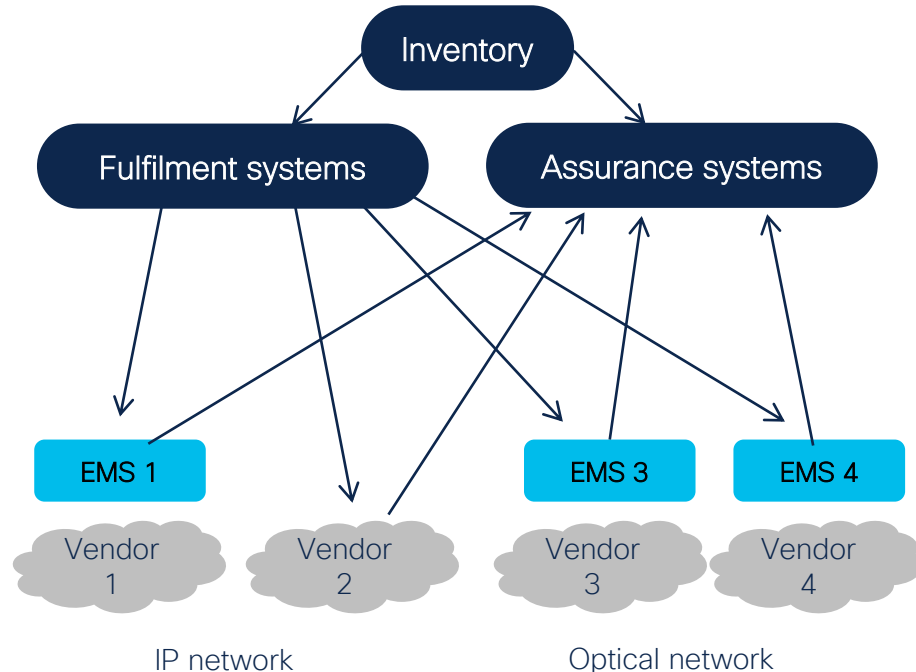
Why the need for hierarchical control?

- All service providers networks are complex
 - Multi Layer
 - Multi Domain
 - Multi Vendor
- Demands on the network are ever increasing
 - 5G services
 - On-demand expectations
 - Rapid data growth
 - Architecture shifts

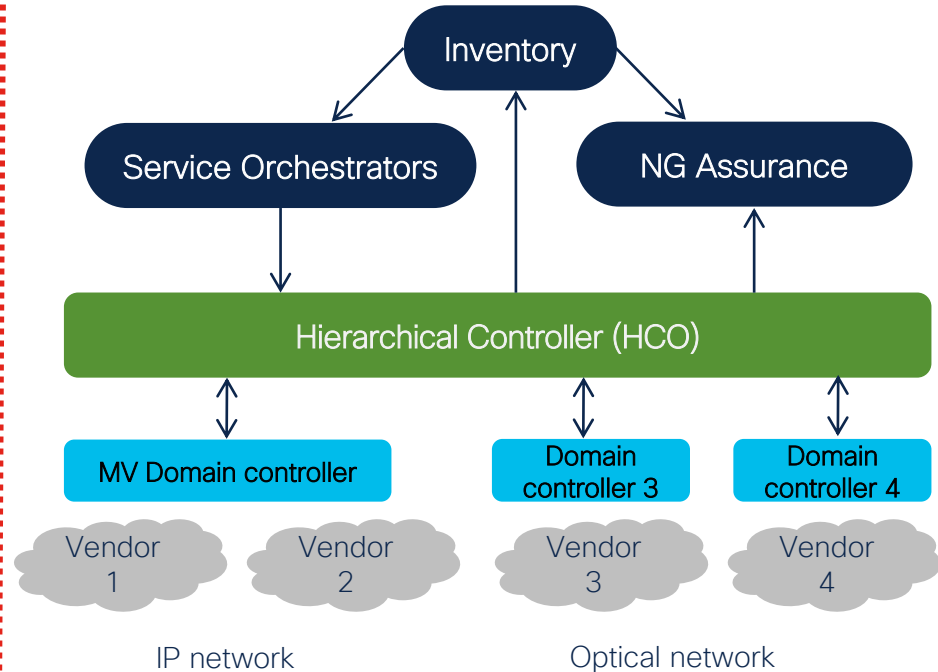


Legacy Network Management vs. SDN Hierarchy

Legacy mgmt stack

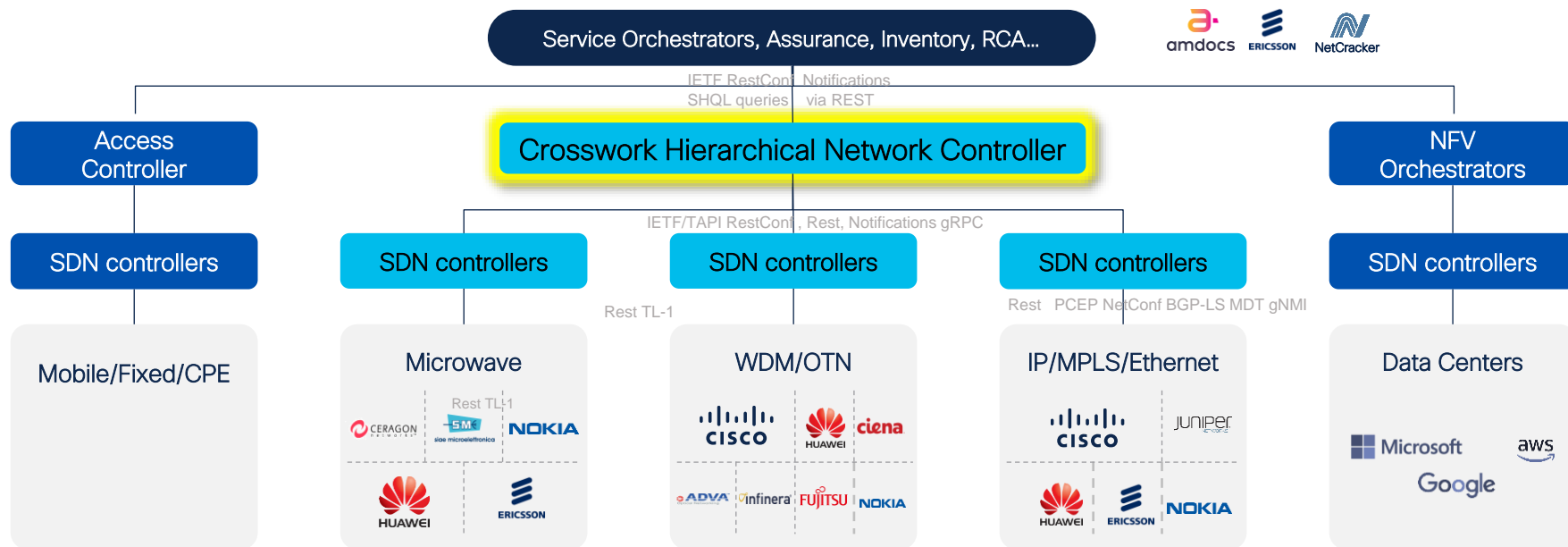


New SDN stack

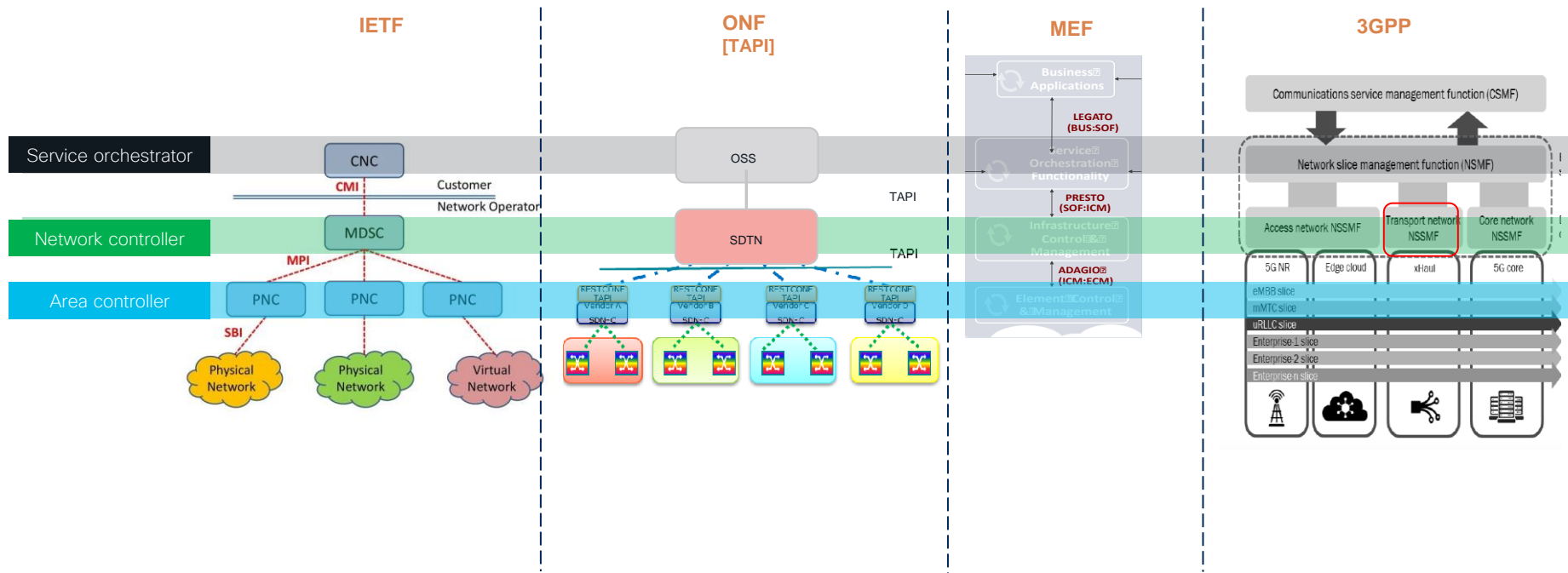


SDN Network architecture

Industry and operators

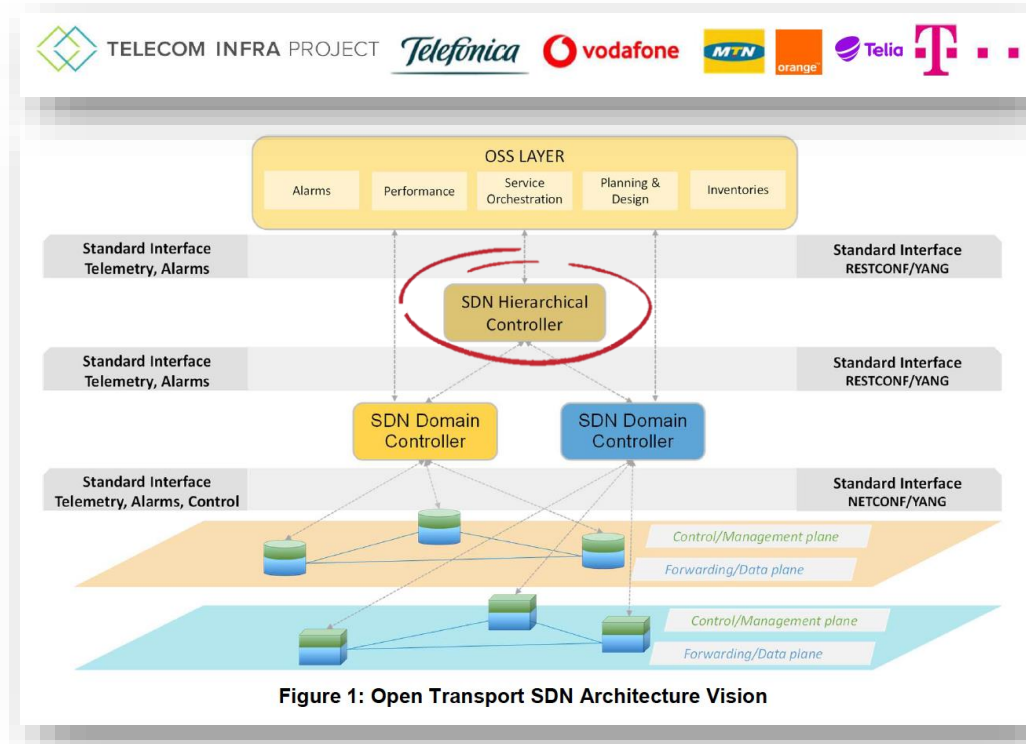


Aligned to standards



...As Well as by Major Telco Groups

- HCO is the interface between the OSS world and the network
- HCO has complete network visibility
- HCO closes the loop for network functions (remediation, optimization)
- HCO abstracts the network towards the OSS



https://cdn.brandfolder.io/D8DI15S7/at/jh6nnbb6bjvn7w7t5jbgm5n/OpenTransportArchitecture-Whitepaper_TIP_Final.pdf

The challenge: Rigid and fragmented networks

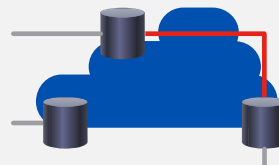
- Transport networks are a patchwork of technologies, domains, layers, and vendor turfs
- Most still rely on a siloed, highly manual, and error-prone operational apparatus
- Current network data is fiendishly difficult to collect, correlate, and utilize



IP Aggregation NW



Metro Optical Vendor A



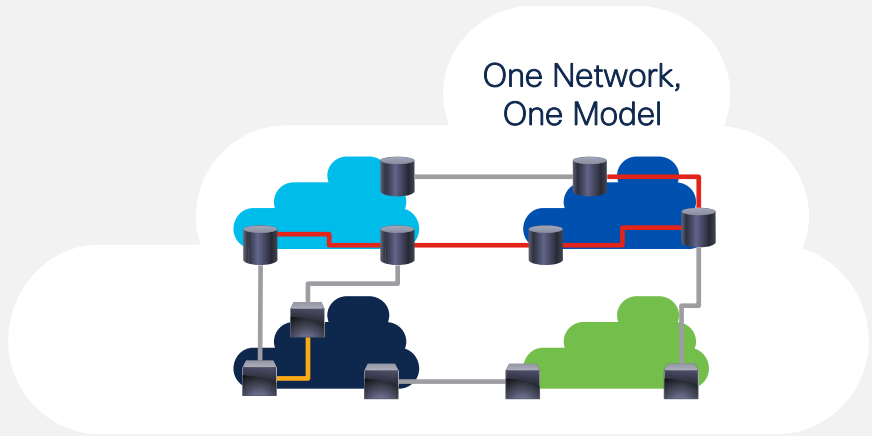
IP Core Network



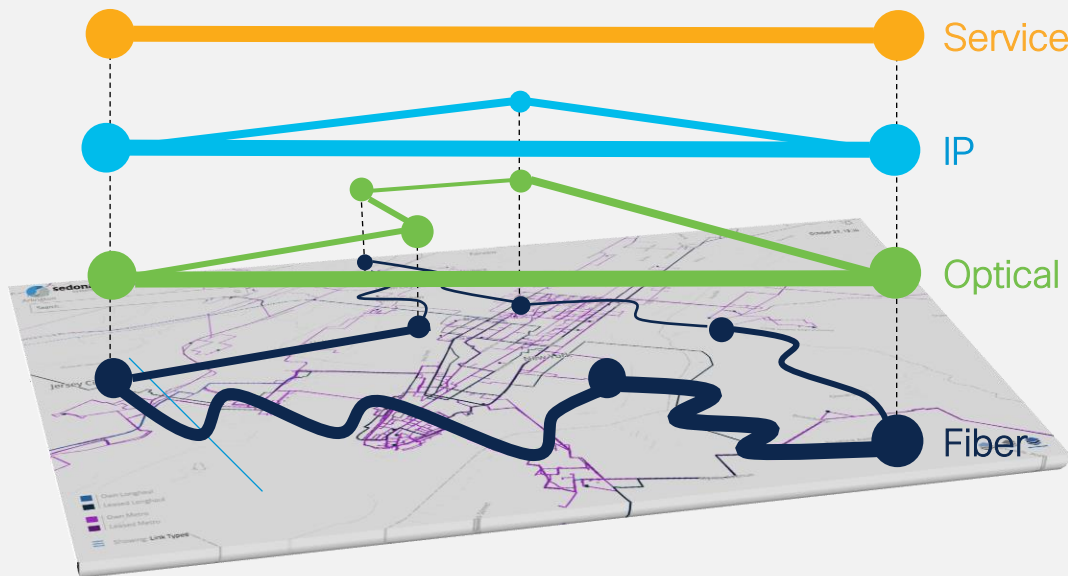
LH Optical Vendor B

Crosswork Hierarchical Controller puts this puzzle together

- Automatically acquire domain-specific network data
- Normalize into network structure
- Understand how domains in one layer are connected
- Understand how layers are connected to each other
- Analyze the network to identify issues
- Visualize it
- Automate it



Creating the ultimate network data source: Fiber-to-service visibility



Complete

Multilayer, multivendor, and multidomain topology, traffic, and services (SDN and legacy)

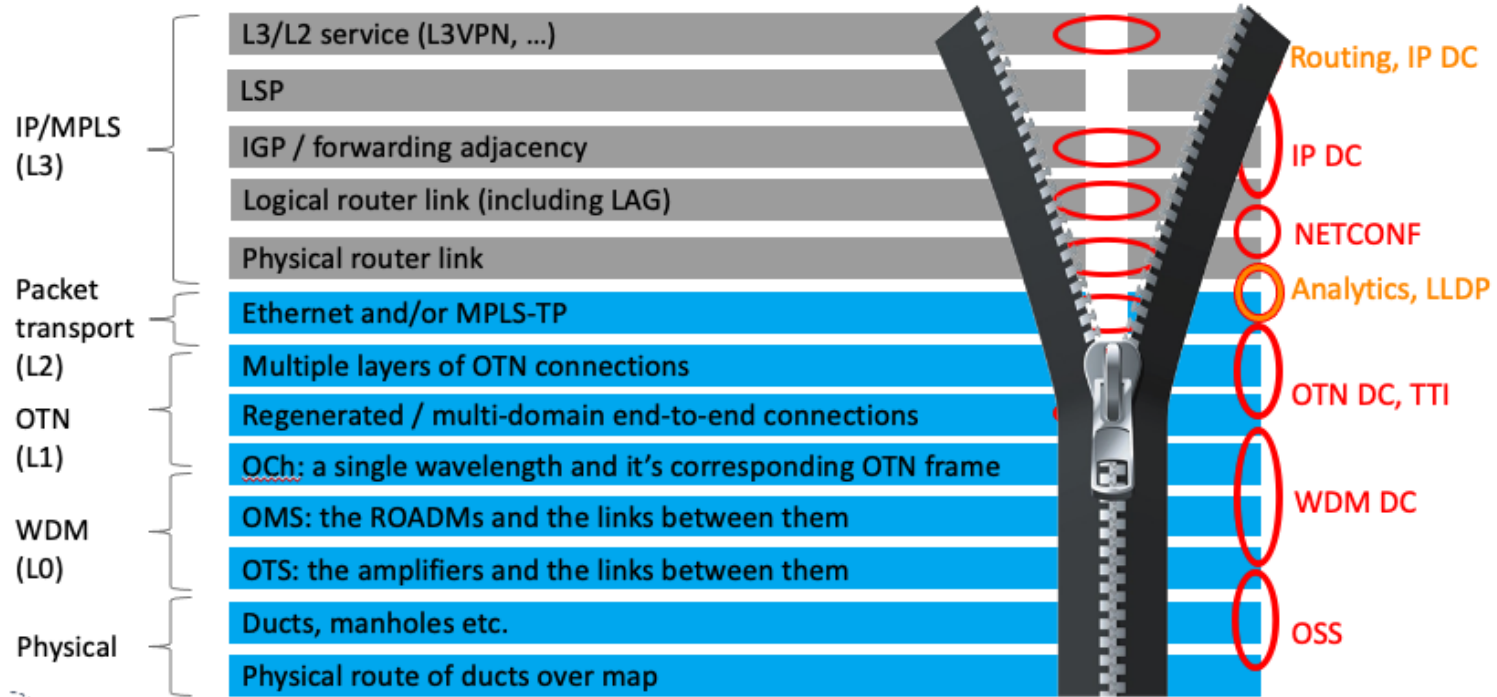
Current

automatically and ongoingly discovered – directly from the network

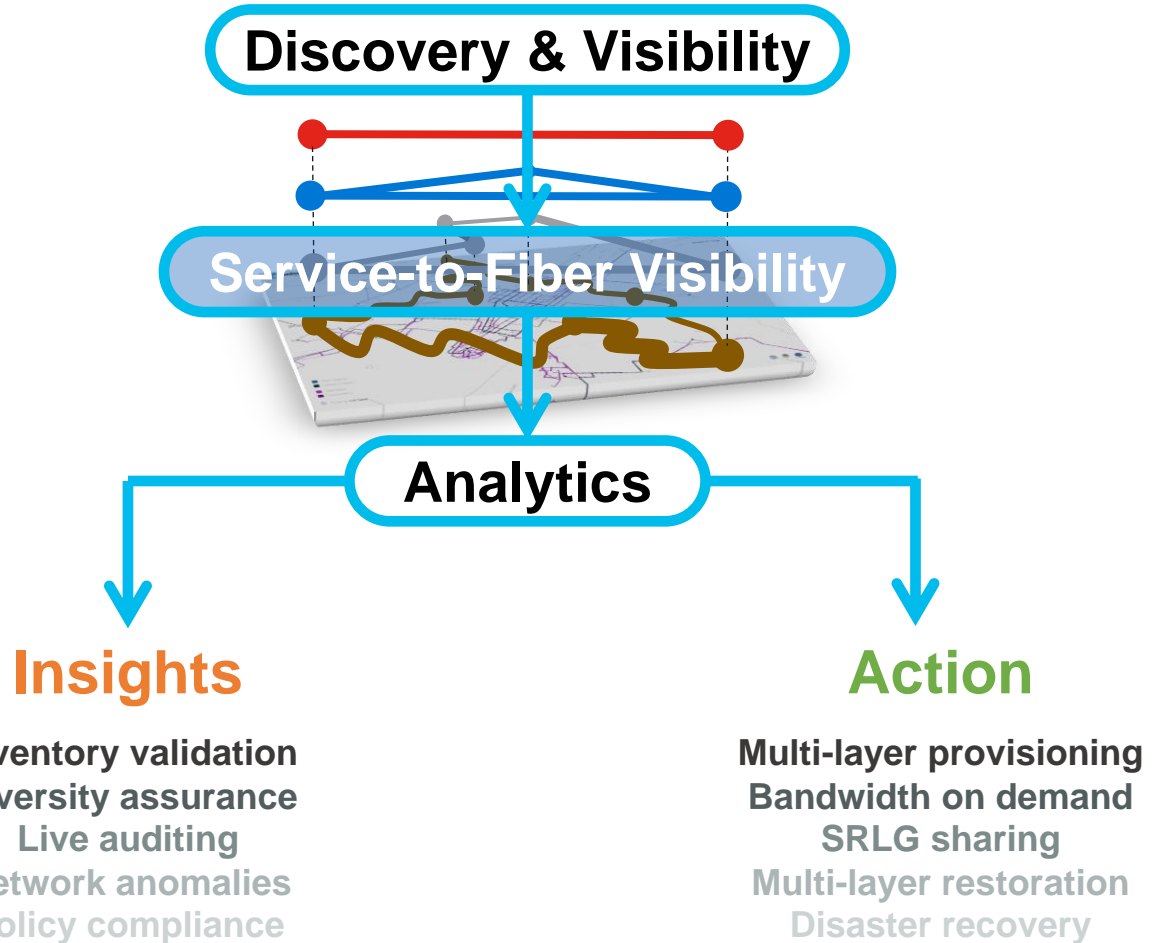
Correlated

dynamically deducing cross-domain connectivity

Inter-domain / inter-layer stitching

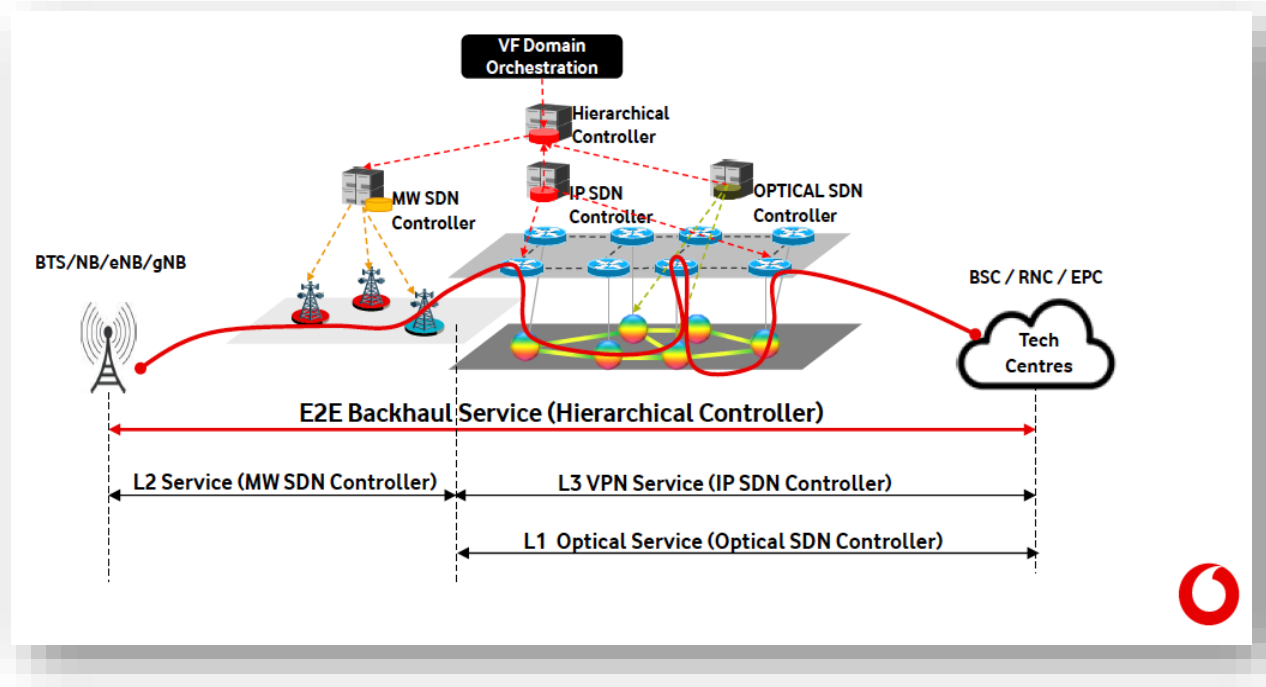


We Apply the Data
to Transform
Network Operation



Manage all Services from a Single Platform

- L0-L3 services:
 - WDM
 - OTN
 - ELINE
 - ELAN/ETREE
 - L2VPN(Opt & Packet)
 - L3VPN
- Over any underlay:
 - WDM
 - OTN
 - MPLS-TP
 - Microwave
 - MPLS
 - SR
- Multivendor
- Hybrid services



Network query language



Problem

- Raw network data model too complex for BI tools
- Costly OSS development due to need to ingest complex network models



Solution

Sedona Hierarchical Query Language (SHQL)

Extract complex network data, in a simple, flat structure

- Navigation up and down the layers
- Transform from one object type to another
- Integrated time machine

Usage patterns

- By Crosswork Hierarchical Controller **apps**
- By users, via **reporting** app
- Creation of customized, rule-based **tags**
- Through Hierarchical Controller **REST API**

“All core routers”:

```
inventory_item[.type = "ROUTER" and .name contains "CR"]
```

“All ports of Cisco edge routers”:

```
inventory_item[.type = "ROUTER" and .name contains "ER" and .vendor = "Cisco"] | port
```

“All logical links going to/from site FRA”:

```
site[.name contains "FRA"] | inventory_item | port | link [.layer = "R_LOGICAL"]
```

“All WDM links that are down and affect an LSP that is down”:

```
link[.layer = "LSP" and .operStatus = "DOWN"] | downward | port |  
link[.layer = "OMS" and .operStatus = "DOWN"]
```

Reduce cost of integration with network apps by 30-70%

CISCO *Live!*

[illegible]

CISCO *Live!*

The screenshot displays the Sedona Systems network visualization interface. At the top, a breadcrumb trail shows the path: DUS > CR1.DUS > 10.40.0.21. Below this, a search bar contains the text "CR1.DUS:CR1.VAL:lsip_0". The main area is divided into three tabs: "Info", "Connections", and "Path". The "Info" tab is active, showing a network topology diagram. The diagram features a vertical column of nodes on the left, with a path highlighted in grey. The path starts at "CR1.DUS" (IP: 10.40.0.21), goes down to "CR1.DUS" (IP: 10.40.0.118), then to "CR1.DUS" (IP: TenGigE0/1/0/0), then to "CR1.DUS" (IP: TenGigE0/1/0/0), then to "SD1DU501" (IP: 1-5-100-2), and finally to "SD1DU501" (IP: 1-5-100-2). The "Connections" tab is also visible, showing a table of connections. The table has columns for "Name" and "Bandwidth". The connections listed are:

Name	Bandwidth
9582 ITEMS	
<ETH> CISLLCUT-0023-CISLLCU...	10
<ETH> DALDBX101011206177AB-...	10
<ETH> HOU0JV03021609177AA-...	10
<ETH> BST022K01114A05177BA-...	10
<ETH> CINYKNY-0077-CINYKN...	10
<ETH> LSA07UM11000102177BF-...	10

A map of Spain and surrounding regions (Portugal, France, Andorra) showing a network topology. The nodes are represented by purple circles with labels: [LIS] (Lisbon), [MAD] (Madrid), [CDB] (Cordoba), [BIL] (Bilbao), and [OVE] (Oviedo). The connections are as follows:

- [LIS] is connected to [MAD] by a blue line.
- [MAD] is connected to [CDB] by a blue line.
- [MAD] is connected to [BIL] by an orange line.
- [BIL] is connected to [OVE] by a green line.
- [OVE] is connected to [LIS] by a grey line.

 The map also shows major cities like Vigo, Bordeaux, Barcelona, and Seville, and geographical features like the Atlantic Ocean and the Mediterranean Sea.

Ver 3.5.100.2
Sedona Systems
Collections Report

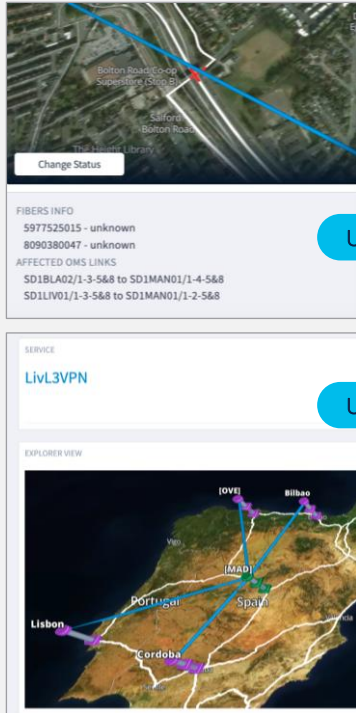
Network based inventory

Name	Bandwidth (GBps)	Distance (Km)	Node A	Port A
9582 ITEMS				
<ETH> CISLLCUT-0023-CISLLOCU...	10	N/A	CISLLCUT-0023	<ETH> CISLLCUT-0023-CISLLOCU... STTLWAGAH15
<ETH> DALDBX1010112061T7AB-...	10	N/A	DALDBX1010112061T7AB	<ETH> DALG0Z020102021T7BA...
<ETH> HOU0JVB030216091T7AA-...	10	N/A	HOU0JVB030216091T7AA	<ETH> HOU0RQJ08000M2297TAB...
<ETH> BST022K01114A051T7BA-...	10	N/A	BST022K01114A051T7BA	<ETH> BST03CM010128041T7BA...
<ETH> CINYKYNY-0077-CINYKN...	10	N/A	CINYKYNY-0077	<ETH> CIPHLPA-0063
<ETH> LSA07UM10001021T7BF-...	10	N/A	LSA07UM10001021T7BF	<ETH> LSA0BWB051507051T7BF...

Protection Status: Unknown
 Path Group Type: Single Path
 Port A: 91.204.0.92/80
 Port B: 94.35.208.51/24

[illegible]

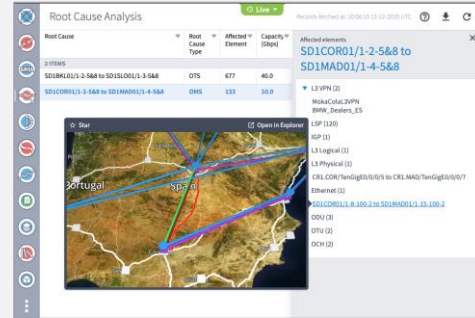
Risk management



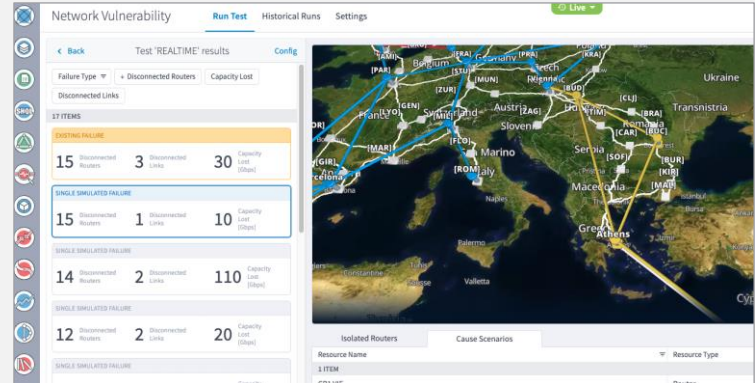
Understand physical risks

Understand traffic route

Identify root cause of service failure



Identify vulnerability to additional failures



Main Crosswork Hierarchical Controller differentiators

Preintegrated with all vendors: Both pre-SDN and SDN APIs

Ensuring tight SLA: Provisioning and assurance for both service overlay and underlay

Unique discovery solution for all network layers, all services, and cross-layer and cross-domain links

Sophisticated path computation allowing to optimize path for multilayer constraints using powerful path computation algorithms



Crosswork
Hierarchical
Controller



Network analytics engine: Understand network anomalies, track changes and degradations over time using powerful query language

Scalability: Hierarchical control scales to over 10,000 elements in real time

Supporting evolution from pre-SDN to SDN and from legacy networks to new ones

Demonstrable leadership for advanced use cases: multilayer restoration, optimization, predictive failure avoidance

The only deployed network controller in market today

Cisco Webex App

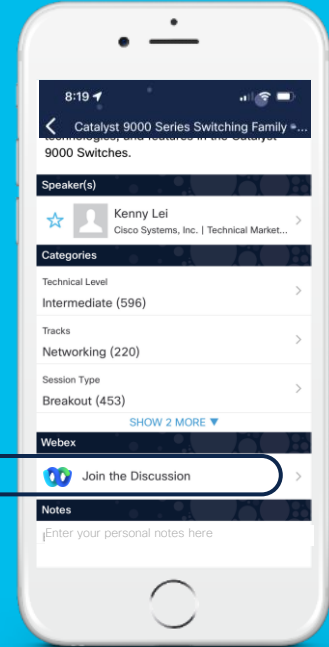
Questions?

Use Cisco Webex App to chat with the speaker after the session

How

- 1 Find this session in the Cisco Live Mobile App
- 2 Click “Join the Discussion”
- 3 Install the Webex App or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

Webex spaces will be moderated by the speaker until February 24, 2023.



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The bridge to possible

Thank you

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For more information on
Cisco's Automation
portfolio and Crosswork
Hierarchical Controller ,
please visit

cisco.com/go/crosswork


The screenshot shows the Cisco Crosswork Network Automation website. At the top, there is a navigation bar with the Cisco logo and links for Products, Support & Learn, Partners, and Events & Videos. Below this is a blue banner with the text "Try Crosswork Network Insights free for 30 days" and a "Get trial" button. The main content area features the heading "Cisco Crosswork Network Automation" and a subheading "Modernize network operations". A central image shows a laptop displaying a server room. To the right of the image, there is a paragraph describing the benefits of Crosswork Network Automation and a "Watch overview (3:10)" button. Below this, there is a section titled "Simplify network automation" with a paragraph explaining the software suite. At the bottom, there is a section titled "Economic benefits from Crosswork Network Automation" with three circular charts showing percentages: 85% for Faster time to service, 55% for OpEx savings, and 46% for TCO savings.

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Cisco Crosswork Network Automation



Modernize network operations

Crosswork Network Automation helps your customers simplify operations so they can deliver services faster and improve their customers' experiences. Increase visibility of your infrastructure to derive valuable insights so you can take proactive actions.

[Watch overview \(3:10\)](#)

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Simplify network automation

Crosswork Network Automation is a closed-loop, outcome-driven software suite used to deliver efficient mass-scale network operations across the services lifecycle. This is a scalable solution for operators of all-sized networks to accelerate mean-time-to-value by monetizing agile new services and minimizing mean-time-to-remediation to proactively prevent customer impacting issues.

Economic benefits from Crosswork Network Automation

Metric	Benefit
85%	Faster time to service
55%	OpEx savings
46%	TCO savings

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ALL IN