



# IS-IS Configuration Guide

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# Part 1. Configuring IS-IS

## 1.1. Introduction

The RtBrick Full Stack (RBFS) is a distributed, web-scale network operating system based on micro-service architecture and packaged in a Linux container currently based on Ubuntu 18.04. The RBFS decreases the complexity of a network by providing users with capabilities such as composability, programmability, and elasticity in a visionary way.

The RBFS operating system operates on the leaf and spine framework. This framework provides the network operators with methods to configure and manage a network brick by brick, and provides full control of the network so the focus can be on the deployment of the new services and not the constant juggling of hardware. The Intermediate System-to-Intermediate System (IS-IS) protocol is an interior gateway protocol (IGP) that uses link-state information to make routing decisions.

## 1.2. IS-IS CLI Overview

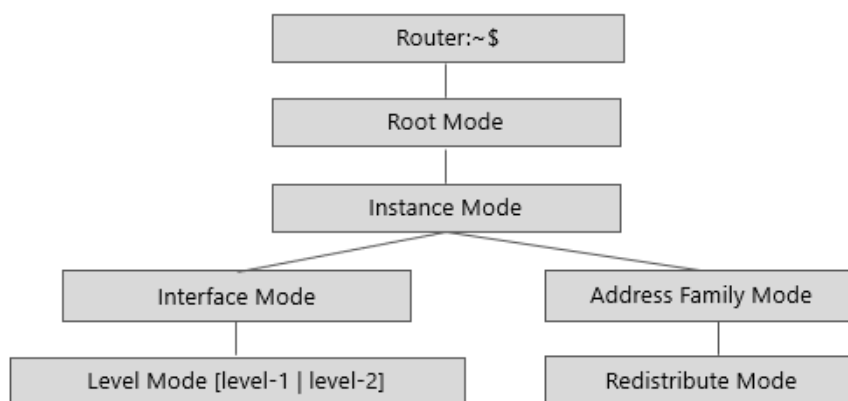
This guide provides the various IS-IS configuration and show CLI commands for RBFS. It shows you how to configure IS-IS using the **confd** daemon, view the command hierarchy, and make configuration changes.

## 1.3. RBFS IS-IS Instance Hierarchy

The RBFS uses a distinct hierarchy for the IS-IS statements and commands. When installed, the RBFS runs a default instance named "default."

You can apply IS-IS configuration statements and commands at the instance, address family, or protocol IS-IS hierarchy level.

The figure below shows the IS-IS command hierarchy:



The table below shows the IS-IS configuration modes and CLI prompts:

Configuration Mode	Prompt
Root	root@confd:/>
Instance	root@confd:/isis>
Interface	root@confd:/isis/interface>
Interface level [level-1   level-2]	root@confd:/isis/ift-0/0/1/1/1/level-1> root@confd:/isis/ift-0/0/1/1/1/level-2>
Address Family [ipv4   ipv6]	root@confd:/isis/ipv4-unicast> root@confd:/isis/ipv6-unicast>
Redistribute	root@confd:/isis/ipv4-unicast/redistribute>

### 1.3.1. Modes and Commands

All edit and set operations are performed through the configuration daemon **CONF**D. Their end result is similar, but the terms apply to slightly different configuration methods:

- **Mode:** An “edit” is used to provide a hierarchical configuration option for the module instance.
- **Commands:** A “set” is used to set the statement parameters and attributes for the module instance.

In a typical configuration session, you will use both methods.

#### Syntax

```
root@is-is-router:confd> edit instance red
[ instance red ]
root@is-is-router:confd> edit protocol isis
[ instance red protocol isis ]
```



You can execute the **exit** command to exit the current level of the statement hierarchy, returning to the level prior to the last edit command. To exit from the configuration mode, enter the **end** and **exit** commands.

### 1.3.2. IS-IS Instance

To enter into the IS-IS default instance mode, enter the following command:

```
root@rta:confd> edit instance protocol isis
[ instance protocol isis ]
root@rta:confd>
```

### 1.3.3. Interface

In this mode, you can configure the interface-specific IS-IS properties.

#### Example (Default Instance)

```
root@is-is-router:confd> edit interface if1-0/0/1/2/1
[ instance protocol isis interface if1-0/0/1/2/1 ]
root@rta:confd>
```

#### Example (VRF Instance)

```
root@is-is-router:confd> edit interface if1-0/0/1/2/1
[ instance red protocol isis interface if1-0/0/1/2/1 ]
root@rta:confd>
```

### 1.3.4. Level (IS-IS Interfaces)

The level mode enables you to configure the IS-IS operational characteristics of the interface at Level 1 and/or Level 2. Level 1 and Level 2 can be configured inside a logical interface. By default, an interface operates in both Level 1 and Level 2 modes.

- Level 1: Specifies the IS-IS operational characteristics of the interface at level 1.
- Level 2: Specifies the IS-IS operational characteristics of the interface at level 2.

#### Example (Default Instance)

```
root@is-is-router:confd> edit level-1
[ instance protocol isis interface if1-0/0/1/2/1 level-1 ]
root@is-is-router:confd> edit level-2
[ instance protocol isis interface if1-0/0/1/2/1 level-2 ]
```

#### Example (VRF Instance)

```
root@is-is-router:confd> edit level-1
[ instance red protocol isis interface if1-0/0/1/2/1 level-1 ]

root@is-is-router:confd> edit level-2
[ instance red protocol isis interface if1-0/0/1/2/1 level-2 ]
```

## 1.3.5. Redistribute

IS-IS determines support for route redistribution based on address family. The selected address family can redistribute local interface routes, static routes, routes learned by IS-IS, and so on.

The examples below show the route redistribution options:

### Example (Default Instance)

```
root@isr1:confd> edit instance protocol isis address-family ipv4 unicast
[ instance protocol isis address-family ipv4 unicast ]
root@isr1:confd>
```

### Example (VRF Instance)

```
root@ is-is-router:confd> edit instance vrf1
instance vrf1 ]
root@ is-is-router:confd> edit address-family ipv4unicast
[ instance vrf1 address-family ipv4 unicast ]
```

## 1.4. IS-IS Instance Configuration Commands

This section describes the commands used to configure IS-IS in an instance.

### 1.4.1. IS-IS Instance

To enter into the IS-IS default instance mode configuration mode, enter the following command:

```
root@rta:confd> edit instance protocol isis
[ instance protocol isis ]
root@rta:confd>
```

### Example



```
root@isr1:confd> edit instance protocol isis
[ instance protocol isis ]
root@isr1:confd>

root@isr1:confd> set
  address-family      Address family config
  area                ISO area
  holding-time        ISIS neighbor hold time
  hostname            ISIS System Host Name
  interface           Interface Configuration
  lsp                LSP Flooding Related Configuration
  overload            Set ISIS Overload bit in LSP
  system-id          ISO system id associated with the system
[ instance protocol isis ]
root@isr1:confd>
```

## 1.4.2. area

This command specifies the ISO area.

### Syntax

```
set area <area>
```

### Command arguments

<area>	The area can be represented in 1, 3, 5, 13 bytes format.
--------	--

### Example

```
root@rta:confd> edit instance protocol isis
root@rta:confd> set area 49.0001/24
```

## 1.4.3. holding-time

This command sets the adjacency expiry interval. This is a global setting for the instance.

### Syntax

```
set holding-time < seconds>
```

### Command arguments

<seconds>	<p>Specifies the adjacency expiry and the hello interval time in seconds.</p> <p>Default value: 30 seconds</p> <p>Range: 1 through 65535 seconds</p> <p><b>Note:</b> You need to adjust the hold time configuration for stable operations.</p>
-----------	--

### Example

```
root@rta:confd> edit instance protocol isis
root@rta:confd> set holding-time 30000
```

## 1.4.4. lsp lifetime

This command sets the link-state PDU (LSP) lifetime, after which the LSP expires.

### Syntax

```
set lsp lifetime <seconds>
```

### Command arguments

<seconds>	<p>Specifies the LSP lifetime in seconds.</p> <p>Default value: 20 seconds</p> <p>Range: 5 through 65535 seconds</p>
-----------	--

### Example

```
root@rta:confd> edit instance protocol isis
root@rta:confd> set lsp lifetime 30000
```

## 1.4.5. hostname

This command sets the IS-IS hostname of the node.

### Syntax

```
set isis hostname <name>
```

### Command arguments

<name>	Specifies the IS-IS hostname of the node.
--------	---

### Example

```
root@rta:confd> edit instance protocol isis
root@rta:confd> set hostname rta
```

## 1.4.6. overload

This command sets the IS-IS overload bit in a link-state PDU (LSP).

### Syntax

```
set overload
```

### Example

```
root@rta:confd> edit instance protocol isis
root@rta:confd> set overload
```

## 1.4.7. system-id

This command sets the ISO system ID.

### Syntax

```
set system-id <system ID>
```

### Command arguments

<system ID>	Six-byte value that identifies a system in an area.
-------------	---

### Example

```
root@rta:confd> edit instance protocol isis
root@rta:confd> set system-id 1921.0000.1001
```

## 1.5. IS-IS Interface Configuration Commands

This section describes the IS-IS interface mode configuration commands.

### 1.5.1. interface-type

This command sets the interface type. You can execute this command from the Instance mode.

#### Syntax

```
set isis interface ifl-0/0/1/1/1 interface-type <interface-type>
```

#### Command arguments

<interface-type>	<p>Specifies the interface type.</p> <p><b>Note:</b> The point-to-point is the default interface type and hence you actually do not need to configure it.</p>
------------------	---

#### Example

```
root@isr1:confd> edit instance protocol isis interface ifl-0/0/1/2/1
[ instance protocol isis interface ifl-0/0/1/2/1 ]
[ instance protocol isis interface ifl-0/0/1/2/1 ]
root@isr1:confd> set interface-type point-to-point
```

### 1.5.2. passive

This command sets the interface in passive mode. In this mode, no IS-IS hello packets are sent out on the interface and no IS-IS adjacencies are created. But the IP prefixes will be mentioned in the self LSP to make the network reachable via other links. You can execute this command from the interface mode.

#### Syntax

```
set isis interface ifl-0/0/1/1/1 passive
```

## Example

```
root@isr1:confd> edit instance protocol isis interface ifl-0/0/1/2/1
[ instance protocol isis interface ifl-0/0/1/2/1 ]
root@isr1:confd> set passive
```

## 1.6. IS-IS Level (Interface) Configuration Commands

This section describes the IS-IS interface level configuration mode commands.

### 1.6.1. level-1 disable

This command disables level-1 adjacencies on an interface. By default, it is enabled. You can execute this command from the interface level mode.

#### Syntax

```
set isis interface ifl-0/0/1/1/1 level-1 disable
```

#### Example

```
root@isr1:confd> edit instance protocol isis interface ifl-0/0/1/2/1 level-1
[ instance protocol isis interface ifl-0/0/1/2/1 level-1 ]
root@isr1:confd> set disable
```

### 1.6.2. level-2 disable

This command disables the level-2 adjacencies on an interface. By default, it is enabled. You can execute this command from the interface level mode.

#### Syntax

```
set isis interface ifl-0/0/1/1/1 level-2 disable
```

#### Example

```
root@isr1:confd> edit instance protocol isis interface ifl-0/0/1/2/1 level-2
[ instance protocol isis interface ifl-0/0/1/2/1 level-2 ]
root@isr1:confd> set disable
```

### 1.6.3. level-1 metric

This command sets the interface level-1 metric value. If the metric value is not set, the default value is set to 1000000. You can execute this command from the interface level mode.

#### Syntax

```
set isis interface ifl-0/0/1/1/1 level-1 metric <metric value>
```

#### Command arguments

<metric value>	This option sets the level-1 metric value.  Default Value: 1000000
----------------	--

#### Example

```
[ instance protocol isis interface ifl-0/0/1/2/1 ]
root@isr1:confd> set level-1 metric 10
```

### 1.6.4. level-2 metric

This command sets the interface level-2 metric value. If the metric value is not set, the default value is set to 1000000. You can execute this command from the interface level mode.

#### Syntax

```
set isis interface ifl-0/0/1/1/1 level-2 metric <metric value>
```

#### Command arguments

<metric value>	Specifies the level-2 metric value.  Default Value: 1000000
----------------	---

#### Example

```
[ instance protocol isis interface ifl-0/0/1/2/1 ]
root@isr1:confd> set level-2 metric 10
```

## 1.7. IS-IS Redistribute Configuration Commands

This section describes the IS-IS redistribute configuration commands.

### 1.7.1. redistribute source

This command redistributes route from a selected source into a selected IS-IS level database. This configuration command can be executed from the redistribute or address family modes.

#### Syntax

```
set isis address-family ipv4 unicast redistribute source <source> into isis [level-1 | level-2]
```

#### Command arguments

<source>	Specifies the source from which the routes are to be redistributed from. The available options are <i>bgp</i> , <i>ospf</i> , <i>direct</i> , and <i>static</i> .
level-1   level-2	Specifies the IS-IS level database into which the selected routes will be redistribute to.

#### Example

```
root@isr1:confd> edit instance protocol isis address-family ipv4 unicast
[ instance protocol isis address-family ipv4 unicast ]
root@isr1:confd> set r
    source                               Source to be distributed
    [<Enter>]                             Execute the command
[ instance protocol isis address-family ipv4 unicast ]
root@isr1:confd> set redistribute sou
    bgp                                   <source>
    direct                                <source>
    ospf                                  <source>
    static                                 <source>
[ instance protocol isis address-family ipv4 unicast ]
root@isr1:confd> set redistribute source st
    level-1                               <dest-sub-type>
    level-2                               <dest-sub-type>
[ instance protocol isis address-family ipv4 unicast ]
root@isr1:confd> set redistribute source static into isis level-1
```

## 1.8. IS-IS Show Commands for IOD

Configuration statements can be shown to be working properly using show commands. IS-IS is implemented in two modules: IOD and APPD.

This section details the fields displayed by IS-IS show commands handled by the IOD module.

### 1.8.1. show isis neighbors

This command shows the summary of the IS-IS neighbors.

#### Syntax

```
show isis neighbors
```

```
show isis neighbors instance <instance name>
```

#### Command arguments

<instance name>	Displays the neighbors in the specified instance. By default, the neighbors in the default instance are shown.
-----------------	--

#### Example (default instance)

```
ubuntu@isr1:~$ rtb isis.iod.1 show isis neighbors
  ISIS neighbor information summary for the mentioned instance is given
  below:
  Instance: default
  Interface          System          Level State   Type   UP from
  Expires in
  if1-0/0/1/2/1     1921.6800.1002 L1    Up      P2P    0d:1h:3m:32s
  expires in 28s 38...
  if1-0/0/1/3/1     1921.6800.1003 L1    Up      P2P    0d:1h:2m:40s
  expires in 20s 22...
  ubuntu@isr1:~$
```

#### Output Fields

Name	Description
Interface	Name of the interface on which the neighbor is identified
System	System ID of the neighbor
Level	Specifies the interface level (1, 2)
State	State of the IS-IS neighbor (Up, Down, etc.)



Name	Description
Type	Type of the adjacency on which neighbor is identified
UP from	The time for which session is in UP state
Expires in	Number of seconds until adjacency expires

### Example (vrf instance)

```
ubuntu@bangalore:~$ rtb isis.iod.1 show isis neighbors instance isisvrf

ISIS neighbor information summary for the mentioned instance is given
below:

Instance: isisvrf
Interface          System          Level State   Type   UP from
Expires in
ifl-0/0/2/1/1     1921.6800.1001 L1L2  Down   P2P    0d:0h:0m:0s
expires in 49710d...
ifl-0/0/2/1/1     1921.6800.1002 L1L2  Up     P2P    0d:0h:3m:48s
expires in 24s 77...
```

## 1.8.2. show isis neighbors detail

This command shows the detailed information about the IS-IS neighbors.

### Syntax

```
show isis neighbors detail
```

```
show isis neighbors instance <instance name> detail
```

### Command arguments

<instance name>	Displays the neighbors in the specified instance. By default, the neighbors in the default instance are shown.
-----------------	--

### Example

```

ubuntu@isrl1:~$ rtb isis.iod.1 show isis neighbors detail

Neighbor System ID: 1921.6800.1002, Interface: if1-0/0/1/2/1
  State: Up, Level: L1, Adjacency type: P2P
  Holding time: 30, Expiry time: 24s 640162us
  Local IPv4 address: 12.1.1.1, Remote IPv4 address: 12.1.1.2
  Local IPv6 address: fe80::2:0:faff:febd:1020, Remote IPv6 address:
fe80::2:0:faff:febd:2010
  Last Down Reason: Parameter change
  Neighbor Up Since: 0d:1h:5m:54s
  Last transition times:
    Last transition time: 2019-11-13T14:14:09.250134+0530

Neighbor System ID: 1921.6800.1003, Interface: if1-0/0/1/3/1
  State: Up, Level: L1, Adjacency type: P2P
  Holding time: 30, Expiry time: 20s 404566us
  Local IPv4 address: 13.1.1.1, Remote IPv4 address: 13.1.1.2
  Local IPv6 address: fe80::2:0:faff:febd:1030, Remote IPv6 address:
fe80::2:0:faff:febd:3010
  Last Down Reason: Parameter change
  Neighbor Up Since: 0d:1h:5m:2s
  Last transition times:
    Last transition time: 2019-11-13T14:15:01.717950+0530

```

## Output Fields

Name	Description
Interface	Interface through which the neighbor is reachable
Neighbor System ID	System ID of the neighbor
Level	Level negotiated for neighbor <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
State	State of the IS-IS neighbor
Adjacency type	Adjacencies established on the interface. The value is P2P.
Type	Type of the adjacency on which neighbor is identified
Last Down Reason	Reason the adjacency is down
Neighbor Up Since	The time for which session is in UP state
Expiry time	The time after which the session expires
Holding time	The adjacency expiry interval configured
Local IPv4 address	Local IP address from matching subnet with neighbor

Name	Description
Remote IPv4 address	Remote IP address from matching subnet with neighbor
Local IPv6 address	Local IPv6 address from matching subnet with neighbor
Remote IPv6 address	Remote IPv6 address from matching subnet with neighbor

### 1.8.3. show isis interface

This command shows the summary of IS-IS interfaces.

#### Syntax

```
show isis interface
```

```
show isis interface instance <instance name>
```

#### Command arguments

<instance name>	Displays the neighbors in the specified instance. By default, the neighbors in the default instance is shown.
-----------------	---

#### Example

```
ubuntu@isr1:~$ rtb isis.iod.1 show isis interface
```

```
ISIS interface information summary for the mentioned instance is given below:
```

```
Instance: default
Interface      Level Adjacencies Metric      Type           Passive
ifl-0/0/1/2/1  1     1           10         point-to-point false
ifl-0/0/1/2/1  2     1           10         point-to-point false
ifl-0/0/1/3/1  1     1           10         point-to-point false
ifl-0/0/1/3/1  2     1           10         point-to-point false
ubuntu@isr1:~$
```

#### Output Fields

Name	Description
Interface	Interface configured for IS-IS

Name	Description
Level	Configured level of IS-IS <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
Adjacencies	Number of neighbors in UP state
Type	Type of the interface, that is, point-to-point
Metric	Metric configured on the interface
Passive	Interface passive state

### 1.8.4. show isis interface level

This command shows the detailed information of a specific IS-IS interface per level.

#### Syntax

```
show isis interface <interface name> level [level-1 | level-2]
```

#### Command arguments

<interface name>	Interface configured for IS-IS Level
------------------	--------------------------------------

#### Example

```
ubuntu@isr1:~$ rtb isis.iod.1 show isis interface if1-0/0/1/2/1 level-1
Interface: if1-0/0/1/2/1, Level: 1
  Adjacencies: 1, Metric: 10, Interface type: point-to-point
  Local Circuit ID: 1, Passive: false
  CSNP : In: 10 , Out: 113 , Fail: 0
  PSNP : In: 6 , Out: 6 , Fail: 0
  LSP : In: 8 , Out: 6 , Fail: 0
, Processed: 3 , Purge In: 0
  IIH : In: 413 , Out: 416
ubuntu@isr1:~$ rtb isis.iod.1 show isis interface if1-0/0/1/2/1 level-2
Interface: if1-0/0/1/2/1, Level: 2
  Adjacencies: 1, Metric: 10, Interface type: point-to-point
  Local Circuit ID: 1, Passive: false
  CSNP : In: 46 , Out: 113 , Fail: 0
  PSNP : In: 4 , Out: 9 , Fail: 0
  LSP : In: 12 , Out: 4 , Fail: 0
, Processed: 10 , Purge In: 0
  IIH : In: 32 , Out: 418
ubuntu@isr1:~$
```

## Output Fields

Name	Description
Interface	Name of the interface on which IS-IS is configured
Level	Configured level of IS-IS <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
Adjacencies	Number of neighbors in UP state
Interface type	Type of the interface - point-to-point
Metric	Metric configured on the interface
Passive	Interface passive state
CSNP In	Count of incoming CSNP packets on that interface for the specified level
CSNP Out	Count of outgoing CSNP packets on that interface for the specified level
CSNP Fail	Count of failed parse cases for CSNP packets on that interface for the specified level
PSNP In	Count of incoming PSNP packets on that interface for the specified level
PSNP Out	Count of outgoing PSNP packets on that interface for the specified level
PSNP Fail	Count of failed parse cases for Partial Sequence Number Packets (PSNP) on that interface for the specified level
LSP In	Count of incoming LSP packets on that interface for the specified level
LSP Out	Count of outgoing LSP packets on that interface for the specified Level
LSP Fail	Count of failed parse cases for LSP packets on that interface for the specified level
LSP Processed	Count of non-duplicate LSP packets processed on that interface for the specified level
LSP Purge In	Count of LSP purge packets processed on that interface for the specified level
IIH In	Count of incoming IS-IS Hello (IIH) packets on that interface for the specified level
IIH Out	Count of outgoing IIH packets on that interface for the specified level

## 1.8.5. show isis lsp database

This command shows the IS-IS LSP database summary for L1 and L2.

### Syntax

```
show isis lsp database
```

```
show isis lsp database instance <instance name>
```

### Command arguments

<instance name>	Displays the neighbors in the specified instance. By default, the neighbors in the default instance are displayed.
-----------------	--

### Example

```
ubuntu@isr1:~$ rtb isis.iod.1 show isis lsp database

ISIS database summary for the mentioned instance is given below:

Instance: default Level: 1
      ID                Level   Sequence   Checksum Lifetime      Expiry Status      Purged
1921.6800.1001.00-00    1         7         52839   65535 expires in 17h 3m 57s 96564...
1921.6800.1002.00-00    1         5         36037   65534 expires in 17h 3m 5s 685363us
1921.6800.1003.00-00    1         5         41602   65534 expires in 17h 3m 57s 97062...

ISIS database summary for the mentioned instance is given below:

Instance: default Level: 2
      ID                Level   Sequence   Checksum Lifetime      Expiry Status      Purged
1921.6800.1001.00-00    2         12        24073   65535 expires in 17h 4m 81219us
1921.6800.1002.00-00    2         13        48990   65526 expires in 17h 3m 58s 87700...
1921.6800.1003.00-00    2         13        11067   65526 expires in 17h 3m 58s 87703...
1921.6800.1004.00-00    2         5         58170   65434 expires in 16h 57m 27s 4173...
1921.6800.1005.00-00    2         5         26798   65494 expires in 16h 57m 27s 4105...
1921.6800.1006.00-00    2         5         60451   65454 expires in 16h 57m 27s 4260...

ubuntu@isr1:~$
```

### Output Fields

Name	Description
ID	The LSP identifier
Level	Configured level of IS-IS <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
Sequence	Sequence number of LSP

Name	Description
Checksum	Checksum of the entire LSP packet
Lifetime	Link-state PDU lifetime, in seconds
Expiry Status	Time after which LSP expires
Purged	This field is set if the LSP is in purge holddown mode

## 1.8.6. show isis lsp database level

This command shows the IS-IS Link State Database (LSDB) summary for a specific level (level-1 or level-2).

### Syntax

```
show isis lsp database [level-1 | level-2]
```

```
show isis lsp database [level-1 | level-2] instance <instance name>
```

### Command arguments

level-1   level-2	This option will select the level database to be displayed.
<instance name>	This option will list the neighbors in the specified instance. By default, the neighbors in the default instance is shown.

### Example

```
ubuntu@isr1:~$ rtb isis.iod.1 show isis lsp database level-1

ISIS database summary for the mentioned instance is given below:

Instance: default Level: 1
      ID                Level   Sequence   Checksum Lifetime
Expiry Status          Purged
  1921.6800.1001.00-00    1         3         44687    65535 expires in
18h 4m 59s 88463us
  1921.6800.1002.00-00    1         3         17129    65534 expires in
18h 4m 58s 61250...
  1921.6800.1003.00-00    1         3         21971    65533 expires in
18h 4m 58s 23672...
ubuntu@isr1:~$
```

### Output Fields

Name	Description
ID	The LSP identifier
Level	Configured level of IS-IS <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
Sequence	Sequence number of LSP
Checksum	Checksum of the entire LSP packet
Lifetime	Link-state PDU lifetime, in seconds
Expiry status	Time after which LSP expires

### 1.8.7. show isis lsp database level detail

This command shows the actual content of the link state database.

#### Syntax

```
show isis lsp database [level-1 | level-2] detail
```

```
show isis lsp database [level-1 | level-2] detail instance <instance name>
```

#### Command arguments

level-1   level-2	This option will select the level database to be displayed.
<instance name>	This option will list the neighbors in the specified instance. By default, the neighbors in the default instance is shown.

#### Example



```
ubuntu@isrl:~$ rtb isis.iod.1 show isis lsp database level-1 detail

LSP ID: 1921.6800.1001.00-00, Level: 1
  Sequence no: 3, Checksum: 44687, Remaining Lifetime: 65535
  Attached bit: 0, Overload bit: 0
  Last received time: 2019-11-18T17:31:37.083306+0530
  Expiry time: expires in 18h 8m 24s 123427us
  Supported Protocols:
    Protocol supported: IPv6
    Protocol supported: IPv4
  Neighbor List:
    Node ID: 1921.6800.1002.00, Metric: 10
  IPv4 Prefix List:
    Prefix: 12.1.1.0/24, Metric: 10
    Prefix: 1.1.1.1/32, Metric: 10
  IPv6 Prefix List:

LSP ID: 1921.6800.1002.00-00, Level: 1
  Sequence no: 3, Checksum: 17129, Remaining Lifetime: 65534
  Attached bit: 0, Overload bit: 0
  Last received time: 2019-11-18T17:31:37.607666+0530
  Expiry time: expires in 18h 8m 23s 647289us
  Supported Protocols:
    Protocol supported: IPv6
    Protocol supported: IPv4
  Neighbor List:
    Node ID: 1921.6800.1001.00, Metric: 10
    Node ID: 1921.6800.1003.00, Metric: 10
  IPv4 Prefix List:
    Prefix: 12.1.1.0/24, Metric: 10
    Prefix: 23.1.1.0/24, Metric: 10
    Prefix: 2.2.2.2/32, Metric: 10
  IPv6 Prefix List:

LSP ID: 1921.6800.1003.00-00, Level: 1
  Sequence no: 3, Checksum: 21971, Remaining Lifetime: 65533
  Attached bit: 0, Overload bit: 0
  Last received time: 2019-11-18T17:31:38.232094+0530
  Expiry time: expires in 18h 8m 23s 271164us
  Supported Protocols:
    Protocol supported: IPv6
    Protocol supported: IPv4
  Neighbor List:
    Node ID: 1921.6800.1002.00, Metric: 10
  IPv4 Prefix List:
    Prefix: 23.1.1.0/24, Metric: 10
    Prefix: 3.3.3.3/32, Metric: 10
  IPv6 Prefix List:
ubuntu@isrl:~$
```

## Output Fields

Name	Description
ID	The LSP identifier

Name	Description
Level	Configured level of IS-IS <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
Sequence	Sequence number of LSP
Checksum	Checksum of the entire LSP packet
Remaining Lifetime	Link-state PDU lifetime, in seconds
Expiry status	Time after which LSP expires

## 1.9. IS-IS Show Commands for APPD

This section details the fields displayed by IS-IS show commands handled by the APPD module.

### 1.9.1. show isis spf-results level

This command shows the IS-IS SPF results for a specific level and topology.

#### Syntax

```
show isis spf-results level [level-1 | level-2] topology [ipv4-unicast | ipv6-unicast]
```

```
show isis spf-results instance <instance name> level [level-1 | level-2] topology [ipv4-unicast | ipv6-unicast]
```

#### Command arguments

level-1   level-2	Displays the configured level of IS-IS <ul style="list-style-type: none"> <li>• 1—Level 1 only</li> <li>• 2—Level 2 only</li> </ul>
<instance name>	Displays the neighbors in the specified instance. By default, the neighbors in the default instance is shown.
ipv4-unicast   ipv6-unicast	This option will select the topology

#### Example

```
ubuntu@isr1:~$ rtb isis.appd.1 show isis spf-results level level-1 topology
ipv4-unicast
Node                Metric    Nexthop
1921.6800.1001.00   0         via local
1921.6800.1002.00   10        12.1.1.2 via if1-0/0/1/2/1
1921.6800.1003.00   10        13.1.1.2 via if1-0/0/1/3/1
ubuntu@isr1:~$
```

## Output Fields

Name	Description
Node	IS-IS Node ID
Metric	Metric value associated with the route
Nexthop	Displays the nexthop IP address

## 1.9.2. show isis routes

This command shows the IS-IS routes for the selected topology.

### Syntax

```
show isis routes [ipv4-unicast | ipv6-unicast] summary
```

```
show isis routes [ipv4-unicast | ipv6-unicast] instance <instance name>
summary
```

### Command arguments

<instance name>	Displays the neighbors in the specified instance. By default, the neighbors in the default instance are displayed.
ipv4-unicast   ipv6-unicast	This option will select the topology.

### Example

```
ubuntu@isr1:~$ rtb isis.appd.1 show isis routes ipv4-unicast summary
Table: default.isis.fib-local.ipv4.unicast
Prefix          Metric    Next-Hop    Egress Interface
10.0.16.0/24    2000000   10.0.68.6   memif-0/8/6/68
10.0.27.0/24    2000000   10.0.78.7   memif-0/8/7/78
ubuntu@isr1:~$
```

## Output Fields

---

<b>Name</b>	<b>Description</b>
Prefix	The IPv4/IPv6 prefix and mask
Metric	Metric value associated with the route
Source	Source of the route. This value is always IS-IS.
Nexthop	Displays the nexthop IP address

# Part 2. Configuring Segment Routing for IS-IS Protocol

## 2.1. Introduction

Segment Routing (SR) allows for a flexible definition of end-to-end paths within IGP topologies by encoding paths as sequences of topological sub-paths, called "segments". These "segments" need to be advertised by a routing protocol such as IS-IS. Prefix segments represent a shortest-path to a prefix (or a node), as per the state of the IGP topology. Adjacency segments represent a hop over a specific adjacency between two nodes in the IGP.

## 2.2. Supported Hardware

- Edgecore AS5916-XKS
- RBFS Virtual Service Router

## 2.3. Guidelines and Limitations

- Support only Prefix SID with Node Flag, that is, SID can be configured only on Loopback interfaces.
- Support only for configuration of single SRGB block.

## 2.4. Prerequisites

- All the nodes in the network are SR enabled. So, if the intermediate router has no SR enabled, the previous SR-enabled router will not install SID for that node. So, the path can be incomplete.

## 2.5. System Overview

This section shows the interaction of this ISIS-SR feature with various daemons in RBFS. The figure below shows the interaction on with respect to this feature.

CONF	<p>Conf is RBFS configuration daemon. It stores ISIS SR configurations. ISIS IOD and ISIS APPD daemons subscribes for the following configuration:</p> <ul style="list-style-type: none"><li>• ISIS SR enable/disable information.</li><li>• Global SRGB configuration.</li><li>• Segment Index for loopback interfaces.</li></ul>
------	--

HALD	ISIS IOD interacts with HALD to send and receive ISIS packets. All ISIS SR related information is sent and received from other routers through HALD.
FWDD	ISIS APPD interacts with FWDD to download the SR routes. FWDD subscribes labeled unicast table with ISIS APPD.

## 2.6. Configuring Segment Routing for IS-IS Protocol

Segment routing on the IS-IS control plane supports the following:

- IPv4 control plane
- Level 1 and level 2 routing
- Prefix SIDs for host prefixes on loopback interfaces

To configure segment routing for the IS-IS protocol, perform the following steps:

1. Enter into the IS-IS default instance mode, and enable IS-IS routing for the specified routing instance.

```
root@is-is-router:confd> edit instance red
[ instance red ]
root@is-is-router:confd> edit protocol isis
[ instance red protocol isis ]
```

2. Enter into the IS-IS configuration mode.

```
root@rtbrick:confd> edit instance protocol isis
[ instance protocol isis ]
```

3. Configure SRGB (base label and range).

```
[ instance protocol isis ]
set segment-routing srgb start-label <base-value> index-range <range-
value>
```

4. Configure index (either ipv4 or ipv6) on an interface.

```
[ instance protocol isis ]
set interface <ifl-name> segment-routing <ipv4 | ipv6> index <sid-value>
```

For more information about the configuration and show commands, see the chapters below.

## 2.7. Configuration Commands

### 2.7.1. Instance Level Commands

- srgb start-label

#### 2.7.1.1. srgb start-label

This command assigns a segment routing SRGB global block.

#### Syntax

**set instance protocol isis segment-routing srgb start-label** <base-value> **index-range** <range-value>

#### Command arguments

<base-value>	SRGB Start Label
<index-range>	SRGB range value

#### Command modes

```
[instance protocol isis]
```

#### Example

The following example shows how to configure SRGB with start-label 5000 and index-range 100. The start label of the label block is 5000 and the end of the label block is 5099.



The SRGB label values 0 to 15 are reserved.

```
[ ]
root@rtbrick:confd> edit instance protocol isis

[ instance protocol isis ]
root@rtbrick:confd> set segment-routing start-label 5000 index-range 100
```

To delete the operation that you performed, enter the following command:

**delete instance isisvrf protocol isis segment-routing srgb**

#### Example

The following example shows how to unconfigure, configured SRGB with start-

label 5000 and index-range 100.

```
[ ]
root@rtbrick:confd> edit instance protocol isis

[ instance protocol isis ]
root@rtbrick:confd> delete segment-routing srgb
```

## 2.7.2. Interface Level Commands

- segment-routing index

### 2.7.2.1. segment-routing index

This command assigns a label from the configured global SRGB range for address assigned to this interface.

#### Syntax

**set instance protocol isis interface** <ifl-name> **segment-routing** <ipv4 | ipv6> **index** <sid-value>

#### Command arguments

<ifl-name>	Interface name
<ipv4   ipv6>	Specifies ipv4 or ipv6 address family
<sid-value>	Segment routing index from the SRGB range assigned to this interface

#### Command modes

```
[instance protocol isis]
[instance protocol isis interface <ifl-name>]
```

#### Example

```
[ ]
root@rtbrick:confd> edit instance protocol isis
[ instance protocol isis ]
root@rtbrick:confd> edit interface lo-0/0/0/1/0

[ instance protocol isis interface lo-0/0/0/1/0 ]
root@rtbrick:confd> set segment-routing ipv4 index 100
```

To delete the operation that you performed, enter the following command:



```
delete instance protocol isis interface <ifl-name> segment-routing <ipv4 | ipv6> index
```

### Example

```
[ ]
root@rtbrick:confd> edit instance protocol isis
[ instance protocol isis ]
root@rtbrick:confd> edit interface lo-0/0/0/1/0

[ instance protocol isis interface lo-0/0/0/1/0]
root@rtbrick:confd> delete segment-routing ipv4 index
```

## 2.8. IS-IS Anycast Configuration Commands

### 2.8.1. Configuring IS-IS IPv4/IPv6 Anycast

This command configure ISIS Anycast index for IPv4/IPv6.

#### Syntax

```
set instance protocol isis interface <ifl-name> segment-routing <ipv4 | ipv6> anycast index <sid-value>
```

#### Command arguments

<ifl-name>	Interface name
<ipv4   ipv6>	Specifies ipv4 or ipv6 address family
<sid-value>	IS-IS index range assigned to this interface

#### Command modes

```
[instance protocol isis]
[instance protocol isis interface <ifl-name>]
```

### Example

```
[ ]
root@rtbrick:confd> edit instance protocol isis
[ instance protocol isis ]
root@rtbrick:confd> edit interface lo-0/0/0/1/0

[ instance protocol isis interface lo-0/0/0/1/0]
root@rtbrick:confd> set segment-routing ipv4 anycast index 100
```

To delete the operation that you performed, enter the following command:

**delete instance protocol isis interface <ifl-name> segment-routing <ipv4 | ipv6> anycast index**

### Example

```
[ ]
root@rtbrick:confd> edit instance protocol isis
[ instance protocol isis ]
root@rtbrick:confd> edit interface lo-0/0/0/1/0

[ instance protocol isis interface lo-0/0/0/1/0]
root@rtbrick:confd> delete segment-routing ipv4 anycast index
```

## 2.9. Show Commands

- show isis overview
- show isis route

### 2.9.1. show isis overview

You can use this command to view the IS-IS SRGB-related information.

#### Syntax

#### show isis overview

#### Example

```
ubuntu@blr:~$ rtb isis.iod.1 show isis overview
Instance: default
  System-ID: 1921.6800.1002, Areas: 49.0001/24
  SRGB start-label: 100, index-range: 100
  Neighbor Hold Time: 30000ms, LSP Lifetime Interval: 65535ms
  System OverLoad: false, System OverLoad Timeout: 60000ms
  Current Up Neighbors Count : 2, Neighbors Flap Count : 0
ubuntu@blr:~$
```

## 2.9.2. show isis route

This command displays all the labelled unicast (SR) prefixes for the IPv4 Address Family Identifiers (AFI).

### Syntax

**show isis route instance** <instance-name> <afi> <safi>

### Command arguments

<instance-name>	Name of the instance
<afi>	IPv4 Address Family Identifier (AFI)
<safi>	Subsequent address family identifier (unicast   labeled-unicast   multicast)

### Command modes

```
rtb isis.appd
```

### Example

```
ubuntu@blr:~/development/libisis$ rtb isis.appd.1 show isis route instance
default ipv4 unicast
Table: default.isis.fib-local.ipv4.unicast
Prefix          Metric      Next-Hop      Egress Interface
10.0.16.0/24    2000000    10.0.68.6    memif-0/8/6/68
10.0.27.0/24    2000000    10.0.78.7    memif-0/8/7/78
ubuntu@blr:~/development/libisis$
```

## 2.9.3. show isis database

This command displays the entries in the IS-IS link-state database.

### Syntax

**show isis database** <level 1 | 2> **detail**

**show isis database instance** <instance name>

### Command arguments

<level 1   2>	Displays the IS-IS link-state database entries for the specified IS-IS level
---------------	--

<instance name>	Displays the IS-IS link-state database entries for the specified instance
-----------------	---

## Example

```

ubuntu@blr:~/development/libisis$ rtb isis.iod.1 show isis database detail
1921.6800.1001.00-00, Instance: default, Level: 1
Sequence no: 0x3, Checksum: 0x8, Remaining Lifetime: 65534ms
Attached bit: 0, Overload bit: 0
Last received time: 2019-12-10T14:45:15.610799+0530
Expiry time: expires in 17h 58m 4s 672416us
Supported Protocols:
  Protocol supported: IPv6
  Protocol supported: IPv4
Neighbor List:
  Node ID: 1921.6800.1002.00, Metric: 10
IPv4 Prefix List:
  Prefix: 12.1.1.0/24, Metric: 10
  Prefix: 1.1.1.1/32, Metric: 10
IPv6 Prefix List:
SRGB List:
1921.6800.1003.00-00, Instance: default, Level: 1
Sequence no: 0x3, Checksum: 0xd, Remaining Lifetime: 65534ms
Attached bit: 0, Overload bit: 0
Last received time: 2019-12-10T14:45:15.610884+0530
Expiry time: expires in 17h 58m 4s 671564us
Supported Protocols:
  Protocol supported: IPv6
  Protocol supported: IPv4
Neighbor List:
  Node ID: 1921.6800.1002.00, Metric: 10
IPv4 Prefix List:
  Prefix: 23.1.1.0/24, Metric: 10
  Prefix: 3.3.3.3/32, Metric: 10
IPv6 Prefix List:
SRGB List:
1921.6800.1002.00-00, Instance: default, Level: 1
Sequence no: 0x5, Checksum: 0xb, Remaining Lifetime: 65535ms
Attached bit: 0, Overload bit: 0
Last received time: 2019-12-10T14:47:07.340859+0530
Expiry time: expires in 17h 59m 57s 400741us
Supported Protocols:
  Protocol supported: IPv6
  Protocol supported: IPv4
Neighbor List:
  Node ID: 1921.6800.1001.00, Metric: 10
  Node ID: 1921.6800.1003.00, Metric: 10
IPv4 Prefix List:
  Prefix: 12.1.1.0/24, Metric: 10
  Prefix: 23.1.1.0/24, Metric: 10
  Prefix: 2.2.2.2/32, Metric: 10, Segment-Index: 10, Flags: Node
IPv6 Prefix List:
SRGB List:
  SRGB start-label: 100, index-range: 100

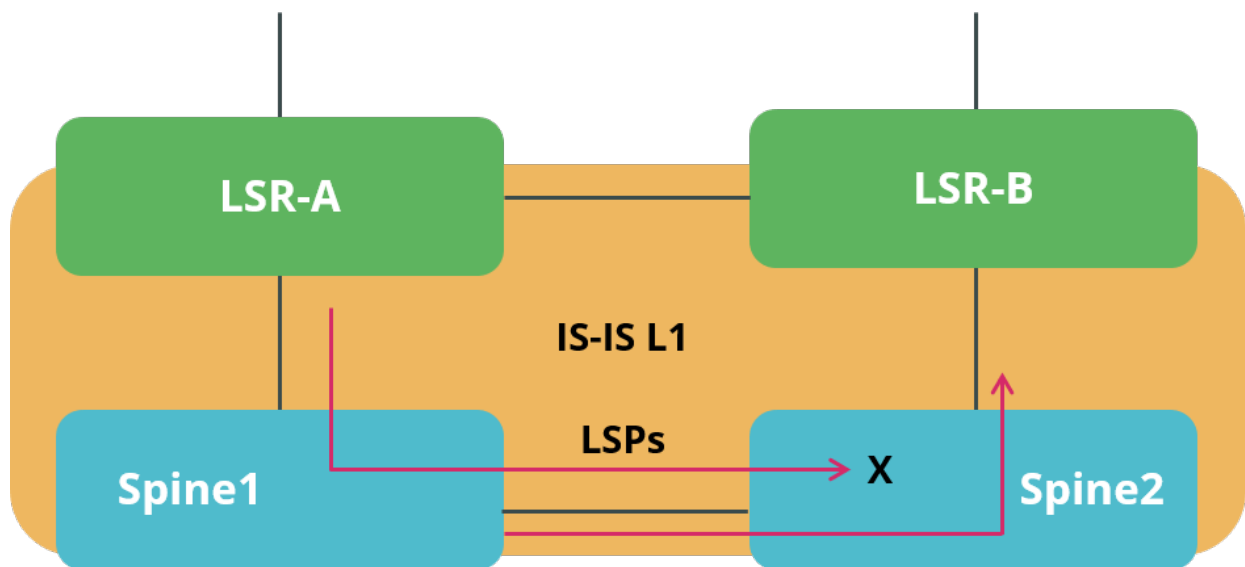
```

# Part 3. Configuring Flood Filter for IS-IS Protocol

## 3.1. Introduction

IS-IS flood filtering reduces flooding that allows to match and filter on specific IS-IS systems IDs.

## 3.2. Topology



## 3.3. Commands to configure ISIS Flood Filter

### 3.3.1. Global Config Command

Use these commands to filter flooding Globally.

#### Syntax

- **set isis flood-filter** <flood\_filter\_name> **ordinal** <ordinal\_number> **ordinal-name** <ordinal\_name>
- **set isis flood-filter** <flood\_filter\_name> **ordinal** <ordinal\_number> **match system-id** <system\_id>
- **set isis flood-filter** <flood\_filter\_name> **ordinal** <ordinal\_number> **action** <flood/block>

#### Command arguments

<flood_filter_name>	Filter-name which binds a flooding filter to an IS-IS interface
<ordinal_number>	Number to filter rule
<ordinal_name>	Name to filter rule
<system_id>	ID which matches ISIS system-ID
<flood/block>	Action required to flood or not

## Command modes

```
[isis.flood-filter.ordinal]
```

## Example

```
edit isis
edit flood-filter spine1_lsr1_flood_filter
edit ordinal 1
set ordinal-name spine1
set match system-id 1920.0100.4001
set action flood
exit
exit
exit
```

## 3.3.2. Interface-level Config Command

Use this command to filter flooding on interface level.

### Syntax

**set instance** <instance\_name> **protocol isis interface** <spine\_lsr\_ifl> **flood-filter** <flood\_filter\_name>

### Command arguments

<instance_name>	configured Instance vrf name
<spine_lsr_ifl>	Interface name
<flood_filter_name>	Filter-name which binds a flooding filter to an IS-IS interface

## Command modes

```
[instance.protocol.interface]
```

## Example

```
edit instance ip2vrf
edit protocol isis
edit interface memif-0/1/6/16
set flood-filter spine1_lsr1_flood_filter
exit
exit
exit
```

## 3.4. Configuration Example

The following examples shows how to configure IS-IS Flood Filter on Spine1 and Spine2

### Spine1:

```
rtb confd set isis flood-filter spine1_lsr1_flood_filter ordinal 1 ordinal-
name spine1
rtb confd set isis flood-filter spine1_lsr1_flood_filter ordinal 1 match
system-id 1920.0100.4001
rtb confd set isis flood-filter spine1_lsr1_flood_filter ordinal 1 action
flood

rtb confd set isis flood-filter spine1_lsr1_flood_filter ordinal 2 ordinal-
name spine2
rtb confd set isis flood-filter spine1_lsr1_flood_filter ordinal 2 match
system-id 1920.0100.4002
rtb confd set isis flood-filter spine1_lsr1_flood_filter ordinal 2 action
flood
```

### Spine2:

```
rtb confd set isis flood-filter spine2_lsr2_flood_filter ordinal 1 ordinal-
name spine1
rtb confd set isis flood-filter spine2_lsr2_flood_filter ordinal 1 match
system-id 1920.0100.4001
rtb confd set isis flood-filter spine2_lsr2_flood_filter ordinal 1 action
flood

rtb confd set isis flood-filter spine2_lsr2_flood_filter ordinal 2 ordinal-
name spine2
rtb confd set isis flood-filter spine2_lsr2_flood_filter ordinal 2 match
system-id 1920.0100.4002
rtb confd set isis flood-filter spine2_lsr2_flood_filter ordinal 2 action
flood
```

## 3.5. Viewing the Configuration

The **show running configuration** command displays the current configuration:

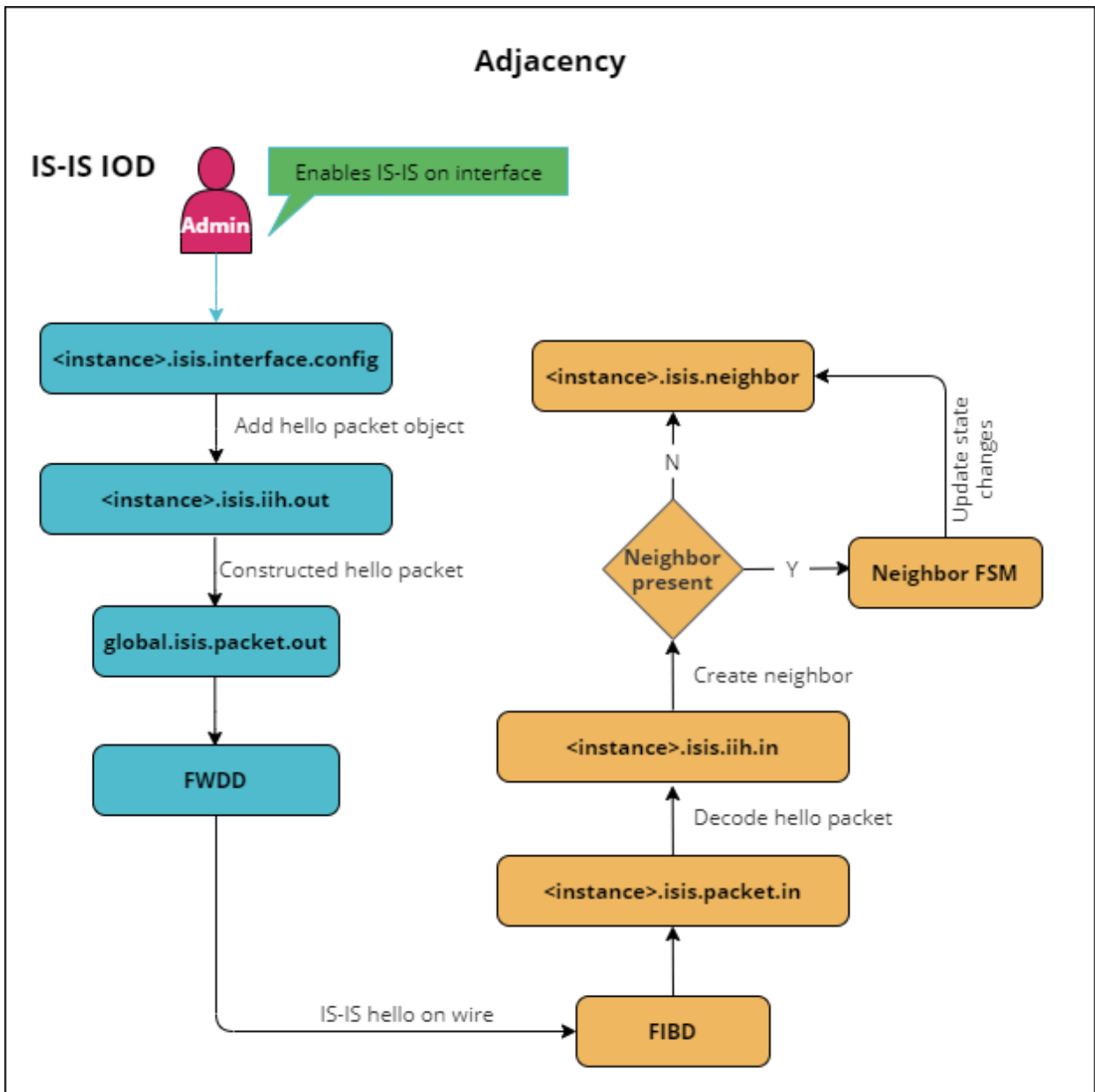
```
show running-configuration

"isis": [
{
"flood-filter:spine1_lsrl_flood_filter": {
"ordinal:1": {
"ordinal-name": "spine1",
"match-sysid": "1920.0100.4001",
"action": "flood"
},
"ordinal:2": {
"ordinal-name": "spine2",
"match-sysid": "1920.0100.4002",
"action": "flood"
}
},
"protocol isis":
"isis interface:memif-0/1/6/16": {
"interface-type": "point-to-point",
"level2-disable": true,
"flood-filter-name": "spine1_lsrl_flood_filter"
```

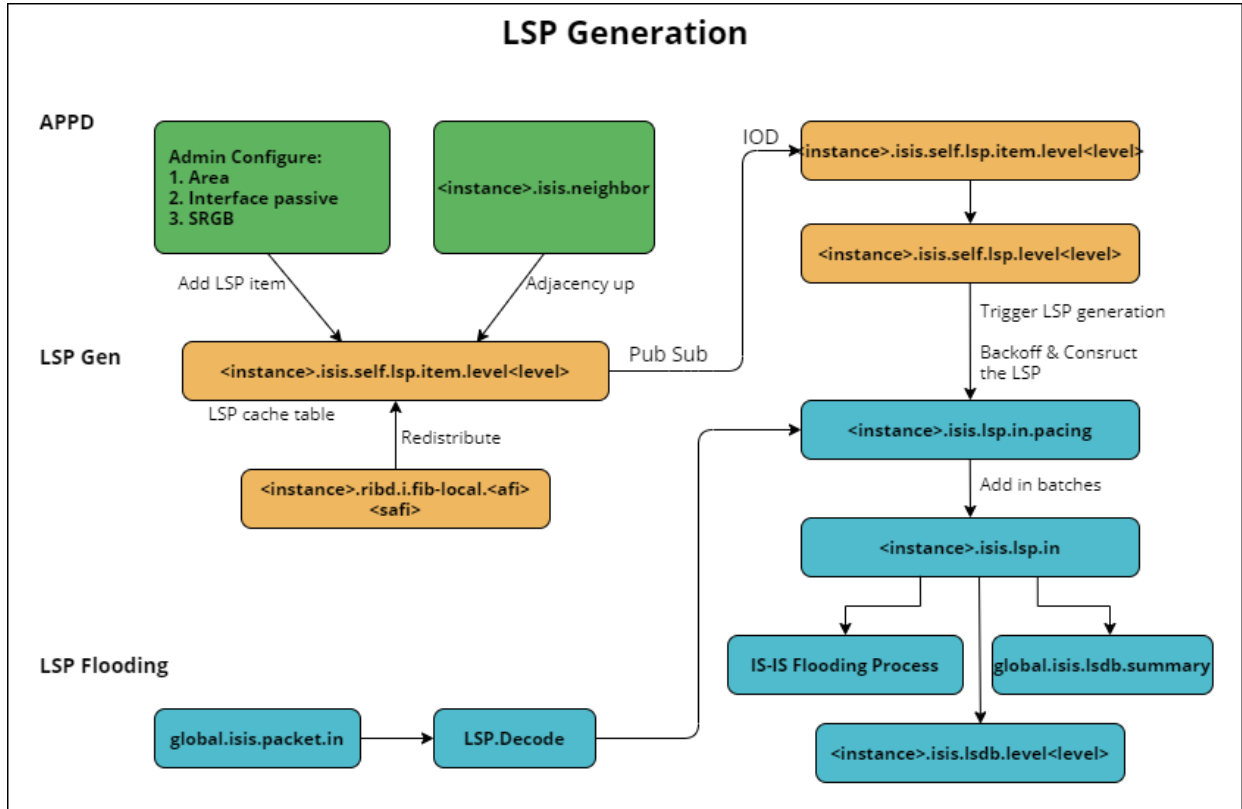


# Part 4. IS-IS Theory of Operation

## 4.1. Adjacency



## 4.2. LSP Generation



### 4.3. Route Calculation

