

Sample End-to-end Configuration

This appendix describes an end-to-end provisioning example for a Routed Optical Networking topology.

• Sample Configuration, on page 1

Sample Configuration

This section details the step-by-step approach to build a new Routed Optical Networking based, 75 km fiber span to replace an existing legacy span in a two-node DCI topology.

- Network Sizing Requirements, on page 1
- Planning and Design Phase, on page 4
- Implement Phase, on page 5
- Operate Phase, on page 59
- Optimization Phase, on page 71

Network Sizing Requirements

This section details the sizing requirements for a network. For a small lab installation, three servers with 256 GB of RAM is enough to run the Crosswork, Crosswork Network Controller, Cisco Optical Network Controller, NSO, Crosswork Hierarchical Controller, and EPNM in a non-HA deployment. For a production setup, calculate the total resources required using information in the following tables.

Network Profiles

Network profiles are defined based on network size, services, and application features.

Network Entity/Feature	Lab	Production
	(20%)	(100%)
Devices	2000	10000
Total number of interfaces	100000	650000
IGP interfaces	20000	100000

Network Entity/Feature	Lab	Production
	(20%)	(100%)
VPN Services (L2, L3)	40000	200000
Endpoints per VPN service	2 to 10	50
Total LSPs (SR policies and RSVP tunnels)	12000	60000
Number of PCEP sessions	2000	10000

Note

Deployment Size per Network Profile

The following table is the recommended deployment sizing requirement for solution using Cisco Crosswork Network Controller.

Package	Contents	Crosswork Data Gateway Deployment	Recommended number of cluster VMs
Cisco Crosswork Network Controller Essentials	Cisco Crosswork Optimization Engine	On-Premise Standard (default): Collectors only.	When Essentials package is installed
	Cisco Crosswork Active Topology	On-Premise Standard (default): Collectors only.	WITHOUT Element Management Functions:
	Element Management Functions	On-Premise Standard (default): Collectors only.	• 3 Hybrid nodes
			When Essentials package is installed WITH Element Management Functions: • 3 Hybrid nodes + 1 Worker node
Cisco Crosswork Network Controller Advantage	Cisco Crosswork Service Health	On-Premise Extended : Collectors and offload services.	3 Hybrid nodes + 2 Worker nodes

Each SR-PCE pair can only support 2000 PCEP sessions which means only 2000 headends for lab networks and 10000 headends for production networks. While counting headends, LCM nodes must be included.

Package	Contents	Crosswork Data Gateway Deployment	Recommended number of cluster VMs
Add-on Package	Cisco Crosswork Change Automation	On-Premise Extended : Collectors and offload services.	3 Hybrid nodes + 2 Worker nodes
	Cisco Crosswork Health Insights	On-Premise Extended : Collectors and offload services.	-
	Cisco Crosswork Zero Touch Provisioning	On-Premise Standard (default): Collectors only.	

Note

For non-production lab installations without HA, you can use 1 Hybrid node.

VM Resources

The following table provide the details on CPU, memory, and disk requirements needed for each Crosswork VM and the other VMs in the deployment.

Crosswork VM	Crosswork Data Gateway	NSO	SR-PCE	Crosswork Hierarchical Controller	EPNM
• CPU: 12 vCPU • RAM: 96 GB • DISK: 1 TB (SSD)	• CPU: 20 vCPU • RAM: 112 GB • DISK: 0.5 TB	 Small Network Profile CPU: 8 vCPU RAM: 64 GB DISK: 250 GB Large Network Profile CPU: 24 vCPU RAM: 132 GB DISK: 1TB 	 CPU: 8 vCPU RAM: 24 GB DISK: 45 GB 	 CPU: 10 cores RAM: 96 GB DISK: 400G SSD (lab), 3TB SSD (production) 	 Professional (Small) CPU: 16 vCPU RAM: 64 GB DISK: 2.8 TB Extended (Medium/Large) CPU: 24 vCPU RAM: 128 GB DISK: 4 TB



Note In Routed Optical Networking 2.1, Cisco Optical Network Controller and Crosswork Network Controller require different Crosswork Infrastructure versions. The Crosswork Infrastructure Cluster for Cisco Optical Network Controller must have:

- 3 VM
- CPU: 12 vCPU
- RAM: 96 GB
- DISK: 1TB SSD

Cisco Optical Network Controller Scale Support

Cisco Optical Network Controller supports a maximum of 500 nodes and 600 services. Cisco Optical Network Controller can run on the same cluster. Cisco Optical Network Controller adds more resources incrementally at the maximum supported scale. It is captured in Crosswork VM resources in the table above.

Planning and Design Phase

The planning and design phase involves:

1. Network Planning and Design

Inputs needed: Packet layer traffic demands, optical fiber topology, resiliency criteria, and other network constraints.

- a. WAE can be used to determine a new network build or augmentations to an existing network.
- **b.** After the IP network circuits have been determined, Cisco ONP is used to determine the optical layer feasibility and components that are used to support the network.

Output for a sample configuration:

This topology uses two Cisco 8201 routers, two NCS 2006 terminal nodes with NCS1K-MD-64 add/drop multiplexers, and EDFA-35 bi-directional amplifiers. The span length is 75 kms. Longer spans may require additional ILA nodes for amplification.

2. Automation Software Resource Planning

Server requirements for the Routed Optical Networking software elements

Determine the servers required for the full solution. See Network Sizing Requirements, on page 1 and Installation Requirements for Routed Optical Networking Components, on page 4.

- **a.** For a lab or EFT setup, it is recommended to use three servers each with 384 G of RAM, 32 cores, and two TB SSD.
- **b.** The solution requires the use of VMware ESX 6.7 or higher.

Installation Requirements for Routed Optical Networking Components

The following list points to the installation requirements for different Routed Optical Networking components.

Cisco Optical Network Planner 5.1

- Cisco WAN Automation Engine 7.5.0
- Cisco NCS 2000 Shelf Virtualization Orchestrator 12.3.x
- Cisco Crosswork Cluster, Crosswork Data Gateway, and Crosswork Applications
- Cisco Optical Network Controller 2.1
- Cisco Evolved Programmable Network Manager 7.0.1
- Cisco Network Services Orchestrator 6.1
 - Cisco NSO Routed Optical Networking Core Function Pack 2.1
 - Cisco NSO Transport-SDN Function Pack Bundle 5.0
 - Cisco Network Services Orchestrator DLM Service Pack 5.0
- Cisco Crosswork Hierarchical Controller 7.0
- Cisco Crosswork Network Controller 5.0

Implement Phase

The implement phase involves:

- 1. Installation of hardware components
 - a. Hardware staging or installation and initial base configuration required for management connectivity.
 - b. All onboard software updates must be completed to the required revision.
 - c. All associated base wiring must be completed to support the network. This includes connections between the optical elements and connections between routers and optical add/drop end-points to support Routed Optical Networking circuits using ZR/ZR+ optics. See Deployment Topologies.
 - **d.** SVO 12.2 server or line card based installation to support NCS 2000 nodes. See Install the External Server, and Run the SVO Installation Tool.
 - e. Create SVO instances for all NCS 2000 nodes. See Create an SVO Instance.

2. Installation of the Automation Software Components

- **a.** Complete all server hardware installation and base configuration to support the solution, including VMWare ESX if not already installed.
- b. Install the following software components to support the Routed Optical Networking solution.
 - Cisco Optical Network Planner 5.1 (for optical planning)
 - Cisco WAN Automation Engine 7.5.0 (for IP planning)
 - Cisco Crosswork Cluster, Crosswork Data Gateway, and Crosswork Applications (for supporting Crosswork Network Controller)
 - Cisco Optical Network Controller 2.1 (for supporting optical network)
 - Cisco Evolved Programmable Network Manager 7.0.1 (for managing the physical router and the optical network nodes)

- Cisco Network Services Orchestrator 6.1 (base installation to support RON FP)
 - Cisco NSO Routed Optical Networking Core Function Pack 2.1 (for RON ML provisioning)
 - Cisco NSO Transport-SDN Function Pack Bundle 5.0 (for Crosswork Network Controller SR and xVPN provisioning)
 - Cisco Network Services Orchestrator DLM Service Pack 5.0 (for device synchronization between Crosswork Network Controller and NSO)
- Cisco Crosswork Hierarchical Controller 7.0 (for provisioning the Routed Optical Networking ML service using the Crosswork Hierarchical Controller)



Note This is required only if the Routed Optical Networking ML service is provisioned via the Crosswork Hierarchical Controller GUI.

3. Onboarding of Devices

- **a.** Add devices to Cisco Optical Network Controller. See Onboard Devices to Cisco Optical Network Controller.
- b. Add NSO, SR-PCE, and devices to Crosswork Network Controller. See Add SR-PCE, NSO, and Routers to Crosswork Network Controller, on page 7.
- c. Add routers to NSO using the IOS-XR CLI NED. See Step 3 in Provision ML Service Using NSO Routed Optical Networking CFP, on page 20.
- d. Add Cisco Optical Network Controller to NSO using the ONF TAPI NED.
- e. Add and configure the following Crosswork Hierarchical Controller adapters. See Configure Adapters for Crosswork Hierarchical Controller, on page 13.



- **Note** This step is required only if the Routed Optical Networking ML service is provisioned via the Crosswork Hierarchical Controller GUI.
 - Add and configure the Crosswork Network Controller adapter.
 - Create or import sites in Crosswork Hierarchical Controller. See the sections, "Add Sites" and "Export and Import Sites" in the Cisco Crosswork Hierarchical Controller Administration Guide 5.1.
 - Add and configure the IOS-XR adapter. Create router devices in Crosswork Hierarchical Controller using the IOS-XR adapter type. After the routers are created, add the Crosswork Network Controller adapter to the router device.
 - · Add and configure the Cisco Optical Network Controller adapter.

4. Provisioning of Services

a. Ensure all device interconnections are complete.

b. To provision the Routed Optical Networking ML service, use either one of the procedures:

1. Using the NSO GUI:

- **a.** Utilize the Routed Optical Networking FP ML services to provision and end-to-end service. See Provision ML Service Using NSO Routed Optical Networking CFP, on page 20.
- **b.** Verify that the end-to-end service has been deployed by checking the NSO service deployment status using the check-sync status.
- c. Verify the router optics controller state using the CLI or in EPNM. See Troubleshoot Provisioning Issues.
- 2. Using the Crosswork Hierarchical Controller GUI:
 - a. Utilize the Crosswork Hierarchical Controller GUI to provision and end-to-end Routed Optical Networking ML service. See Provision Routed Optical Networking ML Service Using Crosswork Hierarchical Controller, on page 34.
 - b. Verify the router optics controller state using the Link Assurance tool in Crosswork Hierarchical Controller. See Step 4 in Provision Routed Optical Networking ML Service Using Crosswork Hierarchical Controller, on page 34.

Add SR-PCE, NSO, and Routers to Crosswork Network Controller

Perform these steps to add SR-PCE providers, NSO providers, and routers to Crosswork Network Controller.



Note When you add or import devices, or create providers, you need to specify the credential profile.

- **1.** Log in to the Crosswork user interface.
- To create a credential profile, choose Device Management > Credential Profiles from the main menu. See Manage Credential Profiles.
 - **a.** For the NSO credential profile, the connectivity type must be set to NETCONF and HTTPS. Optionally, HTTP can also be defined if HTTPS is not used in NSO.

Edit Profile nso							>
Profile Name * nso Add Credential Protoco	ls						
Connectivity Type NETCONF	~	User Name * nso	Password *	٥	Confirm Password *	٠	Ē
Connectivity Type HTTPS	~	User Name * nso	Password *	۰	Confirm Password*	۰	Ô
+ Add Another							

Cancel

b. The SR-PCE credential profile requires HTTP credentials to communicate with the SR-PCE Northbound API.

Edit Profile	SR-PCE							×
Profile Name *	SR-PCE							
Add Credentia	al Protocols							
Connectivity Ty	rpe	User Name *	Password *		Confirm Password *			
HTTP	\sim	admin	*****	۰	•••••	۰	Ē	
+ Add Another								

Save Cancel 906125

c. The router credential profile requires at a minimum, the SNMPv2 or SNMPv3 and SSH connectivity types. NETCONF is optional. GNMi is used when utilizing GNMi to configure streaming telemetry sensors on the node.

L

Edit Profile routers								×
Profile Name * routers								
Add Credential Protoco	ols							
Connectivity Type		Read Community *		Write Community				
SNMPv2	\sim	•••••	۰	•••••	•			
Connectivity Type		User Name *		Password *		Confirm Password *		
SSH	\sim	admin		•••••	۰	*****	۰	
Enable Password								
	\sim							
Connectivity Type		User Name *		Password *		Confirm Password*		
NETCONF	\sim	admin		*****	•	•••••	•	Ē
								ш
Connectivity Type		User Name *		Password *		Confirm Password*		
GNMI	\sim	admin		•••••	۰	•••••	۰	Ē
+ Add Another								
+ Add Another								
							Save	Cancel

- 3. Add the providers. See About Adding Providers.
 - **a.** To add the SR-PCE or NSO provider, choose **Administration** > **Manage Provider Access** from the main menu. See Manage Providers.
 - b. Add the NSO provider. See Add Cisco NSO Providers.

Select the credential profile created for NSO. Select the family as NSO. The Device Key may be set to either the HOST_NAME or INVENTORY_ID depending on the specific deployment.

The following image demonstrates the connectivity to NSO's RESTCONF API over SSL using port 8888 and NETCONF using the default port of 2022. Since the Routed Optical Networking NSO CFP utilizes the XR CLI NED, the Cisco-IOS-XR model is not applicable and may be set to any version.

Edit Provider								\times
Provider Name *	nso-58							
Credential Profile*	nso	\sim						
Family*	NSO	\sim						
Device Key*	HOST_NAME	\sim						
Connection Type(s)								
Protocol * IF	P Address / Subnet Mas	sk *				Port *	Timeout	
HTTPS \checkmark 1	172.29.11.58			/	25	8888	60	Ē
NETCONF \checkmark	172.29.11.58			/	25	2022	60	Ē
+ Add Another								
Provider Properties								
Property Key		Property Value	9					
forward		true			Ē			
+ Add Another								
Model Prefix Info								
Model *		Version *						
Cisco-IOS-XR	\sim	7.3.1			Ē			
						s	ave C	ancel

c. Add the SR-PCE provider. See Add Cisco SR-PCE Providers.

Select the credential profile created for SR-PCE. Select the family type as SR_PCE. The connectivity type for SR-PCE must be the HTTP. In the following image, the default API port of 8080 is specified. When the Property Key, "auto-onboard" is set to a Property value, "off", Crosswork Network Controller does not automatically add nodes that are discovered via the SR-PCE IGP topology to the device inventory. Devices must be added through the Crosswork Network Controller UI or inventory API.

Edit Provider						\times
Provider Name *	sr-pce-test					
Credential Profile*	SR-PCE	~				
Family*	SR_PCE	\sim				
Connection Type(s) Protocol * IP #	Address / Subnet Ma	sek *		Port *	Timeout	
	72.29.11.54		/ 25	8080	60	
+ Add Another Provider Properties						
Property Key ?		Property Value ?				
auto-onboard		off	Ō	Ī		

- 4. Validate communications with one or more providers. Check on the provider's reachability using the steps in Get Provider Details.
- 5. Onboard devices. See Add Devices Through the UI.
 - a. The Administration State, Reachability Check, and Credential Profile are mandatory elements. The Host Name must be used if the NSO provider device key is set to the Host Name value. If the NSO provider device key is set to Inventory ID that field must be populated. The Software Type, Software Version, UUID, Serial Number, MAC address, and Product Type are filled by device discovery. Optionally, tags can be applied to the device. The GNMI encoding type can be set to JSON or PROTO.

Administration State*	UP 🗸		UUID				
Reachability Check*	ENABLE V		Serial Number				
Credential Profile*	routers \lor		Mac Address				
Host Name	ron-8201-1		Capability*	YANG_MDT,	SNMP, GNMI	\sim	
Inventory ID			Tags			\sim	
Software Type			Product Type				
Software Version			Syslog Format			\sim	
Connectivity Details Protocol *	IP Address / Subnet Mask *		Port *	Timeout	Encoding Type		
SSH \checkmark	172.29.11.20	/ 25	22	60		\sim	Ī
SNMP \checkmark	172.29.11.20	/ 25	161	60		\sim	Ē
GNMI \checkmark	172.29.11.20	/ 25	57333	60	PROTO	\sim	Ē
NETCONF \checkmark	172.29.11.20	/ 25	830	60		\sim	Ē
+ Add Another							

Optionally, location information can be entered. Latitude and Longitude information place the node at a specific location on a geographic map.

Add the previously configured NSO provider as a provider for the device.

Ac	d New Device									>
	SNMP \checkmark	172.29.11.	20		/ 25	161	60		\sim	Ē
	GNMI 🗸	172.29.11.	20		/ 25	57333	60	PROTO	\sim	Ē
	NETCONF \lor	172.29.11.	20		/ 25	830	60		\sim	Ē
	+ Add Another									
>	Routing Info									
>	Streaming Telemetry	config								
\vee	Location									
	Building					Region				
	Street City					Zip				
						Latitude				
	State									
	Country			Altitude						
\sim	Providers and Access	2								
	Provider Family	-	Provider Name		Credenti	al		Device Key		
	NSO	\sim	nso-58	\sim	nso			ron-8201-1		
	Ô									
	+ Add Another									
									Save	Cancel

b. Attach the devices to an active Cisco Crosswork Data Gateway pool to manage them (device discovery).

Review the Data Gateways pane (see Overview of Cisco Crosswork Data Gateway). The operational state of the Cisco Crosswork Data Gateway pool to which you want to attach devices must be **Up**.

Follow the steps in Attach Devices to Cisco Crosswork Data Gateway.

	Pools Virtual M	achines							
Data Gatewa	y Metrics Summary								
Operation	nal State	Adı	ministration State		High Availabil	lity Status		Devices	
\mathbb{C}	Up (1) Error (0) Oegraded (0) Unknown (0)	(Up (1) Maintenance (0)		()	Protected (0) Not Protected (0) Limited Protection (0) None Planned (1)	(Attached (13) Available (0)	
a Gateways									Total 1 🔿 🗘
									٣
	Operational State	Administration State	High Availability Status	Pool Name	Outage History	② Average Availability	VM ID	Attached Device Count	Actions
0									
	O Up	O Up	None Planned	cdg-pool-1			cdg-soltest	13 🚯	Ξ
pool-1-1 (j)	O Up	O Up	None Planned	cdg-pool-1			cdg-soltest	13 🚯	Attach Devices
	G Up	O Up	None Planned	cdg-pool-1			cdg-soltest	13	

Configure Adapters for Crosswork Hierarchical Controller

Prerequisite

When you work with Crosswork Hierarchical Controller adapters you are required to use credentials. These credentials are used for authentication when a device is assigned to an adapter. The same credentials may be shared by multiple adapters. The credentials are added under the **Services > Device Manager > Credentials**

tab in the Crosswork Hierarchical Controller GUI. The adapters needed for the Routed Optical Networking solution are:

Adapter	Credential Type
Crosswork Network Controller	HTTP (username/password)
Crosswork Network Controller Crosswork Data Gateway	HTTP (username/password)
Cisco Optical Network Controller	HTTP (username/password)
IOS-XR	SSH - User and password



Note If Cisco Optical Network Controller and Crosswork Network Controller are on the same Crosswork cluster, they can use the same credential profile.

To add the adapters, perform the following steps:

- In the applications bar in Crosswork Hierarchical Controller, select Services > Device Manager > Adapters.
- 2. Click Add new adapter.
- 3. Enter the adapter details:
 - Adapter Type: Select an adapter type from the list of available adapter types currently installed in Crosswork Hierarchical Controller.
 - Adapter Name: Unique user defined name of this adapter type instance (there can be several instances of the same adapter type).
- 4. To configure the adapter, select the adapter in the Adapters pane. Configure the parameters as displayed in the following images.
 - Crosswork Network Controller Adapter:



Note API version for Crosswork Network Controller must be V2.

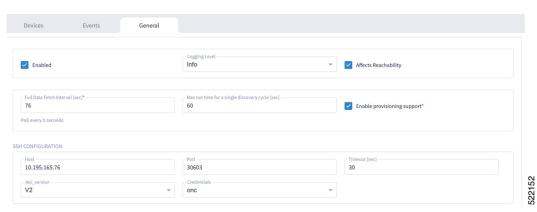


Figure 1: Crosswork Network Controller Adapter Configuration - General Tab



Note

The Full Data Fetch Interval must be set to 300s or higher in a production network.

The following parameters must be configured for Crosswork Network Controller notifications and collection.

Figure 2: Crosswork Network Controller Adapter Configuration - General Tab

NOTIFICATIONS CONFIGURATION		
Enabled	✓ Log_notifications	Log_level DEBUG ~
Congestion_control_period_sec	Netconf_session_end	Yang_library_update
Termination_point_event	✓ L3_prefix_event	Notification_complete
✓ L3_link_event	Netconf_confirmed_commit	Data_changed_notification
Netconf_config_change	Yang_library_change	Netconf_session_start
Sr_policy_change_event	Replay_complete	✓ L3_node_event
Sr_policy_oper_state_change_event	Netconf_capability_change	
FILE-BRINGERS CONFIGURATION		
Enabled	Remote address with file pattern	Credentials 👻
COLLECTION PARAMETERS		
Enable Topology Collection	Chable L1 IGP IS-IS Collection	Enable L2 IGP IS-IS Collection
IGP IS-IS Priority	 Enable Sr-Policy Collection 	Enable Rsvp-Te Collection

• IOS-XR Adapter

Z Enabled		Debug ~	Affects Reachability		
Polling Cycle [sec]*		Number of concurrent routers collected			
60		1 Enable provisioning support			
Poll every X seconds					
CONFIGURATION DI DANETERE					
I CONFIGURATION PARAMETERS					
Enable Tunnel		Tunnel Host	Tunnel Port		
		Router Connect timeout	Router Command timeout		
Tunnel Credentials Key 👻		10	10		
E BRINGER PARAMETERS					
		File Server Location	File Type Dash-and-Pound		
Enable File Bringer			Dash-and-Pound		
		"[sftp]file]:// <server>:<port>/<absolute path="">"</absolute></port></server>			
Authentication	*	Backup File Server Location (optional)	Backup_server_authentication		
		"[sftp[file]:// <server>:<port>/<absolute path="">"</absolute></port></server>			
TFUSION COLLECTION CYCLE FILES					

Note

The Polling Cycle should not be less than 300s in a production network. Concurrency can be increased. The Logging Level must be set to Info if everything is working correctly.

The following collection parameters must be configured. These parameters collect optical power values for the link assurance application.

Figure 4: IOS-XR Adapter - General Tab

COLLECTION PARAMETERS		
Enable Topology Collection	Enable IGP IS-IS Collection	Enable IGP OSPF Collection
Enable Interface Stats Collection	Enable VRF Collection	Chable LLDP Collection
Enable MPLS Tunnels Collection	Enable LSP Stats Collection	Enable SNMP Collection
IGP IS-IS Priority	Collect only IGP IS-IS seed routers	Allow to use loopback IP as management IP
Callection	Enable collection of optics and coherent DSP	Enable Segment Routing Collection

The status of the devices must be **ok** in the Devices tab after the addition and completion of a successful collection cycle.

Figure 5: IOS-XR Adapter - Devices Tab

Radia Processing Processing Processing norm 1231137 640 64 600 600 600 7231137 norm 1231137 640 6 Merry 6000 7231137 norm 1231137 640 6 Merry 6000 7231137 norm 6231137 640 6 600 600 7231137 1231137 640 6 Merry 6000 7231137 1231137 640 6 6000 6000 7231137 1231137 640 6 6000 6000 7231137 1231137 640 6 6000 6000 7231137 1231137 640 6 6000 60000 7231137 1231137 640 6 6000 60000 7231137 1231137 640 6 60000 60000 7231137 1231137 640 6 6000000000 60000000	Polity Nonery disay,cro30 122111.36 2 Nonery disay,cro30 12211.16 2 Sick 0 Sick 2 Sick 0 Sick 2 2 Sick 0 Sick 3 2 Sick 0 Sick 3 2 Sick 0 Sick 3 3 3 Sick 0 Sick 3 </th <th>Adapters</th> <th>Devices Ev</th> <th>ients G</th> <th>eneral</th> <th></th> <th></th> <th></th> <th></th> <th></th>	Adapters	Devices Ev	ients G	eneral					
NAME Interpretation Interpretation </td <td>volta volta <th< td=""><td>cisco-xr</td><td>Name</td><td> Status </td><td></td><td>Site</td><td> Adapter(s) </td><td>✓ Host</td><td>* Port</td><td></td></th<></td>	volta volta <th< td=""><td>cisco-xr</td><td>Name</td><td> Status </td><td></td><td>Site</td><td> Adapter(s) </td><td>✓ Host</td><td>* Port</td><td></td></th<>	cisco-xr	Name	 Status 		Site	 Adapter(s) 	✓ Host	* Port	
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Problem Problem <t< td=""><td>• 0k 0 Tacon desk,crd3 722114 2 • 0k 2 kavga desk,crd3 722114 2 • 0k 2 kavga desk,crd3 722114 2 • 0k 3 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Caron desk,crd3 722114 2 • 0k 0 Tacon desk,crd3 722114 2 • 0k 0 Maren desk,crd3 722114 2 • 0k 0 Maren desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0</td><td>nc-76</td><td>16 ITEMS</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	• 0k 0 Tacon desk,crd3 722114 2 • 0k 2 kavga desk,crd3 722114 2 • 0k 2 kavga desk,crd3 722114 2 • 0k 3 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Caron desk,crd3 722114 2 • 0k 0 Tacon desk,crd3 722114 2 • 0k 0 Maren desk,crd3 722114 2 • 0k 0 Maren desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0 Steep desk,crd3 722114 2 • 0k 0	nc-76	16 ITEMS							
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172.29.1129 • Øk 0 6.6erge 6.erse 6.7erge 7.227.27.1 172.27.27.11 • Øk 0 6.erse 6.erse 6.erse 7.227.27.1 172.27.11 • Øk 0 6.erse 6.erse 6.erse 7.227.27.1 172.27.11 • Øk 0 6.erse 6.erse 6.erse 7.227.1 172.27.12 • Øk 0 6.erse 6.erse 7.23.11.2 7.23.11.2 172.21.12 • Øk 0 6.erse 6.erse 6.erse 7.23.11.2 172.21.12 • Øk 0 8.erse 6.erse 6.erse 7.23.11.2 172.21.12 • Øk 0 8.erse 6.erse 6.erse 7.23.11.2 172.21.21 • Øk 0 8.erse 6.erse 6.erse 7.23.11.2 172.21.21 • Øk 0 8.erse 6.erse	> Ok 0 Storage dow, crid3 2723113 21 > Ok 0 OcdOrQ direx, crid3 1723113 21 > Ok 0 Tecn direx, crid3 1723113 21 > Ok 0 Tecn direx, crid3 1723113 21 > Ok 0 Tecn direx, crid3 1723113 21 > Ok 0 Material direx, crid3 1723113 21 > Ok 0 Material direx, crid3 1723113 21 21 > Ok 0 Material direx, crid3 direx, crid3 1723113 21 21 > Ok 0 Stafe direx, crid3 1723113 21<		172.29.11.23	🗸 Ok	2	Las Vegas	cisco-xr, cnc30	172.29.11.23	22	
172.272.11 • Øk 0 CedrQi 0.0000 <td>> 0k 0 cde/0 cosx.cc/0 cosx.cc/0 cp272211 2 > 0ko 0 Noren closx.cc/0 1272211 2 > 0ko 0 Noren closx.cc/0 127211 2 > 0ko 0 Sofer closx.cc/0 127211 2 > 0ko 0 Loss.cc/0 closx.cc/0 127211 2 > 0ko 0 Loss.cc/0 closx.cc/0 128112 2</td> <td></td> <td>172.29.11.40</td> <td>✓ Ok</td> <td>0</td> <td>Monterey</td> <td>cisco-xr, cnc30</td> <td>172.29.11.40</td> <td>22</td> <td></td>	> 0k 0 cde/0 cosx.cc/0 cosx.cc/0 cp272211 2 > 0ko 0 Noren closx.cc/0 1272211 2 > 0ko 0 Noren closx.cc/0 127211 2 > 0ko 0 Sofer closx.cc/0 127211 2 > 0ko 0 Loss.cc/0 closx.cc/0 127211 2 > 0ko 0 Loss.cc/0 closx.cc/0 128112 2		172.29.11.40	✓ Ok	0	Monterey	cisco-xr, cnc30	172.29.11.40	22	
172.91.1126 0.4 172.00 172.00.00 172.91.112 172.91.172 × 0.40 0.4 Morean 60.00, co.020 172.91.123 172.91.172 × 0.40 0.4 Morean 60.00, co.020 172.91.124 172.91.144 × 0.40 0.4 Softward 60.00, co.021 172.91.134 172.91.147 × 0.40 0.4 Softward 60.00, co.021 172.91.134 172.91.127 × 0.40 0.4 Softward 60.00, co.021 172.91.134	• Øk Øc Tacan disex.cn/30 172.211.120 22 • Øk Øc Moreplans disex.cn/30 172.311.22 2 • Øk Øc Moreplans disex.cn/30 172.311.20 2 • Øk Øc Moreplans disex.cn/30 172.311.30 2 • Øk Øc Sinfer disex.cn/30 172.311.30 2		172.29.11.29	🗸 Ok	0	ST. George	cisco-xr, cnc30	172.29.11.29	22	
172.29.1122 0 Kok 0 Koken/Palma (dxose, cxd) (72.23.1124) 172.29.1124 0 Kok 0 Koken/Palma (dxose, cxd) (72.23.1124) 172.29.1124 0 Kok 0 Koken/Palma (dxose, cxd) (72.23.1124) 172.29.1124 0 Koken 0 Koken/Palma (dxose, cxd) (72.23.1124) 172.29.1124 0 Koken 0 Koken (dxose, cxd) (72.23.1124) 172.29.1124 0 Koken 0 Koken (dxose, cxd) (72.23.1124) 172.29.1124 0 Koken 0 Koken (dxose, cxd) (72.23.1124)	 Moters Pains discs, cn20 122.11.22 2 		172.27.227.11	🗸 Ok	0	Cedar City	cisco-xr, cnc30	172.27.227.11	22	
172.29.11.28 • Øk 0 Макенра сколов склов 172.29.11.28 172.29.11.24 • Øk 0 San Diego сколов склов 172.29.11.24 172.29.11.24 • Øk 0 San Diego сколов склов 172.29.11.24 172.29.11.24 • Øk 0 San Giego сколов склов 172.29.11.24 172.29.11.24 • Øk 0 Stofego сколов склов 172.29.11.24 172.29.11.21 • Øk 0 Livégo сколов склов 172.29.11.24	・ ◇ ん ○ ん Λοφαφφφ ακοι καλ0 π.22.11.28 2 • ◇ ん 0 San Bago ακοι καλ0 π.22.11.24 2 • ◇ Λ 0 San Bago ακοι καλ0 π.22.11.24 2 • ◇ Λ 0 San Bago ακοι καλ0 π.27.127.10 2 • ◇ Λ 0 San Bago ακοι καλ0 π.27.127.10 2 • ◇ Λ 0 San Bago ακοι καλ0 π.27.127.10 2 • ◇ Λ 0 San Bago ακοι καλ0 π.27.11.10 2 • ◇ Λ 0 San Bago ακοι καλ0 π.29.11.10 2 • ◇ Λ 2 San Bago ακοι καλ0 ακοι καλ0 17.21.12 2		172.29.11.120	✓ Ok	0	Tucson	cisco-xr, cnc30	172.29.11.120	22	
172251124 0 kok	• Øk Ø Sahlige disex,cnd0 17,221,134 21 • Øk Ø Sahlife disex,cnd0 17,272,721,00 22 • Øk Ø Sofergi disex,cnd0 17,272,721,00 22 • Øk Ø Sofergi disex,cnd0 17,221,12,00 22 • Øk Ø Lavga disex,cnd0 17,231,120 22 • Øk Ø Lavga disex,cnd0 17,231,120 22		172.29.11.22	🗸 Ok	0	Mortero Palms	cisco-xr, cnc30	172.29.11.22	22	
172.272.271.9 0 bk 9 bk 6 bk 6 bk 6 bk 7 22.272.71.9 172.291.120 • 0 kk 0 5.66erge 6 dko se, cnd0 172.291.130 172.291.121 • 0 kk 0 LsVegts 6 dko se, cnd0 172.291.121	・Ok 0 Sata Fe cites or, crc30 17.27.27.19 2 ・Ok 0 57.080 cites or, crc30 17.27.27.10 2 ・Ok 0 57.080 cites or, crc30 17.27.27.10 2 ・Ok 0 Livitgs cites or, crc30 17.27.27.10 2 ・Ok 2 Satu folipio cites or, crc30 17.27.27.10 2		172.29.11.28	✓ Ok	0	Albuquerque	cisco-xr, cnc30	172.29.11.28	22	
172.29.11.20 • Ok 0 57.6eege dicke se, ocl0 172.29.11.31 172.29.11.21 • Ok 0 Lsviegs dicke se, ocl0 172.29.11.21	✓ 0k 0 50 erge cicxx, cr.09 17.29.11.30 22 ✓ 0k 0 LaVega cicxx, cr.03 17.29.11.21 2 ✓ 0k 2 SanLus 00:pp cicxx, cr.03 17.29.11.27 2		172.29.11.24	✓ Ok	0	San Diego	cisco-xr, cnc30	172.29.11.24	22	
172.28.11.21 V Ok 0 Las Vegas cisco ex, cnc20 172.29.11.21	v Ok 0 LaVkgs cisex,cnc30 172,251.121 22 v Ok 2 San Lia Obipo cisex,cnc30 172,251.127 22		172.27.227.10	✓ Ok	0	Santa Fe	cisco-xr, cnc30	172.27.227.10	22	
	✓ Ok 2 San Luís Obispo cisco ar, cncl0 172.29.11.27 22		172.29.11.30	✓ Ok	0	ST. George	cisco-xr, cnc30	172.29.11.30	22	
	✓ 0k 2 San Luis Obipo cisco xr, cncl0 172,29.11.27 22		172.29.11.21	✓ Ok	0	Las Vegas	cisco-xr, cnc30	172.29.11.21	22	
			172.29.11.27	✓ Ok	2			172.29.11.27	22	
172.29.11.20 V 0k 0 Los Angeles cisco xr. cn:30 172.29.11.20			172.29.11.20		0					

To add routers to Crosswork Hierarchical Controller, click the **Managed Devices** tab and then + **Add Device**.

Figure 6: IOS-XR Adapter -Add New Device - General Tab

172	2.29.11.40					
	General	Adapters	Events			
	Name* 172.29.11.40			Network Element Site Monterey	×Q	522157

It is recommended to use the hostname+hco (ron-8201-1-hco) or the device IP address. The device must be assigned a site for it to be displayed in the Explorer UI.

Assign both the IOS-XR and Crosswork Network Controller adapter type to the device. Do not enable discovery for the Crosswork Network Controller adapter.

Figure 7: IOS-XR Adapter -Add New Device - Adapters Tab

cisco-xr		 Unassign device 	from this adapt
Hust 172.29.11.40	Port* 22		
 Direct Connect (avoid tunnel if configured) 	Authentication	~	
✓ Enabled*			
			from this adapt

Cisco Optical Network Controller Adapter

Figure 8: Cisco Optical Network Controller Adapter - General Tab

The Polling cycle must be set to 300s or higher in a production network. Polling retrieves TAPI SIPs, topology, and connectivity services.

The URL in the following figure is for the Cisco Optical Network Controller cApp installed on the CW cluster.

Devices Events General		
Zenabled	Logging Level	Affects Reachability
ADAPTER PROPERTIES		
Polling Cycle [sec]* 120	Provisioning	Max run time for a single discovery cycle [sec] 600
Poll every X seconds Minimal interval between data updates [sec] 0	- Full Data Fetch Interval [sec]	Save persistor request to disk?
CONNECTION PROPERTIES		
Host (including protocol, port and URI prefix) https://10.195.165.76:30603/crosswork/onc-tapi/	Timeout [sec] 1500	Credentials onc
FILE-BRINGERS CONFIGURATION		
Enabled	Remote address with file pattern	Credentials

The optical nodes are discovered automatically from Cisco Optical Network Controller. Nodes must be assigned a site for it to be displayed in the Explorer UI.

Figure 9: Cisco Optical Network Controller Adapter - Devices Tab

Device Manager Adapters Manag	ged Devices Credentials				
Adapters 😇	Devices Events	General			
cisco-xr cnc30	Name	Status 👻	Status Changes(Last 24 hr)	Site	Adapter(s)
onc-76	5 ITEMS ron-ols-5-roadm	✓ Ok	0	Monterey	onc-76
onc-poc90-1	ron-ols-4-roadm	✓ Ok	0	San Luis Obispo	onc-76
SVO	ron-ols-2-roadm	✓ Ok	0	Las Vegas	onc-76
	ron-ols-1-roadm	✓ Ok	0	Los Angeles	onc-76
	ron-ols-3	✓ Ok	0	Barstow	onc-76

Crosswork Network Controller Crosswork Data Gateway Adapter

Crosswork Network Controller Crosswork Data Gateway adapter is used to collect telemetry data via gNMI to the router. In Crosswork Network Controller, the routers must be configured with the gNMI protocol with the encoding type set to "PROTO" and the GNMI capability enabled. In IOS XR, the routers must be configured for gRPC so that Crosswork Data Gateway can create gNMI telemetry subscriptions.

29.11.40 29.11.40 29.11.40 29.11.40 29.11.40	1	25 25 25 25	22 161 830 57333	60 60 60 60	PROTO	~ ~ ~
✓ ⑦.29.11.40	1	25	830	60	PROTO	~
.29.11.40					PROTO	
					PROTO	
.29.11.40	/	25	57333	60	PROTO	\sim
CLI 🗌 YANG EPNM 🔽 SNMP 🔽 GNI	MI					
	SLI 🗌 YANG EPNM 🗹 SNMP 🗹 GN	SLI 🗌 YANG EPNM 🗹 SNMP 🗹 GNMI	SLI 🗌 YANG EPNM 🗹 SNMP 🗹 GNMI	SLI 🗌 YANG EPNM 🗹 SNMP 🗹 GNMI	SLI 🗌 YANG EPNM 🗹 SNMP 🗹 GNMI	SLI 🗌 YANG EPNIM 🗹 SNIMP 💟 GNIMI

Figure 10: Crosswork Network Controller Crosswork Data Gateway Adapter

The Crosswork Data Gateway adapter is configured to connect to Crosswork Network Controller controlling Crosswork Data Gateway instance. It can be the same as the Crosswork Network Controller used for the topology or a different Crosswork Network Controller. The collection parameters describe the supported telemetry collection jobs. The statistics show up in the physical interface statistics and in the Link Assurance application.

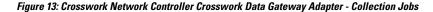
Figure 11: Crosswork Network Controller Crosswork Data Gateway Adapter - General Tab

Adapters 😇	Devices Events General		
cisco-edg			
cisco-w		- Logging Level	
cnc30	Enabled	Info ~	
onc-76			
onc-poc90-1			
940	Collector Cadence [sec] 90	Status Update Interval [sec] 180	
	Collector sample cadence in seconds	NOTE: You can see missed stats errors if the interval is less than the collector cadence	
	CNC CONFIGURATION		
	Most*	Port	Timeout [sec]
	10.195.165.76	30603	30
	Request Retries	Oredentials"	
	GRPC LISTENER CONFIGURATION		
	P Address*	Port*	Destination Name*
	172.29.11.60	65001	netfusion_cdg
	NOTE: Make sure that the address is forwarded (or belonged) to the docker host	NOTE: Nake sure that a firewall does not block the docker host port	NOTE: The name should be unique in the crosswork context
	COLLECTION PARAMETERS		
	Missed ports stats error threshold (percentage) 10	 Enable Interface Counters 	Cable Optics Counters: Instant
	Threshold in percentages per device ports with no stats to report error		
	Enable Optics Counters: 30 Seconds	Chable Optics Counters: 15 Minutes	Enable Optics Counters: 24 Hours
	Enable OTU Counters: Instant	 Enable OTU Counters: 30 Seconds 	Enable OTU Counters: 15 Minutes
	Enable OTU Counters: 24 Hours		

 The device name in Cisco Crosswork Hierarchical Controller must match the device name in Crosswork Network Controller for successful deployment. If successful, you will see Cisco Crosswork Hierarchical Controller as a new destination in Crosswork Network Controller. This is setup by Cisco Crosswork Hierarchical Controller and user interaction is not required. As Crosswork Data Gateway is enabled on devices, new collection jobs are populated. A single collection job is available for each router collecting multiple KPIs.

Figure 12: Crosswork Network Controller Crosswork Data Gateway Adapter - Data Destinations

	Data Destinations ⑦				
+ /	Destination Name	Server Type	Compression Type	Encoding	UUD
	Crosswork_Kafka cdg-astack-pipeline	Kafka gRPC	snappy gzip	gpbkv gpbkv	c2a8fba8-8363-3d22-b0c2-a9e449693fae e9b4c2ec-b2e6-4db0-a942-0402dd347a1d
	netfusion_cdg	gRPC	gzip	gpbkv	0a088f8b-3fea-4694-a744-54c02fbdda5e



Collection Jobs			1/11 01	Job Details	 netfusion_cdg : 	ron-poc-8201-1					
+ 🗇			[C Last Eval S Success		Job Configuration Config Details	(6	GNMI	Туре	C Last Modifie 08-DEC-202	ed On 21 11:00:39 AM EST
Status	App ID	Context ID	Action	00 000 10110		Collection	ns (7)	Dis	tributions (7)	9	
 Successful 	netfusion_cdg	ron-poc-8201-2	0			Devices	Data Gatewa	ys	Destin	ations	
Successful	cw.dlminvmgr0	dim/cli-collector/group/	0	Showing - All Coll	ections (7) Collection	n Issues (0)					T
 Successful 	cw.dlminvmgr0	dim/cli-collector/group/	0	Status	Hostname	Device Id	Sensor Data		Topic	1	Last Reported Time
Successful	cw.optimatraffic	cw.optimatrafficmdt-ctx	0								
 Successful 	cw.dlminvmgr0	dim/snmp-collector/gro	Ó	Successful	ron-poc-8201-1	3dd19b98-be21-4c72-ab	Cisco-IOS-XR-pme	D all.			08-DEC-2021 11:00:40
Successful	cw.dlminvmgr0	dim/cli-collector/group/	0	Successful	ron-poc-8201-1	3dd19b98-be21-4c72-ab	Cisco-IOS-XR-pme	(i) at.			08-DEC-2021 11:00:40
Successful	cw.topo_svc	cw.toposvc.snmp	Ó	 Successful 	ron-poc-8201-1	3dd19b98-be21-4c72-ab	Cisco-IOS-XR-pme	D al.			08-DEC-2021 11:00:40
Successful	netfusion_cdg	ron-poc-8201-1	0	Successful	ron-poc-8201-1	3dd19b98-be21-4c72-ab	Cisco-IOS-XR-pme	at.			08-DEC-2021 11:00:40
 Successful 	cw.optimatraffic	cw.optimatrafficsnmp-ctx	0	Successful	ron-poc-8201-1	3dd19b98-be21-4c72-ab	openconfig-interfac	() at			08-DEC-2021 11:00:40
 Successful 	cw.topo-visualization	topo-visualization.colle	0	Successful	ron-poc-8201-1	3dd19b98-be21-4c72-ab	Cisco-IOS-XR-cont	(i) at		1	08-DEC-2021 11:00:41
O Degraded	(i) cw.topo_svc	cw.toposvc.snmptraps	0	Successful	ron-poc-8201-1	3dd19b98-be21-4c72-ab	Cisco-IOS-XR+cont	(D) eff.			08-DEC-2021 11:00:41

NSO Adapter In Hierarchical Controller

In Hierarchical Controller 8.0 there is an embedded NSO installed when Hierarchical Controller 8.0 is installed. The NSO adapter can use the internal NSO or point to an external NSO instance. Provisioning using the NSO adapter requires adding the NSO adapter to the devices you want to provision.



Note

- If using the internal NSO, the Routed Optical Networking 3.0 Core Function Pack must be installed on the NSO instance.
- If using the internal NSO, devices must be added to that NSO, adding them to Hierarchical Controller does not automatically onboard them into the internal NSO.

Start configuration with NSO and XR adapters.

Provision ML Service Using NSO Routed Optical Networking CFP

Perform the following steps to provision the Routed Optical Networking ML service using the NSO Web UI.

- 1. To add a new device, perform these steps:
 - **a.** In the Device manager, click the + to add a new device. Specify a name for the new device. Click **Confirm**.

Figure 14: NSO Adapter - General Tab

name	address	port	type	services	ping	connect	check-sync	sync-from	sync-to	compare-config	alarm	cor
cloud-ncs540-1	172.29.11.120		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3									
onc-cw-100	172.29.11.100	30666	onf-tapi-nc-1.0:onf-tapi-nc-1.0	3 💌								
onc-poc-62	172.29.11.62	30666	onf-tapi-nc-1.0:onf-tapi-nc-1.0	3 🔻								
onc-soltest-72	172.29.11.72	30666	onf-tapi-nc-1.0:onf-tapi-nc-1.0									
ron-8201-1	172.29.11.20		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	3 💌								
ron-8201-2	172.29.11.21		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	2 🐨								
ron-8201-3	172.29.11.22		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	Add da			ck-sync					
ron-8201-4	172.29.11.23		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	Add de	vice		eck-sync					
ron-asr9903-1	172.29.11.27		cisco-losxr-cli-7.33cisco-losxr-cli-7.3	name	-8202-1		eck-sync					
ron-ncs540-1	172.29.11.25		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3				rck-sync					
ron-ncs57b1-1	172.29.11.26		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	cancel	confirm		eck-sync					
ron-poc-57b1-1	172.29.11.30		cisco-losxr-nc-7.3:cisco-losxr-nc-7.3		ping	connect	check-sync					
ron-poc-8201-1	172.29.11.28		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	1 🐨								
ron-poc-8201-2	172.29.11.29		cisco-iosxr-nc-7.3:cisco-iosxr-nc-7.3	1 👻								
xrv9k-pe-1	172.29.11.24		cisco-iosxr-cli-7.33cisco-iosxr-cli-7.33									

b. After creating the new device, click the device name to fill required and optional parameters. In this screen, the required parameters are the authgroup and IP address of the device.

			Due to the size of this configuration model,	subtolders are not included
See 'ron-poc-8202-1' in Device manager				8885
name	authgroup	read-timeout	out-of-sync-commit-behaviour	
ron-poc-8202-1	routers	- Valid range: 1 4294967	(reject V	
	And a subscription of the local division of the	STREET, STREET		
local-user	device-profile	write-timeout	snmp-notification-address	
		Valid range: 1 4294967		
description	connect-timeout	trace		
Cisco 8202 router in PoC lab	Valid range: 1 4294967	pretty - Pretty-printed data	Interpretation in the second secon	
	-0-0-0-0-0-0-	0-0-0-0-0-0-0-0-		
file	-8-8-8-8-8-8-			
	-9-9-9-9-9-9-			
external	- 2808080808080-			
			URORORORORORORORORORO	
device				
address				
device				
device address 172.29.11.31				
device address 172.29.11.31 port				
address 172.29.11.31				
172.29.11.31 port				

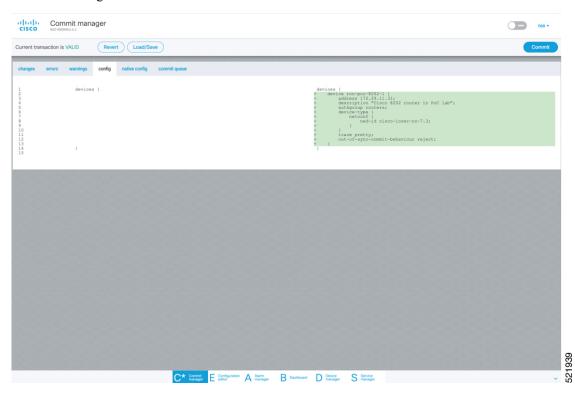
c. Scroll down in the device configuration screen. Click the "device-type" to bring up the device type selection screen. The device-type that is supported in the Routed Optical Networking ML FP is IOS-XR CLI NED.

CISCO Configuration editor			(#) ()•	• View options • nso •
1 1/ncs:devices/device(ron-poc-8202-1)/device-type			Due to the size of this configuration	n model, subfolders are not included
See 'ron-poc-8202-1' in Device manager				8-8-8-8-8-
ne-type netconf generic cli snmp				
netconf/				
	-343-343-343-343		84848484848484848	-8-8-8-8-8-
				88888
				1999999
				88886
				888888
				66666
				1999-999
				322222233
	C* Commit E Configuration A Alarm manager	B Dashboard D Device manager	S service S manager	 601007

d. Click the blue NETCONF text to select the proper NED. The Routed Optical Networking ML FP requires the use of the **cisco-iosxr-nc-7.3** NED.

CISCO Configuration editor			View options • nso •
1 /ncs:devices/device(ron-poc-8202-1)/device-type/netconf/]		Due to the size of this configuration model, subfolders are not included
Certor-poc-1202-1' in Deuce manager			
	C* Commit E Configuration A Alarm manager	B Dashboard D Device S Service	~

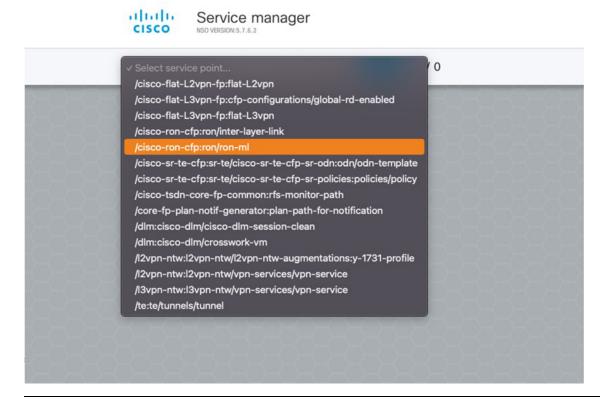
e. Click the Commit manager to view the NSO CLI configuration being applied. Click **Commit** to save the device configuration to NSO.





Note

Next we add the multilayer end-to-end service to configure and provision both the optical line system and routers. We recommend you to click **check-sync** in the Device manager to ensure that the device configuration is properly in sync with NSO before provisioning. If the device is out of sync, initial provisioning fails.



- 2. To create Routed Optical Networking ML service, perform these steps:
 - **a.** In the Service manager, select the Routed Optical Networking ML service point from the drop-down list. When we create the new Routed Optical Networking ML service, the required components are the service name, mode of the service (transponder or muxponder), and the bandwidth. The bandwidth corresponds to the line rate of the ZR/ZR+ optics. Click **Confirm**.

name	
poc_8201_1_to_poc_8201	_2_20
mode	
transponder	~
bandwidth	
400	

b. In the Configuration editor, click the newly created service name for editing the additional parameters that are required for the service. In this example, we set the circuit-id name in the global parameters. The frequency is set by the optical controller based on the specified optical add/drop port. The dac-rate

is set to the default value.

Configuration editor)		the the test of t
cuit_195200' in Service manager			
circuit- t_195200 This is	t-id 💼 🚺 dac-rate	0	
er v (100m)	ype (j clear-rollbar nhz-grid) v	ck ()	
frequer	ency 🚺		
0	T	iis list is empty	Add list item →
tomain/ ate () ED) ~			
nplate 🚺		This list is empty	Add list item →
		This list is empty	Add list it

Note

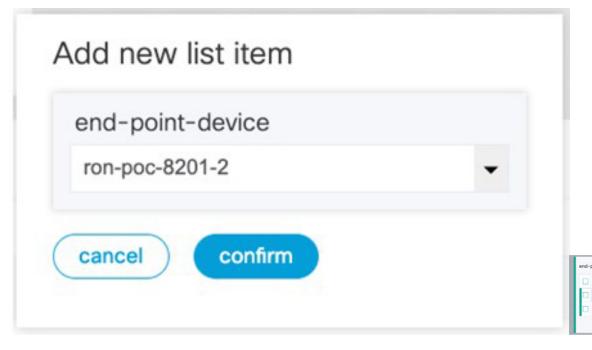
- User configuration global options are frequency and dac-rate
- Dac-rate controls the TX shaping parameters: 1x1.25 = enabled, 1x1 = disabled. Leaving it blank uses system default of enabled, and can be used in most circumstances
- Modulation of 16 QAM is available for 2x100G muxponder mode.
- **c.** After the ols-domain is added, you must add end-points to the circuit. Two end-points are always required. The end-points are the routers with ZR/ZR+ optics.

Configuration ec	litor				tiew options v nso v
1_/cisco-ron-cfp:ron/ron-mi{poc_circuit	_195200)()				
See 'poc_circuit_195200' in Service mana	•••)				
name poc_circuit_195200	circuit-id This is a demo circuit	dac-rate	0		
mode* transponder	i grid-type (100mhz-grid)	i clear-rollt	ack i		
bandwidth* 400	frequency	0			
end-point ()			This list is empty		Add list item → 🔶
all ols-domain/			- <u>494949</u>		
service-state (UNLOCKED)	•				
custom-template ()			This list is empty		Add list Item → 🕂
	C*	Commit E Configuration A Alarm	ger B Dashboard D Device	S Service manager	~

d. Add the end-point-device to the service. Click Confirm.

L /eisco-ron-clp.ron/ron-milpoc_circuit_195 See 'poc_circuit_195200' in Service manager name	5200)()		
name A			
poc_circuit_195200	circuit-id 💼 🚺	dac-rate ()	
mode* i	grid-type () (100mhz-grid)	clear-rollback	
bandwidth*	frequency	Add new list item	
end-point 🚺		end-point-device	Add list hom - (
ervice-state		cancel confirm	
(UNLOCKED) ~			
custom-template 🧻			Add list item →

After the end-point is created, click the end-point to edit the end-point parameters. The line-port is a required parameter and refers to the optics port on the router. In this example, this is the same as the line-port specified in the inter-layer-link service for the end-point router.



The transmit-power is an optional parameter for end-to-end provisioning. If it is omitted the optical controller (Cisco Optical Network Controller) will provide the transmit power. Transmit power sets the transmit power, the value is in 100*value in 0.1dBm increments. For example, -100 is -10dBm. If no value is specified the default of -10dBM is used for QDD-400G-ZR-S or QDD-400G-ZRP-S, or 0dBm for DP04QSDD-HE0 (Bright ZR+). The transceiver-capability field specifies the optic type and is only required if no packet layer configuration is being performed. In this example, you are performing packet layer provisioning so specifying the transceiver capability is not required.

Add the line-port of 0/0/0/20 to the Routed Optical Networking ML service.

L

Configuration editor		(# View options * nso *
Cisco-ron-cfp:ron/ron-ml{poc_circuit_195200}/end-point	(ron-poc-8201-1)()	
See 'poc_circuit_195200' in Service manager		
end-point-device () ron-poc-8201-1		
terminal-device-optical/		
line-port*		
0/0/0/20		
transmit-power i		
Valid range: -150 0		
) ols-domain/		
end-point-state		
UNLOCKED ~		
transceiver-capability* ()		
terminal-device-packet/		
bundle 🚺	This list is empty	Add list item → 🕂
interface 🚺	This list is empty	Add list item → 🛨
custom-template ()	This list is empty	Add list item → 🔶
	C* Commit E Configuration A Alarm B Dashboard D Device S Service manager	

e. Click end-point to go back to the top-level endpoint configuration, click **terminal-device-packet** to configure Ethernet/IP parameters

CISCO Configuration editor		() m View options + nso →
1 /cisco-ron-cfp:ron/ron-mi{poc_8201_1_to_poc_8201_2_20]/e	end-point[ron-poc-8201-1]/terminal-device-packet/	
See 'poc_8201_1_to_poc_8201_2_20' in Service manager		
bundle	This flat is empty	Add list item + 😛
interface	This list is empty	Add list item + 🚯
custom-template	This list is empty	Add list item → 🛟



• Ethernet/IP configuration is optional.

• Bundle configuration adds an interface to an existing bundle or creates a new bundle and adds the newly created IP interface to it.

Interface configuration is used for configuring IP address parameters on newly created Ethernet interfaces.

In this example we add a new Bundle and assign an IP address to the Bundle.

f. Click the plus sign next to bundle to add a bundle, in this case with an identifier of 500. This creates a bundle interface Bundle-Ether 500 on the endpoint router

The interface index for a bundle use case is always 0. In case of a non-bundle configuration in muxponder mode, the index can be 0-3 representing the number of interfaces created as part of the muxponder configuration.

CISCO manufacture ditor	() di View options + nso ~
1, /cisco-ron-clpron/ron-mi(poc_8201_1_to_poc_8201_2_20)/end-point/ron-poc-8201-1)/terminal-device-packet	
See 'poc, 8201,1,10, poc, 8201,2,20' is Service manager	1908-1918-1918-1918-1918-1918-1918-1918-
bundle	
500	(■) ○ (1)
interface	
index	

g. Click the bundle number and *ip-address* to configure an IP address on the bundle.

cisco	Configuration editor						
↑ 1 /cis	sco-ron-cfp:ron/ron-ml{poc_8201_1_to	_poc_8201_2_20}/e	nd-point{ron-poc-82	01-1}/terminal-device	e-packet/bundle{5	00}/ip-address{)
See 'poc,	=8201_1_to_poc_8201_2_20' in Servic	ce manager	68585		8383		22
v4		18787					
102.20	0.20.20/31	58580					
v6		37676					
2020	20-0-0-0-0	3888					
K K							

h. Return to the top-level endpoint configuration, select the index 0 previously created and click **membership** to add the interface to the bundle



Configuration editor

See 'poc_8201_1_to_poc_8	201_2_20' in Service manager	
oundle-id*		
500	- 323282828	
mode		
active	 D-0-50-50-50-50-50-50-50-50-50-50-50-50-5	

Note

- Bundle-id selects the previously created bundle.
 - Mode sets the bundle LAG signaling mode. Active=LACP, passive=LACP listener only, on=No active signaling, inherit=Inherit signaling from Bundle interface configuration. Default is active.
- i. Return to the top level of the service configuration and similarly configure the second endpoint.

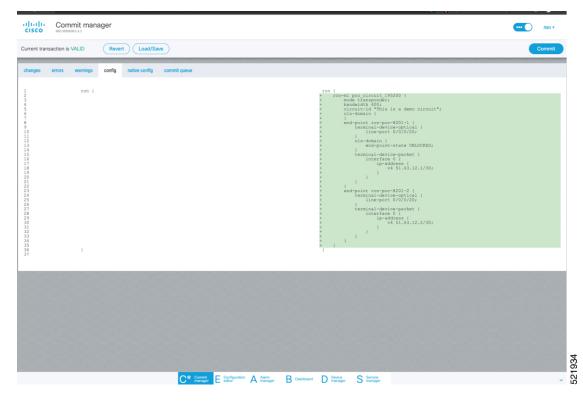
/cisco-ron-cfp:ron/ron-mi[poc_8201_1_to	poc 8201 2 20M		
'poc_8201_1_to_poc_8201_2_20' in Servic	ce manager		
ie	circuit-id	dac-rate	
_8201_1_to_poc_8201_2_20	poc_circuit		
je*	grid-type	clear-rollback	
nsponder ~	(100mhz-grid)	-	
dwidth*	frequency		
0	1952000		
-point			
end-point-device			
ron-poc-8201-1			
ron-poc-8201-2			

j. Click SRLG to perform SRLG configuration

1 //cisco-ron-cfp:ron/ron-milpoc_8201_1_to_poc_8201_2	_20)/shg	
See 'poc_8201_1_to_poc_8201_2_20' in Service manager	51515151515151515151515151515151515151	5-5-5-5-5-5-5-5-5-5
group		
	-0	
value-list		
□ ¹⁴	value	
10	1000	
20	2000	
		•

Note

- Configuration options are to specify a preconfigured group, a list of numeric SRLG values, or a list of SRLG names associated with preconfigured name:value pairs.
- Each type can be populated in the same configuration.
- In this example we specify a list of explicit numeric values. An index is used along with the numeric value.
- **3.** In the Commit manager, click the config tab. The NSO CLI configuration for the end-to-end service is displayed. If the ols-domain component is not specified in the global configuration, no optical line system provisioning is performed, only router provisioning. You can preview and then commit the configuration.



4. Verify status in NSO UI.

You can verify the status by inspecting the plan associated with the service. You can find the plan under the main ron-ml configuration which you can access by clicking the top portion of the service configuration. An example is highlighted in the following image.

↑ 1 /cisco-ron-cfp:ron/ron-mi(poc_8201_1_to_poc_8201_2_20)/									
See 'poc_8201_1_to_poc_8201_2_20' in Service manager	080808080808080								
name	bandwidth*	frequency							
poc_8201_1_to_poc_8201_2_20	400	1952000							
	the second se								
plan-location	circuit-id	dac-rate							
/cisco-ron-cfp:ron/cisco-ron-cfp:ron-ml-plan[cisco	- poc_circuit								
ron-cfp:name='poc_8201_1_to_poc_8201_2_20']									
			1000						
mode*	grid-type	clear-rollback							
transponder	 (100mhz-grid) 	~							

a. Inspect the plan by clicking on the newly created service

ume	
82b3df2_30b2_4af2_9438_6dfb7738d0ef	
e2b4907_b08b_4338_8304_a4f2903b3311	
a00076_d3db_4bd9_9d94_673d4cc462cb	
00c_8201_1_to_poc_8201_2_20	

If all steps are green and complete, the service has been properly deployed to the network

2/2	•		•
	ncsihit		ncs.ready
3/3			
	nesthit	cisco-ron-cfp-nano-	nostready
11/11 Optical-Controller	nesint	pian-	resteady
		services.config-	
3/3		•	•
ron-poc-8201-1	ncs.init	cisco-ron-cfp-nano-	ncs.ready
ion-poc-8201+1		plan-	
		services.config-	2.27
3/3		•	•
	nesinit	cisco-ron-cfp-nano-	nosready
ron-poc-8201-2		pian- services.config-	

b. Inspect router configuration.

The **show configuration commit changes last 1** command shows the CLI config applied to the device during the NSO provisioning.

The show optics controller 0/0/0/20 command verifies the operational status.

<pre>RP/0/RP0/CPU0:ron-poc-8201-1#show configuration commit changes last 1 Mon Oct 17 09:51:11.625 PDT Building configuration 7.7.1 srlg interface Bundle-Ether500 10 value 1000 20 value 2000 ! interface Bundle-Ether500 ipv4 address 102.20.20 255.255.255.254 ! controller Optics0/0/020 description poc_circuit transmit-power -100 fec OPEC dwdm-carrier 100MHz-grid frequency 1952000 DAC-Rate 1x1.25 ! interface FourHundredGigE0/0/020 bundle id 500 mode active ! End</pre>	<pre>RP/0/RP0/CPU0:ron-poc-8201-1#show controllers optics 0/0/0/20 Mon Oct 17 09:57:25.475 POT Controller state: up Transport Admin State: In Service Laser State: On LED State: Green FEC State: FEC ENABLED Optics Status Optics Status Optics Type: QSFPDD 400G ZRP DWDM carrier Info: C BAND, MSA ITU Channel=19, Frequency=195.20THz, Wavelength=1535.822nm Alarm Status: Detected Alarms: None</pre>
---	--

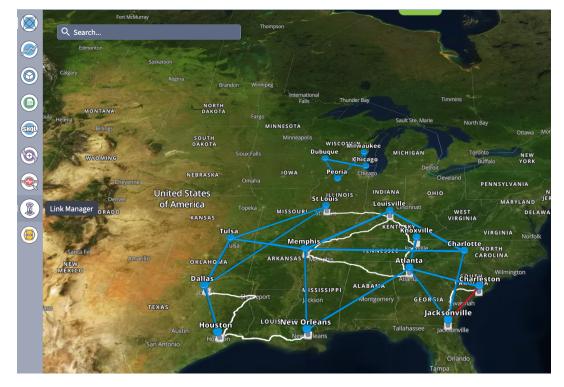
Provision Routed Optical Networking ML Service Using Crosswork Hierarchical Controller

1. If you are performing both router and optical line system provisioning, you must create NMC Cross Links between router optics port and optical line system add/drop port.

Crosswork Hierarchical Controller 7.0 in Routed Optical Networking 2.1 also supports "router only" provisioning which provisions optical parameters on router optics port and IP layer parameters but does not provision OLS.

a. Select Link Manager application.

Figure 15: Crosswork Hierarchical Controller



You get the following initial view that shows the list of Cross Links.

8	Link Manager Cross	Links										0 C 4
	+ Add Cross Link											🗸 Validate All Manual Li
<u>م</u> (Description 	т Туре т	Provider	۲	Device A / Port A	Device B / Port B	Status	•	Method	•	Last Change
	3 OUT OF 20 ITEMS MATCHING FILTERS Manual Cross Link ron-poc-8201-1 Optics		NMC	Manual		ron-poc-ols-1-roadm / 1/CHAN 13 (195.200)	ron-poc-8201-1 / Optics0/0/0/20	Unknown		N/A		2023-04-13 10:59:28 EDT
	Manual Cross Link ron-poc-8201-2 Optics		NMC	Manual		ron-poc-ols-2-roadm / 1/CHAN 13 (195.200)	ron-poc-8201-2 / Optics0/0/0/20	Unknown		N/A		2023-04-13 11:01:00 EDT
	Manual Cross Link ron-poc-8201-1 Optics		NMC	MANUAL_CROSS_LINK		ron-poc-8201-1 / Optics0/0/0/22	ron-poc-ols-1-roadm / 1/CHAN 29 (194.000)	Unknown		N/A		2023-04-13 10:58:13 EDT
•	names a cost control por ocor a opaco			in ito in_oncoo_critic		Ton per out a r operativitar				1.00		2020 01 20 20:00:10 201
2												
ŝ												
91												
<u>v</u>												

b. Click Add Cross Link.

Figure 16:

۲	Link Manager o	Cross Li	nks						_							0 C	۰
9	+ Add Cross Link															🗸 Validate All Manu	al Links
\bigcirc	Link Name		Description	*	Туре	Provider	۲	Device A / Por	٨	* (Device B / Port B	Statu		 Method	*	Last Change	•
	3 OUT OF 20 ITEMS MATCHING FILTERS Manual Cross Link ron-poc-8201-1 C				NMC	Manual		and more also	-roadm / 1/CHAN 13 (195.20	- 100	ron-poc-8201-1 / Optics0/0/0/20	Unk		N/A		2023-04-13 10:59:28 ED	
	Manual Cross Link ron-poc-8201-2 C				NMC	Manual			roadm / 1/CHAN 13 (195.20		ron-poc-8201-2 / Optics0/0/0/20	Unk		N/A		2023-04-13 10:55:28 ED	
	Manual Cross Link ron-poc-8201-1 C				NMC	MANUAL_CROSS_LINK			-1 / Optics0/0/0/22		ron-poc-ols-1-roadm / 1/CHAN 29 (194.000)			N/A		2023-04-13 10:58:13 ED	
<u></u>	manual cross cirk torrpoc-ozor-r c	poca			AMO	MANUAL_CRUJJ_LINK		1011-poc-020.	-17 00000000000		Tompoc-ois-2-roadin / 2/crime 25 (25-1000)	UTIKA	own	11/0		2023-04-13 10:30:13 10	
0																	
-																	

c. Select the NMC cross link type. Cross Link Manager supports ETH and NMC cross links.

	Link Manager Cross Lin	iks			_	
	+ Add Cross Link					
	Link Name Source Link Name	Description •	Туре 👻	Provider	Device A / Port A	Device B / Port B
	Manual Cross Link ron-poc-8201-1 Optics		NMC	Manual	Add Cross Link	×
	Manual Cross Link ron-poc-8201-2 Optics		NMC	Manual		
SHOL	Manual Cross Link ron-poc-8201-1 Optics		NMC	MANUAL_O	/ clinic () pe	
					✓ ETH NMC	
•					Port A	<u> </u>
					Port B	<u> </u>
					Description	
					Add Cross Li	nk
G						

d. The Link Manager application allows you to select either router DCO port or optical add/drop first. In the following image we filter the ports by the router device that we use for our NMC cross link.

	ger Cross Links					
	1					·
Link Name 3 OUT OF 20 ITEMS	**		Advanced	3D Explorer		1
Manual Cross Link			P	ORTS		2
Manual Cross Link	Name *	Device 💌	Туре 👻	Capacity *	Description *	Admin Status 👻
Manual Cross Link	815 ITEMS	c Filter				
Manada Cross citi	1/CHAN 63 (191.450)	ron poc-82@1-1 ×	NMC		Port: 1/CHAN 63 (191.450), Physical Dev	UP
	1/CHAN 45 (192.800)	ron	NMC		Port: 1/CHAN 45 (192.800), Physical Dev	UP
	1/CHAN 61 (191.600)	ron Cancel Apply	NMC		Port: 1/CHAN 61 (191.600), Physical Dev	UP
	1/CHAN 46 (192.725)	ron-poc-ols-1-roadm	NMC		Port: 1/CHAN 46 (192.725), Physical Dev	UP
	1/CHAN 30 (193.925)	ron-poc-ols-2-roadm	NMC		Port: 1/CHAN 30 (193.925), Physical Dev	UP
	1/CHAN 1 (196.100)	ron-poc-ols-2-roadm	NMC		Port: 1/CHAN 1 (196.100), Physical Devic	UP
	1/CHAN 64 (191.375)	ron-poc-ols-1-roadm	NMC		Port: 1/CHAN 64 (191.375), Physical Dev	UP
	1/CHAN 30 (193.925)	ron-poc-ols-1-roadm	NMC		Port: 1/CHAN 30 (193.925), Physical Dev	UP
	1/CHAN 64 (191.375)	ron-poc-ols-2-roadm	NMC		Port: 1/CHAN 64 (191.375), Physical Dev	UP
	1/CHAN 48 (192.575)	ron-poc-ols-2-roadm	NMC		Port: 1/CHAN 48 (192.575), Physical Dev	UP

e. The following image shows the filtered list. Our router, ron-poc-8201-1 has a single ZR+ optics port, select the port and click OK

+ Add Cross Link											
Link Name 3 OUT OF 20 ITEMS	*~				,	Advanced					
Manual Cross Link						РО	RTS				
	Name 1 ITEM MATCHING FI		Device	۲	Туре	•	Capacity	•	Description -	Admin Status	•
Manual Cross Link	Optics0/0/0/22	k	ron-poc-8201-1		осн				OCH port of Cisco QSFPDD 400G ZRP Pl	UP	
											Cancel OK

f. Like in the previous step, select the second port which is the optical add/drop port. Filter by device as *ron-poc-ols-1* and the Name as *194.000* to filter to the add/drop port

Link Manag	er Cross Link	s				_				
+ Add Cross Link										
Link Name 3 OUT OF 20 ITEMS	**				Advanced					
Manual Cross Link						PORTS				
	+ Name	۲	Device	۲	Туре	 Capacity 	•	Description •	Admin Status	-
Manual Cross Link	1 ITEM MATCHING FILTERS 1/CHAN 29 (194.000)		ron-poc-ols-1-roadm		NMC			Port: 1/CHAN 29 (194.000), Physical De	UP	
										Cancel OK

g. Select the two ports (Ethernet and OCH) in your NMC Cross Link. Click Add Cross Link.

(Optional) Add a description

- Add Cross Link									
ink Name	۲	Description	Туре 🔻	Provider	۲	Device A / Port A	 Device B / F 	Port B	
OUT OF 20 ITEMS MATCHING FIL									
Ianual Cross Link ron-poc-820	1-1 Optics		NMC	Manual	Add Cross Link				
/anual Cross Link ron-poc-820	1-2 Optics		NMC	Manual					
/anual Cross Link ron-poc-820	1-1 Optics		NMC	MANUAL_C	– Link Type –				
					NMC				•
					- Port A				
						01-1 / Optics0/0/0/22		×	
					- Port B				
						s-1-roadm / 1/CHAN 29 (194.000)		×	
					· · ·				
					Description				
						01-1 port 0/0/0/22 to NCS 2000 r	on-poc-ols-1 MD-64	channe	l
					29				
									×

h. Click the added cross link to see its attributes.

+ Add Cross Link								🗸 Validate All Manua
Link Name	* Description 🛞	Туре *	Provider *	Device A / Port A	Device B / Port B	• Status	Method *	Last Change
1 OUT OF 20 ITEMS MATCHING FILTERS			Manual					
Optics0/0/0/22 / 1/CHAN 29 (194.000)	ron-poc-8201	NMC	Manual	ron-poc-8201-1 / Optics0/0/0/22	ron-poc-ols-1-roadm / 1/CHAN 29 (194.00	0) Unknown	N/A	2023-04-24 10:23:34 EDT
			Summary	Evidence	History			
LINK NAME			DEVICE A / POP	PT &	DEVICE	B / PORT B		
Optics0/0/0/22 / 1/CHAN 29 (194.0	000)			-1/Optics0/0/0/22		c-ols-1-roadm/1/CHAN 29 (194.0	00)	
TIME ADDED N/A			SOURCE Manual		STATUS			
METHOD			LAST CHANGE		DESCRI			
N/A			N/A		ron-po	c-8201-1 port 0/0/0/22 to NCS 20	00 ron-poc-ols-1 ME	0-64 channel 29

- i. View the added crosslink in the explorer app by clicking on the link.
- j. Similar to the previous steps, create the second NMC cross link.

Link Manager	Cross Links					_					0 C
+ Add Cross Link											🗸 Validate All Manua
Link Name		Description 💿	Type	 Provider 	* D	evice A / Port A	-	Device B / Port B	Status -	Method *	Last Change
2 OUT OF 21 ITEMS MATCHING FILT	ERS										
Manual Cross Link ron-poc-8201-	-1 Optics0/0	ron-poc-8201-1	NMC	Manual	re	on-poc-8201-1 / Optics0/0/0/22		ron-poc-ols-1-roadm / 1/CHAN 29 (194.000)	Unknown	N/A	2023-04-24 10:23:34 EDT
Manual Cross Link ron-poc-57b1	-1 Optics0/0	NCS-57B1 0/0/0	NMC	Manual	re	on-poc-57b1-1 / Optics0/0/0/24		ron-poc-ols-2-roadm / 1/CHAN 29 (194.000)	Unknown	N/A	2023-04-24 10:29:55 EDT
					Summary		idence	History			
LINK NAME Manual Cross Link ron-poc-57 (194.000)	'b1-1 Optics0/0)/0/24 to ron-poc-ols	s-2-roadm	1/CHAN 29	DEVICE A / PORT A ron-poc-57b1-1/O				/ PORT B sls-2-roadm/1/CHAN 29 (194.000)		
TIME ADDED N/A					SOURCE Manual			STATUS Unknowr			
METHOD N/A					LAST CHANGE N/A			DESCRIPT NCS-57B	ION L 0/0/0/24 to NCS 2000 MD-64 char	nnel 29	

- **k.** View the end-to-end network with both crosslinks in the Explorer app.
- 2. (Optional) Cross-Link Connectivity Verification
 - Cross-Link Connectivity Verification is supported on all router platforms and NCS 1010 with MD-32 and BRK-24 modules.
 - Connectivity Verification uses NSO CLI NED to modify router port state and TX power, is service
 affecting.
 - When validation starts, Hierarchical Controller continuously checks the RX power on the optical add/drop port. Connectivity Verification is performed in the background.
 - **a.** Configure NMC Validation Settings. Settings are used to control validation, **Wait period to receive samples while on** must be set to 180 seconds, **Wait period to receive samples while off** must be set to 50.

Provider	✓ Device A / Port A	•	Device B / Port B	×
Manual	Settings		×	Optics0/0/0/0
	ETH validation	NMC Valio	dation	
Summary	Power on [dbm] : -11			History
DEVIC 0/3/0/6 ron2_	Power off [dbm] : _50			DEVICE B / ron-ncs550
	Timestamp precision [sec]: Number of cycles:	2		
SOUR Manu		oles while on [sec	:]: 200	STATUS Validated I
	Wait period to receive samp	oles while off [sec	c]: 50	
LAST	Sample interval [sec]: 2			DESCRIPTIO
2023-	Buffer for power off/on [db	m] : 10		ron-ncs550
	Сон	nfirm		

b. Select a link and click **Validate Link**. Alternatively, you can click **Validate All Manual Links** to perform connectivity verification for all links.

Link Manager Cross Links			0 C 🌣
+ Add Cross Link			✓ Validate All Manual Links
Link Name 💿 Description 👻 Type 👻 Provider	✓ Device A / Port A ✓	Device B / Port B	hod 👻 Last Change 👻
1 OUT OF 24 ITEMS MATCHING FILTERS			
Manual Cross Link ron-ncs5504-1 Optic ron-ncs5504 NMC Manual	ron2_olt2-roadm / 0/3/0/6	ron-ncs5504-1 / Optics0/0/0/0 Validated By Shut No Shut Shu	it no shut 2023-03-30 04:39:03 EDT
Summa	ry Evidence	History	
LINK NAME Manual Cross Link ron-ncs5504-1 Optics0/0/0/0 to ron2_olt2-roadm 0/3/0/6	DEVICE A / PORT A ron2_olt2-roadm/0/3/0/6	DEVICE B / PORT B ron-ncs5504-1/Optics0/0/0/0	
TIME ADDED 2023-03-30 03:16:34 EDT	SOURCE Manual	STATUS Vaildated By Shut No Shut	
METHOD Shut no shut	LAST CHANGE 2023-03-30 04:39:03 EDT	DESCRIPTION ron-ncs5504-1 to ron2_olt2-roadm	
Validate Link			🖥 Delete Link

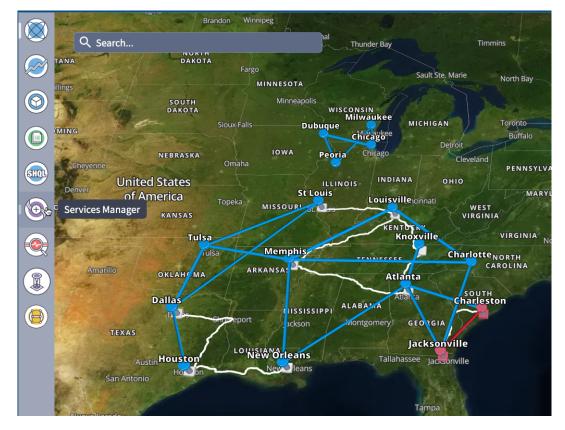
c. After validation completes, inspect the evidence of either successful or unsuccessful verification. The following image shows a successful verification. Status changes from **Unknown** to **Validated By Shut No Shut**. The time it takes for the ZR/ZR+ to start transmitting after no shut is set is typically 60–80 seconds.

Add Cross Link					✓ Validate All Manual Li
Name 🕑 Description 👻	Type * Provider	 Device A / Port A 	▼ Device B / Port B	Status • Method •	Last Change
UT OF 24 ITEMS MATCHING FILTERS					
nual Cross Link ron-ncs5504-1 Optic ron-ncs5504	NMC Manual	ron2_olt2-roadm / 0/3/0/6	ron-ncs5504-1 / Optics0/0/0/0	Validated By Shut No Shut Shut no shut	2023-03-30 04:39:03 EDT
	Summary	Evidence	History		
Validation Time 💿 Validation Res	alt v –	-10			
3 ITEMS	ZR Port		1		
2023-03-30 04:39:03 EDT Validated By 5		-15			
2023-03-21 03:25:50 EDT Validated By	Shut No Shut	-20			
2023-03-09 14:08:00 EST Validated By 3	Shut No Shut Failed				
		-25			
	1-111	-30			
		-35			
		-40			
		-40			
		-45			

The following image shows a failed verification. There is no change in the optical device port power levels after the **no shut** operation

	Description -	Туре	Provider		 Device A / I 		Device B / Port B	- Status	 Method 	 Last Change
JT OF 24 ITEMS MATCHING FILTERS		NMC	Manual					Validated By Shut No Shut	Shut no shut	2023-04-25 03:21:14 EDT
nual Cross Link ron-ncs57c3-1 Optics0/0/2/0 to r		NMC	Manual		ron-ncs57	c3-1 / Optics0/0/2/0	ron2_olt1-roadm / 0/1/0/6	Validated By Shut No Shut	Shut no shut	2023-04-25 03:21:14 EDT
				Summary		Evidence	History			
Validation Time	 Validation Result 			-10						
5 ITEMS				2R Port 0/1/0/6	•			•••••		
2023-04-25 03:21:14 EDT	Validated By Shut	No Shut		-10						
2023-04-20 13:03:35 EDT	Never Validated									
2023-04-20 10:44:25 EDT	Never Validated									
2023-03-21 06:58:57 EDT	Validated By Shut	No Shut		-20						
2023-03-09 14:11:12 EST	Validated By Shut	No Shut Failed								
				-25						
				(dBm)						
				er (dE						
				Pom						
				-35						
				-40						
				-45						
				-60			8 3 8 8 8 6 5 8 8 8 8 8 8 8 8 8			
					~~~~~~	ゆ むべ む む さ さ う り り り よ	やっこう や じ じ こ ひ む ち ち ち ち ち ち	くちょうちょうちょうちょうちょうちょう	' 4' 4' 4' 4' 4' 4' 4' 4	リ が ざ さ さ う う ざ ざ ざ

- 3. To provision the Routed Optical Networking IP link, perform these steps:
  - a. In the applications bar in the Crosswork Hierarchical Controller, click the Services Manager icon.



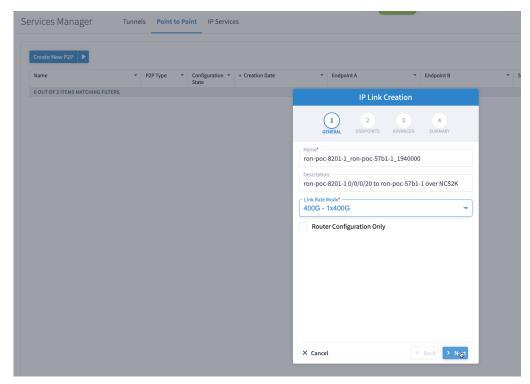
The Service Manager Application shows you a list of services.

**b.** Select the **Point to Point** tab and click **IP Link** from the **Create New P2P** drop-down list to create end to end service between router DCO ports.

	Services Manag	er Tunne	ls Point to Po	oint IP Service	25	
	Create New P2P					
$\bigcirc$	IP Link	-	P2P Type 🔹	Configuration •		Endpoint A
	OCH Link	HING FILTERS		State		
	OCH-NC Link					
SHOL	OTN Line					
Ð	SDH Line					
	Circuit E-Line					
	Packet E-Line					

The IP Link Creation wizard appears.

- **c.** Enter the Cisco Crosswork Hierarchical Controller service name, description of the router optical controller, and the Link Rate Mode in the **General** tab.
  - Here, we are creating a 1x400G link. In 2x100G, 3x100G, and 4x100G modes, you can choose to create separate IP links or create a Bundle with each channel link added as a member.



# Alternatively

• To create a 200G 16-QAM link, Select the 200G – 2x100G link rate mode.

200G 16-QAM allows the use of 200G signals on 50Ghz optical line systems. Default for 200G is QPSK at 60.1Ghz.

	IP Link (	Creation		
	2 ENDPOINTS	3 ADVANCED	4 SUMMARY	
Name* 200G legacy mo	de support			
Description Configure link as	s 200G 16QAM	l @ 30.1Ghz		
Link Rate Mode*	6			W
Router Config	guration Only			
	k			
× Cancel		<	Back > N	ext

# Alternatively

• To create a Bundle interface, Select a bundle option from the link rate mode drop down list.

You can create a 400G bundle interface (400G Member). Alternatively, 300G-bundle (3X100G Members) and 200G-Bundle (2x100G Members) can be created

		Creation	
GENERAL	2 ENDPOINTS	3 ADVANCED	4 SUMMARY
Name* 400G-Bundle-Cis	co8000-ASRS	9903	
Description			
Link Rate Mode* —			
400G - Bundle			
Router Config	uration Only		
Router Config	uration Only		

(Optional) Check the **Router Configuration Only** check box to configure only the router optical controller and IP information and not the optical line system. This configuration is used when the OCHNC is created outside Cisco Crosswork Hierarchical Controller.

**d.** Select the two router ports in the service. This is done by selecting the Site and Port. The transmit power for each endpoint is an optional parameter. The default TX power is used if no value is provided.

Create New P2P									
lame	▼ P2	Р Туре 👻	Configuration * State	↓ Creation Date	•	Endpoint A	*	Endpoint B	* :
OUT OF 2 ITEMS MATCHING F	ILTERS					IP Link (	Creation		
						1 2 ENDPOINTS	3 ADVANCED	4 SUMMARY	
					ENDPOINT	A			
					Site A			٩	
					Port A*			ې م	
					Transmi	t Power [dBm]			
					ENDPOINT	В			
					Site B			٩	
					Port B*			٩	
					Transmi	t Power [dBm]			

e. Click the magnifying glass icon to select the first router port.

The ports are displayed based on the following criteria:

- Is a ZR/ZR+ interface
- · Has no existing optics configuration
- Has a proper NMC cross-connect configured

This page lists all available ZR/ZR+ ports currently unused on all devices. Select the *ron-poc-8201-1 Optics0/0/0/22* port.

		OCH	PORTS		
Name 👻	Device 👻	Туре 👻	Capacity +	Description +	Admin Status
17 ITEMS					
Optics0/0/0/24	ron-poc-57b1-1	OCH		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/0/24	ron-ncs57b1-1	OCH		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/0/14	ron-8201-32FH-3	OCH		OCH port of Cisco QDD 400G BRT ZRP Plug	UP
Optics0/0/0/16	ron-8201-32FH-3	осн		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/0/0	ron-ncs540-2dd-1	осн		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/0/18	ron-8201-1	OCH		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/0/8	ron-8201-1	OCH		OCH port of Cisco QSFPDD 400G ZRP Plug	DOWN
Optics0/0/0/20	ron-8201-1	осн		OCH port of Cisco QSFPDD 400G ZR Plugg	UP
Optics0/0/0/22	ron-8201-1	OCH		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/1/4	ron-asr9903-1	осн		OCH port of 400G ZRP-S QSFPDD Module	UP
Optics0/0/1/8	ron-asr9903-1	OCH		OCH port of 400G ZR-S QSFPDD Module	UP
Optics0/0/0/10	ron-8201-2	ОСН		OCH port of Cisco QSFPDD 400G ZRP Plug	UP
Optics0/0/0/20	ron-8201-2	осн		OCH port of Cisco QSFPDD 400G ZR Plugg	UP
Optics0/0/0/22	ron-poc-8201-1	осн		OCH port of Cisco QSFPDD 400G ZRP Plu	UP
Optics0/0/0/20	ron-8201-4	осн		OCH port of Cisco QSFPDD 400G ZR Plugg	UP
Optics0/0/3/0	ron-ncs57c3-1	OCH		OCH port of Cisco QDD 400G BRT ZRP Plug	UP
Optics0/0/2/2	ron-ncs57c3-1	OCH		OCH port of Cisco QSFPDD 400G ZRP Plug	UP

- f. Similar to the previous step, choose ron-poc-57b1-1 Optics 0/0/0/24 as the second router port.
- **g.** (Optional) Set the transmit power in dBm on each port. If OLS provisioning is being performed, the OLS controller returns the optical power. If the OLS controller does not return the optical power or **router only** provisioning is being used, the router default power is used.
- **h.** (Optional) Enter the IP address information for interfaces. If IP addresses are not entered, ZR/ZR+ router optical configuration happens; however, IP addresses are not configured.
- i. Click Next to move to Advanced configuration.

IP L	.ink C	reation		
1 GENERAL ENDPO	) INTS	3 ADVANCED	4 SUMMARY	ŗ
Iransmit Power [dBm]				
ENDPOINT B				
Site B				
Port B* ron-poc-57b1-1 - Optics	0/0/0/2	4	×	
Transmit Power [dBm] — -10				
LINK #1 IP ADDRESSES				
IP Address A (CIDR) 100.28.30.22/31				
IP Address B (CIDR) 100.28.30.23/31				
× Cancel			Back	Next

- **j.** (Optional) Set the Frequency. If optical provisioning is being performed, the OLS controller can return the frequency to be used, and it may be omitted. If **router only** provisioning is being performed, the Frequency must be specified.
- k. (Optional) Set the DAC rate. A DAC rate setting can be used to enable OpenZR+ compatibility mode, disabling TX shaping and enhanced modem mode. See OpenZR+ Compatibility Mode for more information on mode support.

	IP Link (	Creation		
1 GENERAL	2 ENDPOINTS	3 ADVANCED	4 SUMMARY	
Add to existing LAG			v	
FREQUENCY				l
L Band C Band Frequency THz 194.00				
← Digital-to-Analog Con	iverter (DAC) rat	e ———	k	l
1 X 1 1 X 1.25				
Set Path Preference	es		in Path Criteria atency 🔻	
▼ Include Nodes	or Links			
Select Node o	or Link		Q	
× Cancel		<	Back > Next	

**1.** (Optional) Set links or nodes to include/exclude in the optical path. This setting is not available in **router only** provisioning.

**m.** (Optional) To add the new link or set of links to an existing Bundle LAG interface configured on the routers, choose the bundle from the **Add to existing LAG** drop-down.

		IP Link (	Creation		
	1 GENERAL	2 ENDPOINTS	3 ADVANCED	4 SUMMARY	
<ul> <li></li> </ul>	dle-Ether1	to Bundle-Etl	ner1		
Free	L Band C Band quency THz* – 5.200				
Digit	tal-to-Analo	g Converter (l	DAC) rate		•
Mod	ulation				-
Set Pa	th Preferen	ces		in Path Criter atency	ia 🗤
▼ Inc	lude Nodes	or Links			
s	elect Node	or Link			Q
× ca	incel		<	Back	Next

n. (Optional) If you are configuring a 200G 16-QAM link, set the DAC rate to 1x1.25.

200G link rate mode enables the **Modulation** selection drop-down. Modulation selection is not available in any other mode. Select the16 QAM (30Ghz) modulation.

		IP Link C	reation		
GEI	1 NERAL	2 ENDPOINTS	3 ADVANCED	4 SUMMARY	
Add to exist	ting LAG				•
FREQUEN	СҮ				
L Bai C Ba Frequenc 195.2 Digital-to-A 1 X 1.25 Modulation & 8 QAM 16 QAM	nd :y THz Analog Conv	verter (DAC) rate	<u>}</u>		
QPSK					
▼ Include	e Nodes o	or Links			
Selec	t Node o	r Link			Q
× Cancel			<	Back	Next

**o.** Click **Next** to review the final configuration. Verify the router endpoint and optical line system parameters. Click **Finish** to start provisioning, or click **Save** to save for later provisioning.

		IP Link (	Creation		
	1 GENERAL	2 ENDPOINTS	3 ADVANCED	4 SUMMARY	
	•	1_ron-poc-57 8201-1 0/0/0/		0 c-57b1-1 over NCS	52K
▼ Endpo	int A				
	on-poc-820 nit Power: ·	1-1 - Optics0/ ·10.0 dBm	0/0/22		
▼ Endpo	int B				
	on-poc-57b nit Power: ·	1-1 - Optics0/ ·10.0 dBm	0/0/24		
	<b>Mode:</b> 4000 <b>y:</b> 194.0 THz -			•	
Modulatio					
Optical Ex Included I	ria: Latency cluded List List: - rom Links:				
× Cancel	L		< Back	<ul> <li>Finish</li> </ul>	ave

The following image shows a sample summary for a 200G 16-QAM link.

		IP Link (	Creation	
	1 GENERAL	2 ENDPOINTS	3 ADVANCED	4 SUMMARY
	-	cy mode supp figure link as 2		@ 30.1Ghz
Po	ndpoint A ort: ron-ncs ansmit Pow	540-2dd-1 - Op <b>/er:</b> -	otics0/0/0/0	
Po	idpoint B ort: ron-ncs5 ansmit Pow	57b1-1 - Optic <b>/er:</b> -	s0/0/0/24	
Frequ DAC r	Rate Mode: 2 iency: 195.2 ate: 1 X 1.25 lation: MT_		i	
Optic Inclue	Criteria: Lat al Excluded ded List: - int From Lin	List: -		
× c	ancel		< Back	> Finish Save

**p.** Go to Services Manager to view provisioning progress.

Click the **Operations** > **Logs** tab to view the provisioning API calls used and responses. The logs show API calls and responses for both optical line system provisioning via Cisco Optical Network Controller and router provisioning via Crosswork Network Controller.

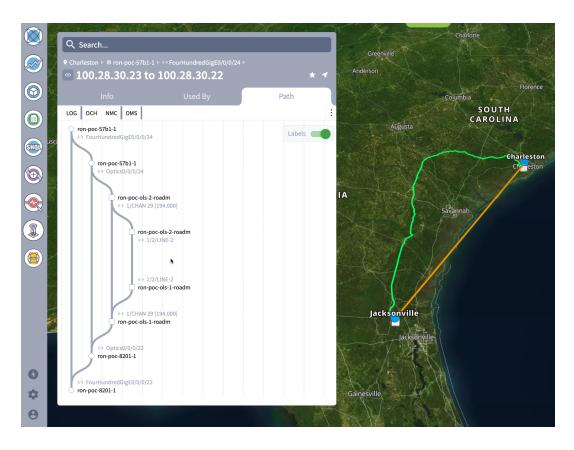
Nata Nave 720         No         Configuration @         Configuration @         Configuration @         Endpoint A         Endpoint B         Speed         Operational *         Last 30h         *         Last 30h         *         Last 30h         *         Configuration @         Configurati	
State         Operations	15
	Create IP Link: Discovery
n good 2011, jon pace 37631, 1, 1940 IP Link IN PROGRESS 24 04 2023 14:44 21 UTC ran pace 3763-1-0 optical/01/0/2 ran pace 2023 1-0 optical/01/0/2 400 CB 1 Create IP Link: D	Create IP Link: Discovery
1-poc-8201-1_ron-poc-57b1-1_1940000	
-boc-ozot-t_101-boc-3101-t_1340000	
-bocs201-7_101bbc-3101-7_7340000	
Summary Endpoints Underlay Path Operations Events Actions	- PRODUCT
Summary         Endpoints         Underlay Path         Operations         Events         Actions           Action         •         Ulleycle State         •         Creations         EBROINS         EBROINS	ERRORS
Actions         Ullegels sate         Creation tale         Last Update         SUMMARY         Lloss         ERRORS	ERRORS
Actions         Commany         Endpoints         Underlay Path         Operations         Events         Actions           Action              • Lifkcycle Sate             • Creation Date             • Last Update             • Last Update             • Loss             •	ERRORS
Summary         Endpoints         Underlay Path         Operations         Events         Actions           Action         •         Lifecycle State         •         Creation Date         •         Last Update         •         SUMMARY         Loss         Enrors           11THH         •         •         24-04-2023 16-44/20 UTC         24-04-2023 16-44/20 UTC         •         Normal Flow	ERRORS
Actions         Commany         Endpoints         Underlay Path         Operations         Events         Actions           Action              • Lifkcycle Sate             • Creation Date             • Last Update             • Last Update             • Loss             •	ERRORS

If the provisioning is successful, the **Configuration State** field changes to INSTALLED state and the **Operational State** field changes to UP state.

ervices Manag	ien runn	Point to P	pint IP Service	15								Operations	<b>Q</b> :
Create New P2P	2												
Name		P2P Type *	Configuration 👻 State	+ Creation Date		Endpoint A *	Endpoint B 👻	Speed •	Operational * State	Last 24h Operations	* Last Oper	ration	
1 OUT OF 3 ITEMS MA	TCHING FILTERS												
ron-poc-8201-1_ron	n-poc-57b1-1_1940	IP Link 😓	INSTALLED	24-04-2023 14:44:21 UTC		ron-poc-57b1-1 - Optics0/0/0/2	ron-poc-8201-1 - Optics0/0/0/2	400 GB	Up	1	Create IF	P Link: ✓ Done	
ron-poc-8201-	-1_ron-poc-57	<b>b1-1_194000</b> Underlay Pat		ions Events	Act								
Summary GUID: SI/7d4cd Name: ron-poc Creation Timee Last Changed: Template Nam Service Link 100.28.30.23	Endpoints 130b6c6d4eb7ad44; 8201-1_ron-poc-57 24-04-2023 14;44;2 24-04-2023 14;44;2 e: default-template	Underlay Pat 441269d2d45b 7b1-1_1940000 21 UTC 1 UTC		ions Events	Act								

The **Summary** tab displays the new service link.

q. Verify the end to end link across both IP and optical layers in the Explorer view.



4. Use the Link Assurance application to verify the end to end path and relevant PM data. Select a link or port to see data on the ZRM, OCH, and OTS layers.



# **Operate Phase**

To monitor the ZR/Z+ optics:

- Use either CLI commands or EPNM to monitor router ZR/ZR+ optics for proper operation. See Monitor ZR or ZR+ Optics Using EPNM, on page 59.
- 2. (Optional) Setup router ZR/ZR+ optics data collection in CW Health Insights. See Monitor Performance of ZR/ZR+ Optics Using KPIs, on page 68.

# Monitor ZR or ZR+ Optics Using EPNM

This section adds the 8201 router to EPNM for monitoring the PM parameters on the ZR or ZR+ optics.

 To add a new device to EPNM choose Inventory > Device Management > Network Devices. Click Routers or a subgroup if it is already defined in the left panel.

vice Groups		Broups / Device Type i 8000 Series Ro								Selected	0/Total 4 ① 연 후 *
÷* '≣ +	+ •		min State 🔻 Sync	Groups & Sites 🔻	vice Revoke Certi	ficate OAM Co			Show	Quick Fi	lter 🔻 🍸
Q Search All		Reachability	Admin Status	Device Name	IP Address		DNS Name	Device Type	Last Inventory Collection Sta	tus	Last Successful Collect
II Devices (j)											200100000000000000000000000000000000000
Nevice Type (j)											
Optical Networking (j)		$\checkmark$	Managed	ron-8201-1	172.29.11.20	. ()	172.29.11.20	Cisco 8201 Router	Completed	<i>(i)</i>	2021-Jun-24 12:37:07 Ea
Routers ()		Solution	Managed	ron-8201-2	172.29.11.21		172.29.11.21	Cisco 8201 Router	Completed with Warning	٢	
Cisco 8000 Series Routers		$\checkmark$	Managed	ron-8201-3	172.29.11.22	UI ()	172.29.11.22	Cisco 8201 Router	Completed	1	2021-Jun-24 12:36:29 E
ocation (j)		$\checkmark$	Managed	ron-8201-4	172.29.11.23	11 ()	172.29.11.23	Cisco 8201 Router	Synchronizing	٢	
Jser Defined (j)											

2. Click the + icon above the Network Devices table, then choose Add Device.

I Inventory / Device Managem		ips / Device Type									00 🗭
	Cisco 80	00 Series Ro	outers							Selected	0/Total 4 ① 만 다
+ ≣ *	+-		Imin State 🔻 Sync	Groups & Sites 🔻	Export Device Revoke Certi	icate OAM Co			Show	Quick F	iter 💌
Q Search All	Add D	lity	Admin Status	Device Name	IP Address		DNS Name	Device Type	Last Inventory Collection Sta	tus	Last Successful Col
All Devices (j)	Bulk I	mport									
▼ Device Type ④											
<ul> <li>Optical Networking ()</li> </ul>		$\checkmark$	Managed	ron-8201-1	172.29.11.20	11 ()	172.29.11.20	Cisco 8201 Router	Completed	(i)	2021-Jun-24 12:37:0
▼ Routers ①		<b>~</b>	Managed	ron-8201-2	172.29.11.21		172.29.11.21	Cisco 8201 Router	Completed with Warning		
Cisco 8000 Series Routers ()		<b>~</b>	Managed	ron-8201-3	172.29.11.22	H ()	172.29.11.22	Cisco 8201 Router	Completed	0	2021-Jun-24 12:36:2
Location (j)		$\checkmark$	Managed	ron-8201-4	172.29.11.23	II ()	172.29.11.23	Cisco 8201 Router	Synchronizing	(j)	
User Defined (j)											

**3.** Configure the General, SNMP, and SSH parameters as seen in that following figures. Click **Verify Credentials** to validate that Cisco EPN Manager can reach the device. Click **Add** to add the device to EPNM.

 $\times$ Add Device * General Parameters General  $\sim$ IP Address 172.29.11.28 O DNS Name * SNMP (Optional if TL1 is configured) • 0 Full License Level • • --Select--Ŧ Device Role 0 ۰ Telnet/SSH • Add to Group * 0 --Select--۰ • HTTP/HTTPS **Credential Profile** --Select--• 0 TL1 Civic Location 521945 Add Verify Credentials Cancel × Add Device **Telnet/SSH Parameters**  General  $\checkmark$ Protocol SSH2 Ŧ • Port 22 * SNMP (Optional if TL1 is configured) Timeout 60 (secs) . • Username admin Telnet/SSH ٠  $\sim$ 0 Password ..... ۰ • **Confirm Password** ..... HTTP/HTTPS Enable Password 0 TL1 Confirm Enable Password Civic Location * Note:Not providing Telnet/SSH credentials may result in partial collection of inventory data. 521946 Verify Credentials Cancel Add

	* SNMP Parameters			
* General 🗸	Version	v2c	•	]
		* SNMP Retries	2	]
* SNMP tional if TL1 is configured)		* SNMP Timeout	10	(secs)
		* SNMP Port	161	
Telnet/SSH 🗸 •	* Read Community			0
e HTTP/HTTPS	* Confirm Read Community	•••••		ĺ
	Write Community	•••••		0
TL1	Confirm Write Community			
Civic Location				

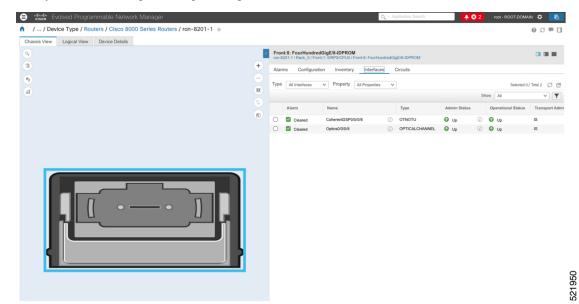
4. To open the chassis view from the Network devices table, click the device name link. The following figure displays the chassis view of the 8201 router.

tsis View Logical View Device Details					
	> ron-8201-1	<b>a</b> ()			
	+ Alarms Con	figuration Inventory Inte	rfaces Circuits Image	Configuration Archive	
	-			Last Updated: 2	2021-Jun-24 16:07:38 EST
	x.	6	2 4 0	0 0	
	\$	All	Critical Major Mino	warning Information	
	Export			Show Qu	ick Filter v
	Severity	Condition	Timestamp V	Affected Objects	Alarm ID
	<b>v</b>	isisAdjacencyChangeDown	2021-Jun-24 12:37:44 EST	FourHundredGigE0/0/0/20	11509938
	v	ROUTING-ISIS-5-ADJCHA	2021-Jun-24 12:37:44 EST	FourHundredGigE0/0/0/20	11509937
	<b>v</b>	ROUTING-ISIS-5-ADJCHA	2021-Jun-24 12:37:44 EST	FourHundredGigE0/0/0/8	11509939
	0	LINK_DOWN	2021-Jun-24 12:37:09 EST	FourHundredGigE0/0/0/20-mpls la	11509935
	0	LINK_DOWN	2021-Jun-24 12:37:09 EST	FourHundredGigE0/0/0/20	11509936
	V	cefcPowerStatusChange	2021-Jun-23 00:05:47 EST	0/PM0	11509854
	N W27 ANN W28 ANN W28 ANN W28 ANN W28				

5. Click the QSFP-DD ZR+ port to see specific data about that port.

			in-8201-1 💟 🔛 ( n-8201-1	D			
		+ A	arms Config	ration Inventory Inte	erfaces Circuits Ima	ge Configuration Archive	
FourHundredGigE0/0/0/8-IDPROM Hardware Version ES03	×	- **		6 All		D 0 0 Warning Information	: 2021-Jun-24 16:07:38 EST 🔮
Part Number QDD-400G-ZRP-S			Export			Show C	Quick Filter
Serial Number ACA2501003X			Severity	Condition	Timestamp	<ul> <li>Affected Objects</li> </ul>	Alarm ID
CLEI Code No Data Available							
Equipment Type			•	isisAdjacencyChangeDown	2021-Jun-24 12:37:44 EST	FourHundredGigE0/0/0/20	11509938
Module State			V	ROUTING-ISIS-5-ADJCHA	2021-Jun-24 12:37:44 EST	FourHundredGigE0/0/0/20	11509937
No Data Available			<b>v</b>	ROUTING-ISIS-5-ADJCHA		FourHundredGigE0/0/0/8	11509939
Location FourHundredGigE0/0/0/8-IDPROM			0	LINK_DOWN	2021-Jun-24 12:37:09 EST 2021-Jun-24 12:37:09 EST	FourHundredGigE0/0/0/20-mpls la FourHundredGigE0/0/0/20	11509935
Product ID			v	cefcPowerStatusChange	2021-Jun-23 00:05:47 EST	0/PM0	11509854
 QDD-400G-ZRP-S				eeer onerenninge	2021 000 20 0000000 201		
Show Details							
 at at a sui atta atta atta atta atta att atta att att att atta atta atta atta atta	B AN 415 AN 417 AN 418 AN 418 AU AU	5 AL VIS					

Here you can view the port and specific optical channel and CoherentDSP entities.



6. Clicking the additional information icon for the optical channel and then the **Optical Physical** measurement tab displays the relevant optical PM values such as **RX/TX signal power** and **OSNR** values.

Chassis View Logical Chassis View Logical	Admin Statu	Show All	cted 0 / Total 2 💭 🕑
Atoms         Optical Physical         FEC         Interface         Circuits/VCs           Total 2 (3 © ~         Show         Substrate         Type           Timestamp         OSNR         RX-POWER         LBC         DGD         PCR         O othors           16:02:55, 24-Jun-2021:EST         31.50         -13.38 dBm         -0.53.88m         0         2.00         0		Show All	
Image: Control of the contro		Show All	
Timestamp         OSNR         RX-POWER         TX-POWER         LBC         DGD         PCR           160256, 24-Jun-2021 EST         31.50         -13.36 dBm         -10.53 dBm         0         2.00         0			
16.0255, 24-Jun-2021 EST 31.50 -13.36 dBm -10.53 dBm 0 2.00 0	0.0	us Operational Sta	atus Transport Adr
16:02:55, 24-Jun-2021 EST 31:50 -13:36 dBm -10:53 dBm 0 2:00 0	2 UP	Ø 00 Up	IS
	LCHANNEL 🕼 Up	() 🚱 Up	IS
16:02:36; 24-Jun-2021 EST 31.70 -13:29:09m -10:55:09m 0 2.00 0			
j rü			

7. Clicking the additional information icon for the coherent DSP and then the **FEC** measurement tab displays the relevant coherent DSP FEC statistics such as **PreFEC Bit Error Rate**, **Bit Error Rate Count (BIEC)**, and **Uncorrected Words (UCW)**. The UCW value must remain 0.

ssis View Logical View		CoherentDS	P0/0/0/8	0 0										
		Interf Transport Adr	If Speed 4	TNOTU					idredGi	E/8-IDPROM				
	$\smile$	Adjacent Int	ice Name ro	n-8201-1 (j)					s (	Circuits				
	Alarms FEC	OTU Ir	nterface	Circuits/VCs					~				Selected 0.	/ Total 2 💭
							Tota	14 G & -				Sł	ow All	<b>v</b>
	Set Baseline					Show	Quick Filter	~ n		Туре	Admin Status		Operational Status	Transport
	Timestamp	UCV	N	BIEC	PreFEC_BER-MIN	PreFE	_BER-AVG		> 0	OTNOTU	O Up	()	🚱 Up	IS
									١	OPTICALCHANNEL	🕢 Up	<i>(i)</i>	🚱 Up	IS
	16:04:14, 24-Jun-2	021 EST 0		493733542753	1.3E-03	1.4E-03	1							
	16:04:34, 24-Jun-2	021 EST 0		507114399500	1.3E-03	1.4E-03	1							
	16:04:54, 24-Jun-2	021 EST 0		520413161689	1.3E-03	1.4E-03	1							
	16:05:14, 24-Jun-2	021 EST 0		533591199474	1.3E-03	1.4E-03	1							
R									6					

The following figures display the current and historical performance monitoring data in EPNM that is specific to the ZR or ZR+ optics.

521951

## Figure 17: Optical Physical Parameters

o-Refresh Off ∨   Ø													View $\vee$	Action
Optics0/0/	0/20 🚱 🚱													
Transport /	erface Type Of Admin State IS Description Mi evice Name ro Interface(s) N/	anaged by NSO .58, do n-8201-1 (j)	o not change manually											
			uits/VCs											
optical Physical	FEC I	nterface Circu	untar v Cra											
optical Physical	FEC I	nterrace Circi	anar v Ga										Total	4 Ø Ø
optical Physical	FEC I	nternace Carci	anar v Go								Show	w Quid	Total k Filter	4 Ø Ø
	FEC I	RX-POWER	TX-POWER	LBC	DGD	PCR	PDL	CD	FREQ-OFF	RX-SIG				
				LBC	DGD	PCR	PDL	CD	FREQ-OFF	RX-SIG			k Filter	
rms Optical Physical imestamp 1:13:55, 14-Apr-2021 IST				LBC	DGD 1.00	PCR 0	PDL	CD 	FREQ-OFF	RX-SIG			k Filter	
imestamp 1:13:55, 14-Apr-2021 IST	OSNR	RX-POWER	TX-POWER								A Q-FACTO		k Filter Q-MARGIN	
imestamp	OSNR 35.60	RX-POWER	TX-POWER	0	1.00	0	1.70	-489	57	-13.37	<ul> <li>Q-FACTO</li> <li>9.80</li> </ul>		k Filter Q-MARGIN 3.50dB	

Figure 18: Historical Optical Physical Parameters

nterface Details			/ @ Ø 🖻 — X	Optical Power			002-X
Property	Value			Transmitted(OPT)   Received(C Zoom: 1h   6h   1d   1w   2v			
Interface Name	Optics0/0/0/20						
Interface Type	OPTICALCHANN	(EL		Time	Minimum	Average	Maximum
Lane	N/A			2021-Apr-15, 19:45:00 IST	-10.54	-10.53	-10.52
Speed	N/A			2021-Apr-15, 20:00:00 IST	-10.55	-10.53	-10.52
Interface Index	39			2021-Apr-15, 20:15:00 IST	-10.55	-10.53	-10.52
Admin Status	Up						
Operational Status	Up						
Device Name	ron-8201-1						
Device Ip	172.29.11.20						
Device Description	Cisco IOS XR So	ftware (8000), Version 7.3.15.	19I-CVT_19I_45rpms Copyright (c) 2013				
A 2021.Apr.15 20-22-50	ICT T21						
★ 2021-Apr-15, 20:32:59	IST				A IE 20.22.00 IPT		
<ul> <li>2021-Apr-15, 20:32:59</li> <li>Optical Signal to No</li> </ul>			@ \\\C^* - \X		21-Apr-15, 20:33:00 IST		
	oise Ratio (OSNR)		@ \$2 t ² - X	Second Order Polari		ersion (SOPMD)	0 0 c – X
Optical Signal to No	oise Ratio (OSNR)	Average	© ♡ ピ - ×		ized Mode Disp	ersion (SOPMD)	@ S Z - X
Optical Signal to No	oise Ratio (OSNR) w   4w   3m   6m   1y			Second Order Polar	ized Mode Disp	ersion (SOPMD) Average	@ び ♂ → X Maximum
Optical Signal to No com: 1h   6h   1d   1w   2 Time	bise Ratio (OSNR) w   4w   3m   6m   1y Minimum	Average	Maximum	Second Order Polar Zoom: 1h   6h   1d   1w   2v	ized Mode Disp v   4w   3m   6m   1y		
Optical Signal to No com: 1h   6h   1d   1w   2) Time 2021-Apr-15, 19:45:00 IST	bise Ratio (OSNR) w   4w   3m   6m   1y Minimum 35.6	Average 35.6	Maximum 35.6	Second Order Polari           Zoom:         th         6h         1d         1w         2v           Time         2021-Apr-15, 19:45:00 IST	ized Mode Disp y   4w   3m   6m   1y Minimum	Average	
Dptical Signal to No           com:         1h         6h         1d         1w         2v           Time         2021-Apr-15, 19:45:00 IST         2021-Apr-15, 20:00:00 IST         2v         2v	bise Ratio (OSNR) w   4w   3m   6m   1y Minimum 35.6 35.6	Average 35.6 35.6	Maximum 35.6 35.6	Second Order Polari Zoom: 1h   6h   1d   1w   2v Time	ized Mode Disp 4 4w   3m   6m   1y Minimum 7	Average 47.17	Maximum 153

521883

#### Figure 19: Historical Optical Physical Parameters

Polarization Depend							
oom: 1h   6h   1d   1w   2	w   4w   3m   6m   1y			Chromatic Dispersio	on (CD)		0 S 5 -
Time	Minimum	Average	Maximum	Zoom: 1h   6h   1d   1w   2v	v   4w   3m   6m   1y		
2021-Apr-15, 19:45:00 IST	1.5	1.61	1.7	Time	Minimum	Average	Maximum
2021-Apr-15, 20:00:00 IST	1.5	1.59	1.7	2021-Apr-15, 19:45:00 IST	-490	-489	-487
2021-Apr-15, 20:15:00 IST	1.5	1.62	1.7	2021-Apr-15, 20:00:00 IST	-490	-489	-487
				2021-Apr-15, 20:15:00 IST	-490	-489	-487
20 20	21-Apr-15, 20:32:59 IST		0.0 A - V	<b>∠</b> ■ <b>₫</b> • <b>∂•</b> 200	21-Apr-15, 20:33:00 IST		
hase Noise torn: 1h   6h   1d   1w   2 ata is unavailable. Possible re The Monitoring Policy is disat The devineous is not support he technology is not support	w   4w   3m   6m   1y easons: Jed insged in the system and/or ar		@ 0 d' - X	Differential Group D Zoom: 1h   6h   1d   1w   2v Time	elay (DGD)	Average	@ G 단 Maximum
hase Noise om: 1h   6h   1d   1w   2 ata is unavailable. Possible re The Monitoring Policy is disat The devhology is not support he technology is not support	w   4w   3m   6m   1y assons: Jed naged in the system and/or ar led on the device		@ 0 t ² - X	Differential Group D.           Zoom:         th   6h   1d   1w   2v           Time         2021-Apr-15, 19:45:00 IST	elay (DGD) v   4w   3m   6m   1y Minimum 1	1.9	Maximum 2
hase Noise torn: 1h   6h   1d   1w   2 ata is unavailable. Possible re The Monitoring Policy is disat The devineous is not support he technology is not support	w   4w   3m   6m   1y assons: Jed naged in the system and/or ar led on the device		Ø ∅ ℓ ^s − X	Differential Group D Zoom: 1h   6h   1d   1w   2v Time	elay (DGD) v   4w   3m   6m   1y Minimum		Maximum

## Figure 20: Historical Optical Physical Parameters

ptical Power Signa			® Ω ⊑ ^s − X				
îme	Minimum	Average	Maximum	Frequency Difference	ce (FREQ_OFF)		0 C C -
021-Apr-15, 19:45:00 IST	-13.39	-13.35	-13.33	Zoom: 1h   6h   1d   1w   2	w   4w   3m   6m   1y		
021-Apr-15, 20:00:00 IST	-13.43	-13.36	-13.33	Time	Minimum	Average	Maximum
021-Apr-15, 20:15:00 IST	-13.43	-13.37	-13.33	2021-Apr-15, 19:45:00 IST	36	56	74
				2021-Apr-15, 20:00:00 IST	36	56	74
				2021-Apr-15, 20:15:00 IST	35	57	79
202	21-Apr-15, 20:33:00 IST						

0

0

0

#### Figure 21: FEC Parameters

Transp	Interface Typ ort Admin Stat	d 400.0Gbps e OTNOTU te IS e ron-8201-1 (j)						Last Upd	Vie	Actions
larms FEC OTU	Interfac	e Circuits/VCs								
Set Baseline								Show	Quick Filter	Total 12 💭 🏠 -
Timestamp ~	UCW	BIEC	PreFEC_BER-MIN	PreFEC_BER-AVG	PreFEC_BER-MAX	PostFEC_BER-MIN	PostFEC_BER-AVG	PostFEC_BER-MAX		face Name
					rior au _our moor	FORGEO_DEROMIN	POSIFEG_BERMANG	POSIFEG_DER-MAA	Inter	lace Harrie
							POSIFEC_BERMAYO	FOSIFEG_DER-MAA	Inter	
21:09:30, 14-Apr-2021 IST	0	259424538363	9.3E-04	1.0E-03	1.0E-03	0	0	0		
	0	259424538363 250149080948	9.3E-04 9.3E-04						Inter	
21:09:10, 14-Apr-2021 IST				1.0E-03	1.0E-03	0	0	0		
21:09:10, 14-Apr-2021 IST 21:08:50, 14-Apr-2021 IST	0	250149080948	9.3E-04	1.0E-03 1.0E-03	1.0E-03 1.0E-03	0 0	0	0		
21:09:30, 14-Apr-2021 IST 21:09:10, 14-Apr-2021 IST 21:08:50, 14-Apr-2021 IST 21:08:29, 14-Apr-2021 IST 21:08:29, 14-Apr-2021 IST 21:06:20, 14-Apr-2021 IST	0	250149080948 241029855399	9.3E-04 9.3E-04	1.0E-03 1.0E-03 1.0E-03	1.0E-03 1.0E-03 1.0E-03	0 0 0	0 0 0	0 0 0		
21:09:10, 14-Apr-2021 IST 21:08:50, 14-Apr-2021 IST 21:08:29, 14-Apr-2021 IST	0 0 0 0	250149080948 241029855399 231895488278	9.3E-04 9.3E-04 9.3E-04	1.0E-03 1.0E-03 1.0E-03 1.0E-03	1.0E-03 1.0E-03 1.0E-03 1.0E-03	0 0 0 0	0 0 0 0	0 0 0 0		
21:09:10, 14-Apr-2021 IST 21:08:50, 14-Apr-2021 IST 21:08:29, 14-Apr-2021 IST 21:06:20, 14-Apr-2021 IST	0 0 0 0 0	250149080948 241029855399 231895488278 171915528470	9.3E-04 9.3E-04 9.3E-04 9.7E-04	1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03	1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03	0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0		
21:09:10, 14-Apr-2021 IST 21:08:50, 14-Apr-2021 IST 21:08:29, 14-Apr-2021 IST 21:06:20, 14-Apr-2021 IST 21:06:01, 14-Apr-2021 IST	0 0 0 0 0 0 0	250149080948 241029855399 231895488278 171915528470 162585187635	9.3E-04 9.3E-04 9.3E-04 9.7E-04 9.7E-04	1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03	1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03 1.0E-03	0 0 0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0		

1.0E-03

1.0E-03

1.0F-03

1.0E-03

1.0F-03

0

0

0



21:04-21, 14-Apr-2021 IST 0 116370733446 9.7E-04 21:04:01 14-Apr-2021 IST 0 106598278785 9.7E-04

21:04:40, 14-Apr-2021 IST 0 125294694470 9.7E-04 1.0E-03

Forward Error Corre Bit Errors Corrected   Uncorrec Zoom: 1h   6h   1d   1w   2v	table Words   Pre-FEC		0 C 🖻 – X
Time	Minimum	Average	Maximum
2021-Apr-14, 21:30:00 IST	0.00092	0.00099	0.001
2021-Apr-14, 21:45:00 IST	0.00091	0.00097	0.001
2021-Apr-14, 22:00:00 IST	0.00077	0.00099	0.001
2021-Apr-14, 22:15:00 IST	0.00077	0.001	0.001
2021-Apr-14, 22:30:00 IST	0.00094	0.001	0.001
2021-Apr-14, 22:45:00 IST	0.00093	0.001	0.001
2021-Apr-14, 23:00:00 IST	0.00095	0.001	0.001
2021-Apr-14, 23:15:00 IST	0.00093	0.00099	0.001
2021-Apr-14, 23:30:00 IST	0.00091	0.00098	0.001
2021 Apr 14 23:45:00 IST	0 00003	0 00008	0.001

## Figure 23: Historical FEC Parameters

Time	Minimum	Average	Maximum	
2021-Apr-14, 21:30:00 IST	9.7	9.77	9.8	
2021-Apr-14, 21:45:00 IST	9.7	9.76	9.8	
2021-Apr-14, 22:00:00 IST	9.7	9.76	9.8	
2021-Apr-14, 22:15:00 IST	9.7	9.77	9.8	
2021-Apr-14, 22:30:00 IST	9.7	9.75	9.8	
2021-Apr-14, 22:45:00 IST	9.7	9.77	9.8	
2021-Apr-14, 23:00:00 IST	9.7	9.75	9.8	
2021-Apr-14, 23:15:00 IST	9.7	9.77	9.8	
2021-Apr-14, 23:30:00 IST	9.7	9.76	9.8	
7021 Apr 14 22:45-00 IQT	0.7	0.75	0.9	

ality Factor Marg			
Time	Minimum	Average	Maximum
2021-Apr-14, 21:30:00 IST	3.5	3.5	3.5
2021-Apr-14, 21:45:00 IST	3.5	3.5	3.5
2021-Apr-14, 22:00:00 IST	3.5	3.5	3.5
2021-Apr-14, 22:15:00 IST	3.5	3.5	3.5
2021-Apr-14, 22:30:00 IST	3.5	3.5	3.5
2021-Apr-14, 22:45:00 IST	3.5	3.5	3.5
2021-Apr-14, 23:00:00 IST	3.5	3.5	3.5
2021-Apr-14, 23:15:00 IST	3.5	3.5	3.5
2021-Apr-14, 23:30:00 IST	3.5	3.5	3.5
2021 Apr 14 22:4E-00 ICT	2.6	2.5	2 5

## Figure 24: Historical OTN Parameters

coom: 1h   6h   1d   1w   2w   4	w   3m   6m   1y		Severel	ly Errored Secor	nds (SES) Section	ම ග ජ	- ×
Time	FEND	NEND	SES SES	Ratio 6h   1d   1w   2w   4	w   3m   6m   1v		
2021-Apr-14, 21:30:00 IST	0	0		0111011012014			
2021-Apr-14, 21:45:00 IST	0	0	Time		NEND	FEND	
2021-Apr-14, 22:00:00 IST	0	0	2021-Apr-	14, 21:30:00 IST	0	0	
2021-Apr-14, 22:15:00 IST	0	0	2021-Apr-	14, 21:45:00 IST	0	0	
2021-Apr-14, 22:30:00 IST	0	0	2021-Apr-	14, 22:00:00 IST	0	0	
2021-Apr-14, 22:45:00 IST	0	0	2021-Apr-	14, 22:15:00 IST	0	0	
2021-Apr-14, 23:00:00 IST	0	0	2021-Apr-	14, 22:30:00 IST	0	0	
2021-Apr-14, 23:15:00 IST	0	0	2021-Apr-	14, 22:45:00 IST	0	0	
2021-Apr-14, 23:30:00 IST	0	0	2021-Apr-	14, 23:00:00 IST	0	0	
2024 Apr 44 - 22-45-00 IQT	0	0	2021-Apr-	14, 23:15:00 IST	0	0	
				4.4. 00.00.00.107	0	0	
🛫 📄 🔳 🖌 🖈 2021-Ag	r-15, 20:52:58 IST		2021-Apr-	14, 23:30:00 IST	0	0	
			2021 Anr	14 22-46-00 ICT	0	0	
	Section	NEND	ම ග ප ⁸ − × Unavail		w-15, 20:52:58 IST JAS) Section	ං ම	- >
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Zoom: 1h   6h   1d   1w   2w   4	w   Shi   Ohi   Ty		
Time	NEND	FEND	
2021-Apr-14, 21:30:00 IST	0	0	
2021-Apr-14, 21:45:00 IST	0	0	
2021-Apr-14, 22:00:00 IST	0	0	
2021-Apr-14, 22:15:00 IST	0	0	
2021-Apr-14, 22:30:00 IST	0	0	
2021-Apr-14, 22:45:00 IST	0	0	
2021-Apr-14, 23:00:00 IST	0	0	
2021-Apr-14, 23:15:00 IST	0	0	
2021-Apr-14, 23:30:00 IST	0	0	
2021 Apr 14 22:45:00 IST	0	0	

#### Figure 25: Historical OTN Parameters

# Monitor Performance of ZR/ZR+ Optics Using KPIs

Perform the following steps to create KPI Profiles in Health Insights and enable them on the devices to monitor network health.

Note

Plan which Cisco-supplied KPIs you want to begin using, based on each device's function and the device performance characteristics you want to monitor. Review the Cisco-supplied KPIs documented in List of Health Insights KPIs. In the following image, you see the available default L1 optics KPIs.

KPI Categories (17)	Key	Performance Indicators (KPIs)			Selected 0 / Total 6 🔿
	+	□ Link Playbook Unlink			
		KPI Name	Category	Description	Linked Playbook
All KPIs					
BASICS		Layer 1 optical alarms	Layer1-Optics	Monitors per-port optical alarms	
CPU		Layer 1 optical errors	Layer1-Optics	Monitors per-port Layer 1 errors; generates ale	
Dataplane-Counters		Layer 1 optical FEC errors	Layer1-Optics	Monitors per-port optical FEC errors; generate	
Filesystem		Layer 1 optical power	Layer1-Optics	Monitors per-port optical power; generates ale	
IPSLA		Layer 1 optical temperature	Layer1-Optics	Monitors per-port optical temperature; generat	
LLDP					
Layer1-Optics		Layer 1 optical voltage	Layer1-Optics	Monitors per-port optical voltage; generates al	
Layer1-Traffic					
Layer2-Interface					
Layer2-Traffic					
Layer3-Routing					
Layer3-Traffic					
Memory					
Protocol-ISIS					
QoS					
User Defined					
oder Defined					

1. Group the relevant KPIs to form a KPI Profile. A KPI profile can have many different KPIs assigned. In this case, the focus is only on some specific optics KPIs to add to the **optics_profile** KPI profile.

A / Performan	nce Alerts / KPI Profiles / Create Prof	ile		
Create Ne	ew Profile			
Profile	e Name* optics_profile	?	Description Measure optics parameter	rs
External De	stination Details (?)			
Ser	ver Type	~	Name	$\checkmark$
Add KPIs t	to Profile Recommended KPIs			
	Category T	KPI		Summary
	optics			
	Layer1-Optics	Layer 1 optical alar	/ms	Monitors per-port optical alarms
	Layer1-Optics	Layer 1 optical erro	ors	Monitors per-port Layer 1 errors; generates alert when error rates exceeds the configured threshold
	Layer1-Optics	Layer 1 optical FEG	) errors	Monitors per-port optical FEC errors; generates an alert when FEC errors exceeds the configured th.
	Layer1-Optics	Layer 1 optical pow	ver	Monitors per-port optical power; generates alert when power levels exceeds the configured threshole
	Layer1-Optics	Layer 1 optical terr	perature	Monitors per-port optical temperature; generates alert when temperature exceeds the configured th.
~	Layer1-Optics	Layer 1 optical volt	age	Monitors per-port optical voltage; generates alert when voltages exceeds the configured threshold
Save	Cancel			

See Create a New KPI Profile.

 Enable the appropriate KPI Profiles on the devices you want to monitor. From the main menu, choose Performance Alerts > Enable/Disable KPI Profiles. Check the checkboxes of all the nodes to which the profile must be applied to, and click Enable KPI Profiles.

Multiple nodes may be selected. In the following figure, we are applying the KPI profile to a single node.

<b>n</b> /	Perfor	mance Alerts / Enable/Disabl	le KPI Profiles				
Sel	ect By	V      Device      Device Tag	gs				
C	evic	es				Selected 1 / Total 13 🔿	¢
	Enabl	e KPI Profiles Disable KPI	Profiles			Clear All Filters	T
		Reachability	Name <b>T</b>	Device Type	Operational State	Enabled Profiles	
			ron-8201-1				
	~	Reachable	ron-8201-1	ROUTER	<b>О</b> К	3	
							5 2
							915
							52191
							2

**3.** Select the optics_profile KPI profile that was created in the previous step and click next to finalize enabling the KPI for the selected device.

rformance Alerts / Enable/Disable	KDI Drofiles				
mormance Alerts / Enable/Disable	KPI PIOIIIES	0			
	s	elect Devices	Select KPI Profiles	Verify Details	
Pl Profiles					Selected 1 / Total 4 🔿
					Clear All Filters
Name <b>T</b>		Devices Enabled		Description	
optics					
optics_profile		0		Measure optics parameters	
Cancel					Previous

4. The following image displays the final page before enabling the KPI profile for the router. After you click **Enable**, the appropriate configuration is applied to the router to begin streaming the telemetry sensors data for the selected optical KPIs.

/ Performance Alerts / Enable/Dis	sable KPI Profiles				
		o	ct KPI Profiles	Verify Details	
Selected Device(s)	Selected Profile(s)	000000000000000000000000000000000000000	a kri Fioliko	Verity Decans	
Name ron-8201-1	Name     optics_profile	optics_profile			3 0
	<ul> <li>oplics_prolife</li> </ul>	Description : Measure optics parameter Destination : Server Typ			#KPIs on Enabled Profile Devices
		KPI On Profile			
		Layer 1 optical power	Layer 1 optical temperature	Layer 1 optical voltage	
		Alerts OFF Cadence(sec) 300 Alert Frequency 1 Alert Type alarm_stat.	Alerts OFF Cadence(sec) 300 Alert Frequency 1 Alert Type alarm_stat.	Alerts OFF Cadence(sec) 300 Alert Frequency 1 Alert Type alarm_stat	
		View More Details	View More Details	View More Details	
Cancel					Previous Enable

See Enable KPI Profiles on Devices.

5. To view alerts from network devices, see View Alerts for Network Devices.

The following figure displays the RX and TX power of the QDD-400G-ZR-S transceiver.



# **Optimization Phase**

The optimization phase involves:

- **1.** Return to planning stage.
- 2. Continue to add or change circuits on the network to match packet demands.

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