



SRv6 Microloop Avoidance for Network Resilience

SRv6 microloop avoidance is a SRv6 feature designed to prevent brief, transient packet loops that occur during network topology changes. These microloops can cause packet loss and jitter, but this feature detects such possibilities and temporarily steers traffic onto loop-free paths, ensuring stable forwarding during network convergence. This significantly enhances network stability, performance, and the overall user experience.

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SRv6 microloop avoidance

A SRv6 microloop avoidance is a SRv6 feature that

- detects if microloops are possible following a topology change
- creates temporary loop-free SR-TE policy paths to the destination using a list of segments, and
- replaces the temporary paths with regular forwarding paths after a Routing Information Base (RIB) update delay timer expires.

Key concepts of SRv6 microloop avoidance

- **Microloops:** A microloop is a brief packet loop that occurs in the network following a topology change (link down, link up, or metric change events), is caused by the non-simultaneous convergence of different nodes in the network, and results in packet loss, jitter, and out-of-order packets if traffic is looped between nodes.
- **Temporary SR-TE Policy Paths:** Loop-free paths to a destination, constructed using a list of segments, that are temporarily installed by the feature to avoid microloops.
- **RIB update delay timer:** A configurable timer that dictates how long the temporary microloop avoidance policy is used before the network transitions to regular, natively converged forwarding paths.
- **Loop-free forwarding:** The primary goal and outcome of the feature, ensuring that traffic continues to be forwarded without being caught in transient loops during network topology changes and convergence.

Benefits of SRv6 microloop avoidance

SRv6 microloop avoidance provides significant value by mitigating the detrimental effects of microloops, a long-standing challenge in IP networks. This feature offers substantial benefits for network stability, performance, and user experience within SRv6 deployments.

The feature provides these key benefits:

- Addresses a fundamental network challenge: SRv6 microloop avoidance resolves the issue of transient packet loops that occur immediately after topology changes due to non-simultaneous router convergence.
- Prevents service degradation: SRv6 microloop avoidance eliminates packet loss, jitter, and out-of-order packets caused by microloops, which directly impact application performance, especially for real-time services.
- Ensures loop-free forwarding during convergence: The feature proactively detects potential microloops and temporarily steers traffic onto specially constructed, loop-free SRv6-TE policy paths, ensuring continuous and stable forwarding during network convergence.
- Improves network stability and predictability: By preventing microloops, the network's behavior during topology changes becomes more predictable and stable, reducing transient issues and simplifying troubleshooting.
- Enhances application performance: By preventing microloop-induced packet impairments, it directly contributes to a higher quality of service for all applications, particularly sensitive ones.
- Leverages SRv6 capabilities: The solution seamlessly integrates into existing SRv6 deployments by using SRv6 Segment Identifiers (SIDs) to construct and enforce temporary microloop-avoidant paths.
- Offers local behavior with global benefits: The feature operates as a local behavior, meaning that individual nodes can implement it to protect their own forwarding, contributing to overall network stability without requiring universal deployment.

Limitations of SRv6 microloop avoidance

- The Routing Information Base (RIB) update delay value specifies the amount of time the node uses the microloop avoidance policy before updating its forwarding table. The delay-time range is from 1 to 60000 milliseconds; the default value is 5000.

How SRv6 microloop avoidance works

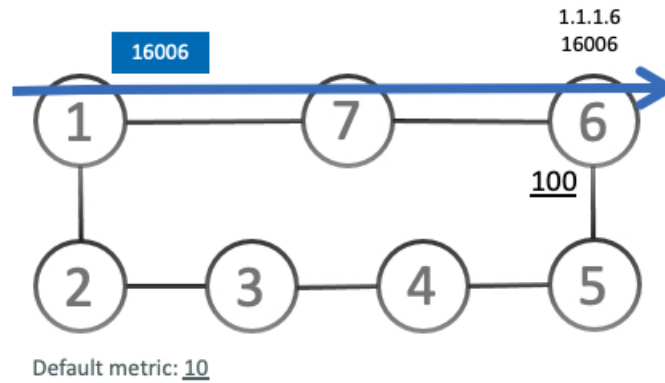
Summary

The SRv6 Microloop Avoidance process involves a router detecting potential microloops following a topology change. The Interior Gateway Protocol (IGP) then computes and temporarily installs an SRv6 microloop-avoidant path using a Segment Identifier (SID) list. After the network converges and a configurable RIB update delay expires, the IGP replaces this temporary path with the native post-convergence forwarding path.

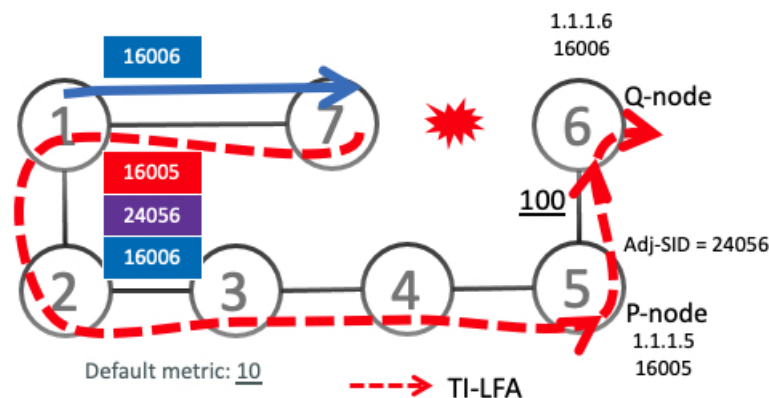
Workflow

These stages describe how SRv6 Microloop Avoidance works in a network:

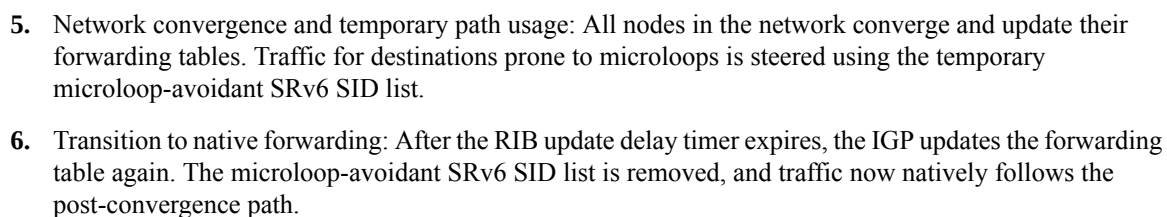
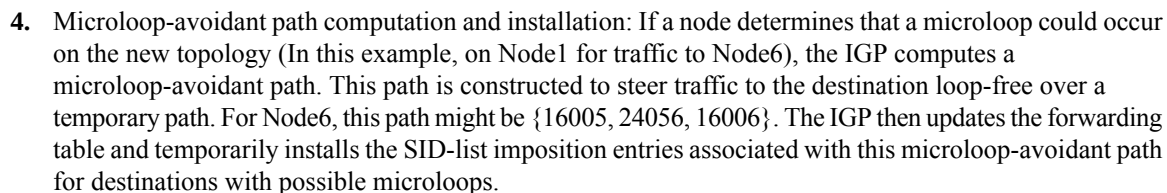
1. Initial network state: The network operates in a stable state. Node1 sends traffic to Node6 (prefix SID 16006) via Node7. Node7 is configured with TI-LFA to protect traffic to Node6.

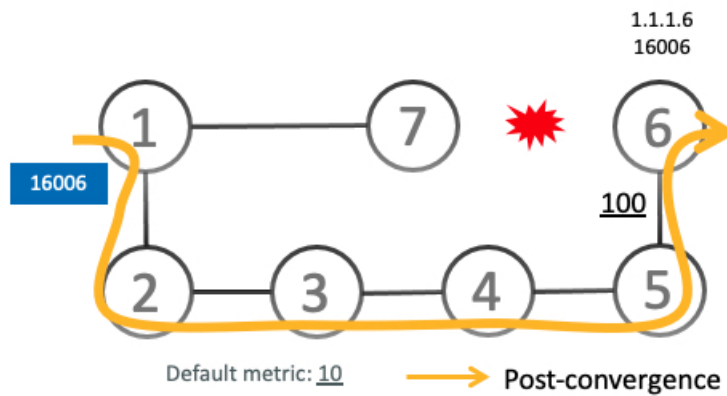


2. Topology change and failure detection: A link failure occurs, for example, between Node6 and Node7. All nodes are notified of this topology change. Node7's TI-LFA pre-computes a backup path for traffic to Node6 (prefix SID 16006), which would steer traffic toward Node5 (prefix SID 16005) and then via the link between Node5 and Node6 (adj-SID 24056).



3. Microloop detection : A router with the SRv6 microloop avoidance feature detects if microloops are possible for a destination on the post-convergence path following the topology change. For example, if Node2 converges before Node3, Node3 might send traffic back to Node2 as the shortest IGP path to Node6, creating a microloop between Node2 and Node3.





Configure SRv6 IS-IS microloop avoidance

Use this procedure to configure SRv6 IS-IS Microloop Avoidance and set the Routing Information Base (RIB) update delay value.

Before you begin

Complete the SRv6 configuration before performing these steps.

Procedure

Configure SRv6 IS-IS microloop avoidance.

Example:

```
Router(config)# router isis test-igp
Router(config-isis)# address-family ipv6 unicast
Router(config-isis-af)# microloop avoidance segment-routing
Router(config-isis-af)# microloop avoidance rib-update-delay 2000
Router(config-isis-af)# commit
```

