



The bridge to possible

# Cisco Crosswork Hierarchical Controller

## Introduction

Rached Bili

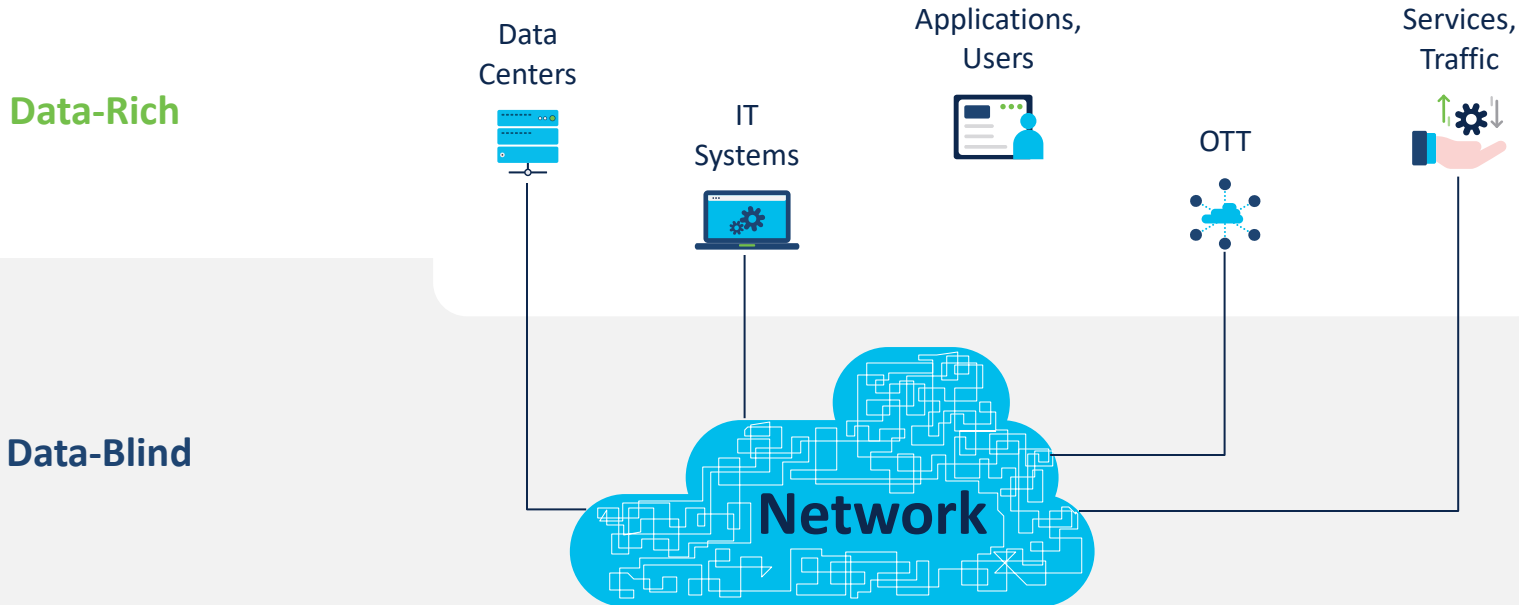
CTO – Global Network Automation Sales, Mass-Scale Infrastructure

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# What is HCO?

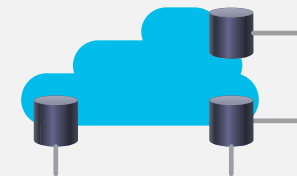
- **Crosswork** **H**ierarchical **C**ontroller
- **Gathers All Network Domains**
- **Exposes Digital Twin**
- **Decomposes Network Services**

# We address a giant black hole in service providers' data domain: The network itself



# The challenge: Rigid and fragmented networks

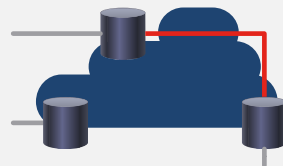
- Transport networks are a patchwork of technologies, domains, layers, and vendor turfs
- Most still rely on a siloed, highly manual, and error-prone operational apparatus
- Current network data is fiendishly difficult to collect, correlate, and utilize



IP Aggregation NW



Metro Optical Vendor A



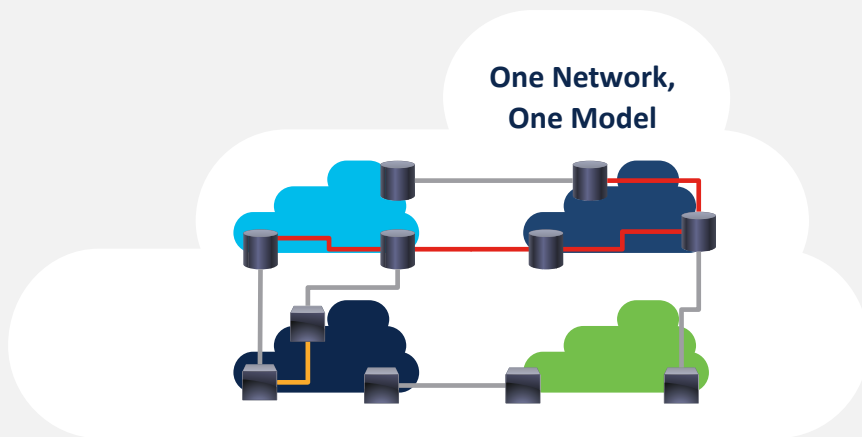
IP Core Network



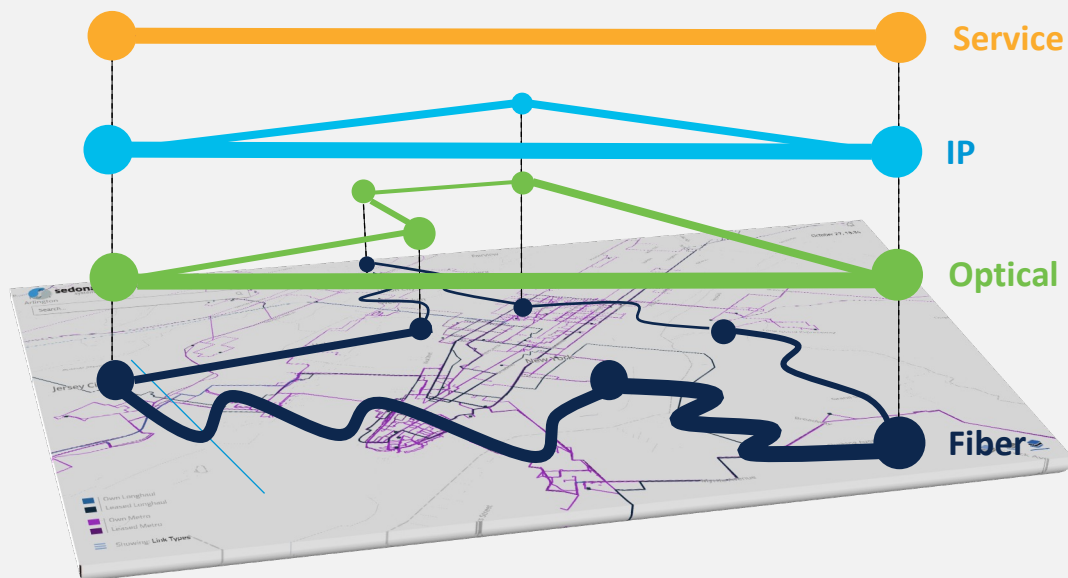
LH Optical Vendor B

# 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 and control



## 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

# Architecture



# A Controller...



## Exposes:

- Network Topology
- Service Topology
- Active Network Inventory
- Network KPIs



## Manages:

- Service Creation
- Service Modification
- Service Deletion
- Path Computation

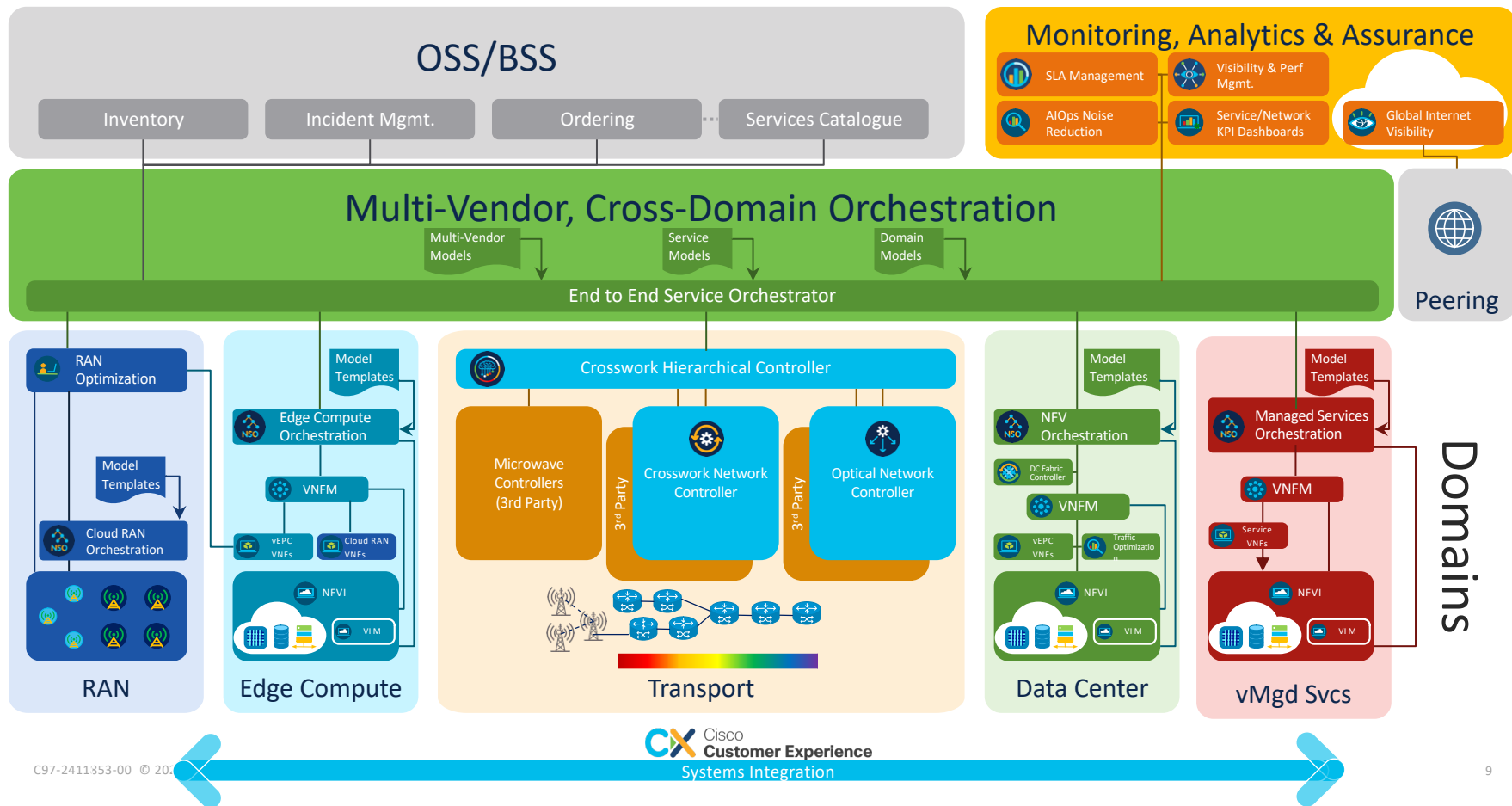


## Assures:

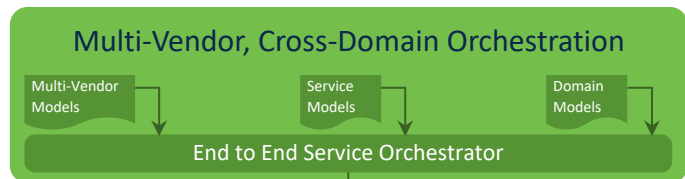
- SLA
- Policy
- Optimization



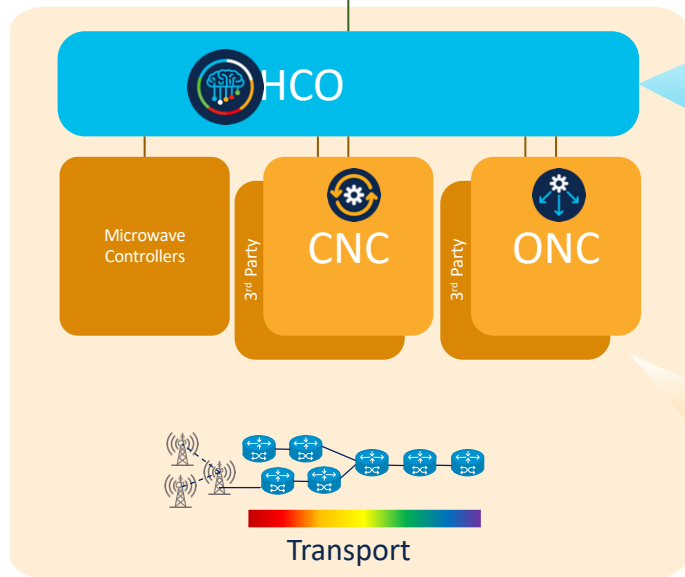
# HCO In Context



# Transport Domain Functional Layers



- E2E service lifecycle management
  - Onboarding, scaling, healing
  - Assurance
  - VNF chaining
- Resource management (storage, compute, network)



- Gather all transport domains, layers and vendors into a single, unified network.
- Hierarchical Path Computation for multi layer/domain/vendor service stitching.
- Decomposes service and SLA and assigns appropriate responsibility to relevant domain controller.
- Maintains sync with all domain controllers.
- Maintains network policies.
- Manages network resources centrally.
- Northbound network abstraction (NBI).

- Path computation for the domain using insight into the equipment.
- Provides an isolation layer between the equipment and the Hierarchical Controller that reduces maintenance to the HCO and Orchestration layers.
  - IP/MPLS/SR layer; Single multi-vendor-domain controller feasible, may also be split between several domains or vendors.
  - Optical Layer usually split between independent line systems.
  - Disaggregated optical networks split the line system and transponder domains
  - Microwave in early stages.

# Management of all services from a single platform

## L1-L3 services:

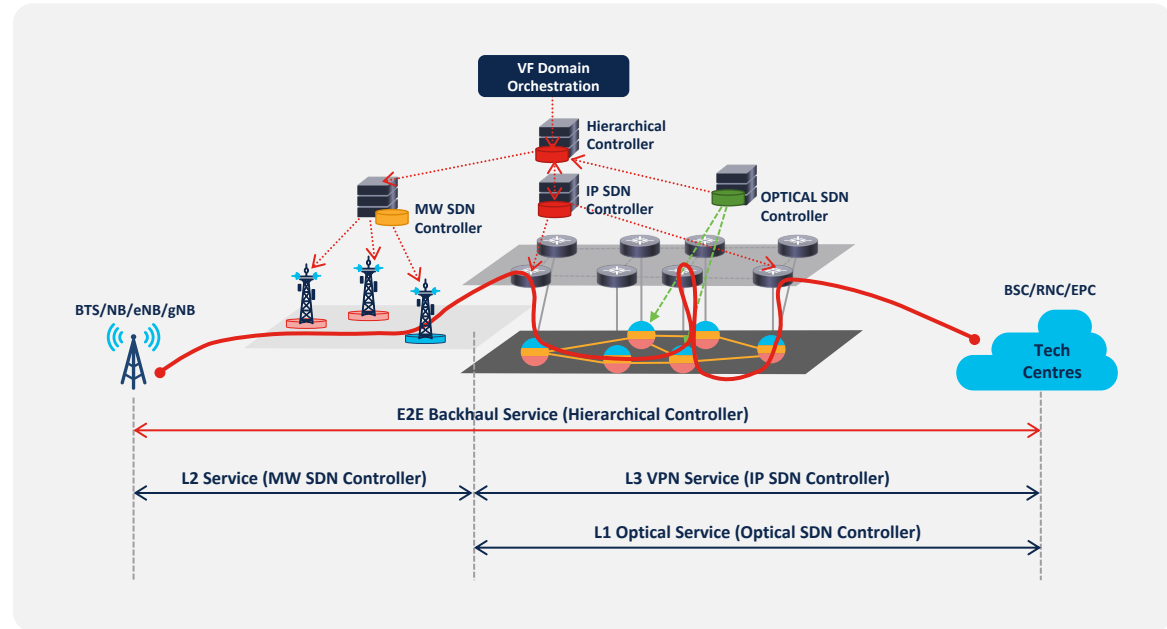
- OTN
- ELINE
- ELAN/ETREE
- L2VPN
- L3VPN

## Over any underlay:

- WDM
- OTN
- MPLS-TP
- Microwave
- MPLS
- SR

Multivendor

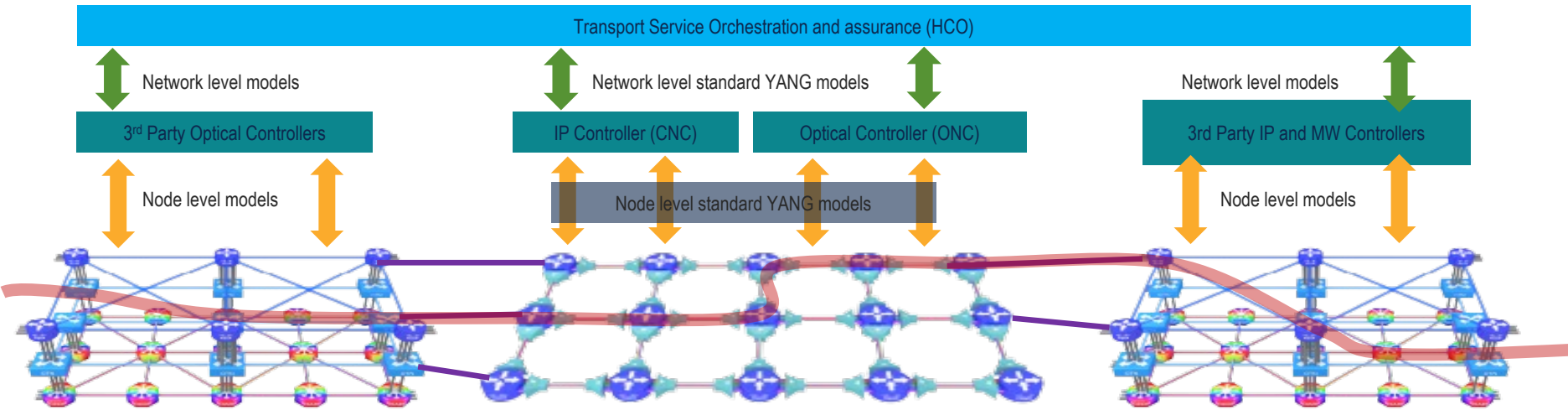
Hybrid services



**Hybrid service example: L3 VPN with L1/L2 "tails" as a single service**

# Role of HCO in a Hybrid RON + Existing Network

- Deployment scenarios:
  - RON is deployed in part of the network (e.g. core) but other parts stay as they are
  - RON routers are deployed over legacy WDM systems
- Role of HCO: control and assure the entire network in a unified and easy manner





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