Visualization of Native SR Path

This section explains the following topics:

Overview

Objective

Visualize the actual path traffic flows physically through the topology map, even if traffic is on a native SR IGP path (not SR-policy) over inter-AS option C.

Challenge

Visualizing the native SR IGP path is often an operational challenge. Without access to a streamlined and simple-to-use interface, diagnosing and troubleshooting the native path requires you to repeatedly login to network devices without a solution to improve efficiency.

Solution

With the Path Query option, the objective is to visualize the native path using the traceroute SR-MPLS multipath command to get the actual paths between the source and the destination. With Cisco Crosswork Network Controller, a traceroute command runs on the source device for the destination TE-router ID and helps in retrieving the paths. By using native gRPC calls from the Crosswork server, you are able to get the paths from the device which assist in visualizing the native path through which the traffic flows. Since the traceroute command results in an operation that might take time to converge, Cisco Crosswork Network Controller provides an asynchronous user experience where you can send a request for such an operation and then be notified when the output is ready for inspection.

How Does it Work?

- Create a new path query, defining the headend and endpoint devices to find the available Native SR IGP paths.

- Visualize the available Native SR IGP paths as defined by the query on the topology map.

- Inspect the available paths and review the Output, Nexthop, Source, Destination, and Hop Index information.

- Create additional path queries as needed based on service type and instance and visualize the paths on the topology map.

- Troubleshoot any failed path queries.

Scenario: Troubleshoot Native SR IGP Paths Over Inter-AS Option C

Scenario Context

Visualization of the paths that traffic flows in is not readily available without manual tasks from different sources. Once attaining traffic-flow paths, the data is often out of date. Cisco Crosswork Network Controller supports the creation of Path Queries, which you define within the Crosswork GUI. This allows visualization of actual SR IGP paths between the source and destination on a topology map. Cisco Crosswork Network Controller provides an asynchronous user experience where the user is notified when results are ready for inspection. This facilitates rapid troubleshooting for issues with native traffic flows.

Assumptions and Prerequisites

- The device should have IOS XR version 7.3.2.

- The device should have gRPC (Remote Procedure Call) enabled. To check, run "show grpc" the in device and follow these steps:

   - For gRPC without a secure connection: If gRPC is showing as not enabled, enable gRPC using the following commands: configure terminal; grpc; no-tls.

   - For gRPC with a secure connection: Upload security certificates to Cisco Crosswork Network Controller in order to connect to the device using the following commands: configure terminal; grpc.

- Your Cisco Crosswork Optimization Engine server should have the devices imported with gNMI (Network Management Interface) capability and gNMI connectivity for the devices.

   - Make sure the credential profiles include connectivity information for gNMI. Go to **Device Management > Credential Profiles**. The Credential Profiles screen appears. Select a profile to edit. On the Edit Profile Devices screen, click + **Add Another**. For Connectivity Type, select **GNMI**. Add the User Name, Password, and Confirm Password information. Click **Save**.

   - Devices should have gNMI capability enabled in Cisco Crosswork Network Controller while attaching the device. Go to **Device Management > Network Devices**. Select the device to edit. The Edit Device Details screen appears. From the required Capability list, select **GNMI**. Click **Save**.

   - Devices should have the gNMI connectivity information enabled. Go to **Device Management > Network Devices**. Select the device to edit. On the Edit Device Details screen, under Connectivity Details, click + **Add Another**. For Protocol, select **GNMI** and add the IP Address / Subnet Mask information. Type the Port information and for Encoding Type, select **JSON**. Click **Save**.

Workflow: Native SR IGP Paths Troubleshooting

Step 1   Select **Services & Traffic Engineering** > **Path Query**. The **Path Query** dashboard appears.

Step 2   Click **+ New Query**. The **New Path Query** window appears, with query parameters displayed on the right and the topology map, with the mapped Device Groups, on the left.

Step 3   Enter the device information in the required fields to find available native SR IGP service paths:

    a)   Select the **Headend** device from the list. For this example, select **P-Edge-A1**

    b)   Select the **Endpoint** device from the list. For this example, select **P-Edge-B2**

Step 4   Click **Get Paths**. The **Running Query ID** pop-up appears, indicating that Crosswork is processing your query.

    Path queries can take time to complete. While your query is running: f you want to review past queries select **View Past Queries**. Crosswork redisplays the **Path Query** dashboard. If you already had path queries in the list, you can view them while your new query continues to run in the background (indicated by the blue Running icon in the **Query State** column). When the new query's state turns green, click on the entry for it in the dashboard to view your results I

Step 5   When the pop-up changes to show that your query was successful, click **View Results**. The **Path Details** panel appears, with corresponding **Available Paths** details displayed below your **Headend** and **Endpoint** selections. Each found path will appear in its own section in the **Available Paths** portion of the panel. Meanwhile, the topology map on the left is filtered to display only the nodes and paths participating in the **Available Paths**.

Step 6   Click on the **Available Paths** option whose details you want to review (for example, click **Path 0** or **Path 1**). Crosswork Status details for Output, Nexthop, Source, Destination, and Hop Index information. When you select one of the available paths, the map will update with the corresponding Device Groups topology mapping of Path 0 and Path 1.

    Note   Ensure that the **Show Participating Only** check box is selected in the top-right corner of the map.
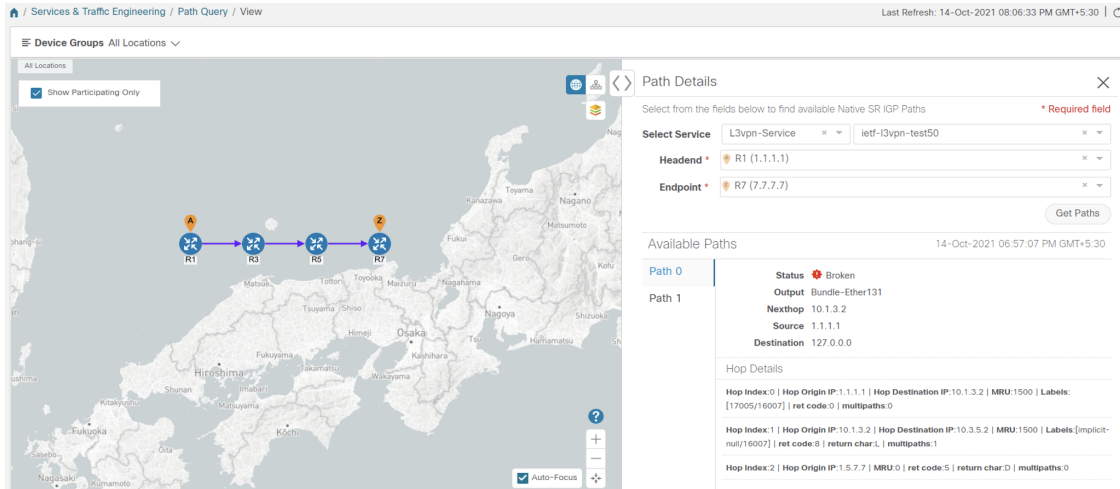
    Note   There are three likely status outcomes to a path query. The screen captures below are independent examples not directly associated with the scenario's workflow:

    a.   **Non-Broken Path (path is complete):** Path Status shows as **Found** with path hop details and overlay shown.


    b.   **Broken Path (Path is complete):** Path Status shows as Broken with path hop details and overlay shown.

c. **Broken Path (Path is not complete):** Path Status shows as Broken with path hop details partially shown (depending on gNMI output for traceroute – see Step 17 for troubleshooting details) and overlay details partially shown. An Error message will appear indicating that the devices and links are not available.
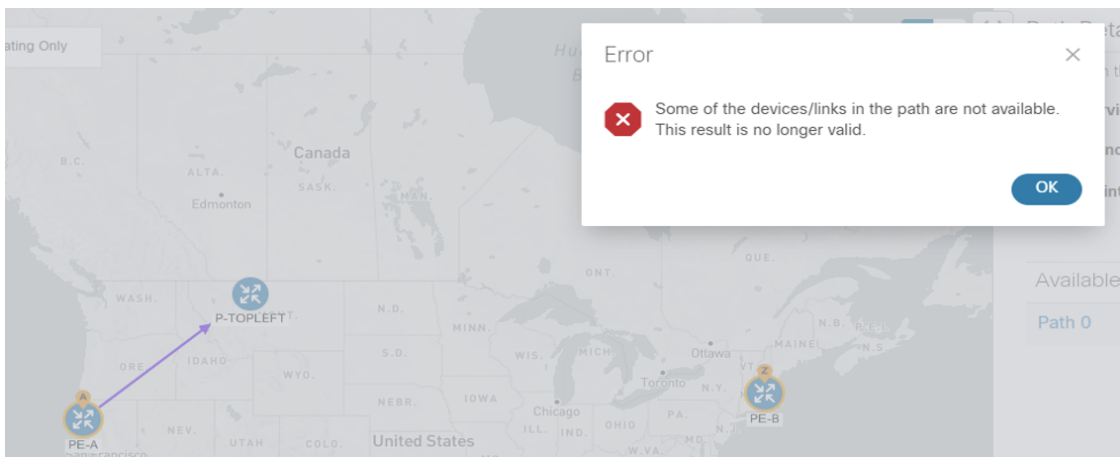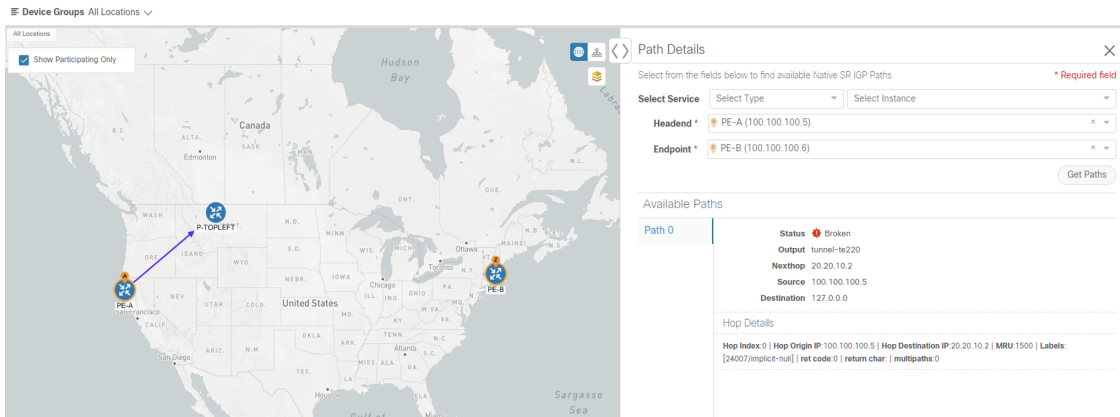
Step 7   Select **Services & Traffic Engineering > Path Query** to return to the **Path Query** dashboard.

Step 8   Ensure that the new path Query State column shows as completed with a green icon. The new path in the table will also show a Query ID link, both the corresponding Headend and destination Endpoint, and the Available Paths column will show 2 for both paths.

If a query state is broken, see the last step in the workflow for troubleshooting details.

Step 9   As needed, click on the **Query ID** link or click ⬚ and select **View Details** to again review the Path Details panel and map.

Step 10   Create additional path queries by selecting **Services & Traffic Engineering > Path Query**. The Path Query Dashboard appears where the previous path queries are listed by Query ID.

> **Note**   Make sure to set the **Automatically delete query older than every** < X > option within the number of hours needed from the Path Query Dashboard. The maximum number of hours provided is **24**.

Step 11   Click **New Query**. The New Path Query panel appears on the right with the mapped Device Groups panel on the left.

Step 12   For Select Service, select the Type from the list. In this example, select **L2VPN-SERVICE**.

By utilizing Select Service, when you later select the Headend and Endpoint, the options are conveniently identified according to the relevant VPN service type.

Step 13   For Select Service, select the Instance from the list. In this example, select **L2VPN_NM_P2P-NATIVE-210**.

The topology map will update to show the path between both servers. In this example, **P-Edge-B2** and **P-Edge-C3** are isolated on the map showing the logical path.

Step 14   Select the following from the list:

a. Headend: **P-Edge-B2**.

b. Endpoint: **P-Edge-C3**.

Step 15   Click **Get Paths**.

The Running Query ID pop-up appears.

Step 16   Click **View Results** when it becomes available. The Path Details panel appears with the corresponding Available Paths details, while the defined topology map appears with the available Native SR IG Paths on the left. This view shows the actual, physical hops between B2 and C3 that is carrying the traffic.

Step 17   To troubleshoot any Failed path queries appearing in the Path Query Dashboard's Query State column, select the "I" icon for error details.

In this example, the gNMI protocol is missing from the Connectivity Details for a previous path query with the Headend P-BOTTOMLEFT device and the Endpoint P-BOTTOMRIGHT devices. To troubleshoot the failed path query, do the following:

a. Select Device Management > Network Devices.

b. Find the device by Host Name and select the check box.

c. Click the Edit icon at the top of the table. The Edit Device window appears.

d. In this example, the Connectivity Details for Protocol is missing gNMI. Click + **Add Another** and type GNMI until it appears in the list. Select it.

e. Enter the IP Address / Subnet Mask information and Port field information.

f. Enter the Timeout field as **30**.

g. In the Endcoding Type list, type **JSON** until it appears in the list. Select it and click **Save**.

h. Select Services & Traffic Engineering > Path Query. The Path Query Dashboard appears.

i. Click **New Query**. The New Path Query panel appears.

j. Select the following from the list:

    1. Headend device: **P-BOTTOMLEFT**.

    2. Endpoint device: **P-BOTTOMRIGHT**.

k. Click **Get Paths.**The Running Query ID pop-up appears.

l. Click **View Results** when it becomes available. The Path Details panel appears with corresponding Available Paths details, while the defined topology map appears with the available Native SR IG Paths on the left and is now in a Completed state.