Limitations

Only two backup labels are supported.

Usage Guidelines and Limitations

The TI-LFA guidelines and limitations are listed below:

TI-LFA Functionality	IS-IS[1]	OSPFv2
Protected Traffic Types		
Protection for SR labeled traffic	Supported	Supported
Protection of IPv4 unlabeled traffic	Supported (IS-ISv4)	Supported
Protection of IPv6 unlabeled traffic	Unsupported	N/A
Protection Types		
Link Protection	Supported	Supported
Node Protection	Supported	Supported
Local SRLG Protection	Supported	Supported
Weighted Remote SRLG Protection	Unsupported	Unsupported
Line Card Disjoint Protection	Unsupported	Unsupported
Interface Types		
Ethernet Interfaces	Supported	Supported
Ethernet Bundle Interfaces	Unsupported	Unsupported
TI-LFA over GRE Tunnel as Protecting Interface	Unsupported	Unsupported

TI-LFA Functionality	IS-IS[1]	OSPFv2
Additional Functionality		
BFD-triggered	Unsuported	Unsuported
BFDv6-triggered	Unsuported	N/A
Prefer backup path with lowest total metric	Unsuported	Unsuported
Prefer backup path from ECMP set	Supported	Supported
Prefer backup path from non-ECMP set	Supported	Supported
Load share prefixes across multiple backups paths	Unsuported	Unsuported
Limit backup computation up to the prefix priority	Supported	Supported

[1] Unless specified, IS-IS support is IS-ISv4 and IS-ISv6

Configuring TI-LFA for IS-IS

This task describes how to enable per-prefix Topology Independent Loop-Free Alternate (TI-LFA) computation to converge traffic flows around link, node, and SRLG failures.

Before you begin

Ensure that the following topology requirements are met:

- Router interfaces are configured as per the topology.

- Routers are configured with IS-IS.

- Segment routing for IS-IS is configured. See Enabling Segment Routing for IS-IS Protocol.

- Enter the following commands in global configuration mode:

```
Router(config)# ipv4 unnumbered mpls traffic-eng Loopback0
Router(config)# mpls traffic-eng
Router(config-mpls-te)# exit
Router(config)#
```

Procedure

	Command or Action	Purpose
Step 1	**configure** **Example:** RP/0/RP0/CPU0:router# configure	Enters mode.
Step 2	**router isis** *instance-id* **Example:** RP/0/RP0/CPU0:router(config)# **router isis**	Enables IS-IS routing for the specified routing instance, and places the router in router configuration mode.

	Command or Action	Purpose
	`1`	**Note** You can change the level of routing to be performed by a particular routing instance by using the **is-type** router configuration command.
Step 3	**interface** *type interface-path-id* **Example:** RP/0/RP0/CPU0:router(config-isis)# **interface GigabitEthernet0/0/0/1**	Enters interface configuration mode.
Step 4	**address-family ipv4** [**unicast**] **Example:** RP/0/RP0/CPU0:router(config-isis-if)# **address-family ipv4 unicast**	Specifies the IPv4 address family, and enters router address family configuration mode.
Step 5	**fast-reroute per-prefix** **Example:** RP/0/RP0/CPU0:router(config-isis-if-af)# **fast-reroute per-prefix**	Enables per-prefix fast reroute.
Step 6	**fast-reroute per-prefix ti-lfa** **Example:** RP/0/RP0/CPU0:router(config-isis-if-af)# **fast-reroute per-prefix ti-lfa**	Enables per-prefix TI-LFA fast reroute link protection.
Step 7	**fast-reroute per-prefix tiebreaker** {**node-protecting** | **srlg-disjoint**} **index** *priority* **Example:** RP/0/RP0/CPU0:router(config-isis-if-af)# **fast-reroute per-prefix tie-breaker srlg-disjoint index 100**	Enables TI-LFA node or SRLG protection and specifies the tiebreaker priority. Valid *priority* values are from 1 to 255. The lower the *priority* value, the higher the priority of the rule. Link protection always has a lower priority than node or SRLG protection. **Note** The same attribute cannot be configured more than once on an interface. **Note** For IS-IS, TI-LFA node protection and SRLG protection can be configured on the interface or the instance.

TI-LFA has been successfully configured for segment routing.

Configuring TI-LFA for OSPF

This task describes how to enable per-prefix Topology Independent Loop-Free Alternate (TI-LFA) computation to converge traffic flows around link, node, and SRLG failures.

Note TI-LFA can be configured on the instance, area, or interface. When configured on the instance or area, all interfaces in the instance or area inherit the configuration.

Before you begin

Ensure that the following topology requirements are met:

- Router interfaces are configured as per the topology.

- Routers are configured with OSPF.

- Segment routing for OSPF is configured. See Enabling Segment Routing for OSPF Protocol.

- Enter the following commands in global configuration mode:

```
Router(config)# ipv4 unnumbered mpls traffic-eng Loopback0
Router(config)# mpls traffic-eng
Router(config-mpls-te)# exit
Router(config)#
```

Procedure

	Command or Action	Purpose
Step 1	**configure** **Example:** RP/0/RP0/CPU0:router# configure	Enters mode.
Step 2	**router ospf** *process-name* **Example:** RP/0/RP0/CPU0:router(config)# **router ospf 1**	Enables OSPF routing for the specified routing process, and places the router in router configuration mode.
Step 3	**area** *area-id* **Example:** RP/0/RP0/CPU0:router(config-ospf)# **area 1**	Enters area configuration mode.
Step 4	**interface** *type interface-path-id* **Example:**	Enters interface configuration mode.

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router(config-ospf-ar)#` **`interface GigabitEthernet0/0/0/1`**	
Step 5	**fast-reroute per-prefix** **Example:** `RP/0/RP0/CPU0:router(config-ospf-ar-if)#` **`fast-reroute per-prefix`**	Enables per-prefix fast reroute.
Step 6	**fast-reroute per-prefix ti-lfa** **Example:** `RP/0/RP0/CPU0:router(config-ospf-ar-if)#` **`fast-reroute per-prefix ti-lfa`**	Enables per-prefix TI-LFA fast reroute link protection.
Step 7	**fast-reroute per-prefix tiebreaker** {**node-protecting** | **srlg-disjoint**} **index** *priority* **Example:** `RP/0/RP0/CPU0:router(config-ospf-ar-if)#` **`fast-reroute per-prefix tie-breaker srlg-disjoint index 100`**	Enables TI-LFA node or SRLG protection and specifies the tiebreaker priority. Valid *priority* values are from 1 to 255. The lower the *priority* value, the higher the priority of the rule. Link protection always has a lower priority than node or SRLG protection. **Note** The same attribute cannot be configured more than once on an interface.

TI-LFA has been successfully configured for segment routing.

TI-LFA Node and SRLG Protection: Examples

The following examples show the configuration of the tiebreaker priority for TI-LFA node and SRLG protection, and the behavior of post-convergence backup-path. These examples use OSPF, but the same configuration and behavior applies to IS-IS.

Example: Enable link-protecting and node-protecting TI-LFA

```
router ospf 1
 area 1
  interface GigabitEthernet0/0/2/1
    fast-reroute per-prefix
    fast-reroute per-prefix ti-lfa
    fast-reroute per-prefix tiebreaker node-protecting index 100
```

Both link-protecting and node-protecting TI-LFA backup paths will be computed. If the priority associated with the node-protecting tiebreaker is higher than any other tiebreakers, then node-protecting post-convergence backup paths will be selected, if it is available.

Example: Enable link-protecting and SRLG-protecting TI-LFA

```
router ospf 1
 area 1
  interface GigabitEthernet0/0/2/1
    fast-reroute per-prefix
    fast-reroute per-prefix ti-lfa
    fast-reroute per-prefix tiebreaker srlg-disjoint index 100
```

Both link-protecting and SRLG-protecting TI-LFA backup paths will be computed. If the priority associated with the SRLG-protecting tiebreaker is higher than any other tiebreakers, then SRLG-protecting post-convergence backup paths will be selected, if it is available.

Example: Enable link-protecting, node-protecting and SRLG-protecting TI-LFA

```
router ospf 1
 area 1
  interface GigabitEthernet0/0/2/1
    fast-reroute per-prefix
    fast-reroute per-prefix ti-lfa
    fast-reroute per-prefix tiebreaker node-protecting index 100
    fast-reroute per-prefix tiebreaker srlg-disjoint index 200
```

Link-protecting, node-protecting, and SRLG-protecting TI-LFA backup paths will be computed. If the priority associated with the node-protecting tiebreaker is highest from all tiebreakers, then node-protecting post-convergence backup paths will be selected, if it is available. If the node-protecting backup path is not available, SRLG-protecting post-convergence backup path will be used, if it is available.