



Visualize Flexible Algorithms

Flexible Algorithm allows operators to customize and compute the IGP shortest path according to their own needs and constraints (specific metrics and link properties). Many possible constraints can be used to compute a path over a network. For example, Flexible Algorithm can confine the path to a particular plane for networks with multiple logical planes. Since the meaning of the algorithm is not defined by any standard, but is defined by the user, it is called a Flexible Algorithm.

Crosswork enables you to filter the IGP topology based on Flexible Algorithm and visualize the subset of the network that is capable of providing a specific set of transport characteristics. The ability to visualize Flexible Algorithm topologies provides an important tool to help you deploy, maintain, and verify that the configured Flexible Algorithm intent is realized in your network. For example, to improve service availability, you may use Flexible Algorithm to define disjoint logical topologies to increase resiliency to network failures. Crosswork allows you to visualize both Flexible Algorithm topologies simultaneously and verify they have no common nodes or links. Or if they do, help you determine the common network elements so that you can update Flexible Algorithm configurations.

Important Notes

- Flexible Algorithm information is collected from the SR-PCE (running Cisco IOS XR 7.3.2).
- You cannot provision SR-MPLS policies or RSVP-TE tunnels with Flexible Algorithm constraints.
- You cannot filter Flexible Algorithms on multiple domains.



Note Throughout this section, the navigation is documented as **Traffic Engineering > Traffic Engineering**. However, when using the Crosswork Network Controller solution, the navigation is **Traffic Engineering & Services > Traffic Engineering**.

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Visualize Flexible Algorithm


Crosswork allows you to visualize Flexible Algorithm nodes and links that have been configured manually in your network.

Before you begin

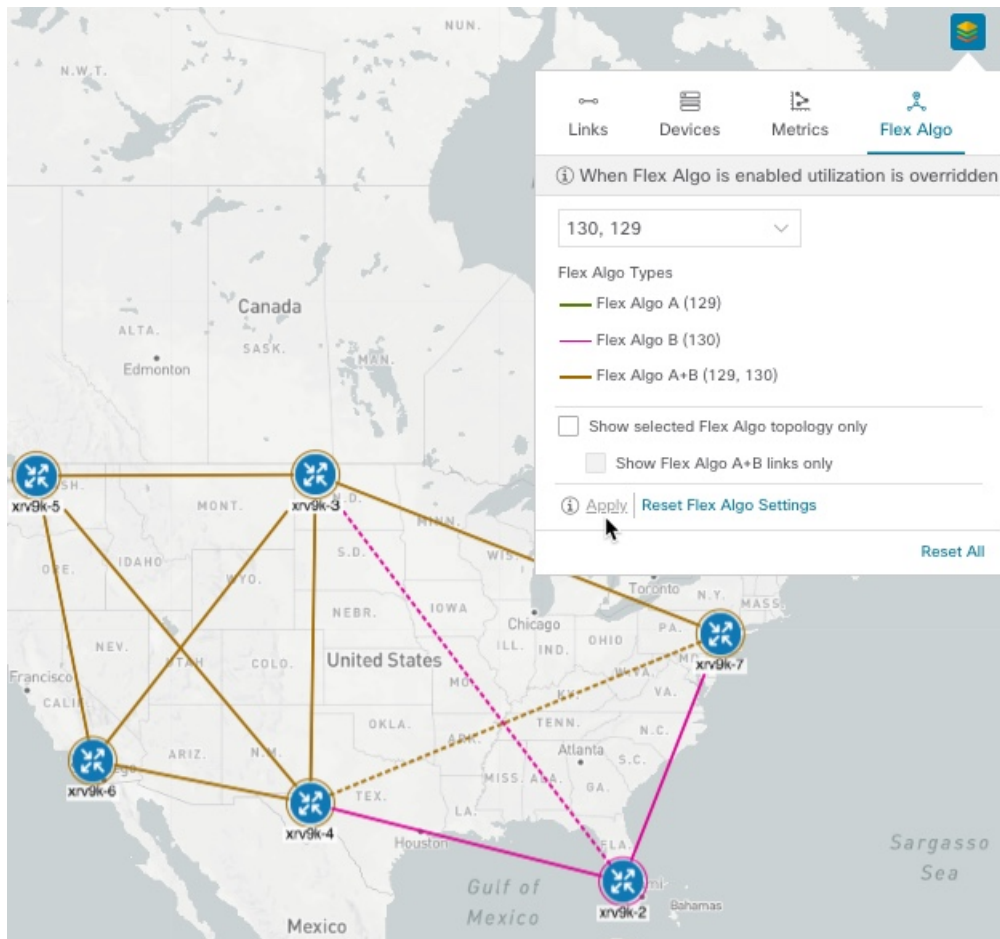
- You must configure Flexible Algorithms in your network. See SR configuration documentation for your specific device to view descriptions and supported configuration commands (for example: [Asr900 Flex Algorithm](#))
- You should know the Flexible Algorithm IDs that are used in your network. To view Flexible Algorithm membership, see [Find Flexible Algorithms for Links and Devices, on page 4](#).



Note You cannot visualize Flexible Algorithms if a Flexible Algorithm ID is the same across different domains.

- Step 1** From the main menu, select **Traffic Engineering > Traffic Engineering**.
- Step 2** From the topology map, click .
- Step 3** Click the **Flex Algo** tab.
- Step 4** From the drop-down list, select up to two Flexible Algorithm IDs.
- Step 5** View the Flexible Algorithm Types and confirm that the selection is correct. Also, note the color assignments for each Flexible Algorithm.
- Step 6** (Optional) Check the **Show selected Flex Algo topology only** check box to isolate the Flexible Algorithms on the topology map. When this option is enabled, SR policy selection is disabled.
- a) Check the **Show Flex Algo A+B links only** to show only those links and nodes that participate in both Flexible Algorithms.
- Step 7** Click **Apply**. You must click **Apply** for any additional changes to Flexible Algorithm selections to see the update on the topology map.

Example:



- Note**
- You cannot filter Flexible Algorithm IDs that are on multiple domains. Domain filtering is not supported based on Flexible Algorithms.
 - If a selected Flexible Algorithm is defined with criteria but there are no link and node combinations that match it (for example, a defined affinity to include all nodes or links with the color blue), then the topology map will be blank. If a selected Flexible Algorithm is not configured on a node or link, then the default blue link or node color appears.

Step 8 (Option) Click **Save View** to save the topology view and Flexible Algorithm selections.

Configure Flexible Algorithm Affinities

Flexible Algorithm affinities that are defined on devices are not collected by Crosswork Optimization Engine. The affinity mapping name is used for visualization. For this reason, you should manually collect Flexible Algorithm affinities on the device interface, then define an affinity mapping in the UI with the same name and bits that are used on the device interface.

The following ISIS and OSPF configuration sub-mode is used to configure Flexible Algorithm:

```
router isis instance flex-algo algo
router ospf process flex-algo algo
```

The following commands are used to configure Flexible Algorithm definition under the flex-algo sub-mode:

- IS-IS

```
metric-type delay
```



Note By default the regular IGP metric is used. If delay metric is enabled, the advertised delay on the link is used as a metric for Flexible Algorithm computation.

- OSPF

```
metric-type {delay | te-metric}
```



Note By default the regular IGP metric is used. If delay or TE metric is enabled, the advertised delay or TE metric on the link is used as a metric for Flexible Algorithm computation.

- *name*—name of the affinity map

```
affinity exclude-any name1, name2, ...
```

- *priority value*—priority

```
priority priority value
```

See SR configuration documentation for your specific device to view descriptions and supported configuration commands (for example: [Segment Routing Configuration Guide for Cisco ASR 9000 Series Routers](#))



Note To edit or delete an affinity mapping, click the relevant menu options.

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- Step 1** From the main menu, select **Traffic Engineering > Affinities > Flex-Algo Affinities**.
 - Step 2** To add a new Flexible Algorithm affinity mapping, click **+ Create**.
 - Step 3** Enter the name (color) and the bit it will be assigned.
 - Step 4** Click **Save** to save the mapping.
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Find Flexible Algorithms for Links and Devices

If you want to know all Flexible Algorithms that a device or link is a member of, do the following:

Before you begin

You must configure Flexible Algorithm in your network.

Step 1 From the main menu, choose **Traffic Engineering > Traffic Engineering**.

Step 2 To view a device's Flexible Algorithm membership:

- From the topology map, click on a device that you know is a member of at least one Flexible Algorithm.
- In the **Device Details** window, click the **Flex-Algo** tab.

The screenshot shows the 'Device Details' window with the 'Flex-Algo' tab selected. It displays two Flexible Algorithms:

- Algo 128:**
 - Participating:** Yes
 - Elected Definition:** Metric Type: LATENCY
 - Exclude-Any Affinity: Yellow(253), Red(255)
 - Include-Any Affinity: Blue(3)
 - Include-All Affinity: Green(5)
 - Advertised:** Yes
 - Priority: 210
 - Definition Equal to Local: No
- Algo 130:**
 - Participating:** Yes
 - Elected Definition:** Metric Type: LATENCY
 - Exclude-Any Affinity:
 - Include-Any Affinity:
 - Include-All Affinity:
 - Advertised:** No
 - Priority: 200

Step 3 To view a link's Flexible Algorithm membership:

- From the topology map, click a link that you know is a member of at least one Flexible Algorithm.
- In the **Links** page, click one of the link types.
- By default, the **Summary** tab is displayed within the **Link Details** window. View **foreign agent Topologies** to see what Flexible Algorithm each source and destination device belong to.

Link Details



Summary

SR-MPLS

SRv6

RSVP-TE

Name GigabitEthernet0/0/0/1-GigabitEthernet0/0/0/0
State Up
Link Type L3 ISIS IPV4
ISIS Level 2
Last Update 24-Aug-2021 09:51:59 AM PDT

	A Side	Z Side
Node	xrv9k-7	xrv9k-3
TE Router ID	192.168.0.7	192.168.0.3
IF Name	GigabitEthernet0/0/0/1	GigabitEthernet0/0/0/0
IF Description	GigabitEthernet0/0/0/1	GigabitEthernet0/0/0/0
IF Alias	T-SDN Interface	
Type	ETHERNETCSMACD	ETHERNETCSMACD
IP Address	10.0.0.42	10.0.0.41
Utilization	0% (0Bps/1Gbps)	0% (0Bps/1Gbps)
IGP Metric	10	10
Delay Metric	10	10
TE Metric	10	10
FA Affinities		
Admin Groups	2,5	2,5
FA Topologies	128, 129, 130, 131, 132, 133, 134, 207	128, 129, 130, 131, 132, 133, 134