SRv6 uSID Migration

This chapter introduces the Full-Replace Migration to SRv6 Micro-SID (f3216), a feature enabling network operators to seamlessly transition existing SRv6 deployments from the legacy "format1" full-length SIDs to the more efficient f3216 uSIDs.

Full-replace migration to SRv6 uSID

The full-replace migration is a network migration process that

- enables incremental migration from format1 to f3216 using the Ship in the Night method
- migrates both the underlay and overlay from format1 to uSID f3216, and
- minimizes service disruption and ensures seamless migration by replacing the initial SRv6 locator with another SRv6 locator.

The Ship in the Night method is a migration approach that enables you to introduce segment routing into your environment incrementally while allowing existing transport protocols to continue operating independently until you are ready to phase them out, thereby minimizing service disruption and supporting a seamless migration process.

Table 1: Feature History Table

Feature Name	Release Information	Feature Description
Full-Replace Migration to SRv6 Micro-SID	Release 25.1.1	Introduced in this release on: Fixed Systems (8700 [ASIC: K100], 8010 [ASIC: A100]) This feature is now supported on: • 8712-MOD-M • 8011-4G24Y4H-I

Feature Name	Release Information	Feature Description
Full-Replace Migration to SRv6 Micro-SID	Release 7.8.1	This feature enables migration of existing SRv6 SID format1 to SRv6 Micro-SIDs (f3216) formats. Earlier, only one format was supported at a time, and you had to choose either format1 or Micro-SID format for the deployment of services. Migration from Full-length SIDs to SRv6 Micro-SIDs was not possible.

The services migration is performed using a replacement procedure, where the initial SRv6 locator is replaced by another SRv6 locator. The format1 to f3216 migration minimizes traffic loss, requires minimal configurations, and no IETF signaling extensions.

Supported configurations and modes

These are supported modes for migration from format1 to u-SIDs:

- Base: SRv6 classic mode with only format1 supported.
- Dual: SRv6 classic with format1 and SRv6 uSID with f3216 will both coexist.
- f3216: uSID format. f3216 represents the format 3216, which is 32-bit block and 16-bit IDs.
- The router supports IS-IS underlay configurations, including TILFA, uLoop, and FlexAlgo, for migration from format1 to uSIDs.

Migration states

The migration starts with SRv6 base format1 and ends with SRv6 uSID f3216. The migration states are:

- Initial state: This is the initial migration state of a deployment. This state comprises SRv6 base with format1.
- In-migration state: The migration procedure is initiated, and in progress. This state comprises SRv6 in dual mode (base with format1, and uSID with f3216). While this state may be maintained for a period of time, it is recommended to progress to the next migration state as soon as possible.
- End state: This is the state of deployment at the end of the migration. At the end state, you can update the network and add new features. In the Full-Replace migration end state, both underlay and overlay are migrated to uSID f3216.

Restrictions for full-replace migration to SRv6 micro-SID

Line card reload

You need to reload the line cards as the hardware profiles go through multiple transitions during the Full-Replace migration to SRv6 uSID.

Delayed Delete Command

You can overcome the traffic drop duration during the swap from format1 by f3216 on a PE node, depending on the BGP/EVPN convergence, by using the **delayed_delete** command. When the **delayed_delete** command

is configured against the format1 SID locator, the RIB notifies EVPN about this change. The EVPN in turn stores the delayed flag in its RIB locator database.

How uSID f3216 migration works

Summary

The uSID f3216 migration involves Network nodes, IS-IS protocol, P nodes, PE nodes, BGP, EVPN, and SRv6. The process begins with network nodes being upgraded to support uSID f3216 and allow coexistence. Subsequently, IS-IS on P and PE nodes is configured to incrementally shift the underlay to f3216 while temporarily coexisting with format1. Finally, BGP and EVPN configurations on PE nodes are updated to migrate overlay services, with SRv6 managing the allocation and deallocation of SIDs. This systematic approach ensures a seamless transition to a fully uSID f3216-based network architecture.

Workflow

These stages describe how the uSID f3216 migration process works.

1. Prepare for migration: Upgrade the network nodes to an image that is uSID f3216 capable, and allows the coexistence of format1 and f3216
2. Migrate the underlay to uSID: IS-IS as an underlay protocol was already configured on P and PE nodes using format1 locators. In this migration step, add f3216 locators in the IS-IS configuration, in addition to the format1 locators. Both format1 and f3216 endpoint SIDs are concurrently allocated, installed, and announced during this stage. f3216 is the preferred option over format1 for underlay paths.

   After the f3216 locators have been configured on all P and PE nodes, the format1 locators are removed from the P nodes. The overlay services still use the format1 locators after completing this migration step, therefore, the format1 locator configuration must be maintained on the PE nodes.

   At the end of this step, the migration status of the P nodes is:

   - Locator reachability: f3216 only
   - Underlay endpoints/headends: f3216 only

   At the end of this step, the migration status of the PE Nodes is:

   - Locator reachability: format1 and f3216
   - Underlay endpoints/headends: f3216 only
   - Overlay endpoints/headends: format1

3. Migrate the overlay to uSID: Enable overlay f3216 locators under BGP and EVPN on all PE nodes. The BGP and EVPN configurations replace the format1 locator with the f3216 locator. During this stage, the f3216 uSIDs are allocated, installed, and announced, while the format1 SIDs are deallocated, uninstalled, and withdrawn.

   For a transient period, BGP and EVPN might have some paths with a format1 SID and some with an f3216 SID.

   The format1 locators are removed from the underlay after all the overlay traffic has converged to use f3216 SIDs. By unconfiguring the format1 locators from BGP and EVPN, they are deleted from SRv6.

At the end of this step, the migration status of the P/PE Nodes is:

- Locator reachability: f3216 only
- Underlay endpoints/headends: f3216 only
- Overlay endpoints/headends: f3216 only

4. Final state: This is the state of deployment at the end of the migration. At the end state, you can update the network and add new features. In the Full-Replace migration end state, both underlay and overlay are migrated to uSID f3216.

Migrate an SRv6 network from format1 to uSID

Migrate the network from SRv6 base format1 to uSID f3216. This migration enables faster convergence and seamless traffic transition.

Upgrade your routers to support SRv6 uSID `f3216`, which allows coexistence and phased migration from format1. This procedure guides network administrators through each transition stage: initial, in-migration, and end state.

Before you begin

- Upgrade all network nodes (P and PE) to a software image that supports SRv6 uSID `f3216` and allows the coexistence of `format1` and `f3216` locators.
- Ensure IS-IS, BGP, and EVPN protocols are configured and operational with SRv6 `format1` locators.

Procedure

Step 1 Configure SRv6 locators in the initial state using format1 only.

This step sets up the base SRv6 configuration with format1 locators, if they are not already present.

Example:

```
Router(config)# segment-routing srv6
Router(config-srv6)# locators
Router(config-srv6-locators)# locator myLoc0
Router(config-srv6-locators)# prefix f1bb:bbbb:bb00:0001::/64
```

Step 2 Configure IS-IS with the SRv6 format1 locator in the initial state.

This step integrates IS-IS with the format1 SRv6 locator.

Example:

```
Router(config)# router isis 100
Router(config-isis)# address-family ipv6 unicast
Router(config-isis-af)# segment-routing srv6
Router(config-isis-srv6)# locator myLoc0
```

Step 3 Configure BGP and EVPN with SRv6 locator in the initial state.

This step integrates BGP and EVPN with the format1 SRv6 locator.

Example:

```
Router(config)# router bgp 100
Router(config-bgp)# bgp router-id 10
Router(config-bgp)# segment-routing srv6
Router(config-bgp-srv6)# locator myLoc0

Router(config)# evpn
Router(config-evpn)# segment-routing srv6
Router(config-evpn-srv6)# locator myLoc0
```

Step 4 Initiate in-migration to dual mode by configuring the uSID locator.

This step configures the uSID locator, enabling dual mode operation. The `delayed-delete` command ensures the format1 locator remains active during the transition.

Example:

```
Router(config)# segment-routing srv6
Router(config-srv6)# locators
Router(config-srv6-locators)# locator myLoc0
Router(config-srv6-locators)# prefix f1bb:bbbb:bb00:0001::/64
Router(config-srv6-locators)# delayed-delete
Router(config-srv6-locators)# locator myuLoc0
Router(config-srv6-locators)# micro-segment behavior unode psp-usd
Router(config-srv6-locators)# prefix fcbb:bb00:0001::/48
```

Step 5 Update IS-IS and BGP/EVPN to use both locators during in-migration.

This step modifies the IS-IS and BGP and EVPN configuration to recognize and use both locators.

Example:

```
Router(config)# router isis 100
Router(config-isis)# address-family ipv6 unicast
Router(config-isis-af)# segment-routing srv6
Router(config-isis-srv6)# locator myLoc0
Router(config-isis-srv6)# locator myuLoc0

Router(config)# router bgp 100
Router(config-bgp)# bgp router-id 10
Router(config-bgp)# segment-routing srv6
Router(config-bgp-srv6)# locator myuLoc0

Router(config)# evpn
Router(config-evpn)# segment-routing srv6
Router(config-evpn-srv6)# locator myuLoc0
```

Step 6 Finalize end-state configuration by retaining only uSID locators.

Example:

```
Router(config)# segment-routing srv6
Router(config-srv6)# locators
Router(config-srv6-locators)# locator myuLoc0
Router(config-srv6-locators)# micro-segment behavior unode psp-usd
Router(config-srv6-locators)# prefix fcbb:bb00:0001::/48
```

```
Router(config)# router isis 100
Router(config-isis)# address-family ipv6 unicast
Router(config-isis-af)# segment-routing srv6
Router(config-isis-srv6)# locator myuLoc0


Router(config)# router  bgp 100
Router(config-bgp)# bgp router-id 10
Router(config-bgp)# segment-routing srv6
Router(config-bgp-srv6)# locator myuLoc0


Router(config)# evpn
Router(config-evpn)# segment-routing srv6
Router(config-evpn-srv6)# locator myuLoc0
```

show

commands

Step 7 Verify SRv6 migration status to confirm that the SRv6 deployment is operating correctly with uSID locators.

Example:

```
RP/0/RSP0/CPU0:Router# show route ipv6 fc00:cc30:600:e004:: detail

Routing entry for fc00:cc30:600::/48
    Known via "isis 2", distance 115, metric 141, SRv6-locator, type level-2
    Installed Nov 2 18:56:55.718 for 00:01:01
    Routing Descriptor Blocks
      fe80::232:17ff:fec3:58c0, from 7511::1, via TenGigE0/0/0/16.1, Protected
        Route metric is 141
        Label: None
        Tunnel ID: None
        Binding Label: None
        Extended communities count: 0
        Path id:1  Path ref count:0
        NHID:0x20006(Ref:193)
        Backup path id:65
      fe80::226:80ff:fe36:7c01, from 7511::1, via TenGigE1/0/9/1.1, Backup (TI-LFA)
        Repair Node(s): 3888::1
        Route metric is 251
        Label: None
        Tunnel ID: None
        Binding Label: None
        Extended communities count: 0
        Path id:65  Path ref count:1
        NHID:0x20007(Ref:163)
        SRv6 Headend:H.Insert.Red [f3216], SID-list {fc00:cc30:700::}
 Route version is 0x0 (8)
 No local label
 IP Precedence: Not Set
 QoS Group ID: Not Set
 Flow-tag: Not Set
 Fwd-Class: Not Set
 Route Priority:RIB_PRIORITY_NON_RECURSIVE_LOW (8) SVD Type RIB_SVD_TYPE_LOCAL
 Download Priority 2, Download Version 261731
 No advertising protos.
```