



# Cisco Crosswork Hierarchical Controller 6.0

## Service Provisioning User Guide

October 2022

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## Introduction

This document is a how-to-use guide for Cisco Crosswork Hierarchical Controller Services Manager.

### Contents

The document contains the following sections and explains:

- The need for services management
- Tunnels
- Point to Point
- Multi Point

The level of detail attempts to provide an understanding of the solution from an architectural and functional perspective as well as a how-to guide for users to execute the required tasks in the user interface.

### Terminology

**Table 1.** Terms

Term	Definition
Adapter	The software used by Crosswork Hierarchical Controller to connect to a device or to the manager, to collect information required by the network model and configure the device.
Agg link	Agg is Link Aggregation Group (LAG) where multiple ETH links are grouped to create higher bandwidth and resilient link.
BGP	Border Gateway Protocol
Circuit E-Line	An Ethernet connection between two ETH client ports on Transponder or Muxponder over OTN signal.
CNC	Crosswork Network Controller.
Device	Optical network element, router, or microwave device.
Device Manager	The application that manages the deployed adapters.
eMBB	Enhanced Mobile Broadband.
ETH link	ETH L2 link, spans from one ETH UNI port of an optical device to another, and rides on top of ODU.
ETH chain	A link whose path is a chain of Ethernet links cross-subnet-connected (found using Crosswork Hierarchical Controller cross-mapping algorithm). Eth-chain is a replacement for R_PHYSICAL link in cases where one side of the link is in devices out of the scope discovered by Crosswork Hierarchical Controller.
Fiber segment	Physical fiber line that spans from one passive fiber endpoint (manhole, splice etc.) to another and is used as a segment in a fiber link.
Fiber	Chain of fiber segments that spans from one optical device to another.
IGP	IGP is the link between two routers that carries IGP protocol messages. The link represents an IGP adjacency.
IP-MPLS	IP multi-protocol label switching.
L3-VPN link	The connection between two sites of a specific L3-VPN (can be a chain of LSP connections or IGP path).
L3 physical	L3 physical is the physical link connecting two router ports. It may ride on top of an ETH link if the IP link is carried over the optical layer.
L3-VPN	A virtual private network based on L3 routing for control and forwarding.

Term	Definition
Logical link, IGP, LSP	Logical link connects VLANs on two IP ports.
LSP	Label Switched Path, used to carry MPLS traffic over a label-based path. LSP is the MPLS tunnel created between two routers over IGP links, with or without TE options.
NMC (OCH-NC, OTSiMC)	NMC is the link between the xPonder facing ports on two ROADMs. This link is the underlay for OCH and it is an overlay on top of OMS links. This is relevant only for disaggregation cases where the ROADM and OT box are separated.
NMS	Network Management System.
OC/OCG	SONET/SDH links that span from one optical device to another and carry SONET/SDH lower bandwidth services, the links ride on top of OCH links and terminate in TDM client ports.
OCH	OCH is a wavelength connection spanning between the client port one OT device (transponder, muxponder, regen) and another. 40 or 80 OCH links can be created on top of OMS links. The client port can be a TDM or ETH port.
OCH-NC	Wavelength link. New service is added as NMC link.
ODU	ODU links are sub-signals in OTU links. Each OTU links can carry multiple ODU links, and ODU links can be divided into finer granularity ODU links recursively.
ONC	Cisco Optical Controller (ONC).
OSPF	Open Shortest Path First, an Interior Gateway Protocol between routers.
OTN-Line	An OTN connection between two ODU client ports over OTN path.
OTS	OTS is the physical link connecting one line amplifier or ROADM to another. An OTS can be created over a fiber link.
OTU	OTU is the underlay link in OTN layer, used for ODU links. It can ride on top of an OCH.
Packet E-Line	A point-to-point connection between two routers or transponders/muxponders over MPLS-TP or IP-MPLS.
PCC	Path Computation Client. Delegated to controller. Router is responsible for initiating path setup and retains the control on path updates.
PCE	Path Computation Element. Controller-initiated.
Radio Media	The media layer as a carrier of radio channels.
Radio Channel	Multiple radio channels can be on top of radio media, each channel represents a different ETH link with its own rate.
RD	Route Distinguisher.
RSVP-TE	Resource Reservation Protocol to control traffic engineered paths over MPLS network.
RT	Route Target.
SCH	A super-channel is an evolution of DWDM in which multiple, coherent optical carriers are combined to create a unified channel of a higher data rate, and which is brought into service in a single operational cycle.
SDN Controller	Software that manages multiple routers or optical network elements.
SR Policy	Segment Routing Policy. A segment routing path between two nodes, with mapping to the IGP links based on SIDs list.
STS	Large and concatenated TDM circuit frame (such as STS-3c) into which ATM cells, IP packets, or Ethernet frames are placed. Rides on top of OC/OCG as optical carrier transmission rates.
uRLLC	Ultra-Reliable Low Latency Communications.
VRF	Virtual Routing Function, acts as a router in L3-VPN.



Term	Definition
ZR Media	The media layer as a carrier of ZR channels, on top of OCH link.
ZR Channel	Multiple ZR channels can be on top of ZR media, each channel represents a different IP link with its own rate.

## Service Provisioning

Crosswork Hierarchical Controller supports the creation of a new transport client services and photonic services.

Crosswork Hierarchical Controller abstracts the service model and provides users with a simple and intuitive user interface to provision new services.

It is assumed that domain controller implicitly handles the creation/use of the underlay path (OTSiMC, OTN, MPLS-TP) as required to fulfil the service request.

The table below defines the required parameters per service type.

Crosswork Hierarchical Controller requires the optical controller to support the connectivity-service API by TAPI. A proper use of the layers is needed per the service type

**Table 2.** Provisioning parameters

Service Type	Provisioning Parameters
<b>OTSiMC (between ROADMs)</b>	<ul style="list-style-type: none"><li>● Service name</li><li>● Service ID</li><li>● Bandwidth</li><li>● Baud rate</li><li>● Frequency</li><li>● Protection option (1+1, 1+1+r)</li><li>● Endpoints</li><li>● Optimization goal (minimize path by admin cost, latency or number of hops)</li><li>● Per path, for main, redundant, and restored paths<ul style="list-style-type: none"><li>◦ Included nodes/links in path</li><li>◦ Excluded nodes/links from path</li></ul></li><li>● Disjoint from a path of an existing service</li></ul>
<b>Photonic Services (OCH Trail between OT/Transponders)</b>	<ul style="list-style-type: none"><li>● Service name</li><li>● Service ID</li><li>● Bandwidth</li><li>● Baud rate</li><li>● Frequency</li><li>● Protection option (1+1, 1+1+r)</li><li>● Endpoints</li><li>● Optimization goal (minimize path by admin cost, latency, or number of hops)</li><li>● Per path, for main, redundant, and restored paths<ul style="list-style-type: none"><li>◦ Included nodes/links in path</li></ul></li></ul>

Service Type	Provisioning Parameters
	<ul style="list-style-type: none"> <li>◦ Excluded nodes/links from path</li> <li>● Disjoint from a path of an existing service</li> </ul>
Circuit E-Line /OTN Line	<ul style="list-style-type: none"> <li>● Service name</li> <li>● Service ID</li> <li>● ODU signal/ETH rate</li> <li>● Protection option (1+1, 1+1+r)</li> <li>● Endpoints</li> <li>● Optimization goal (minimize path by admin cost, latency, or number of hops)</li> <li>● Per path, for main, redundant, and restored paths               <ul style="list-style-type: none"> <li>◦ Included nodes/links in path</li> <li>◦ Excluded nodes/links from path</li> </ul> </li> <li>● Disjoint from a path of an existing service</li> </ul>
Packet E-Line	<ul style="list-style-type: none"> <li>● Service name</li> <li>● Service ID</li> <li>● Protection option (1+1, 1+1+r)</li> <li>● Endpoints               <ul style="list-style-type: none"> <li>◦ CIR/EIR</li> <li>◦ VLAN IDs</li> </ul> </li> <li>● Optimization goal (minimize path by admin cost, latency, or number of hops)</li> <li>● Per path, for main, redundant, and restored paths               <ul style="list-style-type: none"> <li>◦ Included nodes/links in path</li> <li>◦ Excluded nodes/links from path</li> </ul> </li> <li>● Disjoint from a path of an existing service</li> </ul>

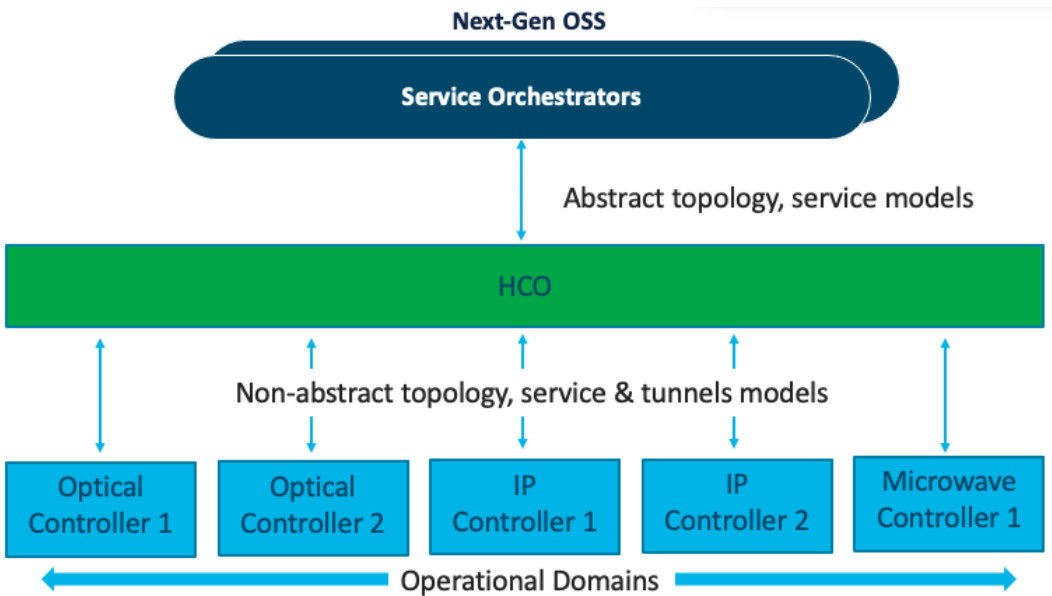
## Crosswork Hierarchical Controller in Brief

The Crosswork Hierarchical Controller product family is a set of software applications built on a common Crosswork Hierarchical Controller platform, designed to accelerate automation and to increase efficiency and reliability of service providers networks. Crosswork Hierarchical Controller addresses the role of the multi-domain, multi-layer, and multi-vendor network controller.

Sedona's innovative capability to learn the mapping between IP/MPLS and optical layer ports (cross-layer mapping) is key to providing a comprehensive view of the network. This has historically been a very difficult problem to solve since there are no standards to automatically provide discovery of such links. This process applies to IP/MPLS-optical links, as well as to cross-domain optical links.

Achieving automation of the complete process, without compromising on resiliency must involve fibers discovery and GIS information. Both enable the understanding of risks in planning phases and crucial information to assess failure impact on services in operations.

Crosswork Hierarchical Controller is the sole product of its type, in today’s market, that is fully multi-layer and multi-vendor. It is also the only product of this type to be deployed in production by Tier 1 service providers. The system interfaces with SDN Domain Controllers for the packet layers (IP, MPLS) and transport layers (WDM, OTN, Packet-Optical, Microwave) to create a coherent view of the entire transport network, as shown in Figure 1 below, and enables automation of its functions and simplified abstracted interaction with Service Orchestrators and OSS tools.



**Figure 1.**  
Transport SDN Architecture



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## Services Management – The Need

Services Manager is a key Cisco Crosswork Hierarchical Controller application that allows for the creation of L1-L3 services and L1-L3 underlay tunnels and links across the entire SP network.

Crosswork Hierarchical Controller can discover L1-L3 services from area/domain controllers. It can discover intra-domain and inter-domain E-Line and L3-VPN services while completing the information on all LSPs along the path, VRFs, and all inter-AS options. This allows Crosswork Hierarchical Controller to discover existing services, as well as new services it has provisioned.

Crosswork Hierarchical Controller supports service lifecycle state (provisioned, pending, planned), operational state and admin state.

Basic service instantiation is supported by the Domain Controller for each domain. However, none of the Domain Controllers understand how to achieve a globally optimal path for an end-to-end service.

Using its own global Path Computation Element (PCE), Crosswork Hierarchical Controller can calculate the optimal end-to-end multidomain path for the service, set it up in each Domain Controller and make sure the service parts are stitched together across domain boundaries.

In fact, a service can span different layers for its delivery. For example, an E-Line service can start on an OTN metro network, then be handed off to the MPLS core network, where it is carried over a pseudowire (PW) in an MPLS tunnel, and then over a packet-optical access network to its final destination. Crosswork Hierarchical Controller figures out which layers should be used to set up the service, based on user-defined policies.

Crosswork Hierarchical Controller supports IP services as defined by IETF in L2NM, L3NM and optical services as defined by ONF TAPI interface.

Crosswork Hierarchical Controller abstracts the service configuration and provides simple, intent-based API and UI to create new services with endpoint details, SLA, and associations to a predefined template that can be overridden for better adjustment.

Services and tunnels currently supported for provisioning and modification by the Services Manager:

- Tunnels:
  - RSVP-TE tunnel over single domain
  - SR policy over single domain
- Point-to-Point:
  - IP links between two routers over ZR/+ and over alien lambda (as multi-vendor optical network)
  - OCH Link
  - OCH-NC Link
  - OTN Line
  - Circuit E-Line
  - Packet E-Line over packet-optical network
- Multi-Point:
  - L3 VPN over multi domain and multi-vendor IP-MPLS (currently in demo mode only)

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Service configuration is based on the use of templates (these will be available in a future version). This helps to abstract service provisioning requests, using templates as a reference, and loading service configuration as a basic default that can be overridden per specific request. The configuration will still be able to be overridden for a specific service provisioning request.

Endpoints can be added to the UI wizard by selecting them from the inventory. Ports enabled for selection are those applicable for the service type. Per endpoint, the bandwidth can be defined (as CIR, EIR, CBS, PBS) and VLAN and COS classification can be added.

Crosswork Hierarchical Controller has a sophisticated global multilayer PCE to calculate services and underlay paths. The calculation is based on the selected criteria: number of hops, latency, or admin cost. It also considers the preferences for protection, diversity, SRLG, specific links, devices, or service paths to include or exclude, and resources available per the requested bandwidth.

PCE works over multiple domains, where it can calculate paths' diversity between domains as a full path of end-to-end service.

Depending on the implementation, PCE knows how to work with vendor-specific capabilities and constraints and how to verify the feasibility of a path before putting it in action.

Creation of a service is managed as a network transaction. Commands are sent to all participating Domain Controllers. Upon completion, the configuration undergoes validation in all domains before notifying the user of configuration success. In the event of failure, PCE knows to roll back and leave no broken configuration in any Domain Controller.

This transaction mechanism knows how to overcome a failure in Crosswork Hierarchical Controller because the backup system can continue tracking the transaction and act according to the response from the Domain Controllers.

Each action on a service or tunnel (creation, modification, deletion) done via the UI or via APIs is recorded as an operation. An operation contains the full details of the action and its results, log of the service scheme sent to the controllers, the returned results, error messages from domain controllers, and the operation status.

Operations can be viewed per selected service or tunnel and as a list of all operations.

## Tunnels

A tunnel is a unidirectional link between source and destination routers, riding over IGP links with only primary, or primary and secondary LSPs. You can create tunnels of type:

- RSVP
- SR Policy

### View Tunnels

You can view a list of the tunnels.

#### To view tunnels:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager > Tunnels**. A list of the tunnels appears in the **Tunnels** pane with the following information:
  - **Tunnel Name:** The tunnel name.
  - **Type:** The type of tunnel, for example, **Segment Routing**.
  - **Configuration State:** The configuration state (**OK**, **ABANDONED**, **REMOVED**).
  - **Creation Date:** The date the tunnel was created.
  - **BW Reservation (Mbps):** The bandwidth reserved for the tunnel.
  - **Control Method:** The control method: by device (**PCC**) or by controller (**PCE**).
  - **Last 24H Operations:** The volume of operations in last 24 hours.
  - **Last Operation:** The last operation executed on the tunnel.

Create New Tunnel

Tunnel Name	Type	Configuration State	Creation Date	BW Reservation [Mbps]	Control Method	Last 24h Operations	Last Operation
12 ITEMS							
SR Policy Tunnel <SR Policy4 - reverse>	Segment Routing	OK		5000	PCE	0	
SR Policy Tunnel <SR Policy4>	Segment Routing	OK		5000	PCE	0	
SR Policy Tunnel <SR Policy3 - reverse>	Segment Routing	OK		10000	PCE	0	
SR Policy Tunnel <SR Policy3>	Segment Routing	OK		10000	PCE	0	
SR Policy Tunnel <SR Policy1002 - reverse>	Segment Routing	OK		3000	PCE	0	
SR Policy Tunnel <SR Policy1002>	Segment Routing	OK		3000	PCE	0	
SR Policy Tunnel <SR Policy2 - reverse>	Segment Routing	OK		3000	PCE	0	
SR Policy Tunnel <SR Policy2>	Segment Routing	OK		3000	PCE	0	
SR Policy Tunnel <SR Policy1001 - reverse>	Segment Routing	OK		1000	PCE	0	
SR Policy Tunnel <SR Policy1001>	Segment Routing	OK		1000	PCE	0	
SR Policy Tunnel <SR Policy1 - reverse>	Segment Routing	OK		1000	PCE	0	
SR Policy Tunnel <SR Policy1>	Segment Routing	OK		1000	PCE	0	

2. Select the required tunnel.
3. To view more tunnel details, see the lower pane view with the following tabs:
  - **Summary:** Additional details about the tunnel, such as, Description, Admin State.
  - **Endpoints:** The source and destination endpoint details.
  - **Underlay Path:** The underlay path items traversed by the tunnel.
  - **Operations:** The tunnel operations.
  - **Events:** The tunnel events.
  - **Actions:** The modification actions (if applicable) and the option to **Delete Tunnel**.

Services Manager

Tunnels P2P MP

Operations Settings

Create New Tunnel

Tunnel Name	Type	Configuration State	Creation Date	BW Reservation [Mbps]	Control Method	Last 24h Operations	Last Operation
12 ITEMS							
SR Policy Tunnel <SR Policy4 - reverse>	Segment Routing	OK		5000	PCE	0	
SR Policy Tunnel <SR Policy4>	Segment Routing	OK		5000	PCE	0	
SR Policy Tunnel <SR Policy3 - reverse>	Segment Routing	OK		10000	PCE	0	
SR Policy Tunnel <SR Policy3>	Segment Routing	OK		10000	PCE	0	
SR Policy Tunnel <SR Policy1002 - reverse>	Segment Routing	OK		3000	PCE	0	
SR Policy Tunnel <SR Policy1002>	Segment Routing	OK		3000	PCE	0	
SR Policy Tunnel <SR Policy2 - reverse>	Segment Routing	OK		3000	PCE	0	

SR Policy Tunnel <SR Policy4>

Summary

Endpoints Underlay Path Operations Events Actions

GUID: S/ SRPolicy4

Name: SR Policy Tunnel <SR Policy4>

Tunnel ID: -

Description: SR Policy Tunnel <SR Policy SR Policy4 from ZR\_ER2.MAD to ZR\_ER2.SQY via ZR\_CR2.MAD, ZR\_CR2.BCN, ZR\_CR2.MIL, ZR\_CR2.SQY>

Creation Time: -

Last Changed: -

BW Reservation [Mbps]: 5000

Virtual Network: -

Tunnel Type: Segment Routing

Control Method: PCE

Template Name: Default SR Policy Template

Admin State: Up

Path Priority: -

Holding Priority: -

Add RSVP Tunnel

You can create an RSVP tunnel between source and target endpoints, with a bandwidth reservation, controlled by device or controller, associate with a specific virtual network. Various advanced settings and limitations (items to be included or excluded from the path) can be added. An RSVP tunnel can only be created over a single domain.

To add a RSVP tunnel:

1.

In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2.

Click **Create New Tunnel**.
3.

Select **RSVP**.

RSVP Tunnel Creation

1

2

3

4

5

GENERAL

ADVANCED

LIMITATIONS

ENDPOINTS

SUMMARY

Tunnel name\*

Tunnel description

BW reservation [Mbps]

Control method

PCC

Virtual Network

Template

default-template

Cancel

Back

Next

4. Specify the following **GENERAL** settings:

- **Tunnel name:** The unique user defined name of this tunnel.
- **Tunnel description:** A description of the tunnel.
- **BW reservation (Mbps):** The bandwidth reserved for this tunnel.
- **Control method:** The control method, by device (**PCC**) or by controller (**PCE**).
- **Virtual Network:** The virtual network (tunnels can be grouped using tags to construct a virtual network. L3-VPN can be assigned to specific virtual network).
- **Template:** This is not available in the current version (there is a **default-template**).

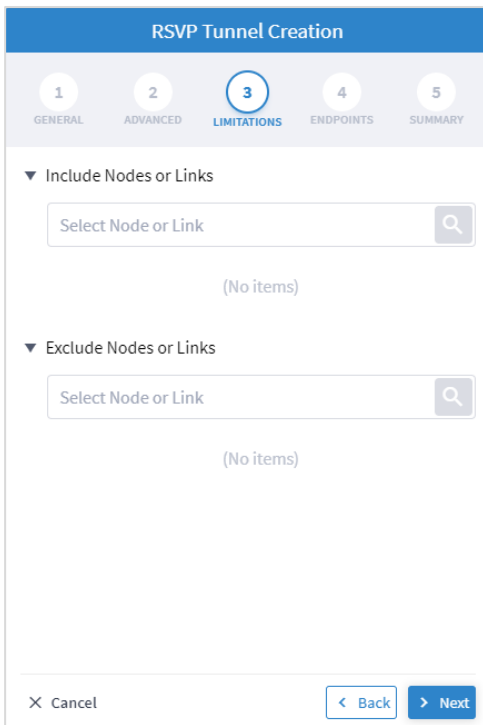
5. Click **Next**.

The screenshot shows the 'RSVP Tunnel Creation' interface with the 'ADVANCED' tab selected. The interface includes a progress bar at the top with five steps: 1. GENERAL, 2. ADVANCED, 3. LIMITATIONS, 4. ENDPOINTS, and 5. SUMMARY. The 'ADVANCED' tab is active, showing several configuration fields: 'Admin State' is a dropdown menu set to 'Up'; 'Setup Priority' is a text input field containing '7'; 'Holding Priority' is a text input field containing '7'; 'Path Criteria' is a dropdown menu set to 'Number of Hops'; 'Max Delay [ms]' is a text input field; 'Max Hops' is a text input field; and 'Path Policy' is a text input field. At the bottom of the form, there are three buttons: 'Cancel' (with a close icon), '< Back', and '> Next'.

6. Specify the following **ADVANCED** settings:

- **Admin State:** The admin state (**Up** or **Down**).
- **Setup Priority:** The setup priority (between 0 and 7). Default is 7.
- **Holding Priority:** The holding priority (between 0 and 7). Default is 7.
- **Path Criteria:** The path control method (**Number of Hops** or **Latency** or **Admin Cost**).
- **Max Delay (ms):** The maximum permissible delay in 100 of ms (between 0 to 500). Only relevant when the path criteria is set to **Latency**.
- **Max Hops:** The maximum number of hops (between 1 to 100). Only relevant when path criteria is set to **Number of Hops**.
- **Path Policy:** Select a policy (**Strict** or **Loose**). If **Strict**, must include the list of nodes and IGP links to be included in the new tunnel path.

7. Click **Next**.



RSVP Tunnel Creation

1 GENERAL 2 ADVANCED 3 LIMITATIONS 4 ENDPOINTS 5 SUMMARY

▼ Include Nodes or Links

Select Node or Link

(No items)




▼ Exclude Nodes or Links

Select Node or Link

(No items)

X Cancel < Back > Next

8. Specify the following **LIMITATIONS** settings:

- **Include Nodes or Links:** Click  and in the **Advanced** tab, select node or IGP link, or click on the **3D Explorer** tab to select node or IGP link.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select node or IGP link, or click on the **3D Explorer** tab to select node or IGP link.
- (Optional) Click  to remove any of the include/exclude items.

RSVP Tunnel Creation

1 GENERAL 2 ADVANCED 3 LIMITATIONS 4 ENDPOINTS 5 SUMMARY

▼ Include Items in Path

Model Item

ZR\_ER2.ROM

ER1.ATH

▼ Exclude Items from Path

Model Item

CR2.VIE

× Cancel < Back > Next

9. Click **Next**.

RSVP Tunnel Creation



1 GENERAL 2 ADVANCED 3 LIMITATIONS 4 ENDPOINTS 5 SUMMARY

Source Endpoint\*

Destination Endpoint\*

× Cancel < Back > Next

10. Specify the following **ENDPOINTS** settings:

- **Source Endpoint:** Click  and select the node (router) or IGP interface as the source endpoint.
- **Destination Endpoint:** Click  and select the node (router) or IGP interface as the destination endpoint.

11. Click **Next**.
12. Review the **SUMMARY**.

The screenshot shows the 'RSVP Tunnel Creation' window with the 'SUMMARY' tab selected. The window has a blue header bar with the title 'RSVP Tunnel Creation'. Below the header is a navigation bar with five tabs: 1 GENERAL, 2 ADVANCED, 3 LIMITATIONS, 4 ENDPOINTS, and 5 SUMMARY (which is highlighted with a blue circle). The main content area displays the following configuration details:

- Name:** TestTunnel
- Description:** None
- BW Reservation [Mbps]:** None
- Control Method:** PCC
- Template Name:** default-template
- Admin State:** Up
- Setup Priority:** 7
- Holding Priority:** 7
- Path Criteria:** Number of Hops
- Max Delay [us]:** None
- Max Hops:** None
- Path Policy:** Strict
- Excluded List:** -
- Included List:** -
- Source Endpoint:** CR2 MAD

At the bottom of the window, there are three buttons: 'Cancel' (with a close icon), '< Back', and '> Finish'.

13. Click **Finish**.



## Add SR Policy Tunnel

The Crosswork Hierarchical Controller network model supports Segment Routing (SR) Policies and SR Segments over IGP links, and the Crosswork Hierarchical Controller adapters can discover policies from network controllers, with their SID list, color, preference, and candidate path attributes. It maps all discovered policies to create SR Segments as a layer between IGP links and SR policies. An SR Segment is the path between two SIDs, shared by multiple SR policies. An SR Policy tunnel can only be created over a single domain.

**To add an SR Policy tunnel:**

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2. Click **Create New Tunnel**.
3. Select **SR Policy**.

The screenshot shows the 'SR Policy Creation' form. At the top, there is a blue header with the title 'SR Policy Creation'. Below the header is a horizontal navigation bar with five tabs: '1 GENERAL' (active), '2 ADVANCED', '3 LIMITATIONS', '4 ENDPOINTS', and '5 SUMMARY'. The 'GENERAL' tab is selected. The form contains the following fields: 'Name\*' (required), 'Description', 'BW reservation [Mbps]', and 'Control method' (a dropdown menu currently showing 'PCC'). At the bottom of the form, there are three buttons: 'X Cancel', '< Back', and '> Next'.

4. Specify the following **GENERAL** settings:
  - **Name:** The unique user defined name of this SR Policy.
  - **Description:** A description of the SR Policy.

5. Click **Next**.




The screenshot shows the 'SR Policy Creation' window with the 'ADVANCED' tab selected. The tab bar at the top includes five options: 1 GENERAL, 2 ADVANCED (highlighted), 3 LIMITATIONS, 4 ENDPOINTS, and 5 SUMMARY. The main content area contains three fields: 'Min Criteria (Metric)\*' with a dropdown arrow, 'Color\*' with a text input, and 'Candidate path preference\*' with a text input containing the value '100'. At the bottom, there are three buttons: 'X Cancel', '< Back', and '> Next'.

6. Specify the following **ADVANCED** settings:
- **Min Criteria (Metric)**: The criteria metric to minimize (**IGP**, **TE**, **Delay** or **Number of Hops**).
  - **Color**: The SR Policy color (a unique identifier of the policy).
  - **Candidate path preference**: The candidate path preference (integer value). The highest preference path is the active one. Multiple candidate paths per policy are currently not support.

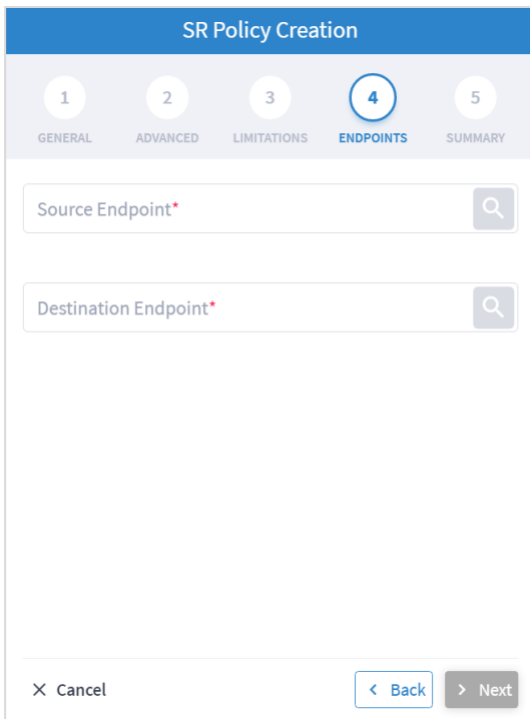
7. Click **Next**.

The screenshot shows the 'SR Policy Creation' dialog with five tabs: GENERAL, ADVANCED, LIMITATIONS (active), ENDPOINTS, and SUMMARY. Under the 'LIMITATIONS' tab, there are two sections: 'Include Nodes or Links' and 'Exclude Nodes or Links'. Each section has a search bar with the placeholder text 'Select Node or Link' and a magnifying glass icon. Below each search bar, it says '(No items)'. At the bottom of the dialog, there are three buttons: 'Cancel' (with a close icon), '< Back', and '> Next'.

8. Specify the following **LIMITATIONS** settings:



- **Include Nodes or Links:** Click  and in the **Advanced** tab, select node or IGP link, or click on the **3D Explorer** tab to select node or IGP link.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select node or IGP link, or click on the **3D Explorer** tab to select node or IGP link.
- (Optional) Click  to remove any of the include/exclude items.

9. Click **Next**.



The image shows a screenshot of the 'SR Policy Creation' wizard, specifically the 'ENDPOINTS' step (step 4 of 5). The wizard has a blue header bar with the title 'SR Policy Creation'. Below the header, there are five tabs: '1 GENERAL', '2 ADVANCED', '3 LIMITATIONS', '4 ENDPOINTS' (which is selected and highlighted with a blue circle), and '5 SUMMARY'. The main content area contains two input fields: 'Source Endpoint\*' and 'Destination Endpoint\*', each with a magnifying glass icon to its right. At the bottom of the form, there are three buttons: 'X Cancel', '< Back', and '> Next'.

10. Specify the following **ENDPOINTS** settings:

- **Source Endpoint:** Click  and select the node (router) or IGP interface as the source endpoint.
- **Destination Endpoint:** Click  and select the node (router) or IGP interface as the destination endpoint.

11. Click **Next**.
12. Review the **SUMMARY**.

The screenshot shows the 'SR Policy Creation' window with the 'SUMMARY' tab selected. The tab bar at the top has five items: 1 GENERAL, 2 ADVANCED, 3 LIMITATIONS, 4 ENDPOINTS, and 5 SUMMARY (which is highlighted with a blue circle). The main content area displays the following policy details:

- Name:** Test
- Description:** None
- BW Reservation [Mbps]:** None
- Control Method:** PCC
- Min Criteria (Metric):** IGP
- Color:** 1
- Candidate path preference:** 100
- Excluded List:** -
- Included List:** -
- Source Endpoint:** CR2.OVE
- Destination Endpoint:** CR1.ATH

At the bottom of the window, there are three buttons: 'X Cancel', '< Back', and '> Finish'.

13. Click **Finish**.

## Delete Tunnel

To delete a tunnel:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Device Manager**.
2. Select a tunnel.
3. Select the **Actions** tab.
4. Click **Delete Tunnel**. A confirmation message appears.
5. Click **Confirm**. The tunnel is deleted.

## Point-to-Point

You can create a point-to-point service of type:

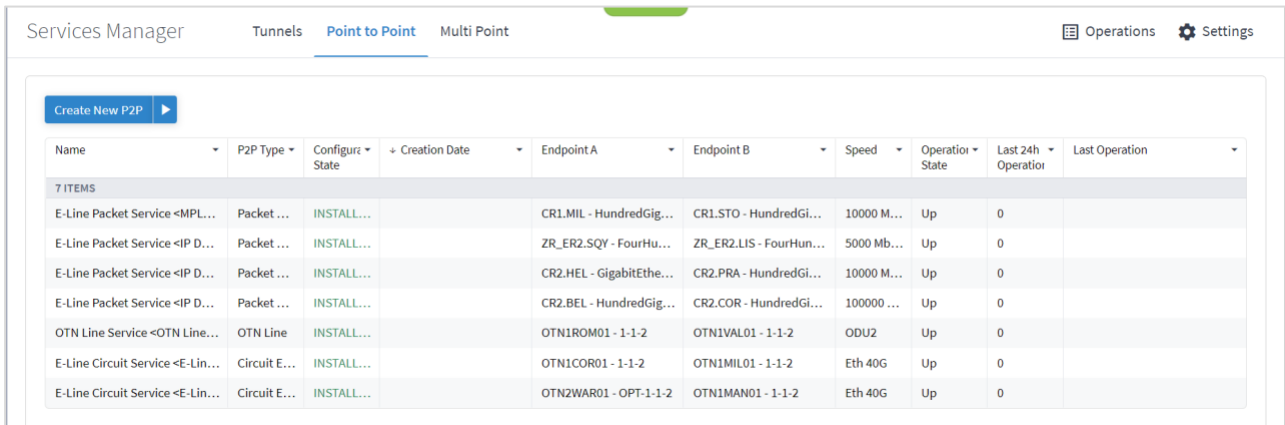
- IP Link
- OCH Link
- OCH-NC Link
- OTN-Line
- Circuit E-Line
- Packet E-Line

### View Point to Point

You can view a list of the Point to Point services.

#### To view PSP services:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager > Point to Point**. A list of the point-to-point services appears in the **Point to Point** pane.



Name	P2P Type	Configur State	Creation Date	Endpoint A	Endpoint B	Speed	Operation State	Last 24h Operation	Last Operation
7 ITEMS									
E-Line Packet Service <MPL...	Packet ...	INSTALL...		CR1.MIL - HundredGig...	CR1.STO - HundredGi...	10000 M...	Up	0	
E-Line Packet Service <IP D...	Packet ...	INSTALL...		ZR_ER2.SQY - FourHu...	ZR_ER2.LIS - FourHun...	5000 Mb...	Up	0	
E-Line Packet Service <IP D...	Packet ...	INSTALL...		CR2.HEL - GigabitEthe...	CR2.PRA - HundredGi...	10000 M...	Up	0	
E-Line Packet Service <IP D...	Packet ...	INSTALL...		CR2.BEL - HundredGig...	CR2.COR - HundredGi...	100000 ...	Up	0	
OTN Line Service <OTN Line...	OTN Line	INSTALL...		OTN1ROM01 - 1-1-2	OTN1VAL01 - 1-1-2	ODU2	Up	0	
E-Line Circuit Service <E-Lin...	Circuit E...	INSTALL...		OTN1COR01 - 1-1-2	OTN1MIL01 - 1-1-2	Eth 40G	Up	0	
E-Line Circuit Service <E-Lin...	Circuit E...	INSTALL...		OTN2WAR01 - OPT-1-1-2	OTN1MAN01 - 1-1-2	Eth 40G	Up	0	

2. Select the required point-to-point service.
3. To view more point to point link details, see the lower pane view with the following tabs:
  - **Summary:** Additional details about the point to point links.
  - **Endpoints:** The source and destination endpoint details.
  - **Underlay Path:** The underlay path items traversed by the link.
  - **Operations:** The point to point link operations.
  - **Events:** The point to point link events.
  - **Actions:** The modification actions (if applicable) and the option to **Delete P2P**.

## testWSS\_2



Summary

Endpoints

Underlay Path

Operations

Events

Actions

**GUID:** SI/b5d6e0f698d24e918962166d6ddd4828

**Name:** testWSS\_2

**Creation Time:** 31-05-2022 12:36:41 UTC

**Last Changed:** 31-05-2022 12:36:41 UTC

**Template Name:** default-template

▼ **Service Links:**

[LI/R\\_PHY/PO/xr/PHY-P-BOTTOMLEFT:FourHundredGigE0/0/0/2/PO/xr/PHY-P-BOTTOMRIGHT:FourHundredGigE0/0/0/2](#)

**IP Address Assignment Policy:** User Allocated

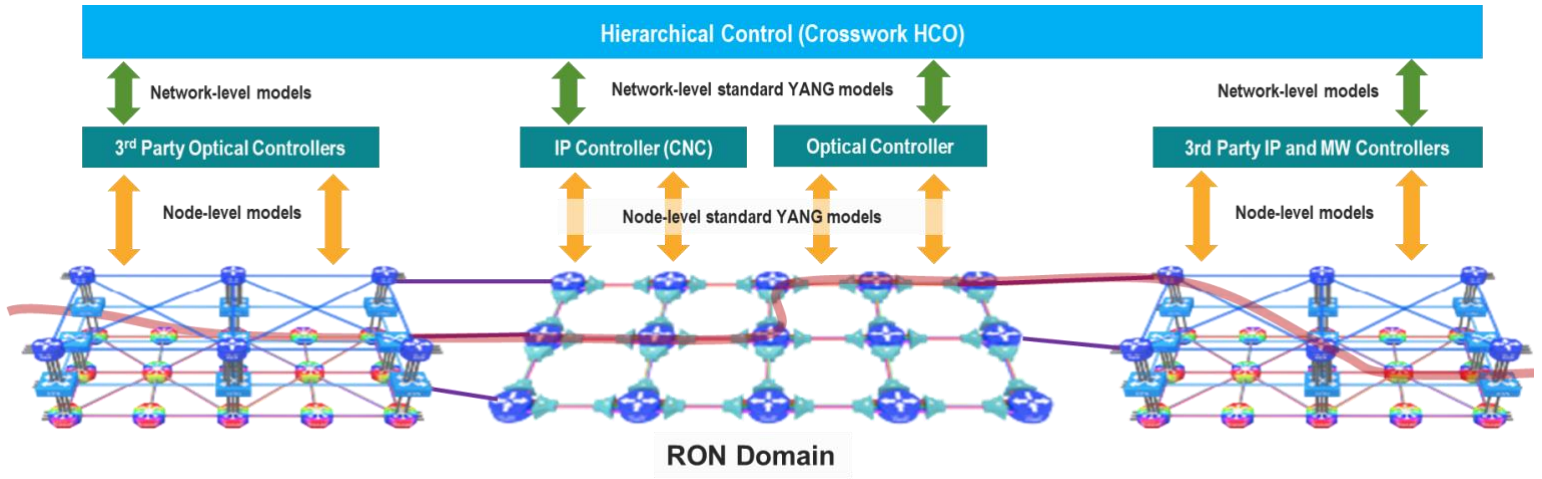
**Is Bundle?** No

**Channel Config:** 1 X 400G

**Path Criteria:** Latency

## Create IP Link

You can create an IP Link between two ZR pluggable components in routers (creating a new link or adding it to a LAG). Various advanced settings and limitations (such as node or link to be included in the path or excluded from the path of the OCH Link) can be added. The end-to-end service between ZR/+ ports may optionally traverse through OLSs (or ONEs, Optical Network Elements, Cisco, or 3rd party). Crosswork Hierarchical Controller decomposes the service into domains and provisions the optical line between ROADMs on the optical domain controller. The activation mode works directly from Crosswork Hierarchical Controller to IP and optical domain controllers (CNC, ONC).



### To create an IP Link:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2. Select the **Point to Point** tab.
3. Click **IP Link**.

IP Link Creation

1

2

3

4

GENERAL

ENDPOINTS

PATH

SUMMARY

Name\*

Description

Link Rate Mode\*

☐ Router Configuration Only

✕ Cancel

< Back

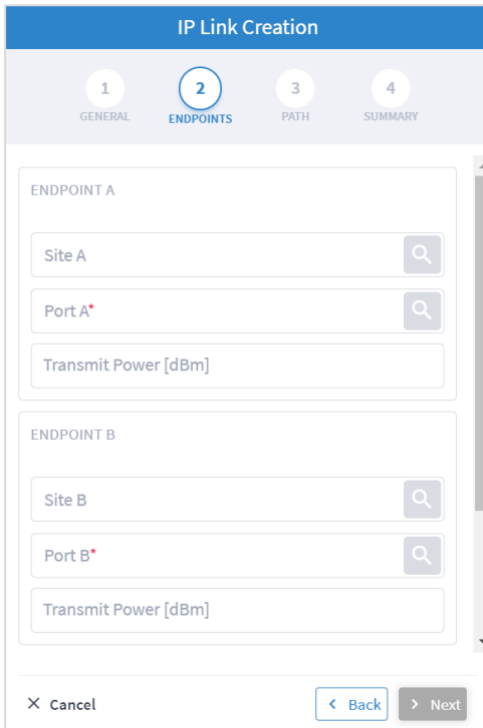
> Next



4. Specify the following **GENERAL** settings:

- **Name:** Enter a name for the service.
- **Description:** Enter a description for the service.
- **Link Rate Mode:** Select a link rate mode, for example, **100G – 1x100G**. Bundles are offered when the selected rate is for muxponder mode. A bundle option is not offered for 400G as it can work in transponder mode.
- **Router Configuration Only:** Select this option when configuring a router only (direct routers connections, not via OLS).

5. Click **Next**.



The image shows a screenshot of the 'IP Link Creation' dialog box, specifically the 'ENDPOINTS' step (Step 2). The dialog has a blue header bar with the title 'IP Link Creation'. Below the header is a progress bar with four steps: 1. GENERAL, 2. ENDPOINTS (highlighted with a blue circle), 3. PATH, and 4. SUMMARY. The main content area is divided into two sections: 'ENDPOINT A' and 'ENDPOINT B'. Each section contains three input fields: 'Site A' and 'Port A\*' for Endpoint A, and 'Site B' and 'Port B\*' for Endpoint B. Each of these fields has a search icon (magnifying glass) to its right. Below the site and port fields is a 'Transmit Power [dBm]' field. At the bottom of the dialog, there are three buttons: 'Cancel' (with a close icon), '< Back', and '> Next'.

**IP Link Creation**

1 GENERAL   **2 ENDPOINTS**   3 PATH   4 SUMMARY

LINK #1 IP ADDRESSES

IP Address A (CIDR)

IP Address B (CIDR)

LINK #2 IP ADDRESSES

IP Address A (CIDR)





IP Address B (CIDR)

LINK #3 IP ADDRESSES

IP Address A (CIDR)

× Cancel   < Back   > Next

6. Specify the following **ENDPOINTS** settings:

- **Site A:** Click  and in the **Advanced** tab, select a site, or click on the **3D Explorer** tab to select a site.
- **Port A:** Click  and in the **Advanced** tab, select an OCH port, or click on the **3D Explorer** tab to select a port. If the port selected is an adjacency port, endpoint B is automatically updated and cannot be edited.
- **Transmit Power (dBm):** Select the transmit power for Endpoint A.
- **Site B:** Click  and in the **Advanced** tab, select a site, or click on the **3D Explorer** tab to select a site.
- **Port B:** Click  and in the **Advanced** tab, select an OCH port, or click on the **3D Explorer** tab to select a port.
- **Transmit Power (dBm):** Select the transmit power for Endpoint B.
- **LINK #1 IP ADDRESSES:** Enter the **IP Address A (CIDR)** and **IP Address B (CIDR)**.
- (Optional depending on the **Link Rate Mode** selected) Enter the **LINK #2 IP ADDRESSES**, **LINK #3 IP ADDRESSES** and **LINK #4 IP ADDRESSES**.




7. Click **Next**.

The screenshot shows the 'IP Link Creation' dialog with the 'PATH' tab selected. The dialog has four tabs: 1 GENERAL, 2 ENDPOINTS, 3 PATH, and 4 SUMMARY. The 'PATH' tab contains the following sections:

- (No items)**: A section with a downward arrow icon.
- Exclude Nodes or Links**: A section with a search input field labeled 'Select Node or Link' and a magnifying glass icon. Below it, it says '(No items)'.
- Disjoint From Links**: A section with a search input field labeled 'Select Node or Link' and a magnifying glass icon. Below it, it says '(No items)'.
- FREQUENCY**: A section with two radio buttons: 'L Band' and 'C Band'.

At the bottom of the dialog, there are three buttons: 'Cancel', '< Back', and '> Next'.

8. Specify the following **PATH** settings:

- **Set Path Preferences:** Not enabled. Set to **Latency**.
- **Include Nodes or Links:** Click  and in the **Advanced** tab, select a ONE node or OTS/OMS link, or click on the **3D Explorer** tab to select the required item.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select a ONE node or OTS/OMS link, or click on the **3D Explorer** tab to select the required item.
- **Disjoint From Link:** Not enabled.
- **Frequency:** Select **L Band** or **C Band** and specify the **Frequency Thz** for this link.
- **Digital-to-Analog Convertor (DAC) rate:** Not enabled.
- (Optional) Click  to remove any of the include/exclude items.

9. Click **Next**.

IP Link Creation

1

GENERAL

2

ENDPOINTS

3

PATH

4

SUMMARY

Name: TestIPLink

Description: Test IP Link

▼ Endpoint A

Port: ron-ncs57c3-1 - Optics0/0/2/0

Transmit Power: None dBm

▼ Endpoint B

Port: ron-ncs5504-1 - Optics0/0/0/0

Transmit Power: None dBm

Link Rate Mode: 400G - 1x400G

Frequency: None THz

Path Criteria: Latency

Optical Excluded List: -

Included List: -

Disjoint From Links: -

▼ IP Addresses:

× Cancel

< Back

> Finish

Save

10. Review the **SUMMARY**.

11. Click **Finish**.

## Create OCH Link

You can create an OCH Link between line side of Transponders/Muxponders, define its capacity, add 1+1 protection if required, and optimize based on number of hops, latency, or admin cost. Various advanced settings and limitations (such as nodes or links to be included or excluded from the OCH Link) can be added.

In this phase, the Transponder and the ROADM must be controlled by the same optical controller. A use case of disaggregated topology is planned for future releases.

### To create an OCH Link:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2. Select the **Point to Point** tab.
3. Click **OCH Link**.

4. Specify the following **GENERAL** settings:
  - **Name:** The unique user defined name of this link.
  - **Description:** A description of the link.

5. Click **Next**.

The screenshot shows the 'OCH Creation' wizard at step 2, 'SETTINGS'. The top navigation bar has five tabs: 1 GENERAL, 2 SETTINGS (active), 3 ENDPOINTS, 4 PATH, and 5 SUMMARY. Below the tabs, there are three dropdown menus: 'Bandwidth Capacity [Gbps]' set to '100 GB', 'Baud Rate' set to 'Auto', and 'Protection' set to 'No Protection'. At the bottom, there is a 'Cancel' button with an 'X' icon, and 'Back' and 'Next' buttons with arrow icons.



6. Specify the following **SETTINGS**:

- **Bandwidth Capacity (Gbps)**: The bandwidth capacity for this OCH link (100 GB, 200 GB, 300 GB, 400 Gb or 800 GB).
- **Baud Rate**: The baud rate for this IP link (Auto or 35 G or 56 G).

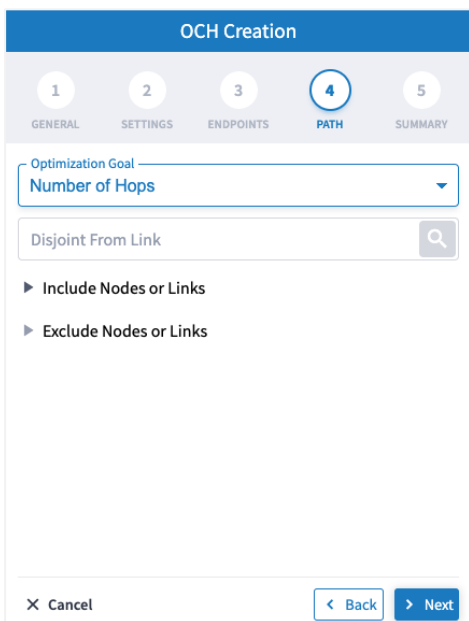
7. Click **Next**.

The screenshot shows the 'OCH Creation' wizard at step 3, 'ENDPOINTS'. The top navigation bar has five tabs: 1 GENERAL, 2 SETTINGS, 3 ENDPOINTS (active), 4 PATH, and 5 SUMMARY. Below the tabs, there are two input fields for endpoints. 'Endpoint A\*' contains 'NE13 - 13-1-1' and 'Endpoint B\*' contains 'WSAi1 - 1-3-1'. Each input field has a clear 'X' button and a search icon. At the bottom, there is a 'Cancel' button with an 'X' icon, and 'Back' and 'Next' buttons with arrow icons.

8. Specify the following **ENDPOINTS** settings:





- **Endpoint A:** Click  and in the **Advanced** tab, select an OCH endpoint, or click on the **3D Explorer** tab to select an OCH endpoint.
- **Endpoint B:** Click  and in the **Advanced** tab, select an OCH endpoint, or click on the **3D Explorer** tab to select an OCH endpoint.

9. Click **Next**.



The screenshot shows the 'OCH Creation' dialog box with the 'PATH' tab selected. The dialog has a blue header and a light blue background. At the top, there are five tabs: 1 GENERAL, 2 SETTINGS, 3 ENDPOINTS, 4 PATH (selected), and 5 SUMMARY. Below the tabs, there is a dropdown menu for 'Optimization Goal' with 'Number of Hops' selected. Below that is a search bar for 'Disjoint From Link' with a search icon. Underneath the search bar are two expandable sections: 'Include Nodes or Links' and 'Exclude Nodes or Links'. At the bottom of the dialog are three buttons: 'X Cancel', '< Back', and '> Next'.

10. Specify the following **PATH** settings:

- **Optimization Goal:** The optimization goal (**Number of Hops** or **Latency** or **Admin Cost**).
- **Disjoint From Link:**  and in the **Advanced** tab, select an OCH link, or click on the **3D Explorer** tab to select an OCH link. This means that the new OTN-Line must not traverse this exclusionary path (this would be equivalent to adding all the links that constitute the disjoint path to the exclude items from path list).
- **Include Nodes or Links:** Click  and in the **Advanced** tab, select an optical node or OMS link, or click on the **3D Explorer** tab to select an optical node or OMS link.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select an optical node or OMS/OTS link, or click on the **3D Explorer** tab to select an optical node or OMS/OTS link.
- (Optional) Click  to remove any of the include/exclude items.

11. Click **Next**.

OCH Creation

1

GENERAL

2

SETTINGS

3

ENDPOINTS

4

PATH

5

SUMMARY

**Name:** test

**Description:** None

**Customer Name:** None

**Capacity [Gbps]:** 100 GB

**Baud Rate:** Auto

**Protection Policy:** No Protection

**Computation Provider:** Domain Controller

**Path Criteria:** Number of Hops

**Disjoint From Link:** None

**Excluded List:** -

**Included List:** -

**Endpoint A:** NE13 - 13-1-1

**Endpoint B:** WSA11 - 1-2-1

✕ Cancel

< Back

> Finish

12. Click **Finish**.

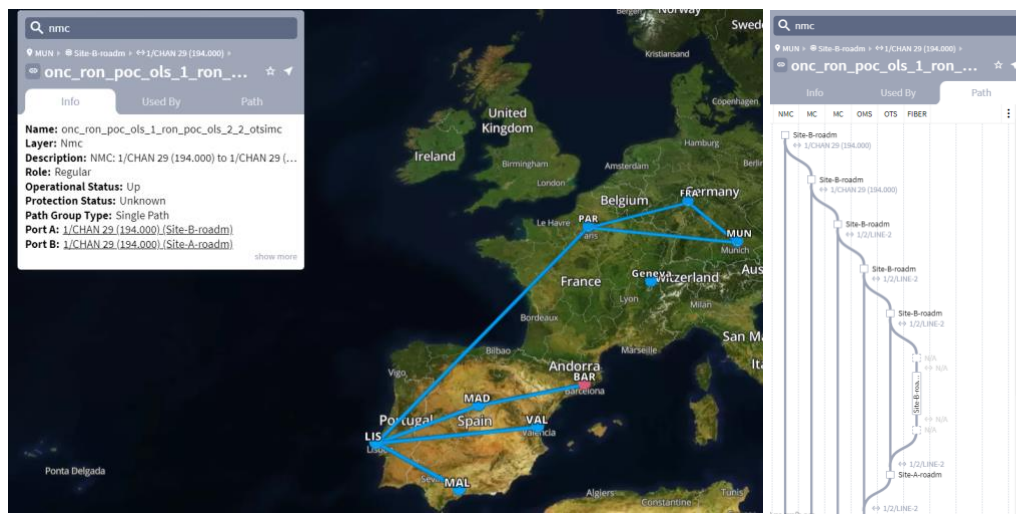


## Create OCH-NC Link

You can create an OCH-NC (or OTSiMC) link. This is the connection between client sides of ROADMs, the ports facing Transponder/Muxponder. You can define its capacity, add 1+1 protection if required, and optimize based on number of hops or admin cost. Various advanced settings and limitations (such as nodes or links to be included or excluded from the OCH-NC Link) can be added.

Before using this wizard, go to the [Settings](#) page and upload a file of app codes. Once file is uploaded, the wizard enables you to select specific codes, which selects an item from the list in the uploaded file.

This only works with Cisco Optical Controller (ONC). The new service is added as an NMC link.



### To create an OCH-NC Link:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2. Select the **Point to Point** tab.
3. Click **UCH-NC Link**.

**OCH-NC Creation**

1 GENERAL 2 SETTINGS 3 APPLICATION CODE 4 ENDPOINTS 5 PATH 6 SUMMARY

Name\*

Description

Template  
default-template

× Cancel < Back > Next

4. Specify the following **GENERAL** settings:
  - **Name:** The unique user defined name of this link.
  - **Description:** A description of the link.
5. Click **Next**.

**OCH-NC Creation**

1 GENERAL 2 SETTINGS 3 APPLICATION CODE 4 ENDPOINTS 5 PATH 6 SUMMARY

☐ Allow Auto Regeneration

Optical Feasibility Threshold  
NONE

Admin State  
ENABLED

Central Frequency (Thz)

× Cancel < Back > Next

6. Specify the following **SETTINGS**:

- **Allow Auto Regeneration**: Whether to allow auto regeneration.
- **Optical Feasibility Threshold**: Select **RED**, **GREEN**, **YELLOW** or **NONE**.
- **Admin State**: Select **ENABLED** or **DISABLED**.
- **Central Frequency (Thz)**: The frequency for this OCH-NC link. A number in range of nine digits, with a dot after the first 3 digits (xxx.xxxxxx). Range is between 000.000000 to 999.999999 in steps of 000.000001.

7. Click **Next**.

OCH-NC Creation

1 GENERAL 2 SETTINGS 3 APPLICATION CODE 4 ENDPOINTS 5 PATH 6 SUMMARY

Vendor Name\*

Product ID\*

FEC\*

Data Rate\*

Baud Rate\*

Sub Mode

Application Code\*

← Reset

× Cancel < Back > Next



8. Specify the following **APPLICATION CODE** settings to generate the required **Application Code**:

- **Vendor Name**: The vendor name.
- **Product ID**: The product ID.
- **FEC**: The FEC depending on the product, for example, CFEC or OFEC.
- **Data Rate**: The data rate supported by the selected product.
- **Baud Rate**: The baud rate supported by the selected product.
- **Sub Mode**: This may appear depending on the other settings.

9. Click **Next**.

The screenshot shows the 'OCH-NC Creation' wizard with six steps: 1. GENERAL, 2. SETTINGS, 3. APPLICATION CODE, 4. ENDPOINTS (highlighted), 5. PATH, and 6. SUMMARY. In the 'ENDPOINTS' step, the 'Single Channel' radio button is selected. Below this, there is a section titled 'BASE ENDPOINTS' containing two input fields: 'Endpoint A\*' and 'Endpoint B\*'. Each field has a magnifying glass icon to its right. At the bottom of the form, there are three buttons: 'Cancel' (with a close icon), '< Back', and '> Next'.

10. Specify the following **ENDPOINTS** settings:

- Select **Single Channel** or **Multiple Channel**.
- **Endpoint A**: Click  and in the **Advanced** tab, select an NMC port, or click on the **3D Explorer** tab.
- **Endpoint B**: Click  and in the **Advanced** tab, select an NMC port, or click on the **3D Explorer** tab.

11. Click **Next**.

OCH-NC Creation

1 GENERAL 2 SETTINGS 3 APPLICATION CODE 4 ENDPOINTS 5 PATH 6 SUMMARY

Optimization Goal  
Number of Hops





Disjoint From Link

► Include Nodes or Links

► Exclude Nodes or Links

× Cancel < Back > Next

12. Specify the following **PATH** settings:

- **Optimization Goal:** The optimization goal (**Number of Hops** or **Admin Cost**).
- **Disjoint From Link:**  and in the **Advanced** tab, select an OCH-NC link, or click on the **3D Explorer** tab to select an OCH-NC link. This means that the new OCH-NC link must not traverse this exclusionary path (this would be equivalent to adding all the links that constitute the disjoint path to the exclude items from path list).
- **Include Nodes or Links:** Click  and in the **Advanced** tab, select a ONES or OMS link, or click on the **3D Explorer** tab to select a ONES or OMS link.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select a ONES or OMS/OTS link, or click on the **3D Explorer** tab to select a ONES or OMS link.
- (Optional) Click  to remove any of the include/exclude items.

13. Click **Next**.

The screenshot shows the 'OCH-NC Creation' window with the 'SUMMARY' tab selected. The window has a blue header bar with the title 'OCH-NC Creation'. Below the header is a navigation bar with six tabs: 1 GENERAL, 2 SETTINGS, 3 APPLICATION CODE, 4 ENDPOINTS, 5 PATH, and 6 SUMMARY (which is highlighted with a blue circle). The main content area displays the following configuration details: Name: TestOCHNCLink, Description: None, Customer Name: None, Allow Auto Regeneration: False, Optical Feasibility Threshold: RED, Admin State: ENABLED, Baud Rate: 36.63G, Data Rate: R300G, Central Frequency(Thz): None, Application Code: 00B08E#NCS1K4-1.2T-K9#2#SD\_FEC\_15\_DE\_OFF#R300G#QPSK\_32QAM#36.63, Optimization Goal: NUMBER\_OF\_HOPS, Disjoint From Link: -, Included List: -, Excluded List: -, and Endpoints: -. At the bottom of the window, there are three buttons: 'Cancel' (with a close icon), '< Back', and '> Finish'.

OCH-NC Creation

1 GENERAL 2 SETTINGS 3 APPLICATION CODE 4 ENDPOINTS 5 PATH 6 SUMMARY

Name: TestOCHNCLink  
Description: None  
Customer Name: None  
Allow Auto Regeneration: False  
Optical Feasibility Threshold: RED  
Admin State: ENABLED  
Baud Rate: 36.63G  
Data Rate: R300G  
Central Frequency(Thz): None  
Application Code: 00B08E#NCS1K4-1.2T-K9#2#SD\_FEC\_15\_DE\_OFF#R300G#QPSK\_32QAM#36.63  
Optimization Goal: NUMBER\_OF\_HOPS  
Disjoint From Link: -  
Included List: -  
Excluded List: -  
Endpoints: -

Cancel < Back > Finish

14. Click **Finish**.

## Create OTN-Line

You can create an OTN Line service between OTN client ports on Transponders/Muxponders, define its capacity, add 1+1 protection if required, and optimize based on **number of hops**, **latency**, or **admin cost**. Various advanced settings and limitations (such as node or links to be included in or excluded from the OTN Line) can be added.

### To create an OTN Line:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2. Select the **Point to Point** tab.
3. Click **OTN Line**.

The screenshot shows the 'OTN Line Creation' wizard with five steps: GENERAL, SETTINGS, ENDPOINTS, PATH, and SUMMARY. The 'GENERAL' step is active. It contains three input fields: 'Name\*' (with a red asterisk and a cursor), 'Customer Name', and a 'Template' dropdown menu currently set to 'default-template'. At the bottom, there are three buttons: 'X Cancel', '< Back', and '> Next'.

4. Specify the following **GENERAL** settings:
  - **Name**: The unique user defined name of this OTN Line.
  - **Customer Name**: The OTN Line customer name.

5. Click **Next**.

The screenshot shows the 'OTN Line Creation' wizard at the 'SETTINGS' step (step 2). The top navigation bar has five steps: 1. GENERAL, 2. SETTINGS (active), 3. ENDPOINTS, 4. PATH, and 5. SUMMARY. Below the navigation bar, there are two dropdown menus: 'Service Capacity\*' and 'Protection'. The 'Service Capacity\*' dropdown is currently empty, and the 'Protection' dropdown is set to 'No Protection'. At the bottom of the form, there are three buttons: 'X Cancel', '< Back', and '> Next'.

6. Specify the following **SETTINGS**:



- **Service Capacity**: The capacity for this OTN-Line, for example, **ODU2**.
- **Protection**: The service protection (**No Protection** or **Protection 1+1**).

7. Click **Next**.

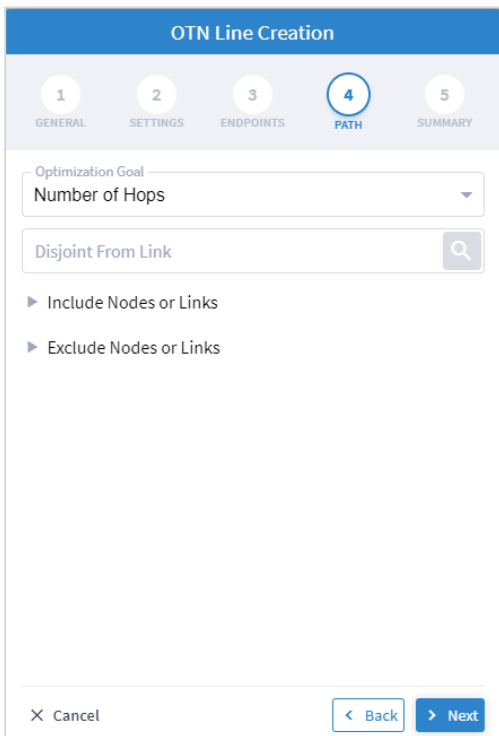
The screenshot shows the 'OTN Line Creation' wizard at the 'ENDPOINTS' step (step 3). The top navigation bar has five steps: 1. GENERAL, 2. SETTINGS, 3. ENDPOINTS (active), 4. PATH, and 5. SUMMARY. Below the navigation bar, there are two text input fields: 'Endpoint A\*' and 'Endpoint B\*', each with a search icon to its right. Below these fields is a dropdown menu labeled 'Path Calculation By' with 'Domain Controller' selected. At the bottom of the form, there are three buttons: 'X Cancel', '< Back', and '> Next'.



8. Specify the following **ENDPOINTS** settings:





- **Endpoint A:** Click  and in the **Advanced** tab, select an endpoint as ODU client port, or click on the **3D Explorer** tab to select an endpoint.
- **Endpoint B:** Click  and in the **Advanced** tab, select an endpoint as ODU client port, or click on the **3D Explorer** tab to select an endpoint.
- **Path Calculation By:** Select **Domain Controller** or **HCO**.

9. Click **Next**.

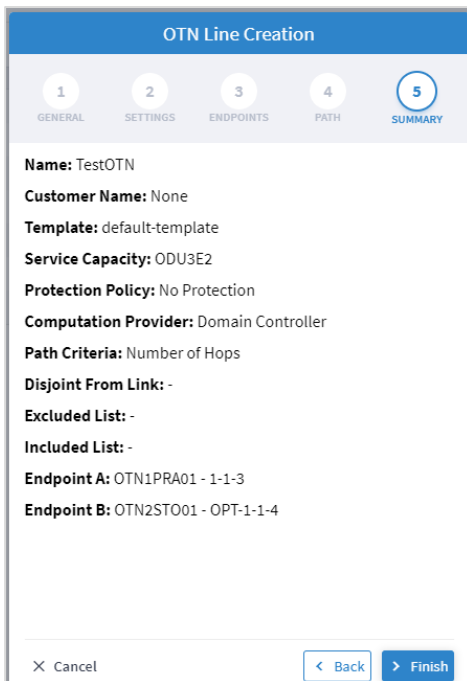


The screenshot shows the 'OTN Line Creation' dialog with the 'PATH' tab selected. The tab bar at the top has five items: 1 GENERAL, 2 SETTINGS, 3 ENDPOINTS, 4 PATH (selected), and 5 SUMMARY. The main content area includes an 'Optimization Goal' dropdown menu set to 'Number of Hops', a 'Disjoint From Link' search field with a magnifying glass icon, and two expandable sections: 'Include Nodes or Links' and 'Exclude Nodes or Links'. At the bottom, there are 'Cancel', 'Back', and 'Next' buttons.

10. Specify the following **PATH** settings:

- **Optimization Goal:** The optimization goal (**Number of Hops** or **Latency** or **Admin Cost**).
- **Disjoint From Link:**  and in the **Advanced** tab, select an OTN line, or click on the **3D Explorer** tab to select an OTN line. This means that the new OTN Line must not traverse this exclusionary path (this would be equivalent to adding all the links that constitute the disjoint path to the exclude items from path list).
- **Include Nodes or Links:** Click  and in the **Advanced** tab, select a node or OTU link, or click on the **3D Explorer** tab to select a node or OTU link.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select a node or any optical link, or click on the **3D Explorer** tab to select a node or any optical link.
- (Optional) Click  to remove any of the include/exclude items.

11. Click **Next**.



The image shows a screenshot of the 'OTN Line Creation' wizard, specifically the 'SUMMARY' step (Step 5). The wizard has five steps: 1. GENERAL, 2. SETTINGS, 3. ENDPOINTS, 4. PATH, and 5. SUMMARY. The 'SUMMARY' step is highlighted with a blue circle and the number 5. The summary information displayed is as follows:

- Name:** TestOTN
- Customer Name:** None
- Template:** default-template
- Service Capacity:** ODU3E2
- Protection Policy:** No Protection
- Computation Provider:** Domain Controller
- Path Criteria:** Number of Hops
- Disjoint From Link:** -
- Excluded List:** -
- Included List:** -
- Endpoint A:** OTN1PRA01 - 1-1-3
- Endpoint B:** OTN2STO01 - OPT-1-1-4

At the bottom of the screen, there are three buttons: 'Cancel' (with a close icon), 'Back' (with a left arrow), and 'Finish' (with a right arrow).

12. Click **Finish**.

## Create Circuit E-Line

You can create a Circuit E-Line, as an Ethernet connection between ETH client ports on Transponders/Muxponders , define its capacity, add 1+1 protection if required, and optimize based on **number of hops, latency, or admin cost**. Various advanced settings and limitations (such as nodes or links to be included in or excluded from the Circuit E-line) can be added.

### To create a Circuit E-Line:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
2. Select the **Point to Point** tab.
3. Click **Circuit E-Line**.

The screenshot shows the 'Circuit E-Line Creation' wizard with five steps: GENERAL, SETTINGS, ENDPOINTS, PATH, and SUMMARY. The 'GENERAL' step is active. It contains a 'Name\*' text field with a cursor, a 'Customer Name' text field, and a 'Template' dropdown menu set to 'default-template'. At the bottom, there are 'Cancel', 'Back', and 'Next' buttons.

4. Specify the following **GENERAL** settings:
  - **Name:** The unique user defined name of this Circuit E-Line.
  - **Customer Name:** The Circuit E-Line customer name.

5. Click **Next**.

The screenshot shows the 'Circuit E-Line Creation' wizard at Step 2, 'SETTINGS'. The top navigation bar has five tabs: 1 GENERAL, 2 SETTINGS (active), 3 ENDPOINTS, 4 PATH, and 5 SUMMARY. The main content area contains two dropdown menus. The first is 'Service Capacity\*' with a red border and a downward arrow. The second is 'Protection' with 'No Protection' selected. At the bottom, there are three buttons: 'X Cancel', '< Back', and '> Next'.



6. Specify the following **SETTINGS**:

- **Service Capacity**: The capacity for this Circuit E-Line, for example, 10 GB WAN.
- **Protection**: The service protection (**No Protection** or **Protection 1+1**).

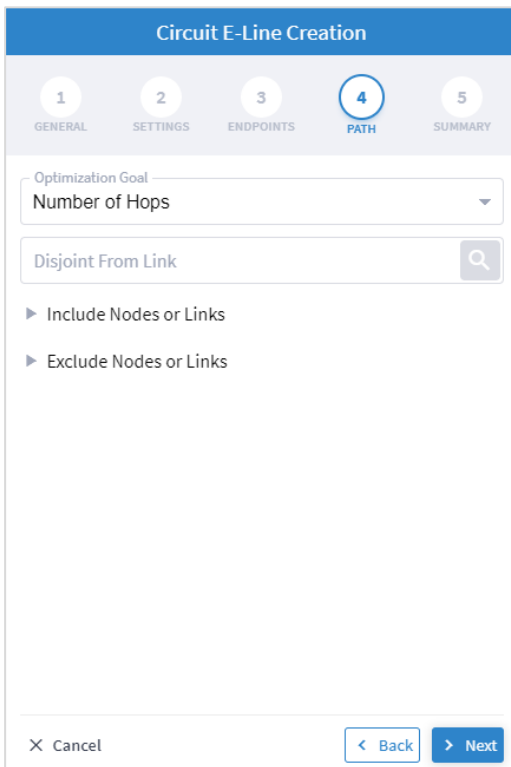
7. Click **Next**.

The screenshot shows the 'Circuit E-Line Creation' wizard at Step 3, 'ENDPOINTS'. The top navigation bar has five tabs: 1 GENERAL, 2 SETTINGS, 3 ENDPOINTS (active), 4 PATH, and 5 SUMMARY. The main content area contains two text input fields with search icons: 'Endpoint A\*' and 'Endpoint B\*'. Below them is a dropdown menu labeled 'Path Calculation By' with 'Domain Controller' selected. At the bottom, there are three buttons: 'X Cancel', '< Back', and '> Next'.





8. Specify the following **ENDPOINTS** settings:

- **Endpoint A:** Click  and in the **Advanced** tab, select an ETH endpoint, or click on the **3D Explorer** tab to select an endpoint.
- **Endpoint B:** Click  and in the **Advanced** tab, select an ETH endpoint, or click on the **3D Explorer** tab to select an endpoint.
- **Path Calculation By:** Select **Domain Controller** or **HCO**.

9. Click **Next**.



10. Specify the following **PATH** settings:

- **Optimization Goal:** The optimization goal (**Number of Hops** or **Latency** or **Admin Cost**).
- **Disjoint From Link:**  and in the **Advanced** tab, select Circuit E-Line, or click on the **3D Explorer** tab to select Circuit E-Line. This means that the new Circuit E-Line must not traverse this exclusionary path (this would be equivalent to adding all the links that constitute the disjoint path to the exclude items from path list).
- **Include Nodes or Links:** Click  and in the **Advanced** tab, select a Circuit E-Line, or click on the **3D Explorer** tab to select a Circuit E-Line.
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select node or any optical link, or click on the **3D Explorer** tab to select node or any optical link.
- (Optional) Click  to remove any of the include/exclude items.

11. Click **Next**.

Circuit E-Line Creation

1

GENERAL

2

SETTINGS

3

ENDPOINTS

4

PATH

5

SUMMARY

**Name:** TestE

**Customer Name:** None

**Template:** default-template

**Service Capacity:** 1 GB

**Protection Policy:** No Protection

**Computation Provider:** Domain Controller

**Path Criteria:** Number of Hops

**Disjoint From Link:** -

**Excluded List:** -

**Included List:** -

**Endpoint A:** OTN2TAMP01 - OPT-1-1-2

**Endpoint B:** OTN1BCN01 - 1-1-4

✕ Cancel

< Back

> Finish

12. Click **Finish**.

## Create Packet E-Line

You can create a Packet E-Line as an Ethernet service between Routers over RSVP-TE tunnels or SR policies, or between Transponders/Muxponders over MPLS-TP tunnels, define its capacity, add 1+1 protection if required, and optimize based on number of hops, latency, or admin cost. Various advanced settings and limitations (such as items to be included or excluded from the Circuit E-line) can be added.

### To create a Packet E-Line:

1. Before creating a Packet E-Line service, create the MPLS-TP tunnels to be used (this is assumed to be handled implicitly by the optical controller).
2. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**.
3. Select the **Point to Point** tab.
4. Click **Packet E-Line**.

The screenshot shows the 'Packet E-Line Creation' form with the 'GENERAL' tab selected. The form has five steps: 1. GENERAL, 2. SETTINGS, 3. ENDPOINTS, 4. PATH, and 5. SUMMARY. The 'Name\*' field is a text input with a cursor. Below it is a 'Customer Name' field. The 'Template' dropdown menu is set to 'default-template'. There is an 'Activate OAM' checkbox which is currently unchecked. At the bottom, there are three buttons: 'X Cancel', '< Back', and '> Next'.

5. Specify the following **GENERAL** settings:
  - **Name:** The unique user defined name of this Packet E-Line.
  - **Customer Name:** The Packet E-Line customer name.
  - **Activate OAM:** Whether to enable OAM PM activation.

6. Click **Next**.

The screenshot shows the 'Packet E-Line Creation' wizard at step 2, 'SETTINGS'. The wizard has five steps: 1. GENERAL, 2. SETTINGS (current), 3. ENDPOINTS, 4. PATH, and 5. SUMMARY. The settings are as follows:

- Underlay Mode:** Use any tunnels
- Underlay Technology:** SR-CS Policy
- Pseudowire Signaling:** EVPN-VPWS (BGP)
- EVI:** (empty text field)
- Protection:** No Protection

At the bottom, there is a 'Cancel' button with a close icon, a '< Back' button, and a '> Next' button.

7. Specify the following **SETTINGS**:

- **Underlay Mode:** The underlay mode, for example, **Use any tunnels**.
- **Underlay Technology:** The underlay technology, for example, **MPLS-TP**.
- **Pseudowire Signaling:** The pseudowire signaling, for example, **EVPN-VPWS (BGP)**.
- **EVI:** The EVPN instance.
- **Protection:** The service protection (**No Protection** or **Protection 1+1**).



8. Click **Next**.

Packet E-Line Creation

1 GENERAL 2 SETTINGS 3 ENDPOINTS 4 PATH 5 SUMMARY

▼ Endpoint A

Port\*

VLAN ID (format: 2,5-7)

CIR [Mbps]\* EIR [Mbps] CBS [KBytes] EBS [KBytes] Local AC

▼ Endpoint B


Port\*

VLAN ID (format: 2,5-7)


CIR [Mbps]\* EIR [Mbps] CBS [KBytes] EBS [KBytes] Local AC

X Cancel < Back > Next

9. Specify the following **ENDPOINTS** settings for **Endpoint A** and **Endpoint B**:

- **Port:** Click  and in the **Advanced** tab, select a port, or click on the **3D Explorer** tab to select an Ethernet port. The port rates should be the same. In case selected ports has already a packet E-Line service defined, with VLAN IDs, the VLAN IDs must be specified for per endpoint for the new service
- **VLAN ID:** The VLAN ID in a range of 1-4094. Enter a single value, multiple values separate by commas, and/or ranges, where '-' designates the range, for example: 390-780. . If the selected endpoint has no services on it, the VLAN ID field is optional. Once defined, a VLAN ID must be defined in both endpoints, although different values/ranges can be specified. If you specify multiple VLANs, you must use the same values for both endpoints.

**Bandwidth parameters are all optional**

- **CIR (Mbps):** The CIR rate in Mbps, range is 0 to <port rate>. The values can be different per endpoint.
- **EIR (Mbps):** The EIR rate in Mbps, range is 0 to <port rate>. The values can be different per endpoint.
- **CBS (Kbytes):** The CBS rate in Kbytes, range is 0 to <port rate>. The values can be different per endpoint.
- **EBD (Kbytes):** The CBS rate in Kbytes, range is 0 to <port rate>. The values can be different per endpoint.
- **Local AC:** The local AC.
- **Endpoint B:** Click  and in the **Advanced** tab, select a port, or click on the **3D Explorer** tab to select a port.

10. Click **Next**.

Packet E-Line Creation

1 GENERAL 2 SETTINGS 3 ENDPOINTS 4 PATH 5 SUMMARY

Optimization Goal  
Number of Hops

Path Calculation By  
HCO

Disjoint From Link

► Include Nodes or Links

► Exclude Nodes or Links






Disjoint From Link (Protection)



► Include Nodes or Links (Protection)

► Exclude Nodes or Links (Protection)

× Cancel < Back > Next

11. Specify the following **PATH** settings:

- **(Only required if tunnels are implicitly created) Optimization Goal:** The optimization goal (**Number of Hops** or **Latency** or **Admin Cost**).
- **(Only required if tunnels are implicitly created) Path Calculation By:** The path calculation mechanism: **Domain Controller** or **Crosswork Hierarchical Controller**. Currently in this version only the Domain Controller option is available.
- **Disjoint From Link:**  and in the **Advanced** tab, select a Packet E-Line, or click on the **3D Explorer** tab to select a Packet E-Line. This means that the new Circuit E-Line must not traverse this exclusionary path (this would be equivalent to adding all the links that constitute the disjoint path to the exclude items from path list).
- **Include Nodes or Links:** Click  and in the **Advanced** tab, select node or underlay link (IGP or OTU), or click on the **3D Explorer** tab to select node or underlay link (IGP or OTU).
- **Exclude Nodes or Links:** Click  and in the **Advanced** tab, select node or underlay link (IGP or OTU) or click on the **3D Explorer** tab to select node or underlay link (IGP or OTU).
- **(Only required with protections) Disjoint From Link (Protection):**  and in the **Advanced** tab, select a Packet E-Line, or click on the **3D Explorer** tab to select a Packet E-Line. This means that the new Circuit E-Line must not traverse this exclusionary path (this would be equivalent to adding all the links that constitute the disjoint path to the exclude items from path list).
- **(Only required with protections) Include Nodes or Links (Protection):** Click  and in the **Advanced** tab, select node or underlay link (IGP or OTU), or click on the **3D Explorer** tab to select node or underlay link (IGP or OTU).

- **(Only required with protections) Exclude Nodes or Links (Protection):** Click  and in the **Advanced** tab, select node or underlay link (IGP or OTU) or click on the **3D Explorer** tab to select node or underlay link (IGP or OTU).
- (Optional) Click  to remove any of the include/exclude items.

12. Click **Next**.

Packet E-Line Creation

1

2

3

4

5

GENERAL

SETTINGS

ENDPOINTS

PATH

SUMMARY

**Name:** Test P

**Customer Name:** None

**Template:** default-template

**Activate OAM:** No

**Protection Policy:** Protection 1+1

**Computation Provider:** HCO

**Path Criteria:** Number of Hops

**Disjoint From Link:** -

**Excluded List:** -

**Included List:** -

**Disjoint From Link (Protection):** -

**Excluded List (Protection):** -

**Included List (Protection):** -

**Endpoint A:** ER1.MOS - GigabitEthernet1/1/2

**Endpoint B:** ER1.BUD - GigabitEthernet1/1/5

× Cancel

< Back

> Finish

13. Click **Finish**.

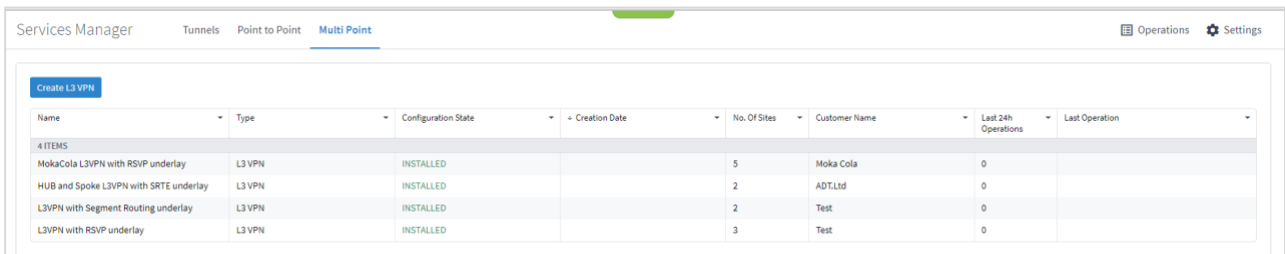
## Multi Point

You can view and add L3-VPN.

### View L3 VPN

To view L3 VPNs:

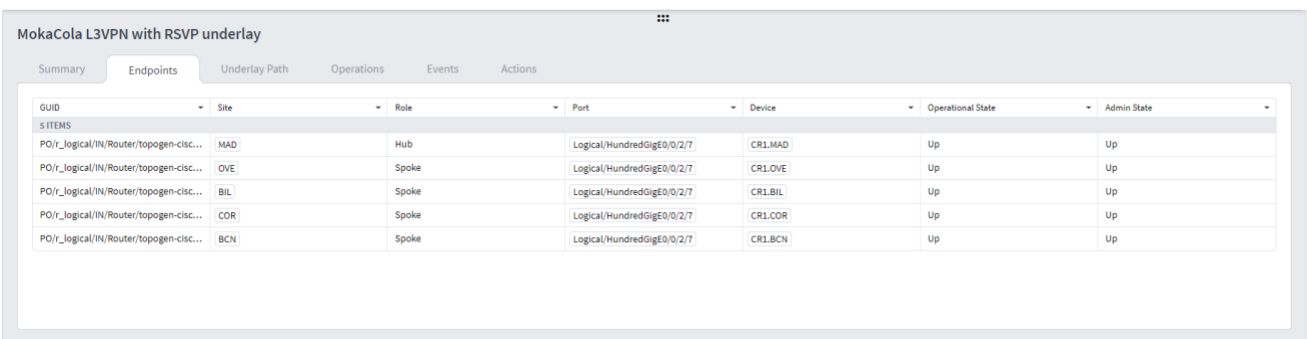
1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager > Multi Point**. A list of the L3VPNs appears in the **Multi Point** pane.



The screenshot shows the 'Services Manager' interface with the 'Multi Point' tab selected. A 'Create L3 VPN' button is visible. Below it is a table listing four L3 VPNs.

Name	Type	Configuration State	Creation Date	No. Of Sites	Customer Name	Last 24h Operations	Last Operation
4 ITEMS							
MokaCola L3VPN with RSVP underlay	L3 VPN	INSTALLED		5	Moka Cola	0	
HUB and Spoke L3VPN with SRTE underlay	L3 VPN	INSTALLED		2	ADTLtd	0	
L3VPN with Segment Routing underlay	L3 VPN	INSTALLED		2	Test	0	
L3VPN with RSVP underlay	L3 VPN	INSTALLED		3	Test	0	

2. Select the required L3 VPN.
3. To view more L3 VPN details, see the lower pane view with the following tabs:
  - **Summary:** Additional details about the L3 VPN.
  - **Endpoints:** The endpoint details.
  - **Underlay Path:** The underlay path items traversed by the link.
  - **Operations:** The L3 VPN link operations.
  - **Events:** The L3 VPN link events.
  - **Actions:** The modification actions (if applicable) and the option to **Delete VPN**.



The screenshot shows the details for 'MokaCola L3VPN with RSVP underlay'. The 'Endpoints' tab is selected, displaying a table of endpoints.

GUID	Site	Role	Port	Device	Operational State	Admin State
5 ITEMS						
PO/r_logical/10/Router/topogen-cisc...	MAD	Hub	Logical/HundredGigE0/0/2/7	CR1.MAD	Up	Up
PO/r_logical/10/Router/topogen-cisc...	OVE	Spoke	Logical/HundredGigE0/0/2/7	CR1.OVE	Up	Up
PO/r_logical/10/Router/topogen-cisc...	BIL	Spoke	Logical/HundredGigE0/0/2/7	CR1.BIL	Up	Up
PO/r_logical/10/Router/topogen-cisc...	COR	Spoke	Logical/HundredGigE0/0/2/7	CR1.COR	Up	Up
PO/r_logical/10/Router/topogen-cisc...	BCN	Spoke	Logical/HundredGigE0/0/2/7	CR1.BCN	Up	Up

## Add L3-VPN

You can add a managed L3 VPN, that is, a VPN created by Crosswork Hierarchical Controller or delegated to Crosswork Hierarchical Controller.

### To add an L3 VPN:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager**
2. Select the **Multi Point** tab.
3. Click **Create L3 VPN**.

The screenshot shows the 'L3 VPN Creation' form. At the top, there is a blue header with the title 'L3 VPN Creation'. Below the header, there are four tabs: '1 GENERAL' (selected), '2 SETTINGS', '3 ENDPOINTS', and '4 SUMMARY'. The 'GENERAL' tab contains three input fields: 'Name\*' (with a red asterisk), 'Customer Name\*' (with a red asterisk), and 'Template' (a dropdown menu showing 'default-template'). At the bottom of the form, there are three buttons: 'X Cancel', '< Back', and '> Next'.

4. Specify the following **GENERAL** settings:
  - **Name:** The unique user defined name of this L3 VPN.
  - **Customer Name:** The L3 VPN customer name.
  - **Template:** This is not available in the current version (there is a **default-template**).

5. Click **Next**.

L3-VPN Creation

1 GENERAL 2 SETTINGS 3 ENDPOINTS 4 SUMMARY

Underlay Options\*

Virtual Network

Virtual Network

Topology

Any to Any

Resource Allocation Policy

HCO Allocated

Min Number of Sites

2

X Cancel < Back > Next

6. Specify the following **SETTINGS**:

- **Underlay Options:** this is to select whether to map the new service to any tunnels exist between the endpoints or to use only tunnels grouped as a virtual network (you can create new virtual network by creating a tag with the virtual network name as the tag value in the tag key VN). Select **All Network** or **Virtual Network**.
- **Virtual Network:** The user created virtual networks (example: **uRLLC** or **eMBB**).
- **Topology:** The topology of the L3 VPN (**Any to Any**, **Hub & Spoke**, **Hub & Spoke Disjoint** or **Unknown**).
- **Resource Allocation Policy:** Refers to allocation of RD and RT, which in this version are allocated by HCO (**HCO Allocated**, that is, allocated by Crosswork Hierarchical Controller).
- **Min. Number of Sites:** The minimum number of sites/endpoints (between 2 and 20). For Hub & Spoke, select the minimum number of hops and minimum number of spokes separately.

7. Click **Next**.

L3-VPN Creation

1 GENERAL 2 SETTINGS 3 ENDPOINTS 4 SUMMARY

▶ 1. Endpoint

▶ 2. Endpoint

+ Add

× Cancel < Back > Next

8. Expand the **Endpoint**.

L3-VPN Creation

1 GENERAL 2 SETTINGS 3 ENDPOINTS 4 SUMMARY

▼ 1. Endpoint

Port\*

Role\*

VLAN ID

IP Address\*

Routing Method\*


ROUTING INFORMATION

▶ 2. Endpoint

+ Add

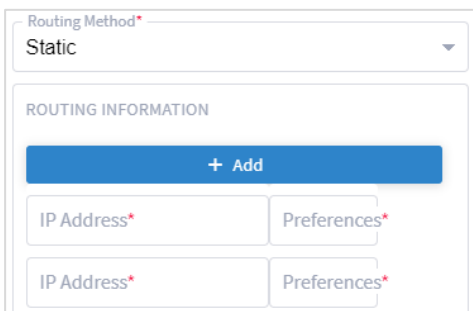
× Cancel < Back > Next

9. Specify the following settings for **Endpoint 1** and **Endpoint 2**:

- **Port:** Click  and in the **Advanced** tab, select a physical or logical port on a router, or click on the **3D Explorer** tab to select a physical or logical port on a router.
- **Role:** Select **Any To Any** or **Hub** or **Spoke** (depending on the option selected in the **SETTINGS** tab).
- **VLAN ID:** The VLAN ID in a range of 1-4094. Enter a single value, multiple values separate by commas, and/or ranges, where '-' designates the range, for example: 390-780. If the selected endpoint has no services on it, the VLAN ID field is optional. Once defined, a VLAN ID must be defined in all endpoints, although different values/ranges can be specified. If you specify multiple VLANs, you must use the same values for all endpoints.
- **IP Address:** The IP address.
- **Routing Method:** The routing method (**Static**, **BGP** or **OSPF**).
- **ROUTING INFORMATION:** Specify the options depending on the **Routing Method** selected.

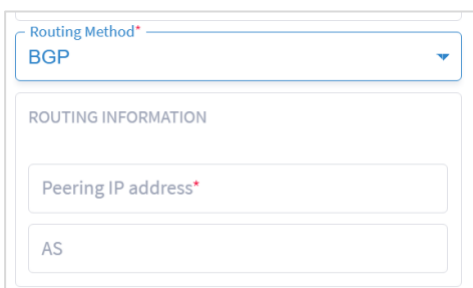
10. If **Static**, add the static routing information. You can add up to 10 entries, with:

- **IP Address:** The IP address for the destination network in the format xxx.xxx.xxx.xxx/CIDR. The CIDR is a number (between 1 and 32).
- **Preferences:** The preference to allow next hop selection control where the customer prefixes are learned via multiple sources or multiple gateways using the same information source (between 0 and 255).



11. If **BGP**, add:

- **Peering IP address:** The directly connected IP address of the Customer CE device.
- **AS:** The BGP Autonomous System number to peer with the Customer CE (between 64512 and 65535).



12. If **OSPF**, add:

- **OSPF Metric:** An optional parameter to denote the cost of the CE-PE link (0 to 65535).
- **OSPF Area ID:** The OSPF area ID that will be used for the CE-PE link (0 to 4294967295).



Routing Method\*

OSPF

ROUTING INFORMATION

OSPF Metric

OSPF Area ID

13. Click **Add** to add additional endpoints (up to 100).
14. Click **Next**.
15. Review the **SUMMARY**.
16. Click **Finish**.


## Service Settings

You can configure which rollbacks are allowed.

To view the service settings:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager > Settings**. A list of the service settings appears.

The screenshot shows the 'Services Settings' page in the Crosswork Hierarchical Controller. The page has a top navigation bar with 'Services Manager' selected, and sub-tabs for 'Tunnels', 'Point to Point', and 'Multi Point'. On the right, there are links for 'Operations' and 'Settings'. The main content area is titled 'Services Settings' and contains three sections: 'OPTICAL TRANSCEIVERS APPLICATION CODES' with a file upload button, 'CONFIGURATION' with checkboxes for 'Develop Mode', 'Advanced Mode', and 'Direct Optical Requests', and 'DEMO MODE' with checkboxes for 'RSVP Tunnel', 'L3-VPN' (which is checked), 'IP Link', 'SR Policy', 'TE++ Container', 'Circuit E-Line', 'OTN Line', 'OCH', 'Packet E-Line', and 'OCH-NC'. At the bottom, there is a section for 'ALLOWED ROLLBACKS'.

2. In **OPTICAL TRANSCEIVERS APPLICATION CODES**, click  to select a file with the application codes.
3. Select which rollbacks are allowed when the services are provisioned (**RSVP Tunnel**, **L3-VPN**, **IP Link**, **SR Policy**, **TE++ Container**, **Circuit E-Line**, **OTN Line**, **OCH**, **Packet E-Line** and/or **OCH-NC**).

## Services Manager Operations

You can view the latest Services Manager operations.

### To view the operations:

1. In the applications bar in Crosswork Hierarchical Controller, select **Services > Services Manager > Operations**. A list of the operations appears.

2. Select the required operation.

Services Manager

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3. To view more details, select the required tab:

- **Summary:** Additional details about the operation, e.g., Status: Rollback Done.

- **Logs:** The operation logs for normal and rollback flows.
- **Errors:** The operation errors, e.g., Discovery took too long.

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