

Cisco Crosswork Hierarchical Controller 7.0

Assurance and Performance Guide

April 2023

Introduction

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

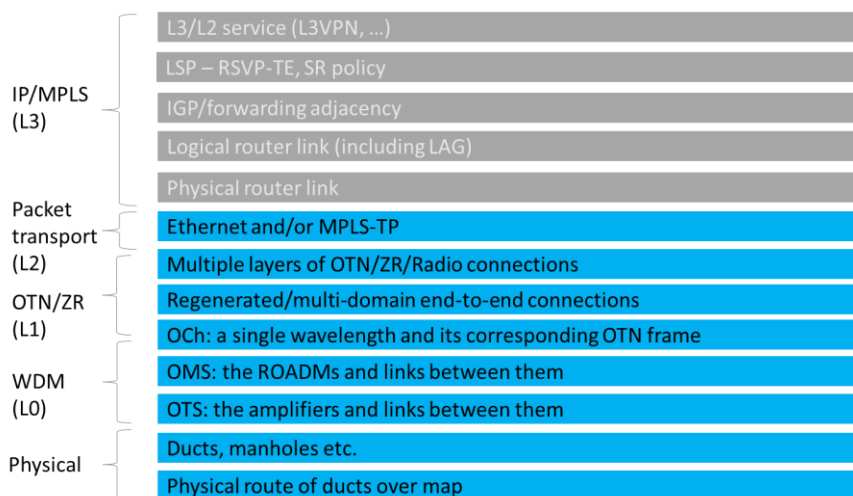
The following table lists the assurance applications. The Legend column indicates if the application falls into one of the following categories:

- **Common:** Common to all layers and multi-layer
- **IP:** Relevant to IP links and services
- **Optical:** Relevant to fibers, optical links, OTN/ETH connections

Table 1. Assurance Applications

Category	Application name	Legend	Description
Assurance	Performance	IP	Traffic utilization and OAM PM of port, links, tunnels and VPNs, group links by topology context (all LAG members, between router A to B), prediction of packet traffic utilization.
		Optical	L0-L1 performance, show correlation between photonic to L1 layer. Show power level across a span of ROADMs and Amplifiers.
	Service Assurance	Common	Visualize L1-L2-L3 service configuration and underlay paths, with UNIs performance and events history.
	Link Assurance	Optical	Visualize RON links across ZR and OLS with performance in all layers.
	Path Analysis	IP	Calculate, on demand, an IGP path between two routers, visualize path and show performance of IP links across the path.
	RCA	Common	Show which services and links in the upper layers were impacted by a lower layer link failure, especially in the case of a multi-layer where an optical link failure impacted IP links and services.

Layers



Terminology

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.
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,

Term	Definition
	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.
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.
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.
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.

Performance

The Performance application provides statistical information on both packet-based traffic and optical (layer 0 and layer 1) performance:

- For layer 0 (OCH, NMC, OMS and OTS), provides Rx and Tx power data (minimum, average, and maximum).
- For layer 1 (ZR Media), provides Pre-FEC (Forwarding Error Correction), Post-FEC, Q Margin and Q Factor.
- For packet-based bandwidth traffic, the application provides statistical information on packet-based bandwidth/traffic usage of ports, links and LSPs over the selected time period. The information is calculated based on collected intervals/bins (15 minutes or 1 hour) of Rx and Tx octets and displayed in tables and in graphs.

You can run a query by selecting resources and the time duration. This returns the Performance for the selected resources for a specified period and time window each day. A Performance test can be run explicitly on up to ten ports, links or LSPs by selecting the specific resources. The test can run on more ports and links by querying for ports, links or LSPs by tags or devices.

The displayed results include the resource capacity/speed and the statistical utilization info. Information on utilization is displayed for the selected resource and for the lower, upper, and adjacent resource, for example: logical ports on top of selected physical port, physical links lower to aggregation (LAG) link.

Resources can be selected explicitly by their type. After selecting the type, the user can use the model selector to select a resource (port, link or LSP). Ports, links or LSPs can also be selected by their tags, and routers (devices) can be selected using the model selector or by tag.

Utilization data is collected on IP links, for both physical and logical links. When links are selected, the user can select to view utilization for specific links/underlay (lower) links. If for example, an underlay link is selected, the application returns the utilization for both the underlay link itself and all the links above it that have utilization data.

It is also possible to view utilization data for links with devices in a single endpoint or links with devices in two endpoints. These endpoints can be defined by specific devices or by tags. For example, this allows the user to select a router and get the utilization data for all the links that end in this router or select two routers and get the utilization data for all the links between the two routers.

Using tags, means that the user can view utilization data for all links between devices with, for example, tag A, and devices with, for example, tag B.

Similarly, it is possible to select specific LSP/underlay links, as well as LSPs by devices in one or two endpoints.

The capacity appears for ports and links, and the reserved bandwidth for LSPs. For all resources, the average utilization, peak utilization, various percentiles (98, 95 and 75), and standard deviation are shown. For ports, lower and upper port capacity and average utilization also appears, and for links the lower physical links, upper aggregate link, and upper logical links names are listed (if they exist).

You can select the following types of resources:

- **Ports:** Packet Ports, Optical Port, and ZR Ports
- **Links:** IP Links, Optical Links, and ZR Links

- **LSPs:** RSVP-TE tunnels and SR Policies.

Traffic Utilization Tab

The Traffic Utilization fields that appear vary according to the type of utilization being viewed.

Note: When selecting optical (layer 0 and 1) links, the **Traffic Utilization** tab appears with the information for the related L3 physical or logical layer.

For ports:

- Device
- Port
- Capacity [Gbps]
- In Link (if this exists)
- Average [%]
- Peak [%]
- Percentile 98[%]
- Percentile 95[%]
- Percentile 75[%]
- St. Deviation
- Lower Ports (only for logical port; aggregate or physical port name)
- Lower Ports Capacity [Gbps]
- Lower Ports Average [%]
- Upper Ports (only for physical port; the logical or aggregate port name, if exists)
- Upper Ports Average (%) (only for physical port)

For Ethernet and IP Links:

- Link
- Layer
- Capacity [Gbps]
- Average [%]
- Peak [%]
- Percentile 98[%]
- Percentile 95[%]
- Percentile 75[%]
- St. Deviation
- Lower Physical Links (link name of one layer lower, if exists)
- Upper Aggregate Link (link name, if exists)

- Upper Logical Links (link name, if exists)

For LSP Tunnels and LSP Policy Links:

- Link (full LSP name including site/device)
- Reserved BW [Mbps]
- Services (Traversing Over This LSP)
- Average Rate [Mbps]
- Peak Rate [Mbps]
- Percentile 98[Mbps]
- Percentile 95[Mbps]
- Percentile 75[Mbps]
- St. Deviation

Note: The export file includes extended information. The **Average** column appears in the UI, but in the export, there are two columns: **Average IN** and **Average OUT**. The UI shows the greater value of these two values.

Performance (OAM) Tab

The following Performance fields appear for Ethernet and IP links:

- Link
- Layer
- Jitter Average (Usec)
- Maximal Round Trip Time Average (Usec)
- Minimal Round Trip Time Average (Usec)
- Delay Average (Usec)

The Performance application has the option to predict the behavior of packet traffic utilization for the next 14 days based on the historical collection of performance monitoring counters. It is possible to view a prediction of packet traffic behavior assuming that you have at least 7 days of data available to base the prediction on.

The utilization graph can be opened per selected packet port or link (Ethernet or IP), and you can view the prediction as a linear line on the graph. The prediction is based on an algorithm that creates traffic patterns based on time of day, weekdays vs. weekends, and seasonal events in the local area where the system is deployed. The graph displays the linear utilization prediction line, as well as lower and upper bounds, indicating the prediction confidence interval. The prediction takes seasonal events into account.

Optical Power Tab

The Optical Power tab appears for layer 0 links (OTS, OMS, and OCH) and includes the following fields:

- Link
- Layer
- A to Z Average Power (DBm)
- A to Z Minimum Power (DBm)
- A to Z Maximum Power (DBm)
- Z to A Average Power (DBm)
- Z to A Minimum Power (DBm)
- Z to A Maximum Power (DBm)

ZR Tab

The ZR tab appears for layer 1 links (ZR Links) and includes the following fields:

- Link
- Layer
- A to Z Pre FEC BER (Q)
- A to Z Post FEC BER (Q)
- A to Z Q Factor (DBq)
- A to Z Q Margin (DBq)

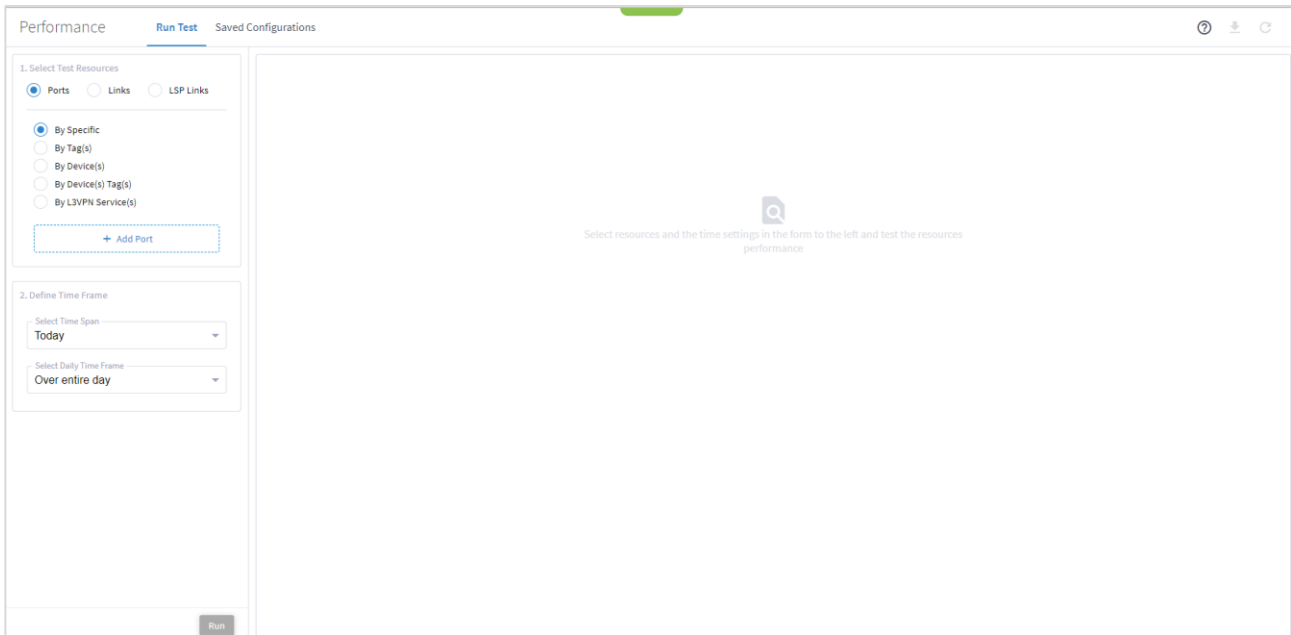
Ports Traffic Utilization and Performance

You can view performance for Ethernet and IP ports:

- Specific ports
- Ports that are tagged with specific tags and tag values
- Ports on specific devices
- Ports by L3VPN Services

To configure performance for ports:

1. In the applications bar, select **Performance**.

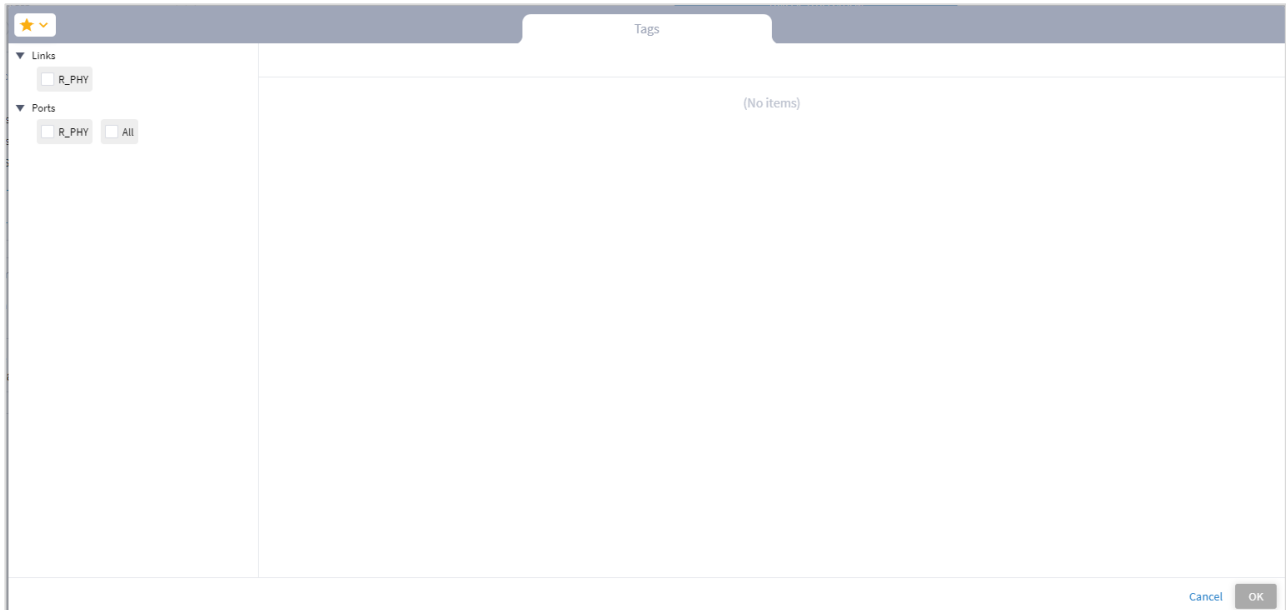


2. Ensure that **Ports** is selected.
3. To check the performance for specific ports, select **By Specific**, and then click **Add Port**. In the **Advanced** tab, select from the **Packet Ports**, **Optical Ports** or **ZR Ports** tabs, or click on the **3D Explorer** tab to select a port. Click **OK**. You can add up to 10 items.

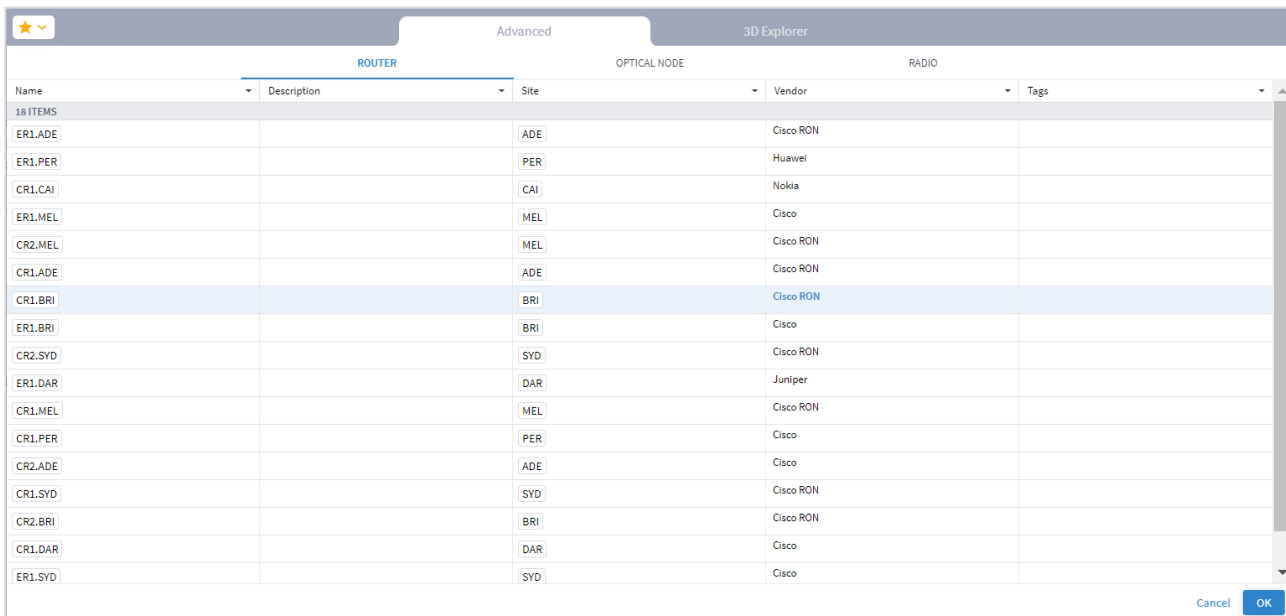
Note: For more information on 3D Explorer, see the *Cisco Crosswork Hierarchical Controller Network Visualization Guide*.

Advanced						
PACKET PORTS			OPTICAL PORTS	ZR PORTS		
Name	Device	Type	Capacity	Description	Admin Status	
279 ITEMS						
HundredGigE0/0/1/8	CR1.DAR	R_LOGICAL		to ER1.DAR:100ge-0/1/1	UP	
10ge-0/1/1	CR1.CAI	R_LOGICAL		to CR1.BR1:TenGigE0/0/2/6	UP	
TenGigE0/0/2/9	ER1.SYD	R_PHYSICAL	10.00 GB		UP	
FourHundredGigE0/0/1/7	CR2.SYD	R_PHYSICAL	400.00 GB	L3 Physical of Cisco RON Cisco QSFP28 10...	UP	
FourHundredGigE0/0/1/9	CR2.MEL	ETH	400.00 GB	Ethernet of Cisco RON Cisco QSFP28 100G...	UP	
HundredGigE0/0/1/6	ER1.BRI	R_PHYSICAL	100.00 GB	to CR1.BR1:HundredGigE0/0/3/6	UP	
10ge-0/1/1	CR1.CAI	R_PHYSICAL	10.00 GB	to CR1.BR1:TenGigE0/0/2/6	UP	
FourHundredGigE0/0/1/9	CR2.SYD	R_PHYSICAL	400.00 GB	L3 Physical of Cisco RON Cisco QSFP28 10...	UP	
HundredGigE0/0/1/6	CR1.PER	R_PHYSICAL	100.00 GB	to CR1.ADE:HundredGigE0/0/1/8	UP	
Bundle-Ether0	CR2.BRI	R_LOGICAL		to ER1.BR1:Bundle-Ether1	UP	
HundredGigE0/0/1/8	CR1.DAR	R_PHYSICAL	100.00 GB	to ER1.DAR:100ge-0/1/1	UP	
FourHundredGigE0/0/1/10	CR2.MEL	R_PHYSICAL	400.00 GB	L3 Physical of Cisco RON Cisco QSFPDD 40...	UP	
FourHundredGigE0/0/1/7	CR2.SYD	R_LOGICAL		to CR2.MEL:FourHundredGigE0/0/1/7	UP	
HundredGigE0/0/1/7	CR1.DAR	R_PHYSICAL	100.00 GB	to CR1.PER:HundredGigE0/0/1/8	UP	
Bundle-Ether1	ER1.BRI	R_LOGICAL		to CR2.BR1:Bundle-Ether0	UP	
HundredGigE0/0/1/13	CR1.ADE	R_PHYSICAL	100.00 GB	to CR2.ADE:HundredGigE0/0/1/6	UP	
Bundle-Ether0	CR2.SYD	R_AGGREGATE			UP	

- To check the performance for ports by tag, select **By Tags(s)**, click **Add Tag**, and then select the tags and click **OK**.



- To check the performance for ports by device, select **By Device(s)**, and then click **Add Device**. In the **Advanced** tab, select from the **Router**, **Optical Node** or **Radio** tabs, or click on the **3D Explorer** tab to select a device. Click **OK**. You can add up to 10 items.



- To check the performance for ports by device tag, select **By Device(s) Tags(s)**, click **Add Tag**, and then select the tags and click **OK**.
- To check the performance for ports by L3VPN services, select **By L3VPN Services(s)**, and then click **Add L3VPN Service**. In the **Advanced** tab, select an L3VPN service, or click on the **3D Explorer** tab to select a L3VPN service. Click **OK**. You can add up to 10 items.
- Continue to [View Utilization and Performance](#).

Links Traffic Utilization and Performance

You can view performance for:

- Specific and underlay links
- Links that are tagged with specific tags and tag values
- Links that include a device in a specific endpoint
- Links that include devices that are tagged with specific tags and tag values
- Links that include devices in two endpoints

To configure performance for links:

- In the applications bar, select **Performance**.
- Select **Links**.

- To check the performance for specific links, select **By Specific And Underlay Lower Link(s)**, click **Add Link**, and then select a link. In the **Advanced** tab, select from the **IP LINKS**, **OPTICAL LINKS** or **ZR LINKS** tabs, or click on the **3D Explorer** tab to select a link. Click **OK**. You can add up to 10 items.

Note: For more information on 3D Explorer, see the *Cisco Crosswork Hierarchical Controller Network Visualization Guide*.

IP LINKS		OPTICAL LINKS		ZR LINKS			
Name	Layer	Device A	Port A	Device B	Port B	Operational Status	Role
122 ITEMS							
SD1ADE02/1-6-4 to SD1ME...	ETH	SD1ADE02	1-6-4	SD1MEL02	1-4-2	UP	REGULAR
CR2.MEL/HundredGigE0/0/...	R_PHYSICAL	CR2.MEL	HundredGigE0/0/2/9	ER1.MEL	HundredGigE0/0/1/9	UP	CROSS_LINK
10.40.0.73 to 10.40.0.74	R_LOGICAL	ER1.SYD	Bundle-Ether1	CR2.SYD	Bundle-Ether0	UP	REGULAR
CR1.ADE/HundredGigE0/0/...	R_PHYSICAL	CR1.ADE	HundredGigE0/0/1/10	CR1.DAR	HundredGigE0/0/1/6	UP	REGULAR
CR2.BRI/HundredGigE0/0/...	R_PHYSICAL	CR2.BRI	HundredGigE0/0/2/6	ER1.BRI	HundredGigE0/0/1/8	UP	CROSS_LINK
CR2.MEL/FourHundredGig...	R_PHYSICAL	CR2.MEL	FourHundredGigE0/0/1/7	CR2.SYD	FourHundredGigE0/0/1/7	UP	REGULAR
LAG Bundle-Ether1<=>Bu...	R_AGGREGATE	CR2.ADE	Bundle-Ether1	CR2.MEL	Bundle-Ether0	UP	REGULAR
CR1.MEL/FourHundredGig...	ETH	CR1.MEL	FourHundredGigE0/0/1/6	CR1.SYD	FourHundredGigE0/0/1/6	UP	REGULAR
CR1.SYD/FourHundredGig...	R_PHYSICAL	CR1.SYD	FourHundredGigE0/0/1/7	CR2.SYD	FourHundredGigE0/0/1/6	UP	REGULAR
HundredGigE0/0/1/7 to 1-...	ETH	CR1.DAR	HundredGigE0/0/1/7	SD1DAR02	1-2-2	UP	CROSS_LINK
LAG Bundle-Ether1<=>Bu...	R_AGGREGATE	ER1.MEL	Bundle-Ether1	CR2.MEL	Bundle-Ether1	UP	REGULAR
10.40.0.89 to 10.40.0.90	R_LOGICAL	ER1.PER	100GE1/1/1	CR1.PER	HundredGigE0/0/1/9	UP	REGULAR
10.40.0.78 to 10.40.0.77	R_LOGICAL	CR1.BRI	Bundle-Ether0	ER1.BRI	Bundle-Ether0	UP	REGULAR
CR1.PER/HundredGigE0/0/...	R_PHYSICAL	CR1.PER	HundredGigE0/0/1/9	ER1.PER	100GE1/1/1	UP	CROSS_LINK
CR1.SYD/HundredGigE0/0/...	R_PHYSICAL	CR1.SYD	HundredGigE0/0/2/9	ER1.SYD	HundredGigE0/0/1/7	UP	CROSS_LINK
CR1.ADE/HundredGigE0/0/...	R_PHYSICAL	CR1.ADE	HundredGigE0/0/1/9	CR1.PER	HundredGigE0/0/1/7	UP	REGULAR
CR1.SYD/HundredGigE0/0/...	R_PHYSICAL	CR1.SYD	HundredGigE0/0/2/8	ER1.SYD	HundredGigE0/0/1/6	UP	CROSS_LINK

4. To check the performance for links by tag, select **By Tags(s)**, click **Add Tag**, and then select the tags and click **OK**.

★
Tags

▼ Links

R_PHY

▼ Ports

R_PHY All

(No items)

Cancel OK

- To check the performance by devices in an endpoint, select **By Device(s) In Some Endpoint**, and then click **Add Device**. In the **Advanced** tab, select from the **Router**, **Optical Node** or **Radio** tabs, or click on the **3D Explorer** tab to select a device. Click **OK**. You can add up to 10 items.

Name	Description	Site	Vendor	Tags
18 ITEMS				
ER1.ADE		ADE	Cisco RON	
ER1.PER		PER	Huawei	
CR1.CAI		CAI	Nokia	
ER1.MEL		MEL	Cisco	
CR2.MEL		MEL	Cisco RON	
CR1.ADE		ADE	Cisco RON	
CR1.BRI		BRI	Cisco RON	
ER1.BRI		BRI	Cisco	
CR2.SYD		SYD	Cisco RON	
ER1.DAR		DAR	Juniper	
CR1.MEL		MEL	Cisco RON	
CR1.PER		PER	Cisco	
CR2.ADE		ADE	Cisco	
CR1.SYD		SYD	Cisco RON	
CR2.BRI		BRI	Cisco RON	
CR1.DAR		DAR	Cisco	
ER1.SYD		SYD	Cisco	

- To check the performance for by device tag, select **By Device(s) Tag(s) In Some Endpoint**, click **Add Tag**, and then select the tags and click **OK**.
- To check the performance for links with devices in two endpoints, select **By Device(s) In 2 Endpoints** and then select one of the following for **Endpoint 1** and **Endpoint 2**.

- Specific Device(s): Click Add Device and then select a device In the Advanced tab, select from the Router, Optical Node or Radio tabs, or click on the 3D Explorer tab to select a device. Click OK. You can add up to 10 items.
- Device(s) By Tag(s): Click Add Tag and then select the tags and click OK.

- Continue to [View Utilization and Performance](#).

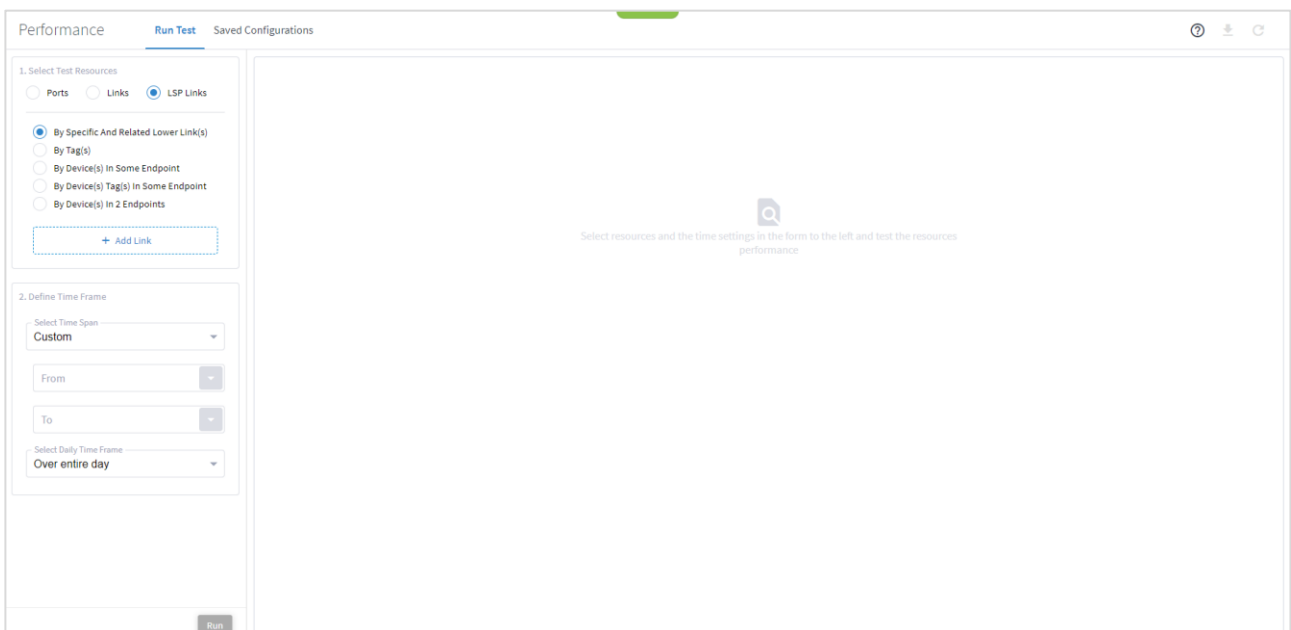
LSP Links Traffic Utilization and Performance

You can view performance for:

- Specific LSP links
- LSP links that are tagged with specific tags and tag values
- LSP links that include a device in a specific endpoint
- LSP links that include devices that are tagged with specific tags and tag values
- LSP links that include devices in two endpoints

To configure performance for LSP links:

- In the applications bar, select **Performance**.
- Select **LSP Links**.



The screenshot shows the 'Performance' configuration window. The 'Run Test' tab is active. On the left, there are two main sections: '1. Select Test Resources' and '2. Define Time Frame'. In the 'Select Test Resources' section, 'LSP Links' is selected. Underneath, 'By Specific And Related Lower Link(s)' is chosen. An 'Add Link' button is visible. The 'Define Time Frame' section has 'Custom' selected for 'Select Time Span', with 'From' and 'To' input fields. 'Over entire day' is selected for 'Select Daily Time Frame'. A 'Run' button is at the bottom left. The main area on the right contains a search icon and the text: 'Select resources and the time settings in the form to the left and test the resources performance.'

- To check the performance for specific LSP links, select **By Specific And Related Lower Link(s)**, click **Add Link**, and then select a link. In the **Advanced** tab, select from the **LSP**, **IGP**, **IP Links**, **Optical Links** or **FIBER** tabs, or click on the **3D Explorer** tab to select a link. Click **OK**. You can add up to 10 items.

Note: For more information on 3D Explorer, see the *Cisco Crosswork Hierarchical Controller Network Visualization Guide*.

Advanced 3D Explorer							
LSP		IGP	IP LINKS		OPTICAL LINKS	FIBER	
Name	Layer	Device A	Port A	Device B	Port B	Operational Status	Role
30 ITEMS							
ER1.DAR:ER1.PER:topo_R...	LSP	ER1.DAR	10.41.0.69	ER1.PER	10.41.0.65	UP	REGULAR
ER1.DAR:ER1.ADE:topo_R...	LSP	ER1.DAR	10.41.0.69	ER1.ADE	10.41.0.61	UP	REGULAR
ER1.ADE:ER1.BRI:topo_RS...	LSP	ER1.ADE	10.41.0.61	ER1.BRI	10.41.0.57	UP	REGULAR
ER1.BRI:ER1.SYD:topo_RS...	LSP	ER1.BRI	10.41.0.57	ER1.SYD	10.41.0.45	UP	REGULAR
ER1.BRI:ER1.DAR:topo_RS...	LSP	ER1.BRI	10.41.0.57	ER1.DAR	10.41.0.69	UP	REGULAR
ER1.DAR:ER1.SYD:topo_R...	LSP	ER1.DAR	10.41.0.69	ER1.SYD	10.41.0.45	UP	REGULAR
ER1.ADE:ER1.MEL:topo_R...	LSP	ER1.ADE	10.41.0.61	ER1.MEL	10.41.0.33	UP	REGULAR
ER1.SYD:ER1.MEL:topo_R...	LSP	ER1.SYD	10.41.0.45	ER1.MEL	10.41.0.33	UP	REGULAR
ER1.MEL:ER1.PER:topo_R...	LSP	ER1.MEL	10.41.0.33	ER1.PER	10.41.0.65	UP	REGULAR
ER1.ADE:ER1.PER:topo_R...	LSP	ER1.ADE	10.41.0.61	ER1.PER	10.41.0.65	UP	REGULAR
ER1.MEL:ER1.ADE:topo_R...	LSP	ER1.MEL	10.41.0.33	ER1.ADE	10.41.0.61	UP	REGULAR
ER1.MEL:ER1.BRI:topo_RS...	LSP	ER1.MEL	10.41.0.33	ER1.BRI	10.41.0.57	UP	REGULAR
ER1.MEL:ER1.SYD:topo_R...	LSP	ER1.MEL	10.41.0.33	ER1.SYD	10.41.0.45	UP	REGULAR
ER1.ADE:ER1.SYD:topo_RS...	LSP	ER1.ADE	10.41.0.61	ER1.SYD	10.41.0.45	UP	REGULAR
ER1.SYD:ER1.DAR:topo_R...	LSP	ER1.SYD	10.41.0.45	ER1.DAR	10.41.0.69	UP	REGULAR
ER1.DAR:ER1.MEL:topo_R...	LSP	ER1.DAR	10.41.0.69	ER1.MEL	10.41.0.33	UP	REGULAR
ER1.PER:ER1.ADE:topo_R...	LSP	ER1.PER	10.41.0.65	ER1.ADE	10.41.0.61	UP	REGULAR

- To check the performance for links by tag, select **By Tags(s)**, click **Add Tag**, and then select the tags and click **OK**.

★
Tags

▼ Links

R_PHY

▼ Ports

R_PHY All

(No items)

Cancel OK

- To check the performance by devices in an endpoint, select **By Device(s) In Some Endpoint**, and then click **Add Device**. In the **Advanced** tab, select from the **ROUTER**, **OPTICAL NODE** or **RADIO** tabs, or click on the **3D Explorer** tab to select a device. Click **OK**. You can add up to 10 items.

Name	Description	Site	Vendor	Tags
18 ITEMS				
ER1.ADE		ADE	Cisco RON	
ER1.PER		PER	Huawei	
CR1.CAI		CAI	Nokia	
ER1.MEL		MEL	Cisco	
CR2.MEL		MEL	Cisco RON	
CR1.ADE		ADE	Cisco RON	
CR1.BRI		BRI	Cisco RON	
ER1.BRI		BRI	Cisco	
CR2.SYD		SYD	Cisco RON	
ER1.DAR		DAR	Juniper	
CR1.MEL		MEL	Cisco RON	
CR1.PER		PER	Cisco	
CR2.ADE		ADE	Cisco	
CR1.SYD		SYD	Cisco RON	
CR2.BRI		BRI	Cisco RON	
CR1.DAR		DAR	Cisco	
ER1.SYD		SYD	Cisco	

- To check the performance for by device tag, select **By Device(s) Tag(s) In Some Endpoint**, click **Add Tag**, and then select the tags and click **OK**.
- To check the performance for links with devices in two endpoints, select **By Device(s) In 2 Endpoints**, and then select one of the following for **Endpoint 1** and **Endpoint 2**.

1. Select Test Resources

Ports
 Links
 LSP Links

By Specific And Related Lower Link(s)
 By Tag(s)
 By Device(s) In Some Endpoint
 By Device(s) Tag(s) In Some Endpoint
 By Device(s) In 2 Endpoints

Endpoint 1

Specific Device(s)
 Device(s) By Tag(s)

+ Add Device

Endpoint 2

Specific Device(s)
 Device(s) By Tag(s)

+ Add Device

- Specific Device(s): Click Add Device and then select a device In the Advanced tab, select from the Router, Optical Node or Radio tabs, or click on the 3D Explorer tab to select a device. Click OK. You can add up to 10 items.

- Device(s) By Tag(s): Click Add Tag and then select the tags and click OK.

8. Continue to [View Utilization and Performance](#).

View Traffic Utilization and Performance

After specifying the ports, links or LSP links, you must configure the time frame and window. You can then view the results in table and graph form.

To view performance:

1. In the **Select time** area, specify the period to report on:

- Select Time Span: Select the required period, either Today, Past 24 hours, Past 7 days, Past 14 days, Past 30 days, Past 60 days, or Custom. If you select Custom, then click From and To and select a date and specify a time.

2. Define Time Frame

Select Time Span
Custom

From

To

Select Daily Time Frame
Over entire day

- In the Select Daily Time Frame area either select Over entire day or Specific time span per day. If you select Specific time span per day, then click From and Until to specify a time.

2. Define Time Frame

Select Time Span
Past 14 days

Select Daily Time Frame
Specific time span per day

From

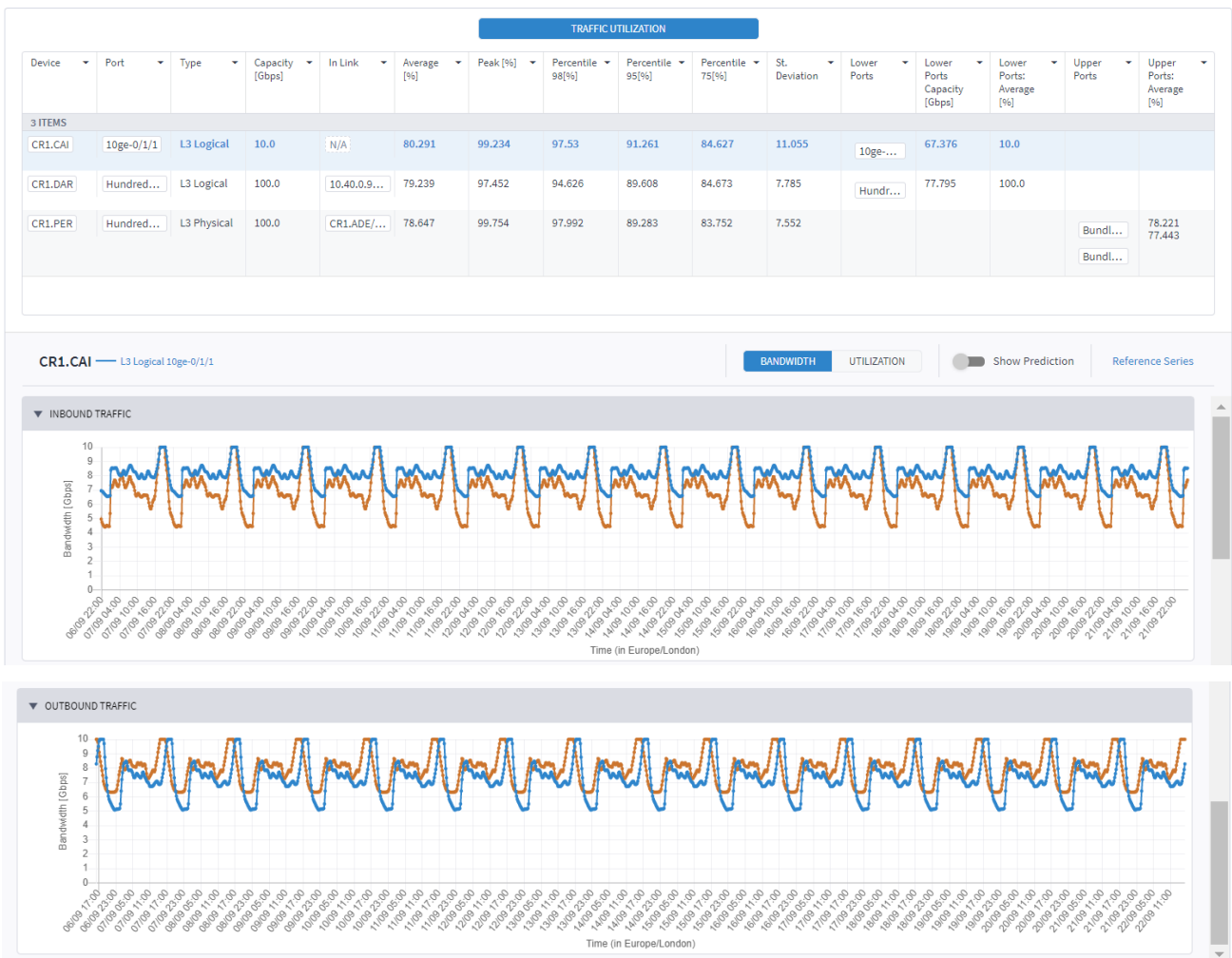
To

- Click **Run**. If there are no relevant results, a **Utilization information is not available for the selected resources** message appears.

Note: When selecting optical (layer 0 and 1) links, the **Traffic Utilization** tab appears with the information for the related L3 physical, logical, or aggregate layers.

TRAFFIC UTILIZATION															
Device	Port	Type	Capacity [Gbps]	In Link	Average [%]	Peak [%]	Percentile 98[%]	Percentile 95[%]	Percentile 75[%]	St. Deviation	Lower Ports	Lower Ports Capacity [Gbps]	Lower Ports: Average [%]	Upper Ports	Upper Ports: Average [%]
3 ITEMS															
CRI.CAI	10ge-0/1/1	L3 Logical	10.0	N/A	80.291	99.234	97.53	91.261	84.627	11.055	10ge...	67.376	10.0		
CRI.DAR	Hundred...	L3 Logical	100.0	10.40.0.9...	79.239	97.452	94.626	89.608	84.673	7.785	Hundr...	77.795	100.0		
CRI.PER	Hundred...	L3 Physical	100.0	CRI.ADE/...	78.647	99.754	97.992	89.283	83.752	7.552				Bundl...	78.221 77.443

- Select an item to see more details on the **INBOUND TRAFFIC** and **OUTBOUND TRAFFIC**.



- To filter the table, click \equiv and select the required options:
 - In numerical fields, the filter is numerical, and you can specify expressions including =, >, <, >=, <=, !=.
 - In textual fields, the filter is character-based (regular expression).

St. Deviation

Filter

✓ Select All ✕ Clear All

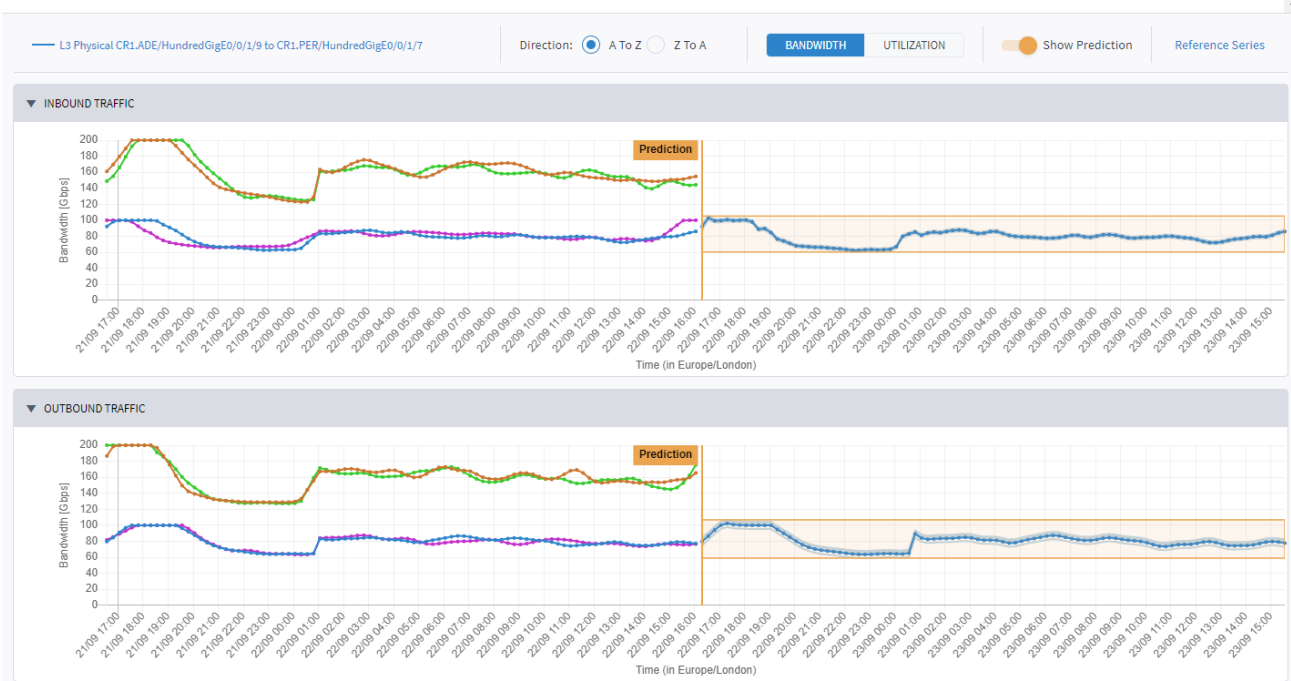
<input checked="" type="checkbox"/>	7.16	2
<input checked="" type="checkbox"/>	7.44	1
<input checked="" type="checkbox"/>	7.03	1

5. To sort the table, click on a column heading.

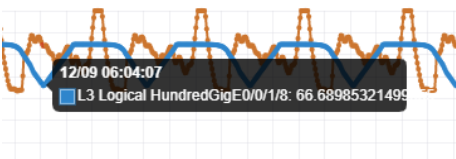
↓ Capacity [Gbps] ↑ Capacity [Gbps]

6. In the **TRAFFIC UTILIZATION** tab, to change the y-axis scaling, click **BANDWIDTH** or **UTILIZATION**.

7. To view the prediction, select **Show Prediction**.



8. Hover over a data point on the graph to see the date, time, element name and utilization value.



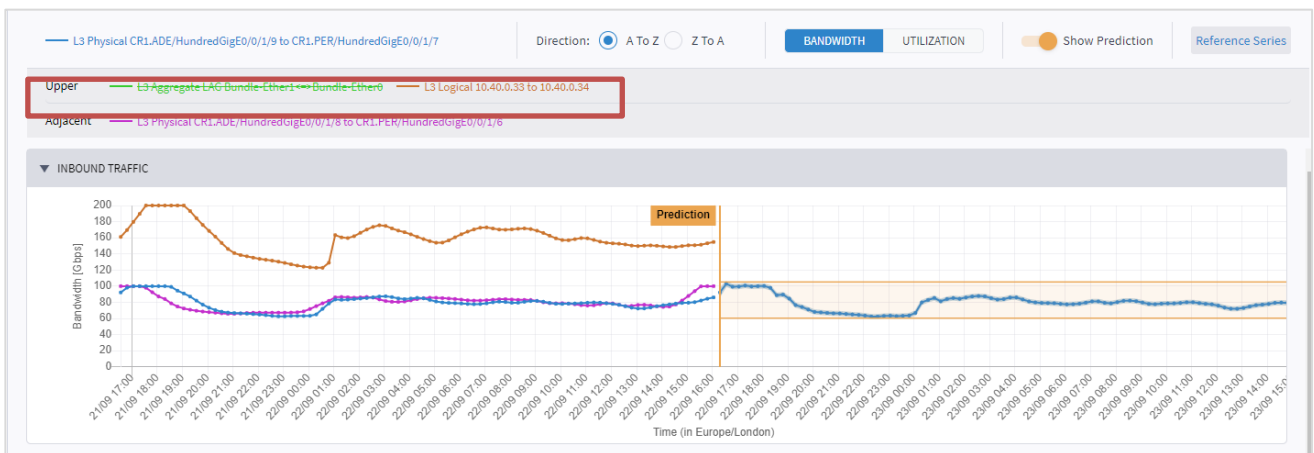
9. To change the date range of the graph and zoom in or out, click on a graph and then using the mouse wheel, scroll up (to zoom in) or scroll down (to zoom out).

10. If you select to view the data over more than one day, for a specific time of day, for example, for the past 7 days between 13:00 and 15:00, the utilization graph appears with the values for the selected time window.

11. To view the reference series toggle, select **Reference Series**.



12. To remove a reference series, click on the series description.

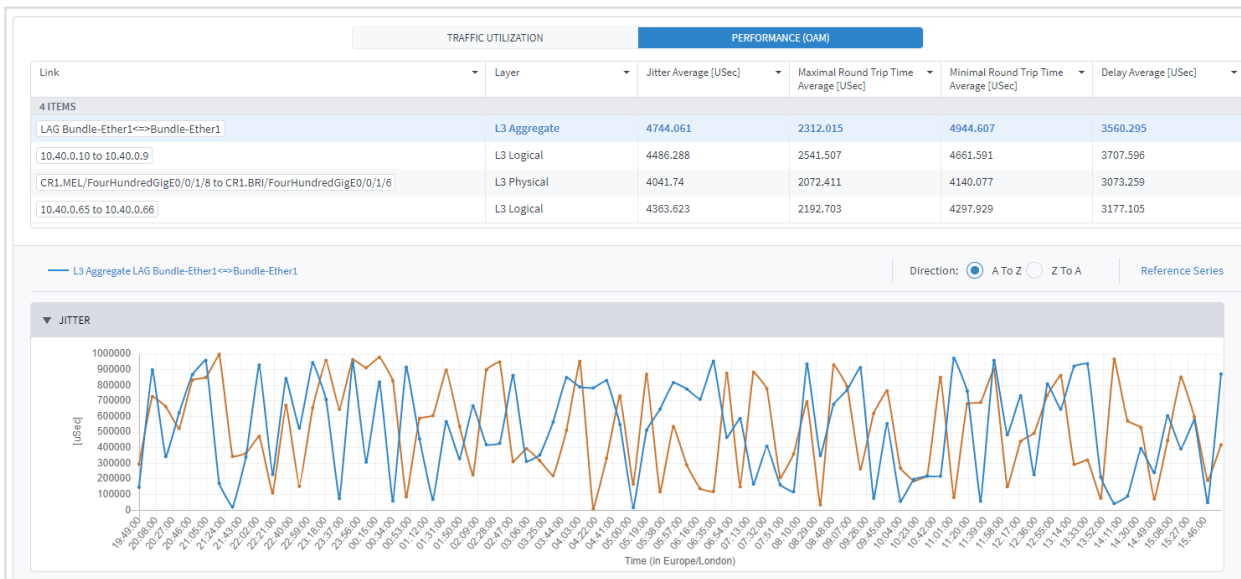


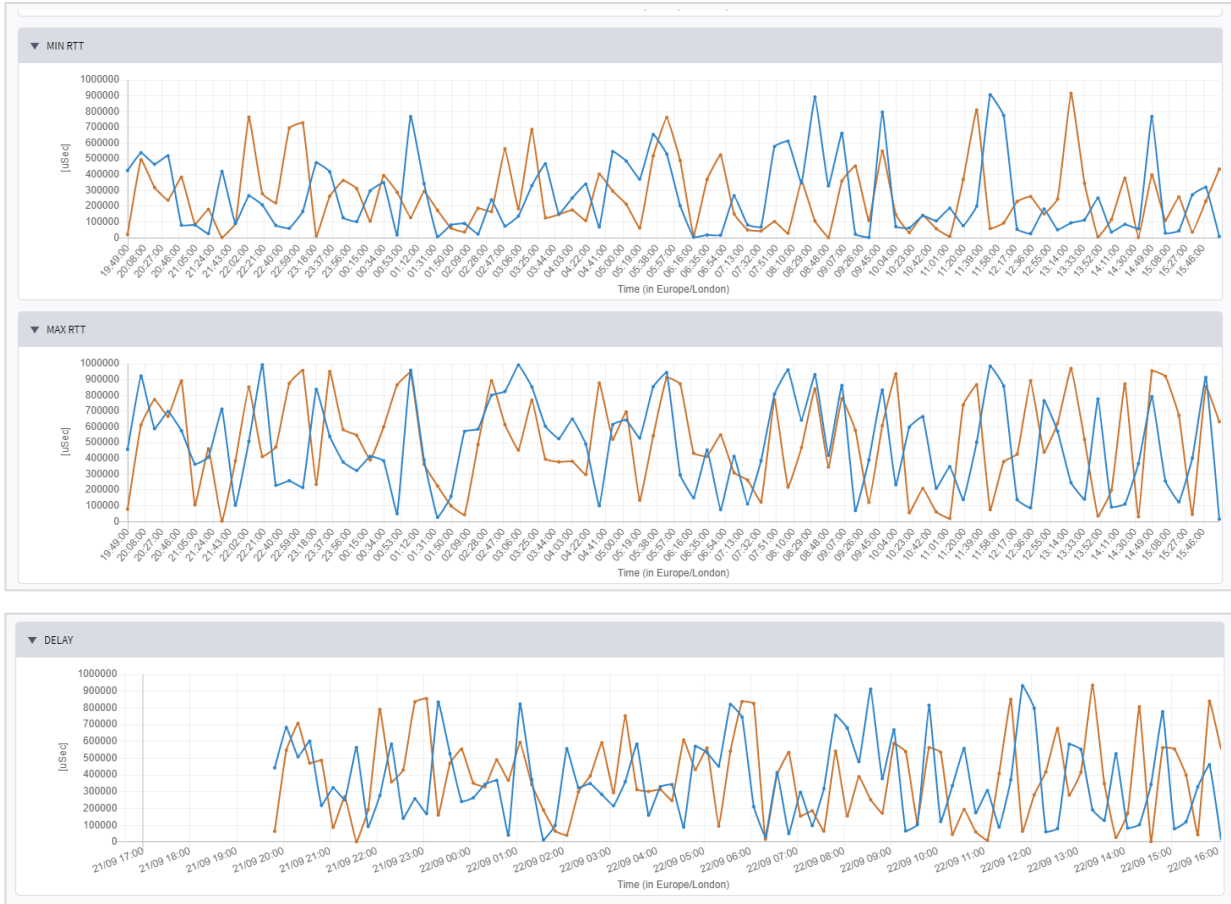
13. To change the direction, select **A to Z** or **Z to A**.

14. To view the OAM data (if relevant), click the **PERFORMANCE (OAM)** tab.

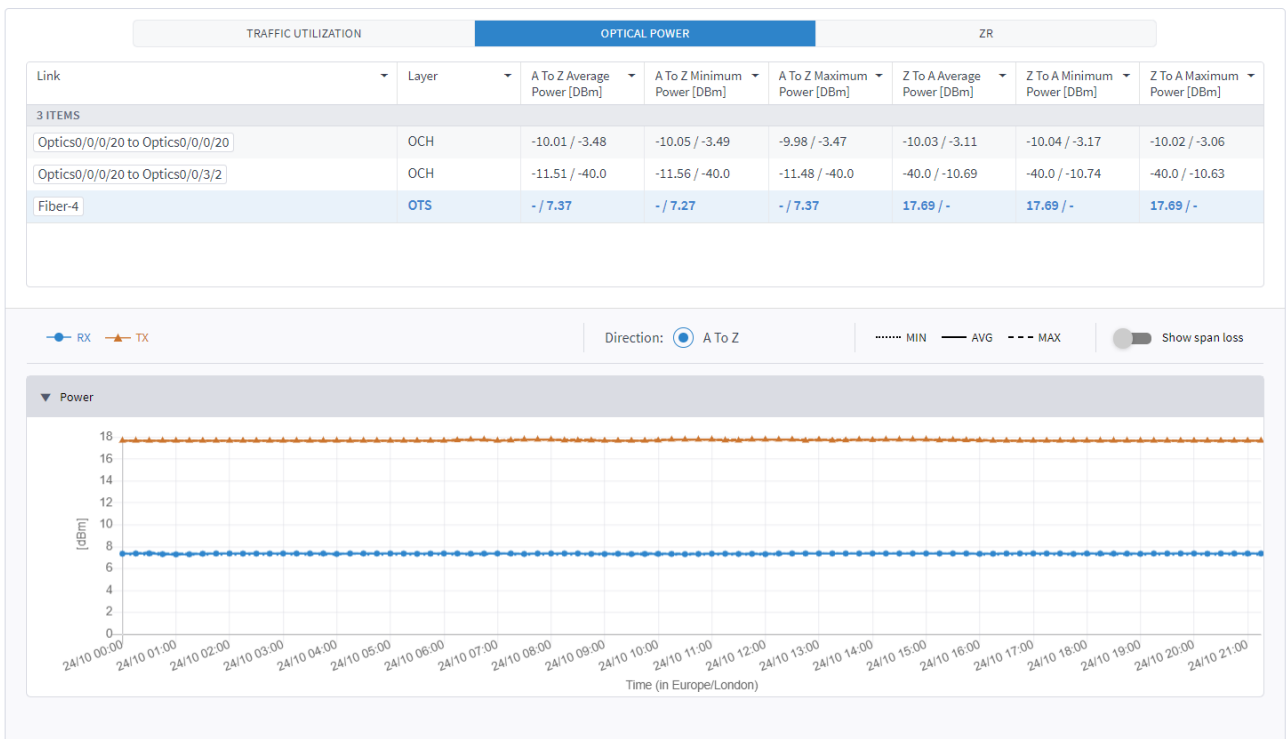
TRAFFIC UTILIZATION		PERFORMANCE (OAM)			
Link	Layer	Jitter Average [Usec]	Maximal Round Trip Time Average [Usec]	Minimal Round Trip Time Average [Usec]	Delay Average [Usec]
18 ITEMS					
CR1.MEL/FourHundredGigE0/0/1/7 to CR2.MEL/FourHundredGigE0/0/1/6	L3 Physical	4773.845	2353.843	4569.303	3429.28
CR1.ADE/HundredGigE0/0/1/9 to CR1.PER/HundredGigE0/0/1/7	L3 Physical	4446.235	1999.178	4213.782	3035.84
CR2.ADE/HundredGigE0/0/1/8 to CR2.MEL/HundredGigE0/0/2/6	L3 Physical	3931.215	2046.172	4396.224	2946.475
CR1.ADE/HundredGigE0/0/1/10 to CR1.DAR/HundredGigE0/0/1/6	L3 Physical	4704.44	2431.859	4536.792	3469.373
CR1.MEL/FourHundredGigE0/0/1/8 to CR1.BRI/FourHundredGigE0/0/1/6	L3 Physical	4190.033	2179.715	4229.106	3124.64
CR2.SYD/FourHundredGigE0/0/1/8 to CR2.BRI/FourHundredGigE0/0/1/6	L3 Physical	4917.803	2217.677	4233.33	3208.933
CR2.MEL/FourHundredGigE0/0/1/7 to CR2.SYD/FourHundredGigE0/0/1/7	L3 Physical	4301.153	2328.121	4313.07	3308.909
CR1.SYD/FourHundredGigE0/0/1/7 to CR2.SYD/FourHundredGigE0/0/1/6	L3 Physical	4698.631	1972.953	4042.561	3002.009
CR1.SYD/FourHundredGigE0/0/1/8 to CR1.BRI/FourHundredGigE0/0/1/7	L3 Physical	4047.538	2384.987	4653.397	3365.912
CR1.ADE/HundredGigE0/0/1/6 to CR1.MEL/HundredGigE0/0/2/6	L3 Physical	4501.58	2108.263	4724.52	3458.121
CR1.ADE/HundredGigE0/0/1/12 to CR1.SYD/HundredGigE0/0/2/7	L3 Physical	3957.105	2089.483	4408.032	3179.302
CR2.ADE/HundredGigE0/0/1/9 to CR2.MEL/HundredGigE0/0/2/7	L3 Physical	4805.431	1916.372	4248.698	3239.325
CR1.MEL/FourHundredGigE0/0/1/6 to CR1.SYD/FourHundredGigE0/0/1/6	L3 Physical	4145.374	2100.352	4748.385	3381.403
CR1.ADE/HundredGigE0/0/1/8 to CR1.PER/HundredGigE0/0/1/6	L3 Physical	3977.8	2027.184	4354.035	3223.713
CR1.DAR/HundredGigE0/0/1/7 to CR1.PER/HundredGigE0/0/1/8	L3 Physical	4373.257	2355.717	4737.333	3571.675
CR1.ADE/HundredGigE0/0/1/7 to CR1.MEL/HundredGigE0/0/2/7	L3 Physical	4547.57	1964.507	4217.899	3290.365
CR1.BRI/TenGigE0/0/2/6 to CR1.CAI/10ge-0/1/1	L3 Physical	4645.89	2047.15	4627.032	3192.799
CR1.ADE/HundredGigE0/0/1/11 to CR1.SYD/HundredGigE0/0/2/6	L3 Physical	4174.743	1972.574	4477.83	3384.236

15. Select an item to see more details on **JITTER**, **MIN RTT**, **MAX RTT**, **DELAY**, and **OUTBOUND TRAFFIC**.





16. To view the optical data (if relevant), click the **OPTICAL POWER** tab. Select an item to see **Power** details.



17. To view the ZR media data (if relevant), click the **ZR** tab. Select an item to see **FEC BER** and **Q** details.




Export Test Results

The tabular test results can be exported into a zip file with CSV files for offline analysis.

The export file includes extended information. The **Average** column appears in the UI, but in the export, there are two columns: **Average IN** and **Average OUT**. The UI shows the greater value of these two values.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R			
1	Execution	Value																		
2	Time	14:55:44	10-05-2020	UTC																
3																				
4	Device	Port	Capacity [C]	In Link	Average IN	Peak IN [%]	Percentile	Percentile	Percentile	St. Deviativ	Average OI	Peak OUT	Percentile	Percentile	Percentile	St. Deviativ	Lower Port	Lower Port	Low	
5	ER1.SQY	L3 Physical	10	L3 Physical	80.68	100	100	100	100	5.28	85.63	100	100	100	100	93.81	6.82	-	-	-
6	ER1.SQY	L3 Physical	10	L3 Physical	82.84	100	100	100	100	4.73	76.43	100	100	100	100	100	6.44	-	-	-
7	ER1.SQY	L3 Physical	10	-	71.69	100	100	100	100	6.09	74.38	100	100	100	100	100	6.54	-	-	-
8	ER1.SQY	L3 Logical	10	-	71.69	100	100	100	100	6.09	74.38	100	100	100	100	100	6.54	L3 Physical	10	

To export the test results:

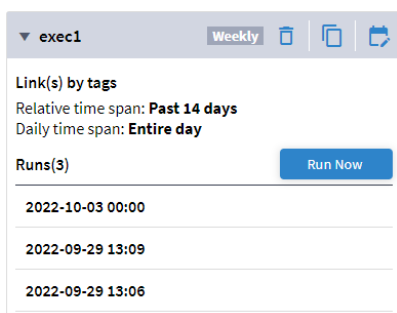
1. In the applications bar, select **Performance**.
2. Run the required test.
3. Click . The file is downloaded automatically.

Manage Configurations

You can save the test configuration and either run the test when required or use it as a basis for a new test. You can also configure a test to run periodically.

To view a saved test result:

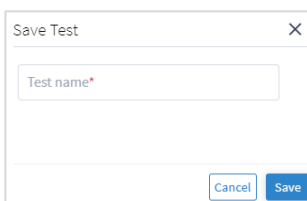
1. In the applications bar, select **Performance**.
2. Expand the required test.



3. Select a run to view the results or click **Run Now** to execute the test.

To save a test configuration:

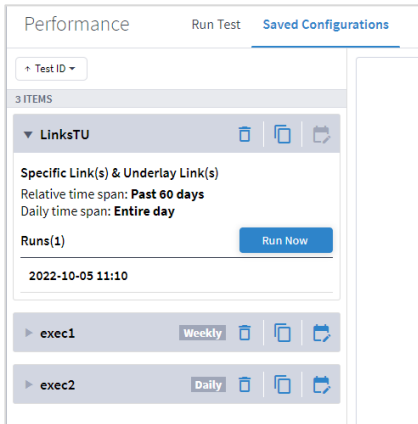
1. In the applications bar, select **Performance**.
2. Run the required test.
3. Click **Save**.



4. Enter a test name.
5. Click **Save**. The configuration is now available to run on the **Saved Configurations** tab.


To run a saved test configuration:

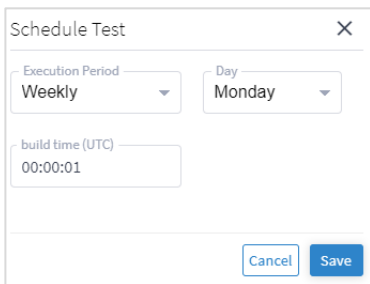
1. In the applications bar, select **Performance**.
2. Select the **Saved Configurations** tab.



3. To run a test, expand the required test.
4. Click **Run Now** or if you want to edit the test, click , modify the test as required, and then click **Run**.


To set a test to run periodically:

1. In the applications bar, select **Performance**.
2. Select the **Saved Configurations** tab.
3. For the required test, click .



4. Select whether to execute the test **Weekly** (and on which day), or **Daily**.
5. Specify the **build time (UTC)**.
6. Click **Save**.

To delete a test:

1. In the applications bar, select **Performance**.
2. Select the **Saved Configurations** tab.
3. Click . The test is deleted (there is no confirmation).

Other Ways to See Performance Data

- In Explorer, for a physical or logical port of a router, the **Utilization Over 24h** graph also appears in the Info window (if the port was utilized over latest 24 hours). For links and LSP links no data is presented in the Explorer window.

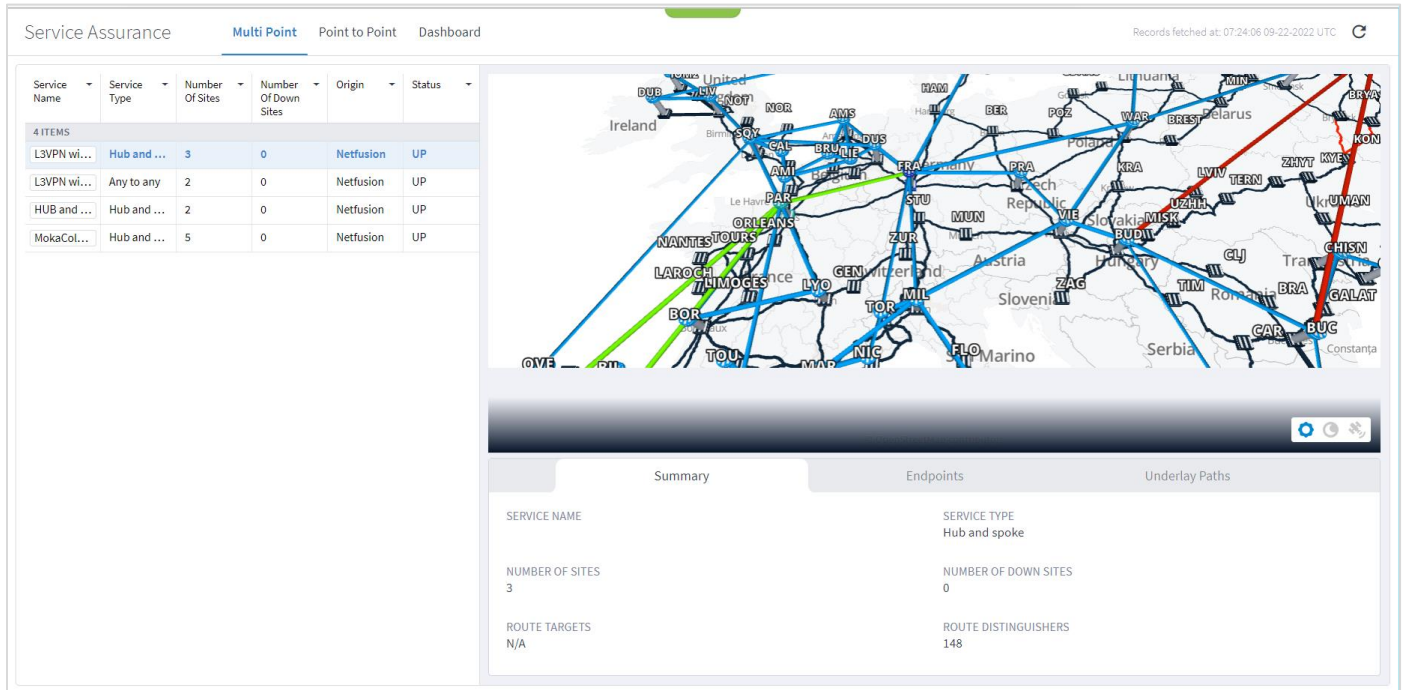


- In the Service Assurance application, for point to point services. See [View the Point to Point Services](#).
- In the Path Analysis application, for a path. See [Analysis a Path](#).

Service Assurance

The Service Assurance application enables you to visualize the L1-L2-L3 service configuration and underlay paths, with UNIs performance and service-related events history.

For more information on services and service provision, see the *Cisco Crosswork Hierarchical Controller Service Provisioning User Guide*.



For more information on the 3D Explorer application, see the *Cisco Crosswork Hierarchical Controller Network Visualization Guide*.

View the Multi Point Services

Crosswork Hierarchical Controller discovers L3-VPN sites (endpoints), VRFs and underlay paths as LSPs across multiple domains (autonomous systems) and vendors and maps it to the optical network. Discovered VPNs are displayed in the Service Assurance application with their Route Distinguishers (RDs), Route Targets (RTs), type (hub & spoke or any to any/full mesh), sites, underlay LSPs and IGP path visualized on the map. The RD is used to keep all prefixes in the BGP table unique, and the RT is used to transfer routes between VRFs/VPNs.

You can view a list of these Multi Point services and view their endpoints and underlay paths. The Multi Point services can be of type:

- **Any to any:** A full mesh non-hierarchical service where any site can communicate with any site.
- **Hub and spoke:** A hierarchical service where hub sites can communicate with all other sites and spoke sites can only communicate with hub sites.

To view the Multi Point Services:

1. In the applications bar, select **Service Assurance**.
2. Select the **Multi Point** tab. The table on the left lists the multi point services and includes information on:
 - **Service Name:** The name of the service as defined in the Services Manager.
 - **Service Type:** The service type, **Any to any** or **Hub and spoke**.
 - **Number of Sites:** The number of sites in the service.
 - **Number of Down Sites:** The number of sites in the service that are DOWN.
 - **Origin:** The service origin of the service, either **Netfusion** (created by Crosswork Hierarchical Controller) or **Network**.
 - **Status:** The service status, either **UP** or **DOWN**.
3. Select the required service. The Explorer map shows all sites and the underlay paths for the selected service.

The screenshot displays the 'Service Assurance' interface with the 'Multi Point' tab selected. On the left, a table lists four services. On the right, a network map shows various sites and their connections. Below the map, there are three tabs: 'Summary', 'Endpoints', and 'Underlay Paths'. The 'Summary' tab is active, showing details for the selected service.

Service Name	Service Type	Num Of Site	Num Of Dow Site	Orig	Stat
4 ITEMS					
L3VPN with RSVP underlay	Hub and spoke	3	0	Ne...	UP
L3VPN with Segment Routing underlay	Any to any	2	0	Ne...	UP
HUB and Spoke L3VPN with SRTE underlay	Hub and spoke	2	0	Ne...	UP
MokaCola L3VPN with RSVP underlay	Hub and spoke	5	0	Ne...	UP

Device Name	Port Name	Operati State	Admin State	VRF Name	VRF Description	VLAN ID	IP Address	Tags
2 ITEMS								
ZR_ER2.SQY	L3_VPN port at ZR...	UP	UP		L3 VPN port at serv...	1400	20.20...	
ZR_ER2.LIS	L3_VPN port at ZR...	UP	UP		L3 VPN port at serv...	1300	20.20...	

4. The **Summary** tab includes the following details:
 - **Service Name:** The service name.
 - **Service Type:** The service type, **Any to any** or **Hub and spoke**.
 - **Number of Sites:** The number of sites in the service.
 - **Number of Down Sites:** The number of sites in the service that are DOWN.
 - **Route Targets:** The number of route targets.
 - **Route Distinguishers:** The number of route distinguishers.

Summary	Endpoints	Underlay Paths
SERVICE NAME	SERVICE TYPE Hub and spoke	
NUMBER OF SITES 3	NUMBER OF DOWN SITES 0	
ROUTE TARGETS N/A	ROUTE DISTINGUISHERS 148	

5. A list of the Endpoints appears below the map with the following details:

- **Device Name:** The device name.
- **Port Name:** The interface port name.
- **Operational State:** The operational status of the port (**UP** or **DOWN**).
- **Admin State:** The admin status of the port (**UP** or **DOWN**).
- **VRF Name:** The Virtual Routing and Forwarding (VRF) name.
- **VRF Description:** The VRF description.
- **VLAN ID:** The endpoint VLAN ID.
- **IP Address:** The endpoint IP address.
- **Role:** The role of the endpoint, **SPOKE** or **HUB**.
- **Tags:** The endpoint tags.

Summary				Endpoints		Underlay Paths			
Device Name	Port Name	Operational State	Admin State	VRF Name	VRF Description	VLAN ID	IP Address	Role	Tags
3 ITEMS									
CR1.LIS	L3_VPN port at CR1.LIS, s...	UP	UP		L3_VPN port at service L3VPN with RSVP underlay	1901	10.1.12...	SPOKE	
CR1.PAR	L3_VPN port at CR1.PAR, s...	UP	UP		L3_VPN port at service L3VPN with RSVP underlay	1900	10.1.10...	HUB	
CR1.FRA	L3_VPN port at CR1.FRA, s...	UP	UP		L3_VPN port at service L3VPN with RSVP underlay	1902	10.1.14...	SPOKE	

6. The Underlay Paths tab includes the following details:

- **RT:** The route target number.
- **LSP Name:** The LSP name (if RSVP-TE or LDP).
- **Path Type:** The type of the underlay path, SR Policies or RSVP-TE Tunnels.
- **Source (Export):** The source site name (geo site:device:port:vlan).
- **Destination (Import):** The destination site name (geo site:device:port:vlan).
- **Underlay Hops:** The number of hops in the underlay path.
- **Link Layer:** The link layer.
- **Tags:** The underlay tags.

Summary				Endpoints		Underlay Paths			
RT	LSP Name	Path Type	Source (Export)	Destination (Import)	Underlay Hops	Link Layer	Oper Status	Tags	
2 ITEMS									
N/A	SR_P_600	SR_POLICY	SPB CR1.SPB L3_VPN port at CR1.SPB, ser...	DUB CR1.DUB L3_VPN port at CR1.DUB, se...	11	L3 VPN	N_A	Tag All	
N/A	SR_P_600_reverse	SR_POLICY	DUB CR1.DUB L3_VPN port at CR1.DUB, se...	SPB CR1.SPB L3_VPN port at CR1.SPB, ser...	11	L3 VPN	N_A	Tag All	

Note: Underlay paths are not discovered or calculated for sites located in different domains (inter-AS option C).

7. Select a path in the table to display it in the map.

View the Point to Point Services

You can view point to point services of type:

- **Circuit E-Line:** An Ethernet connection between two ETH client ports on Transponder or Muxponder over OTN signal.
- **Packet E-Line:** A point-to-point connection between two routers or transponders/muxponders over MPLS-TP or IP-MPLS.

To view the point to point services:

1. In the applications bar, select **Service Assurance**.
2. Select the **Point to Point** tab. The table on the left lists the multi point services and includes information on:
 - **Service Name:** The name of the service as defined in the Services Manager.
 - **Service Type:** The service type, **Packet e-line** or **Circuit e-line**.
 - **Number of Down Sites:** The number of sites in the service that are DOWN.
 - **Origin:** The origin of the service.
 - **Status:** The service status, either **UP** or **DOWN**.
3. Select the required service. The Explorer map shows the selected service.

The screenshot shows the Service Assurance interface with the 'Point to Point' tab selected. On the left, a table lists 6 services. The selected service is 'E-Line Packet Service <IP Domain E-Lin...'. The map on the right shows a network topology with various sites and connections. Below the map, there is a 'Summary' tab with a table of endpoints.

Device Name	Port Name	Operational State	Admin State	VLAN ID	BW Eir	BW Cir	Tags
2 ITEMS							
ZR_ER2.SQY	VIRTUAL_UNI port at ZR_ER2...	UP	UP	2500	2000	5000000000	
ZR_ER2.LIS	VIRTUAL_UNI port at ZR_ER2...	UP	UP	2500	2000	10000000000	

4. The **Summary** tab includes the following details:

- **Service Name:** The service name.

- **Service Type:** The service type, **Packet e-line** or **Circuit e-line**.
- **Status:** The service status, either **UP** or **DOWN**.
- **Origin:** The origin of the service.
- **Creation Date:** The date the service was created.
- **Optimization Goal:** The optimization goal as defined in the service.
- **Include Link:** The IP or optical links that were included in the service intent.
- **Exclude Link:** The IP or optical links that were excluded in the service intent.
- **Disjoint Service Name:** The disjoint service name. This means that the new Packet E-Line or 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).

Summary	Endpoints	Underlay Paths	History
SERVICE NAME E-Line Packet Service <IP Domain E-Line 1>		SERVICE TYPE Packet e-line	
STATUS UP		ORIGIN Netfusion	
CREATION DATE 2022-08-25 15:56:01		OPTIMIZATION GOAL NUMBER_OF_HOPS	
INCLUDE LINK N/A		EXCLUDE LINK N/A	
DISJOINT SERVICE NAME N/A			

5. In the **Endpoint** tab, a list of the Endpoints appears below the map with the following details:

- **Device Name:** The device name.
- **Port Name:** The interface port name.
- **Operational State:** The operational status of the port (**UP** or **DOWN**).
- **Admin State:** The admin status of the port (**UP** or **DOWN**). If **DOWN**, this element constitutes a root cause failure in and of itself (and not simply an affected element).
- **VLAN ID:** The endpoint VLAN ID.
- **BW Eir:** The bandwidth Excess Information Rate (EIR).
- **BW Cir:** The bandwidth Committed Information Rate (CIR).
- **Tags:** The endpoint tags.

6. Select the required endpoint. The performance information appears for the selected service map with the following details:

- **Device Name:** The device name.
- **Port:** The port name.

- **Type:** The port name.
- **Average [%]**
- **Peak [%]**
- **Percentile [98%]**
- **Percentile [95%]**
- **Percentile [75%]**

- **St Deviation**

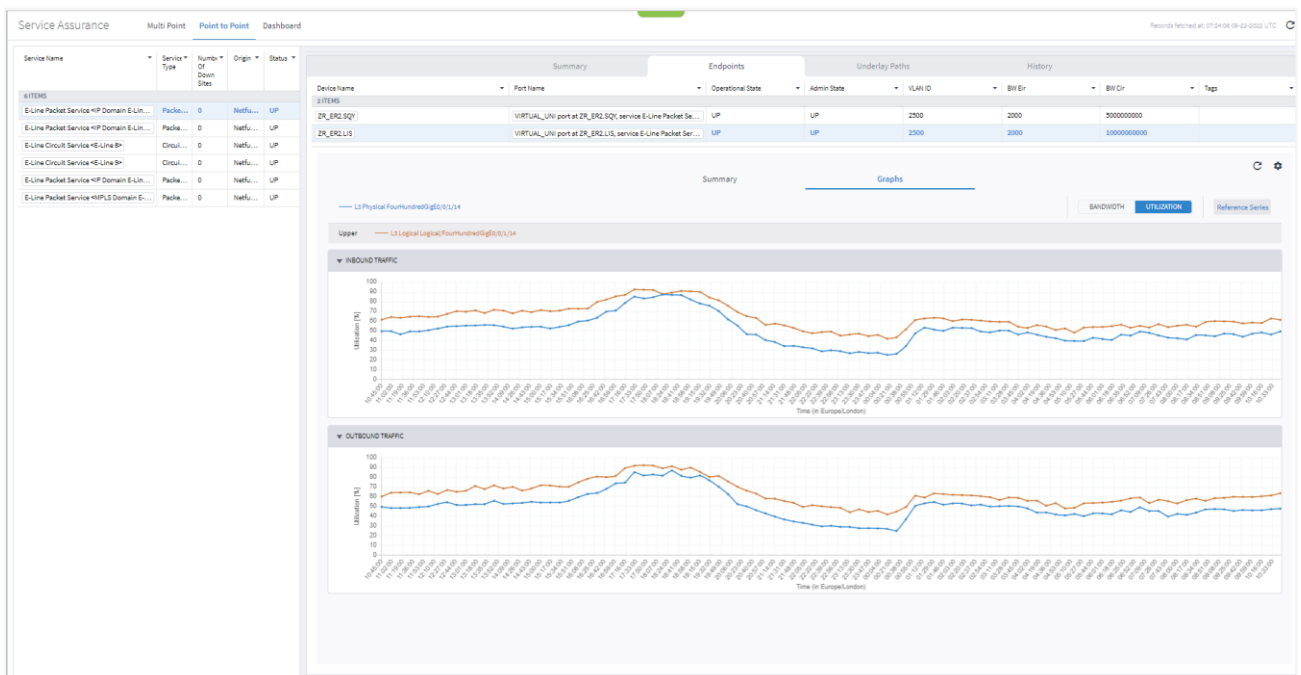
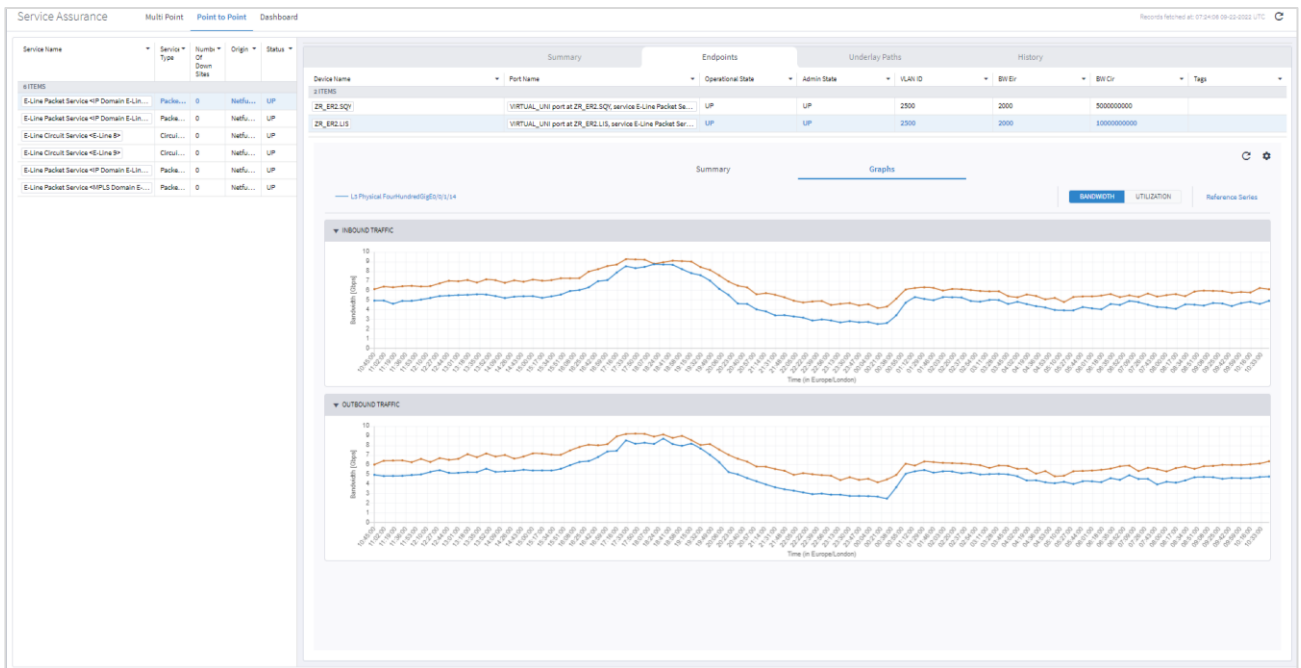
The screenshot shows the Service Assurance dashboard with a network map of Europe and a table of endpoints. The table lists two items:


Device Name	Port Name	Operational State	Admin State	VLAN ID	BW Eir	BW Cir	Tags
ZR_ER2.SQY	VIRTUAL_UNI port at ZR_ER2...	UP	UP	2500	2000	5000000000	
ZR_ER2.LIS	VIRTUAL_UNI port at ZR_ER2...	UP	UP	2500	2000	10000000000	

This view shows a detailed table of endpoints and a performance summary table. The endpoints table is identical to the one above. The performance summary table for ZR_ER2.LIS is as follows:

Device	Port	Type	Average [%]	Peak [%]	Percentile 98[%]	Percentile 95[%]	Percentile 75[%]	St. Deviation
ZR_ER2.LIS	FourHundre...	L3 Physical	50.501	87.313	86.741	83.565	54.355	14.432

To view graphs of the performance, click the **Graphs** tab in the lower pane. For additional information on performance, see [Performance](#).



7. Click  and specify the period to report on:
 - **Select Time Span:** Select the required period, either **Today**, **Past 24 hours**, **Past 7 days**, **Past 14 days**, **Past 30 days**, **Past 60 days**, or **Custom**. If you select **Custom**, then click **From** and **To** and select a date and specify a time.

- In the **Select Daily Time Frame** area either select **Over entire day** or **Specific time span per day**. If you select **Specific time span per day**, then click **From** and **Until** to specify a time.

8. Click **Export** to download the performance statistics.
9. The **Underlay Paths** tab includes the following details:
 - **Link Name:** The link name.
 - **Source (Export):** The source site name (geo site:device:port:vlan).
 - **Destination (Import):** The destination site name (geo site:device:port:vlan).
 - **Link Layer:** The link layer. For Circuit e-line: **ODU**. For Packet e-line: **MPLS TP**, **SR Policy**, or **LSP**.
 - **Oper Status:** The operational status.
 - **Role:** Either the **main** path or the **protection** path.
 - **Tags:** The underlay tags.

Summary		Endpoints		Underlay Paths		History	
Link Name	Source (Export)	Destination (Import)	Link Layer	Oper Status	Role	Tags	
2 ITEMS							
SR_P_100_reverse	ZR_ER2.SQY-100.0.0.157 (router-id) loopb...	ZR_ER2.LIS-100.0.0.134 (router-id) loopb...	SR Policy	Up	main	Tag All	
SR_P_100	ZR_ER2.LIS-100.0.0.134 (router-id) loopb...	ZR_ER2.SQY-100.0.0.157 (router-id) loopb...	SR Policy	Up	main	Tag All	

10. The **History** tab shows all changes in configuration or in operational status of the service and its underlay path links or tunnels and includes the following details:

- **Time:** The time of the event.
- **Object Name:** The object name.
- **Object Type:** The object type, port, service, or link.
- **Action Type:** The action type, **UPDATE**, **INSERT** or **DELETE**.
- **Changed Attributes:** The attributes changed.

Summary		Endpoints		Underlay Paths		History	
Time	Object Name	Object Type	Action Type	Changed Attributes			
10 ITEMS							
Aug 25 2022 16:02:47 UTC	E-Line Packet Service <IP Domain...	Service	UPDATE	tags: {} → {"Tag": ["All"]}			View all changes (1)
Aug 25 2022 16:02:47 UTC	SR_P_100_reverse	Link	UPDATE	tags: {} → {"Tag": ["All"]}			View all changes (1)
Aug 25 2022 16:02:47 UTC	SR_P_100	Link	UPDATE	tags: {} → {"Tag": ["All"]}			View all changes (1)
Aug 25 2022 16:00:31 UTC	VIRTUAL_UNI port at ZR_ER2.LIS, ...	Port	UPDATE	tags: {} → {"Tag": ["All"]}			View all changes (1)

View the Dashboard

In the Dashboard you can see how many services were discovered and how many services are operationally down.

To view the Dashboard:

1. In the applications bar, select **Service Assurance**.
2. Select the **Dashboard** tab.

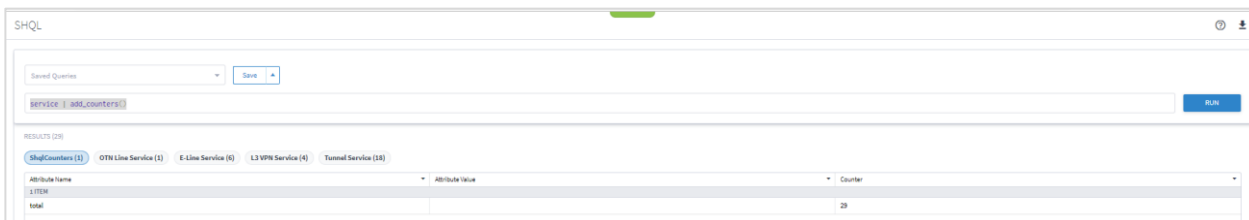
Service Assurance		Multi Point	Point to Point	Dashboard	Records fetched at: 07:24:06 09-22-2022 UTC
Discovered Services	29	Operationally Down Services	0		

View the Services using SHQL

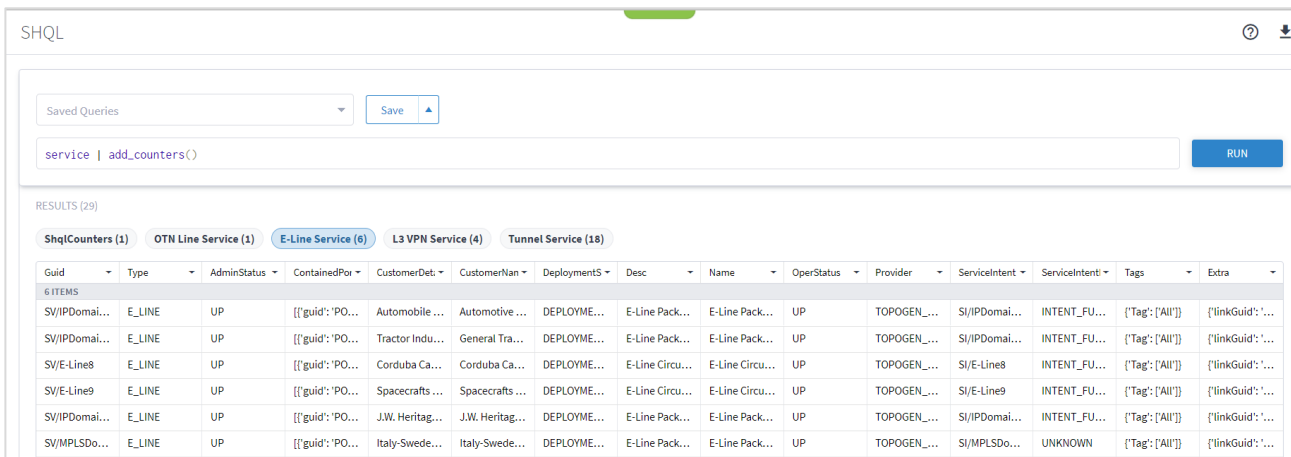
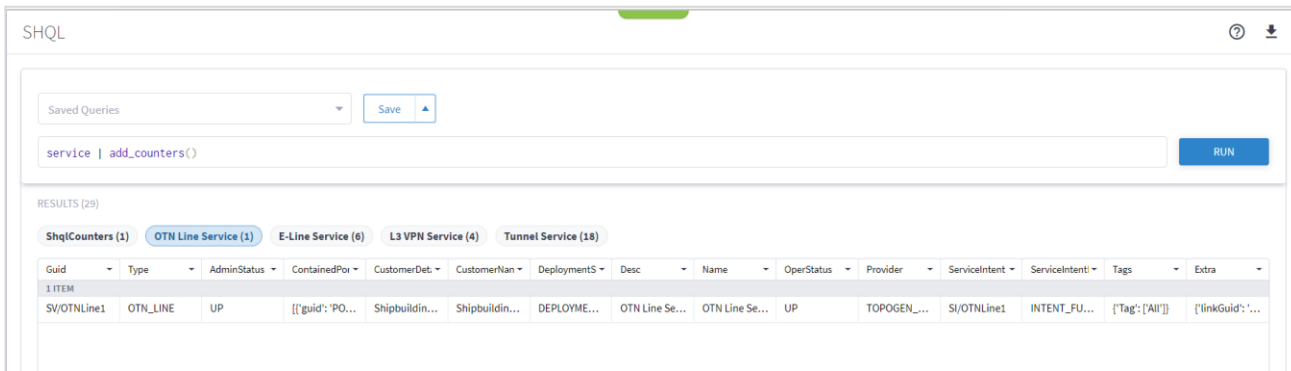
If you have access to SHQL, you can execute a query to view a list of the various services (by type).

To view the services using SHQL:

1. In the applications bar, select **SHQL Query**.
2. Enter service | **add_counters()** and click **RUN**. This shows you the total number of configured services.



3. Click the required service tab to view a list of the services, for example, OTN Line Services, E-Line Services, L3 VPN Services, or Tunnel Services (RSVP Tunnel and SR Policy).



SHQL

Saved Queries Save

service | add_counters()

RUN

RESULTS (29)

[ShqCounters \(1\)](#)
[OTN Line Service \(1\)](#)
[E-Line Service \(6\)](#)
[L3 VPN Service \(4\)](#)
[Tunnel Service \(18\)](#)

Guid	Type	AdminStat	Contained	Customer	Customer	Deployme	Desc	Name	OperStatu	Provider	ServiceInt	ServiceInt	Tags	Extra	AnyToAnyt	SpokeRou	VpnTopolo
4 ITEMS																	
SV/L3VP...	L3_VPN	UP	{{'guid': '...	Test L3 V...	Test	DEPLOY...	L3 VPN s...	L3VPN wi...	UP	TOPOGE...	SI/L3VPN...	INTENT_...	{'Tag': [A...	{'linkGui...			HUB_AN...
SV/L3VP...	L3_VPN	UP	{{'guid': '...	Test L3 V...	Test	DEPLOY...	L3 VPN s...	L3VPN wi...	UP	TOPOGE...	SI/L3VPN...	INTENT_...	{'Tag': [A...	{'linkGui...			ANY_TO...
SV/HUB...	L3_VPN	UP	{{'guid': '...	Agile Dev...	ADTLtd	DEPLOY...	L3 VPN s...	HUB and ...	UP	TOPOGE...	SI/HUB...	INTENT_...	{'Tag': [A...	{'linkGui...	66002	66002	HUB_AN...
SV/Moka...	L3_VPN	UP	{{'guid': '...	Moka Col...	Moka Cola	DEPLOY...	L3 VPN s...	MokaCol...	UP	TOPOGE...	SI/Moka...	INTENT_...	{'Tag': [A...	{'linkGui...	273	273	HUB_AN...

SHQL

Saved Queries Save

service | add_counters()

RUN

RESULTS (29)

[ShqCounters \(1\)](#)
[OTN Line Service \(1\)](#)
[E-Line Service \(6\)](#)
[L3 VPN Service \(4\)](#)
[Tunnel Service \(18\)](#)

Guid	Type	AdminStatus	CustomerDetails	CustomerName	DeploymentStat	Desc	Name	OperStatus	Provider	ServiceIntent	ServiceIntentRel	Extra
18 ITEMS												
SV/lsp/igpp/d16...	TUNNEL	UP	Cisco (Sedona)	SedonaSys	DEPLOYMENT...	RSVP Tunnel <...	RSVP Tunnel <...	UP	TOPOGEN_RS...	SI/RSVP2Rama...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/lsp/igpp/c8e...	TUNNEL	UP	Automobile In...	Automotive Ltd.	DEPLOYMENT...	RSVP Tunnel <...	RSVP Tunnel <...	UP	TOPOGEN_RS...	SI/RSVP1Belfa...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Botas de traba...	Botas de trabajo	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_500_r...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Putilivsky Zav...	Putilivsky Zavod	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_600_r...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Automobile In...	Automotive Ltd.	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_100	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Automobile In...	Automotive Ltd.	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_100_r...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Fashion Indust...	Fashion Ltd.	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_400	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Military Indust...	Military & Wea...	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_300_r...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Fashion Indust...	Fashion Ltd.	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_400_r...	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Automobile In...	Automotive Ltd.	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_101	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Aerospace Ind...	Aerospace Ltd.	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_201	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Military Indust...	Military & Wea...	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_300	INTENT_FULLLY...	{'tunnelGuid': '...
SV/sr_policy/fi...	TUNNEL	UP	Aeromarca Ind...	Aeromarca Ltd	DEPLOYMENT...	SR Policy Tunn...	SR Policy Tunn...	UP	TOPOGEN_SR...	SI/SR_P_201_r...	INTENT_FULLLY...	{'tunnelGuid': '...

View the Services in Services Manager

Services Manager is an application that manages provisioning, modification, and deletion of services of all types. If you have access to Services Manager, you can view a list of the tunnels, point to point services, and multi point services.

Services Manager provides information on configuration of the services. It can help you view the status of user operations and to track mismatches between desired and actual configuration.

To view the services in Services Manager:

1. In the applications bar, select **Services Manager**.
2. Select the required tab.

Services Manager Tunnels Point to Point Multi Point Operations Settings

[Create New Tunnel](#)

Tunnel Name	Type	Configuration State	Creation Date	BW Reservation [Mbps]	Control Method	Last 24h Operations	Last Operation
18 ITEMS							
SR Policy Tunnel <SR_P_400>	Segment Routing Policy	INSTALLED		5000	PCE	0	
SR Policy Tunnel <SR_P_300>	Segment Routing Policy	INSTALLED		10000	PCE	0	
SR Policy Tunnel <SR_P_101_reverse>	Segment Routing Policy	INSTALLED		1000	PCE	0	
SR Policy Tunnel <SR_P_600_reverse>	Segment Routing Policy	INSTALLED		3000	PCE	0	
SR Policy Tunnel <SR_P_600>	Segment Routing Policy	INSTALLED		3000	PCE	0	
SR Policy Tunnel <SR_P_500>	Segment Routing Policy	INSTALLED		3000	PCE	0	

SR Policy Tunnel <SR_P_400>

Summary Endpoints Underlay Path Operations Events Actions

GUID	Site	Role	Port	Device	Operational State	Admin State
2 ITEMS						
PO/fgp/isis/default-domain/ZR...	MAD	Source	ZR_ER2.MAD-100.0.0.127 (route...	ZR_ER2.MAD	Up	N A
PO/fgp/isis/default-domain/ZR...	SQY	Destination	ZR_ER2.SQY-100.0.0.157 (route...	ZR_ER2.SQY	Up	N A

Services Manager Tunnels Point to Point Multi Point Operations Settings

[Create New P2P](#)

Name	P2P Type	Configuration State	Creation Date	Endpoint A	Endpoint B	Speed	Operational State	Last 24h Operations	Last Operation
7 ITEMS									
E-Line Packet Service <MPLS Doma...	Packet E-Line	INSTALLED		CR1.MIL - HundredGigE0/0/2...	CR1.STO - HundredGigE0/0/...	10000 Mbps	Up	0	
E-Line Packet Service <IP Domain E...	Packet E-Line	INSTALLED		CR2.PRA - HundredGigE0/0/...	CR2.HEL - GigabitEthernet0/...	3000 Mbps...	Up	0	
E-Line Packet Service <IP Domain E...	Packet E-Line	INSTALLED		CR2.BEL - HundredGigE0/0/...	CR2.COR - HundredGigE0/0/...	100000 Mbps	Up	0	
E-Line Packet Service <IP Domain E...	Packet E-Line	INSTALLED		ZR_ER2.LIS - FourHundredG...	ZR_ER2.SQY - FourHundred...	10000 Mbp...	Up	0	
OTN Line Service <OTN Line 1>	OTN Line	INSTALLED		OTN1VAL01 - 1-1-2	OTN1ROM01 - 1-1-2	ODU2	Up	0	
E-Line Circuit Service <E-Line 9>	Circuit E-Line	INSTALLED		OTN1MAN01 - 1-1-2	OTN2WAR01 - OPT-1-1-2	Eth 40G	Up	0	
E-Line Circuit Service <E-Line 8>	Circuit E-Line	INSTALLED		OTN1COR01 - 1-1-2	OTN1MIL01 - 1-1-2	Eth 40G	Up	0	

Services Manager Tunnels Point to Point Multi Point Operations Settings

[Create L3 VPN](#)

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 und...	L3 VPN	INSTALLED		2	ADT.Ltd	0	
L3VPN with Segment Routing underlay	L3 VPN	INSTALLED		2	Test	0	
L3VPN with RSVP underlay	L3 VPN	INSTALLED		3	Test	0	

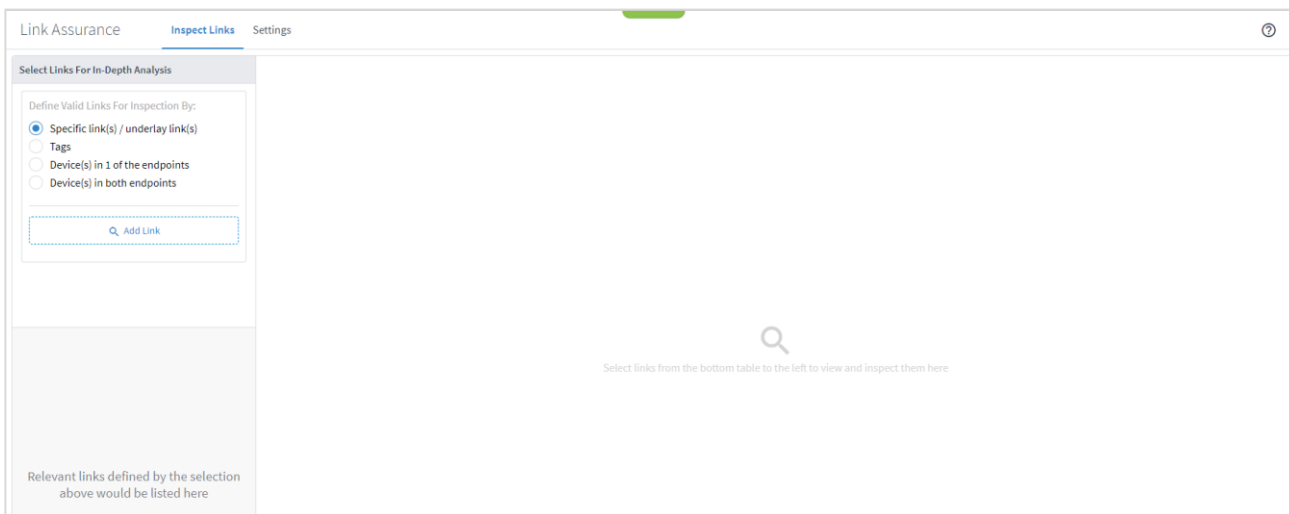
Link Assurance

The Link Assurance application allows you to visualize any IP or Ethernet links across ZR and OLS with performance in all layers, that is, RON links. This all-in-one app is used for analysis of router-to-router or OT-to-OT link across ZR/+ pluggables and optical line systems and enables you to view aggregated link status as propagated from all layers, and drill down to performance and events history per link.

Inspect Links

To inspect links:

1. In the applications bar, select **Link Assurance**.



2. To inspect links for specific links/underlay links, select **Specific link(s) / underlay link(s)**, click **Add Link**. In the **Advanced** tab, select a link in the **LINKS** tab, or click on the **3D Explorer** tab to select a link (optical links are in black). Click **OK**. You can add up to 10 items.

Note: For more information on 3D Explorer, see the *Cisco Crosswork Hierarchical Controller Network Visualization Guide*.

LINKS							
Name	Layer	Device A	Port A	Device B	Port B	Operational Status	Role
43485 ITEMS							
ILA-SD1EV001-SD1LIS01-0...	OTS	ILA-SD1EV001-SD1LIS01-0	1-1-3-8_5	SD1LIS01	1-2-3-8_5	UP	REGULAR
2141748004	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
5512734037	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
2047682057	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
7321748029	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
675963032	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
1010617026	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
2277890071	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
5765253008	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
1160392045	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
7005042027	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
4627150058	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
5927468010	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
6848239012	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
6018374011	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
3387558003	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR
4013129079	FIBER_SEGMENT	N/A	N/A	N/A	N/A	UP	REGULAR



Link Assurance Inspect Links Settings

Select Links For In-Depth Analysis

Define Valid Links For Inspection By:

Specific link(s) / underlay link(s)

Tags

Device(s) in 1 of the endpoints

Device(s) in both endpoints

Add Link

Name Type Status

3 ITEMS

SD1BRI02/1-2-1_2 to SD1CA...	NMC	UP
SD1BRI02/1-2-1 to SD1CAI0...	OCH	UP
SD1BRO02/1-2-1-8_5 to SD...	OMS	UP

3. To inspect links by tag, select **Tags**, click **Add Tag**, and then select the tags and click **OK**.

Tags

▼ Links

R_PHY

▼ Ports

R_PHY All

(No items)

Cancel OK

- To inspect links by endpoint, select **Device(s) in 1 of the endpoints**, and then click **Add Endpoint**. In the **Advanced** tab, select a device in the **DEVICES** tabs, or click on the **3D Explorer** tab to select a device. Click **OK**. You can add up to 10 items.

Name	Type	Description	Site
1300 ITEMS			
ILA-SD2MAL01-SD2THE02-3	ONE	ONE by Coriant at ILA-SD2MAL01-SD2THE02-3	ILA-SD2MAL01-SD2THE02-3
ILA-SD1BARI02-SD2PATRA01-4	ONE	ILA 7100 ONE by Coriant at ILA-SD1BARI02-SD2PATRA01-4	ILA-SD1BARI02-SD2PATRA01-4
ILA-SD2HEL02-SD2OULU01-4	ONE	ONE by Coriant at ILA-SD2HEL02-SD2OULU01-4	ILA-SD2HEL02-SD2OULU01-4
ILA-SD1LMS01-SD2HERKL01-7	ONE	6500 7-Slot Optical Shelf Assembly ILA ONE by Ciena MCP at ILA-S...	ILA-SD1LMS01-SD2HERKL01-7
ILA-SD1MAR01-SD1MIL01-4	ONE	ONE by Ciena MCP at ILA-SD1MAR01-SD1MIL01-4	ILA-SD1MAR01-SD1MIL01-4
ILA-SD2GTBR1-SD2UPP01-1	ONE	ONE by Coriant at ILA-SD2GTBR1-SD2UPP01-1	ILA-SD2GTBR1-SD2UPP01-1
SD1FLO01	ONE	6500 32-Slot Packet-Optical Shelf Assembly Hybrid ONE by Ciena ...	FLO
ILA-SD2KRA01-SD2LVIV01-1	ONE	ONE by Coriant at ILA-SD2KRA01-SD2LVIV01-1	ILA-SD2KRA01-SD2LVIV01-1
ILA-CI_ONC_SD1COR01-CI_ONC_SD1LIS01-0	ONE	ONE by Cisco ONC at ILA-CI_ONC_SD1COR01-CI_ONC_SD1LIS01-0	ILA-CI_ONC_SD1COR01-CI_ONC_SD1LIS01-0
ILA-SD2DIL01-SD2LAM01-0	ONE	ONE by Coriant at ILA-SD2DIL01-SD2LAM01-0	ILA-SD2DIL01-SD2LAM01-0
ILA-SD2LAR02-SD2THE01-0	ONE	ONE by Coriant at ILA-SD2LAR02-SD2THE01-0	ILA-SD2LAR02-SD2THE01-0
ILA-CI_ONC_SD1BIL01-CI_ONC_SD1PAR01-4	ONE	ONE by Cisco ONC at ILA-CI_ONC_SD1BIL01-CI_ONC_SD1PAR01-4	ILA-CI_ONC_SD1BIL01-CI_ONC_SD1PAR01-4
RD_PAR01_ODR	RADIO_DEVICE	FibeAir IP-10G Radio by Ceragon at PAR	PAR
ILA-SD2KONO01-SD2KYE01-2	ONE	ONE by Coriant at ILA-SD2KONO01-SD2KYE01-2	ILA-SD2KONO01-SD2KYE01-2
ILA-SD2ODES01-SD2UMAN01-1	ONE	ONE by Coriant at ILA-SD2ODES01-SD2UMAN01-1	ILA-SD2ODES01-SD2UMAN01-1
ILA-SD1LMS01-SD2HERKL01-9	ONE	6500 7-Slot Optical Shelf Assembly ILA ONE by Ciena MCP at ILA-S...	ILA-SD1LMS01-SD2HERKL01-9
ZR_CR2.FRA	ROUTER		FRA

- To check the performance for links with devices in two endpoints, select **Device(s) in both endpoints** and then click **Add First Endpoint** and select a device. Repeat for the second endpoint.

Select Links For In-Depth Analysis

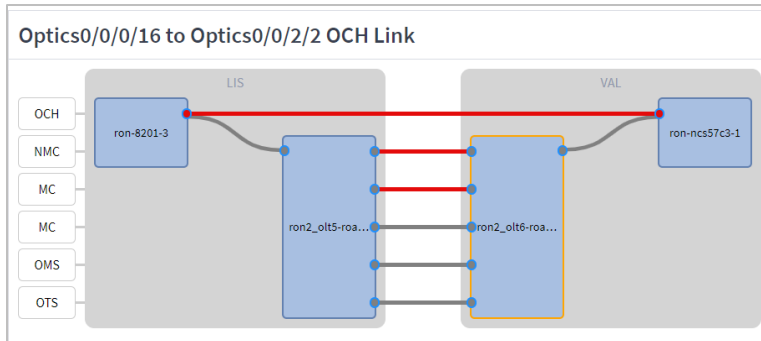
Define Valid Links For Inspection By:

Specific link(s) / underlay link(s)
 Tags
 Device(s) in 1 of the endpoints
 Device(s) in both endpoints

- Continue to [View Links and Performance](#).

View Links and Performance

After specifying the links, you can select one of the links in the list on the left and view the hierarchy of the link layers on the right.



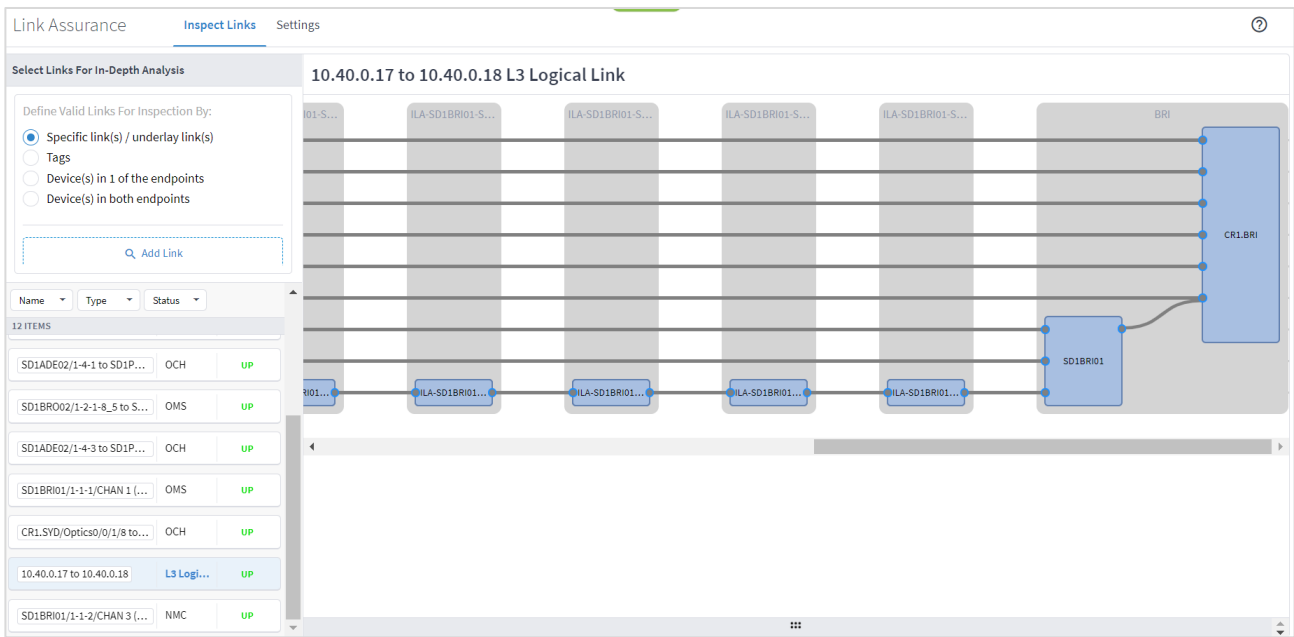
Legend:

- **Blue Filled Rectangle:** Node or router
- **Lines:** Links
- **Circles:** Ports
- **Grey fill:** Up
- **Red fill:** Down
- **Blue Frame:** Not selected
- **Orange Frame:** Selected

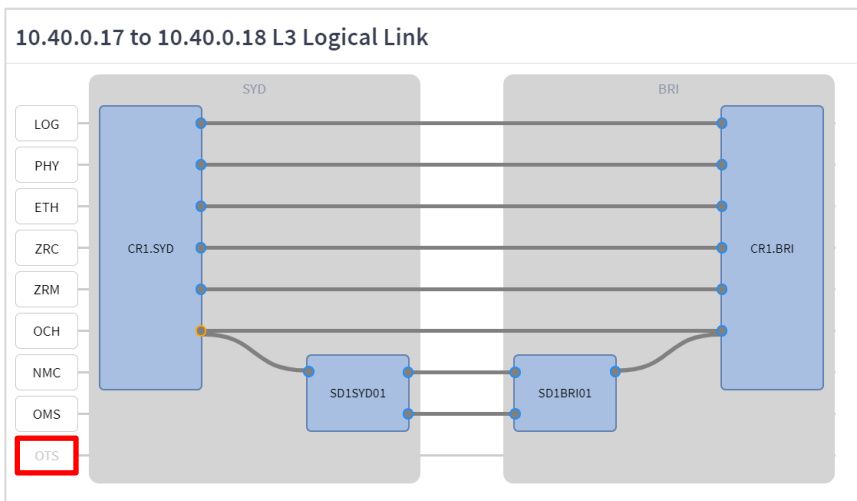
To view links:

1. Select one of the link layers. You can scroll left and right to see the full path.

Name	Type	Status
SD1ADE02/1-4-1 to SD1P...	OCH	UP
SD1BRO02/1-2-1-8_5 to S...	OMS	UP
SD1ADE02/1-4-3 to SD1P...	OCH	UP
SD1BRI01/1-1-1/CHAN 1 (...)	OMS	UP
CRL.SYD/Optics0/0/1/8 to...	OCH	UP
10.40.0.17 to 10.40.0.18	L3 Logi...	UP
SD1BRI01/1-1-2/CHAN 3 (...)	NMC	UP

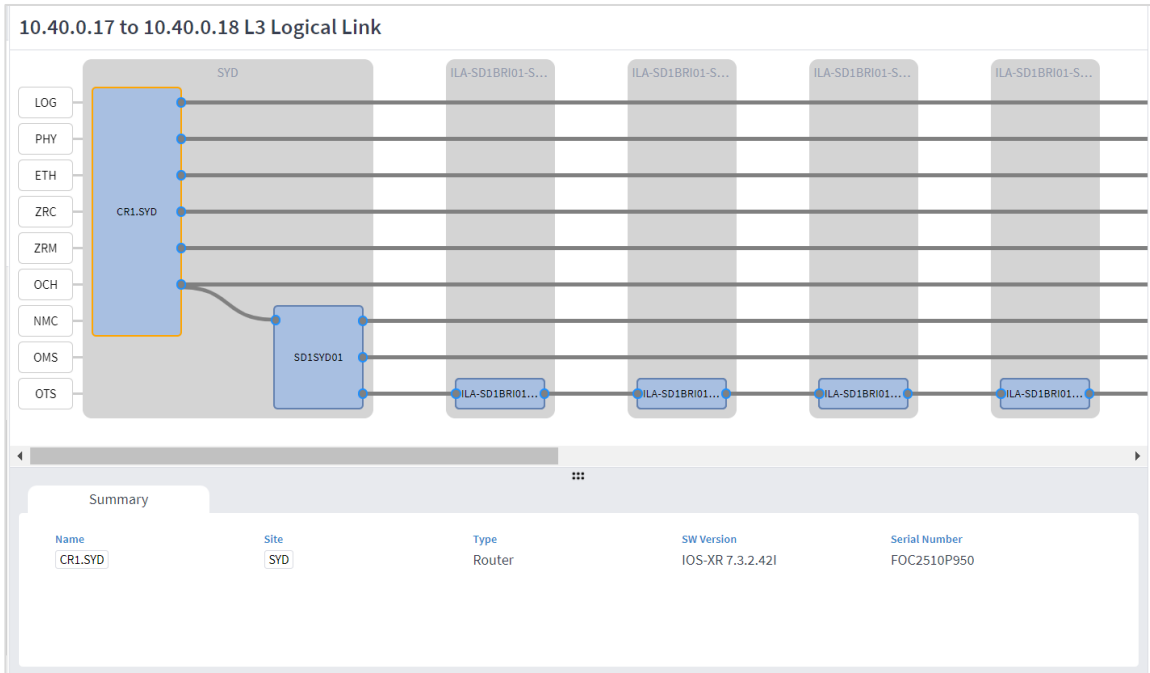


2. Click on a layer name to exclude the layer from the view. For example, click on **OTS**.



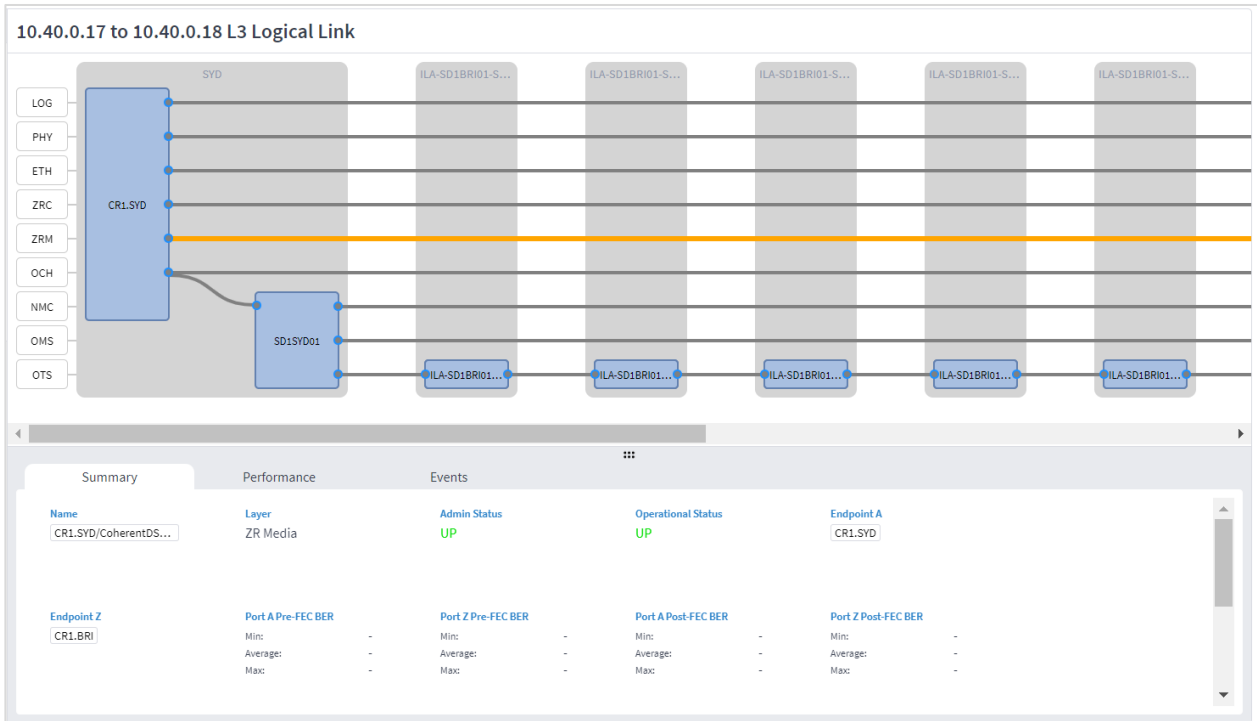
3. Click the blue square representing a router or optical node to view the details for the router or optical node. The router or optical node is framed in orange. The **Summary** tab includes the following details:

- **Name:** The name of the router or optical mode.
- **Site:** The site name.
- **Type:** Router or Optical Node.
- **SW Version:** The software version on the router.
- **Serial Number:** The router or optical node serial number.



4. Click the line representing the link to view the link details. The selected link is orange. The **Summary** tab includes the following details:

- **Name:** The name of the link.
- **Layer:** The layer type: L3 Logical, L3 Physical, Ethernet, ZR Channel, ZR Media, OCH, NMC, OMS or OTS.
- **Admin Status:** The admin status: UP or DOWN.
- **Operational Status:** The operational status: UP or DOWN.
- **Endpoint A:** The starting endpoint.
- **Endpoint Z:** The terminating endpoint.
- For Ethernet links, the rate for **Port A Rate [Gbps]** and **Port Z Rate [Gbps]**.
- For ZRM links, the min, average and max values for **Port A Pre-FEC BER**, **Port Z Pre-FEC BER**, **Port A Pre-FEC BER** and **Port Z Pre-FEC BER**.
- For OCH, NMC, OMS, and OTS links, the min, average and max values for **Port A Tx Power [dbm]**, **Port Z Tx Power [dbm]**, **Port A Rx Power [dbm]** and **Port Z Rx Power [dbm]**.



- For Ethernet and IP links or ports the **Performance** tab includes **INBOUND TRAFFIC** and **OUTBOUND TRAFFIC** graphs for **BANDWIDTH** and **UTILIZATION**.

For additional information on performance, see [Performance](#).

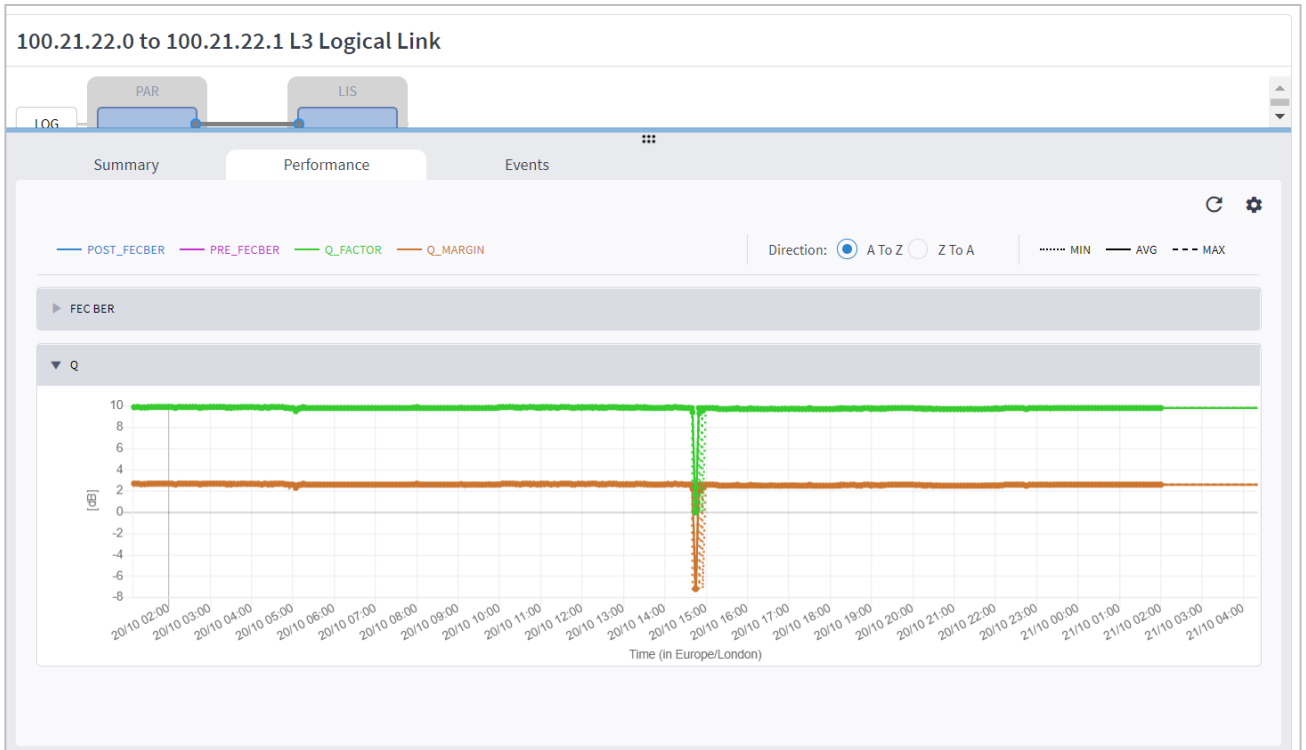


- Click and specify the period to report on:
 - Select Time Span:** Select the required period, either **Today**, **Past 24 hours**, **Past 7 days**, **Past 14 days**, **Past 30 days**, **Past 60 days**, or **Custom**. If you select **Custom**, then click **From** and **To** and select a date and specify a time.

- In the **Select Daily Time Frame** area either select **Over entire day** or **Specific time span per day**. If you select **Specific time span per day**, then click **From** and **Until** to specify a time.

7. Click **Export** to download the performance statistics.
8. For layer 1 (ZR Media), the Performance tab includes **Post_FECBER**, **Pre_FECBER**, **Q_Factor** and **Q_Margin**.

For additional information on performance, see [Performance](#).



9. For layer 0 (OCH, NMC, OMS and OTS), the **Performance** tab includes Rx and Tx power data.

For additional information on performance, see [Performance](#).

10. The **Events** tab includes a list of the operational status changes.

Summary	Performance	Events
Events were fetched from 08/07/2022 19:48:30 UTC to now		
Time	Operational Status Change	
NO ITEMS		
(No items)		

11. Click the port to view the related summary, performance, and events.

10.40.0.17 to 10.40.0.18 L3 Logical Link

Topology diagram showing ports ZRC and ZRM connected to CR1.SYD, with a series of intermediate nodes represented by grey boxes.

Summary		Performance		Events	
Name	CoherentDSP0/0/1/8	Type	ZR Media	Parent	CR1.SYD
Admin Status	UP	Operational Status	UP	Pre-FEC BER	Min: - Average: - Max: -
Post-FEC BER	Min: - Average: - Max: -	Q Factor [db]	Min: - Average: - Max: -	Q Margin [db]	Min: - Average: - Max: -

Configure Link Assurance

- The **Days Back** setting applies to the statistics data for the **Summary** and **Performance** tabs. Use this configuration to apply **the Days Back to Performance** tabs of all ports and links that can be selected, without having to repeat the settings for every port/link.

Link Assurance Inspect Links **Settings**

GENERAL SETTINGS

Days Back*

Path Analysis

This application analyses the potential IGP paths between two endpoints. Each path is analyzed and broken down into links, and the cost of each path is calculated. The path-selection decision is based on the minimum cost, where the cost is the total of the IGP metric values for the links in the path. All paths with a similar cost are returned.

Dynamic paths such as LDP and SR-ISIS, over IGP links, are supported (where no path preferences are provided).

Path Analysis Terminology

Table 2. Path Analysis Terms

Term	Definition
Cost	The accumulated IGP metric for the path, that is, sum of the IGP metrics of the various links in the path.
Hops	The number of links in the path.
IGP Metric	The hop IGP metric.
Latency	The total latency of the links in the path.
TE Metric	The hop TE tunnel metric.

Analyze a Path

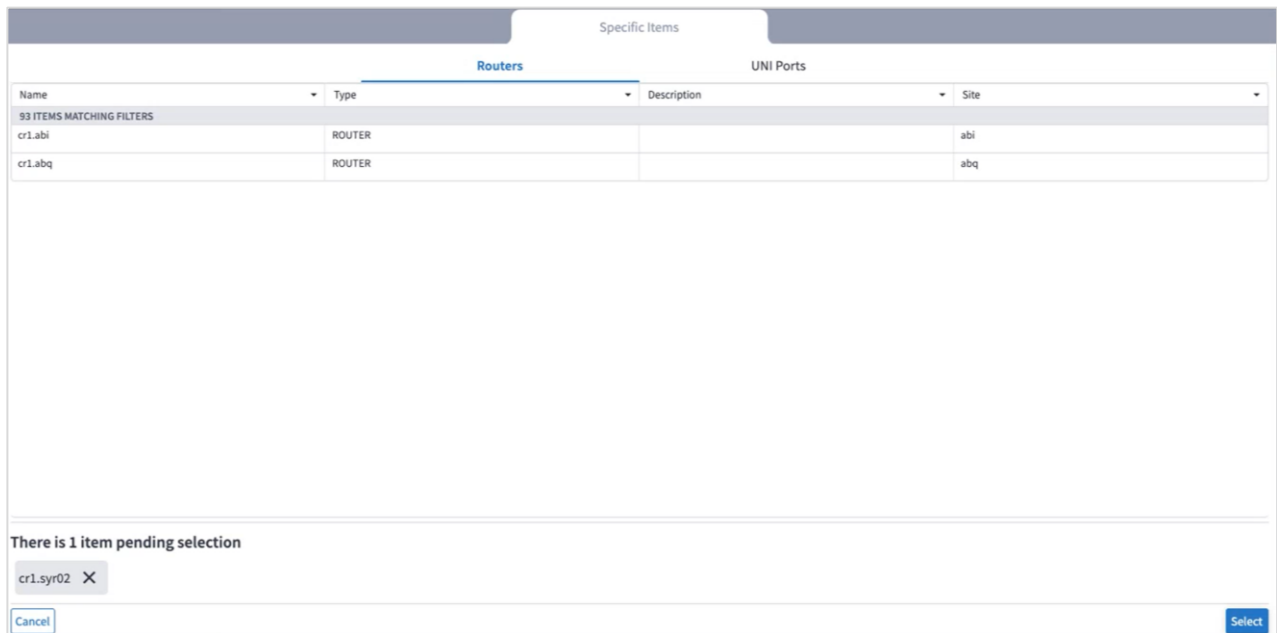
To analyze a path, select two endpoints. Endpoints can be a router or UNI port connected to a VPN service. The application returns all the alternate paths with the same minimum cost, where cost is defined as the aggregation of the IGP Metrics for the links in the path. Related performance data can be viewed for the logical IP links in the path.

To analyze a path:

1. In the applications bar, select **Path Analysis**.



2. Click  to add a router as endpoint A.



3. (Optional) Select the **UNI Ports** tab.

Specific Items						
Routers			UNI Ports			
Name	Type	Capacity	Description	Device	Admin Status	
558 ITEMS						
TenGigE0/0/0/1	R_PHYSICAL	10000000000		cr1.chi	UP	
TenGigE0/0/0/7	R_PHYSICAL	10000000000		cr1.knx	UP	
10ge-0/1/3	R_PHYSICAL	10000000000		cr1.okc	UP	
TenGigE0/0/0/3	R_PHYSICAL	10000000000		cr1.che	UP	
TenGigE0/0/0/9	R_PHYSICAL	10000000000		cr1.ric	UP	
10ge-0/1/3	R_PHYSICAL	10000000000		cr1.hst	UP	
TenGigE0/0/0/4	R_PHYSICAL	10000000000		cr1.che	UP	
TenGigE0/0/0/8	R_PHYSICAL	10000000000		cr1.chi	UP	
TenGigE0/0/0/3	R_PHYSICAL	10000000000		cr1.boi	UP	
TenGigE0/0/0/5	R_PHYSICAL	10000000000		cr1.spf	UP	
TenGigE0/0/0/2	R_PHYSICAL	10000000000		cr1.fre	UP	
GigabitEthernet1/1/2	R_PHYSICAL	10000000000		cr1.pdx	UP	
TenGigE0/0/0/1	R_PHYSICAL	10000000000		cr1.roa	UP	
TenGigE0/0/0/5	R_PHYSICAL	10000000000		cr1.nth	UP	
TenGigE0/0/0/1	R_PHYSICAL	10000000000		cr1.bos	UP	
TenGigE0/0/0/5	R_PHYSICAL	10000000000		cr1.sea	UP	

No items selected yet

4. Select an endpoint and click **OK**.

5. Repeat to select endpoint B. A list of the paths with the same cost appears.

Path Analysis			
Back		Path 1	
ENDPOINTS		Path Summary	
CRL.0VE → CRL.VIE <small>0 RSVP TE Tunnels were found between the endpoints 0 SR Policies were found between the endpoints</small>		Number Of Hops: 6 Latency: 10.92 ms Distance: 2228.80 Km	IGP Domains: 1 Admin Cost: 89442
Path	Latency (MS)	Cost	Hops
1 Optimal	10.92	89442	6
2	10.92	89442	7

#	Link	Router A	Router B	IGP Metric	TE Metric	Operational Status
6 ITEMS						
1	10.40.1.218 to 10.40.1.217	CRL.0VE	CR2.MAD	40442	40442	UP
2	10.40.1.214 to 10.40.1.213	CR2.MAD	CRL.MAD	10000	10000	UP
3	10.40.1.230 to 10.40.1.229	CRL.MAD	CR2.BCN	10000	10000	UP
4	10.40.1.226 to 10.40.1.225	CR2.BCN	CRL.BCN	10000	10000	UP
5	10.40.2.69 to 10.40.2.70	CRL.BCN	CRL.MIL	10000	10000	UP
6	10.40.1.178 to 10.40.1.177	CRL.MIL	CRL.VIE	9000	9000	UP

- Click on a path to see the number of hops, latency, distance, number of IGP domains and admin cost for the path. The table details each of the links with their endpoint routers, IGP metric and TE metric.
- Click on a link in the path to see the related performance information. The information appears in the **Summary** tab in the lower pane.

Path Analysis

Path 1

Path Summary: Number Of Hops: 11, Latency: 23.42 ms, Distance: 4781.75 Km, IGP Domains: 1, Admin Cost: 160612

#	Link	Router A	Router B	IGP Metric	TE Metric	Operational Status
5	10.40.1.134 to 1...	CR2.BKL	CR1.PAR	40411	40411	UP
6	10.40.1.145 to 1...	CR1.PAR	CR2.FRA	10000	10000	UP
7	10.40.1.186 to 1...	CR2.FRA	CR1.WAR	10000	10000	UP
8	10.40.1.214 to 1...	CR1.WAR	CR1.SMOL	5000	5000	UP

IGP 10.40.1.165 to 10.40.1.166 Performance Summary

Link	Average [%]	Peak [%]	Percentile 98[%]	Percentile 95[%]	Percentile 75[%]	St. Deviation
L3 Logical 10.40....	86.756	99.359	98.167	96.254	89.261	6.182

- To view graphs of the performance, click the **Graphs** tab in the lower pane. For additional information on performance, see [Performance](#).

Path Analysis

Path 1

Path Summary: Number Of Hops: 11, Latency: 23.42 ms, Distance: 4781.75 Km, IGP Domains: 1, Admin Cost: 160612

#	Link	Router A	Router B	IGP Metric	TE Metric	Operational Status
1	10.40.1.165 to 1...	CR2.AMS	CR1.SQY	40437	40437	UP
2	10.40.1.106 to 1...	CR1.SQY	CR2.SQY	100	100	UP

IGP 10.40.1.165 to 10.40.1.166 Performance Summary

Graphs: L3 Logical 10.40.1.166 to 10.40.1.165 | BANDWIDTH | % | Add Reference Lines | Prediction

Lower: L3 Physical CR1.SQY/TenGigE0/0/7 to CR2.AMS/TenGigE0/0/6

From CR1.SQY to CR2.AMS

9. Click the **Map** tab to view the path in the 3D Explorer map.

The screenshot shows the 'Path Analysis' interface for 'Path 1'. On the left, the 'ENDPOINTS' section shows a path from CRI.LOVE to CRI.VIE. Below this, a table lists two path items:

Path	Latency (MS)	Cost	Hops
1 (Optimal)	10.92	89442	6
2	10.92	89442	7

The 'Map' view on the right displays a 3D network map with various nodes and links. The path is highlighted in blue, showing a route from the source to the destination through several intermediate nodes across Europe.

10. You can expand and scroll in the Metro view to see more of the path details.

This screenshot shows the 'Path 1' interface with the 'Metro' view expanded. The 'Path Summary' table on the left is more detailed, including columns for IGP, LOG, PHY, ETH, ODU, ODU, OTU, OCH, OMS, and OTS. The 'Map' view on the right shows a more detailed network topology with many nodes labeled with codes like 'LON', 'PAR', 'FRA', 'MUN', 'ZUR', etc. The path is highlighted in blue, showing a complex network structure.

11. You can also filter the path as required.

Path 1

Path Summary Map

IGP	LOG	PHY	ETH	ODU	ODU	OTU	OCH	OMS	OTS	FIBER
							1537.4 km			

✓ Select All × Clear All

- LOG
- PHY
- ETH
- ODU
- ODU
- OTU
- OCH
- OMS
- OTS
- FIBER



Root Cause Analysis

The Root Cause Analysis application finds the failed lower layer links that are the root cause of a link or a service failure. To establish root cause failures, Crosswork Hierarchical Controller considers both the operational status (up/down) of the links and the admin status (up/down) of the router ports.

When the operational status of a link is down, this is considered a failure. Crosswork Hierarchical Controller then checks all the lower layer links that have failed, until the element at the lowest level is identified. This is the root cause element. All elements above this root cause element are considered affected elements. A link with operational status down but with no links above it is still considered as a root cause.

If an element has an admin status of down, it is classified as a root cause element (and not as an affected element).

View Root Causes

You can view a list of the root causes and can view the:

- Root cause resource type: L3 Logical, OCH, OTS, LSP, or OMS.
- Root cause tags
- Number of affected links
- Affected capacity (Gbps)
- Time
- A list of the link layers and elements affected

You can also hover over the affected element to view the element in the map (and then view the element in Explorer) or click on the element name to drilldown directly to the element in Explorer.

Table 3. Elements

Links	Description
LSP	The MPLS tunnel created between two routers over IGP links, with or without TE options.
IGP	The link between two routers that carries IGP protocol messages. The link represents an IGP adjacency.
L3 Logical (R_LOGICAL)	A link that connects VLANs on two IP ports.
L3 Physical (R_PHYSICAL)	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.
Ethernet (ETH)	An ETH L2 link, spans from one ETH UNI port of an optical device to another, and rides on top of ODU.
ODU	ODU links are sub signals in OTU links. Each OTU link can carry multiple ODU links, and ODU links can be divided into finer granularity ODU links recursively.
OTU	The underlay link in the OTN layer, used for ODU links. It can ride on top of an OCH.
OCH	A wavelength connection spanning the client port of one OEO device (transponder, muxponder, regen) and another. 40 or 80 OCH links can be created on top of OMS links. The client port can be TDM or ETH port.

Links	Description
OMS	The link connecting one ROADM to another. One OMS can be created over a chain of OTS links.
OTS	The physical link connecting between one line amplifier or ROADM and another. One OTS can be created over a fiber link.

For more information on Explorer and the various links, see the *Cisco Crosswork Hierarchical Controller Network Visualization Guide*.

To view root cause failures:

- In the applications bar, select **RCA**. A list of the root causes appears with the following information:
 - Root Cause Resource Name:** The root cause link name. In this example, the OTS link.
 - Root Cause Resource Type:** The root cause link type.
 - Root Cause Tags:** The root cause tags.
 - Affected Links:** The total number of elements affected by this root cause.
 - Affected Capacity (Gbps):** The total bandwidth lost in Gbps (the total of all links).

Root Cause Analysis Records fetched at: 15:48:55 09-21-2022 UTC ? ↓ ↻

Filter By Impacted

Root Cause Resource Name	Root Cause Resource Type	Root Cause Tags	Affected Links	Affected Capacity (Gbps)	Time
9 OUT OF 40 ITEMS MATCHING FILTERS					
10.40.2.202 to 10.40.2.201	L3 Logical	Tag All	66	193.0	
SD2BU01/OCH-1-1-20 to SD2MOS01/OCH-1-1-15	OCH	Tag All	4	10.0	
SD2BUD01/OCH-1-1-36 to SD2MOS01/OCH-1-1-18	OCH	Tag All	4	10.0	
SD2KHAR01/OCH-1-1-9 to SD2KURSK01/OCH-1-1-12	OCH	Tag All	4	10.0	
ILA-SD2KHAR01-SD2KURSK01-1/OTS-1-1-3 to ILA-SD2KHAR01-SD2KURSK01-2/OTS-1-1-2	OTS	Tag All	2	0.0	
10.40.3.238 to 10.40.3.237	L3 Logical	Tag All	1	0.0	
ILA-SD2KONO01-SD2ORYOL01-1/OTS-1-1-3 to ILA-SD2KONO01-SD2ORYOL01-2/OTS-1-1-2	OTS	Tag All	1	0.0	
ILA-SD2BRYA01-SD2KONO01-1/OTS-1-1-3 to ILA-SD2BRYA01-SD2KONO01-2/OTS-1-1-2	OTS	Tag All	2	0.0	
10.40.2.225 to 10.40.2.226	L3 Logical	Tag All	50	147.0	

- Select the required root cause. Detailed information for the root cause appears.

Root Cause Analysis Records fetched at: 15:48:55 09-21-2022 UTC

Filter By Impacted

Root Cause Resource Name	Root Cause Resource Type	Root Cause Tags	Affected Links	Affected Capacity (Gbps)	Time
9 OUT OF 40 ITEMS MATCHING FILTERS					
10.40.2.202 to 10.40.2.201	L3 Logical	Tag All	66	193.0	
SD2BUC01/OCH-1-1-20 to SD2MOS01/OCH-1-1-15	OCH	Tag All	4	10.0	
SD2BUD01/OCH-1-1-36 to SD2MOS01/OCH-1-1-18	OCH	Tag All	4	10.0	
SD2KHAR01/OCH-1-1-9 to SD2KURSK01/OCH-1-1-12	OCH	Tag All	4	10.0	
ILA-SD2KHAR01-SD2KURSK01-1/OTS-1-1-3 to ILA-SD2KHAR01-SD2KURSK01-2/OTS-1-1-2	OTS	Tag All	2	0.0	
10.40.3.238 to 10.40.3.237	L3 Logical	Tag All	1	0.0	

Affected Links
Root Cause: SD2KHAR01/OCH-1-1-9 to SD2KURSK01/OCH-1-1-12

Link Name	Link Description	Link Type	Link Tags	Link Speed (Gbps)	Impact Type
4 ITEMS					
SD2KHAR01/ETH-1-1-8 to SD2KURSK01/ETH-1-1-11		Ethernet	Tag All	10.0	Link down
SD2KHAR01/ODU-1-1-8 to SD2KURSK01/ODU-1-1-...		ODU	Tag All	0.0	Link down
SD2KHAR01/ODU-1-1-9 to SD2KURSK01/ODU-1-1-...		ODU	Tag All	0.0	Link down
SD2KHAR01/OTU-1-1-9 to SD2KURSK01/OTU-1-1-...		OTU	Tag All	0.0	Link down




- Hover over the root cause resource name and click  to view the root cause in the map.

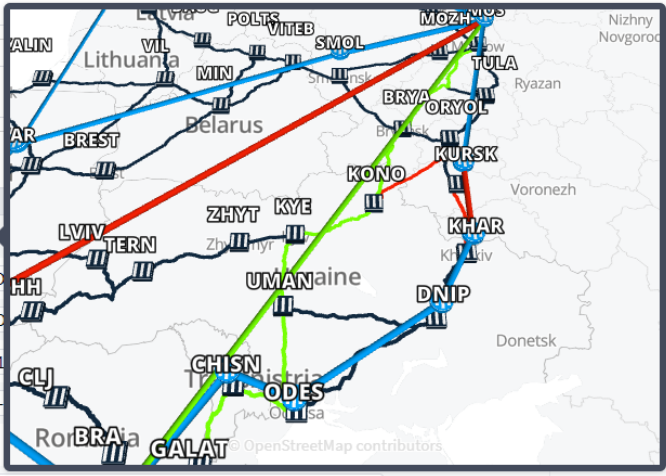
Root Cause Analysis


Filter By Impacted

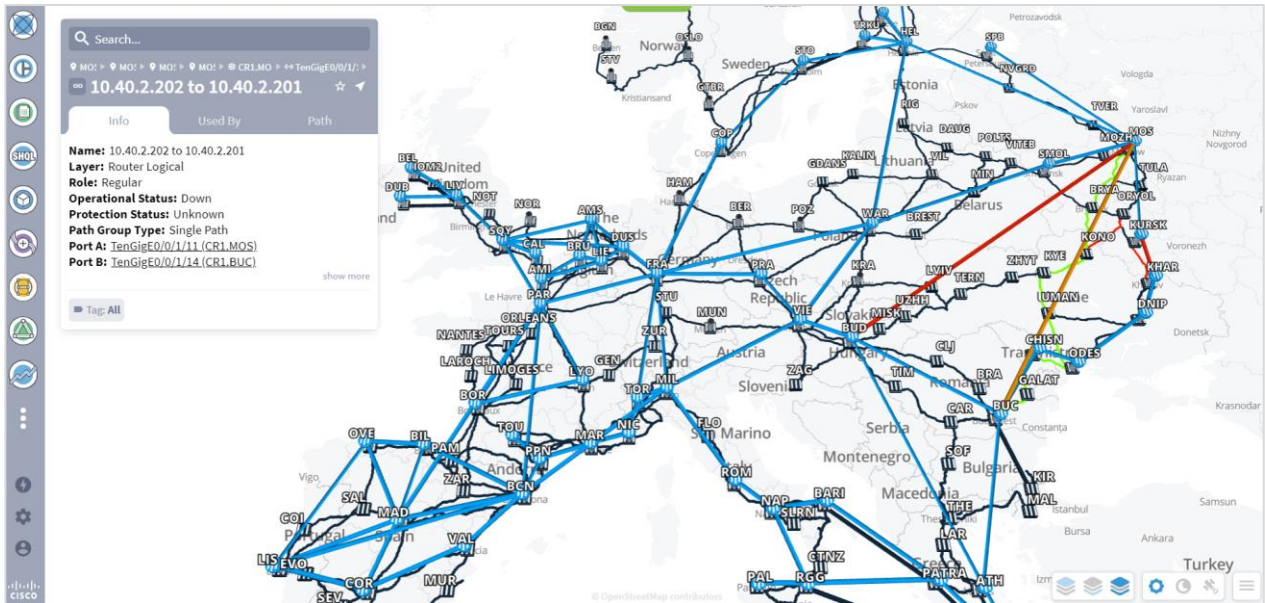
Root Cause Resource Name

9 OUT OF 40 ITEMS MATCHING FILTERS

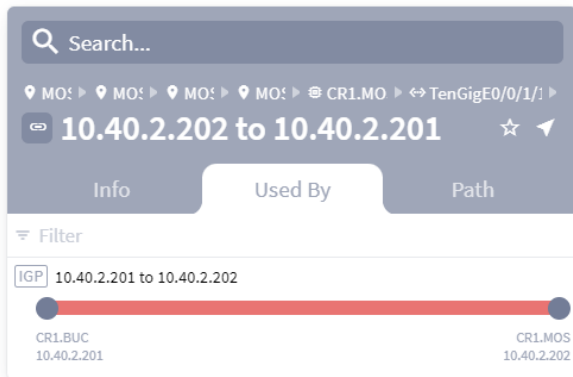
- 10.40.2.202 to 10.40.2.201   
- SD2BUC01/OCH-1-1-20 to SD2MOS01/OCH-1-1-15
- SD2BUD01/OCH-1-1-36 to SD2MOS01/OCH-1-1-18
- SD2KHAR01/OCH-1-1-9 to SD2KURSK01/OCH-1-1-12
- ILA-SD2KHAR01-SD2KURSK01-1/OTS-1-1-3 to ILA-SD2KHAR01-SD2KURSK01-2/OTS-1-1-2
- 10.40.3.238 to 10.40.3.237



4. Click  **Open in Explorer** to open the root cause in Explorer.



5. You can navigate up and down the link layers by clicking on the **Used By** tab.
6. In the **Used By** tab, click on the link name.



7. Repeat this to navigate to the next layer.

Search...

BUC > BUC > BUC > BUC > CR1.BUC > 10.40.2.201

10.40.2.201 to 10.40.2.202

Info Used By Path

Filter

- LSP CR2.STO:CR2.ATH:lsp_1661442049119
 - CR2.STO 10.40.0.114
 - CR2.ATH 10.40.0.73
- LSP CR1.BUC:CR1.STO:lsp_1661442049169
 - CR1.BUC 10.40.0.71
 - CR1.STO 10.40.0.54
- LSP CR1.BUC:CR2.COP:lsp_1661442049168
 - CR1.BUC 10.40.0.71
 - CR2.COP 10.40.0.52
- LSP ER1.ATH:ER1.BEL:lsp_1661442048153
 - ER1.ATH 10.41.1.85
 - ER1.BEL 10.41.0.45
- LSP CR2.ATH:CR2.HEL:lsp_1661442049164
 - CR2.ATH 10.40.0.73
 - CR2.HEL 10.40.0.47
- LSP CR1.HEL:CR2.BUC:lsp_1661442049125
 - CR1.HEL 10.40.0.115
 - CR2.BUC 10.40.0.72

8. Continue until you get to the uppermost layer. The Explorer map is updated as you navigate.

Search...

STO > STO > STO > STO > CR2.STO > 10.40.0.114

CR2.STO:CR2.ATH:lsp_1661442049119

Info Used By Path

Name: CR2.STO:CR2.ATH:lsp_1661442049119

Layer: LSP

Hold Priority: 7

LSP Technology: MPLS

Setup Priority: 7

Speed BPS: 3.00 Gbps

Role: Regular

Operational Status: Down

Protection Status: Unknown

Path Group Type: Single Path

Port A: 10.40.0.114 (CR2.STO)

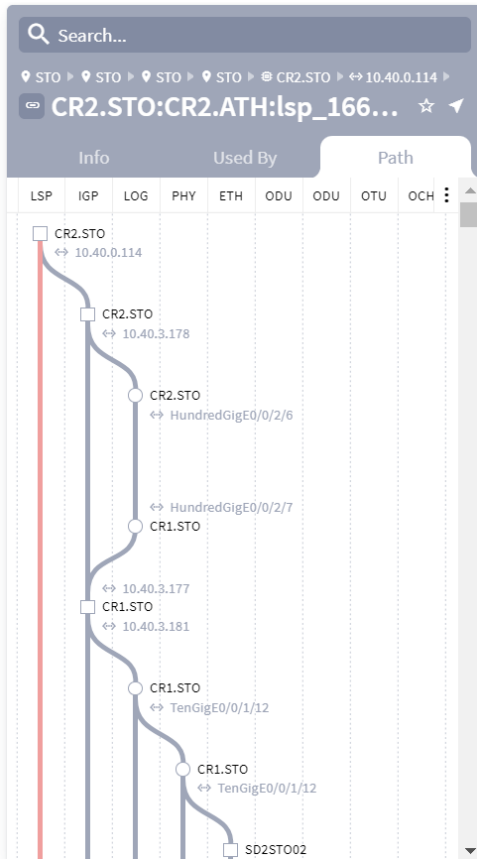
Port B: 10.40.0.73 (CR2.ATH)

Tag: All

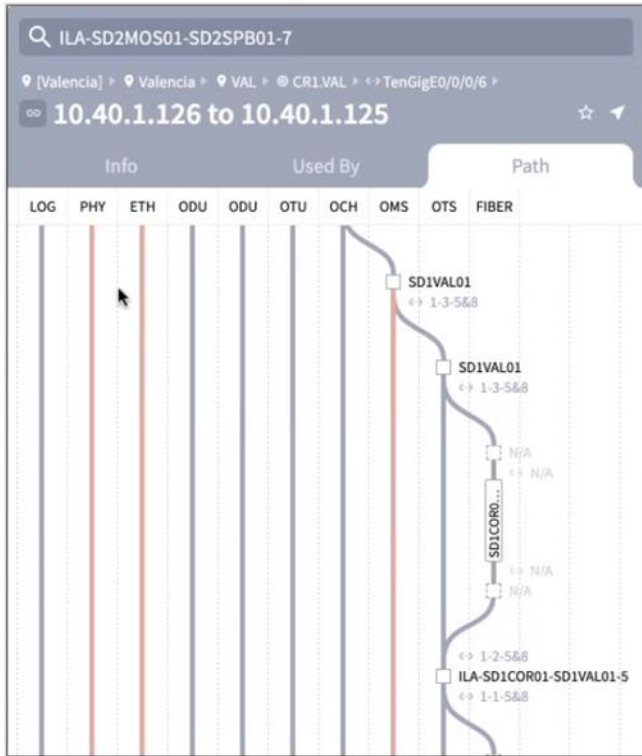
No statistics in the past 24 hours.

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9. Select the **Path** tab to view the layers.



10. In this example, there are two root cause failures. The **Ethernet** root cause failure affects the **PHY** layer above it, but the **OMS** root cause failure does not affect any of the links above it and so there are 0 affected elements.



11. In this example, the root cause failure affects two links, the MC and OMS links.

Root Cause Analysis

Records fetched at: 15:48:55 09-21-2022 UTC

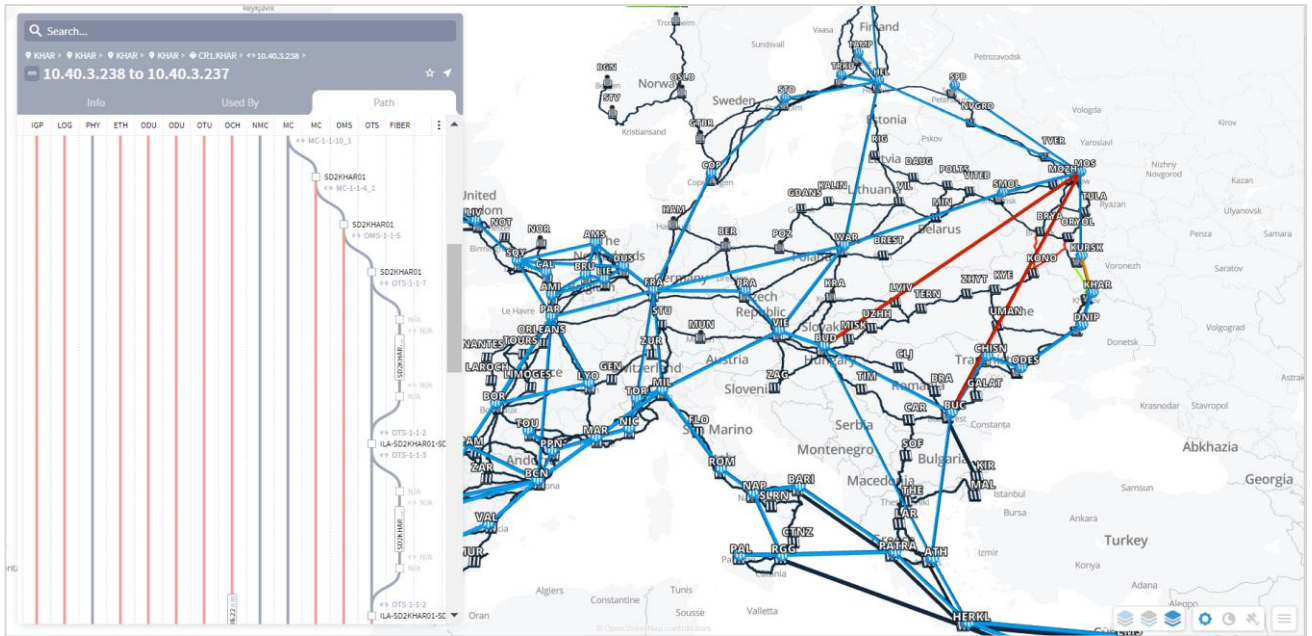
Filter By Impacted

Root Cause Resource Name	Root Cause Resource Type	Root Cause Tags	Affected Links	Affected Capacity (Gbps)	Time
9 OUT OF 40 ITEMS MATCHING FILTERS					
10.40.2.202 to 10.40.2.201	L3 Logical	Tag All	66	193.0	
SD2BUC01/OCH-1-1-20 to SD2MOS01/OCH-1-1-15	OCH	Tag All	4	10.0	
SD2BUD01/OCH-1-1-36 to SD2MOS01/OCH-1-1-18	OCH	Tag All	4	10.0	
SD2KHAR01/OCH-1-1-9 to SD2KURSK01/OCH-1-1-12	OCH	Tag All	4	10.0	
ILA-SD2KHAR01-SD2KURSK01-1/OTS-1-1-3 to ILA-SD2KHAR01-SD2KURSK01-2/OTS-1-1-2	OTS	Tag All	2	0.0	
10.40.3.238 to 10.40.3.237	L3 Logical	Tag All	1	0.0	

Affected Links

Root Cause: ILA-SD2KHAR01-SD2KURSK01-1/OTS-1-1-3 to ILA-SD2KHAR01-SD2KURSK01-2/OTS-1-1-2

Link Name	Link Description	Link Type	Link Tags	Link Speed (Gbps)	Impact Type
3 ITEMS					
SD2KHAR01/MC-1-1-4_1 to SD2KURSK01/MC-1-1-2_1	MC line SD2KHAR01/MC-1-1-4_1 to SD2KURSK01/MC-1-1-2_1	MC	Tag All	0.0	Link down
SD2KHAR01/OMS-1-1-5 to SD2KURSK01/OMS-1-1-3		OMS	Tag All	0.0	Link down



12. In this example, there is an **Admin Status: Down**. This means that this element constitutes a root cause failure in and of itself (and not simply an affected element).

The screenshot shows the configuration page for a network device. The device name is TenGigE0/0/0/7. The configuration details are as follows:

- GUID:** PO/r_physical/640eb904b3651f8e/ad2095e495c...
- Name:** TenGigE0/0/0/7
- Type:** Router Physical Port
- ETH Port Type:** ETH 10G
- Physical Address:** aa:bb:cc:dd:ee:ff
- Speed BPS:** 10.0 Gbps
- Provider:** Topogen
- Description:** to CRI.VAL:TenGigE0/0/0/6
- Relative Direction:** None
- Admin Status:** Down
- Operational Status:** Up
- Device:** CRI.COR

Download the Root Causes

You can download a comma separated file with the root cause information.

To download root causes:

1. In the applications bar, select **RCA**.
2. Click . A **root_cause_analysis_<date>.csv** file is downloaded.
3. Open the downloaded file to view a list of the root causes appears with the following information:
 - **Root Cause:** The root cause link name. In this example, the OTS link.
 - **Root Cause Type:** The root cause link type.
 - **Affected Link:** The link affected by this root cause.

- **Affected Type:** The type of the link affected by this root cause.
- **Capacity [Gbps]:** The bandwidth lost in Gb for the affected link.

Execution Parameter	Value			
Time Machine	14/05/2020 00:21			
Root Cause	Root Cause Type	Affected Link	Affected Type	Capacity [Gbps]
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.SQY:CR1.FRA:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.MAN:CR1.ROM:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.ROM:CR1.BEL:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.SQY:CR2.COR:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	10.40.0.26 to 10.40.0.25	IGP	0
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.BKL:CR2.SQY:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.LIV:CR2.FRA:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.OVE:CR2.SQY:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	SD1BKL01/1-10-1 to SD1SQY01/1-6-1	OTU	0
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.PAR:CR2.SQY:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.MIL:CR1.SQY:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.DUB:CR2.VIE:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.ROM:CR1.LIV:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.BKL/TenGigE0/0/0/6 to CR2.SQY/TenGigE0/0/0/6	R_PHYSICAL	10
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.LIS:CR1.MAN:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.MIL:CR2.DUB:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.DUB:CR1.BEL:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.BEL:CR2.BIL:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	SD1BKL01/1-4-1 to SD1CAM01/1-9-1	OTU	0
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.DUB:CR1.BKL:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.MAN:CR1.FRA:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.LIV:CR1.BKL:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR1.BEL:CR1.OVE:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.VIE:CR2.MAN:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.VIE:CR1.DUB:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	SD1BKL01/1-10-100-2 to SD1DUS01/1-4-100-2	ETH	10
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.DUB:CR2.FRA:isp_0	LSP	0.01
SD1BKL01/1-2-5&&8 to SD1SLO01/1-3-5&&8	OTS	CR2.BKL:CR1.MIL:isp_0	LSP	0.01

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
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Singapore

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