

ATT-bit Filtering with CLNS Filter-Set Configuration Example



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Contents

Introduction

Prerequisites

- Requirements
- Components Used

Configure

- Network Diagram
- Requirements
- Default Behavior
- CLNS Routing Configuration
 - CLNS Verification
- ATT-bit Filtering Configuration

Verify

Troubleshoot

Introduction

This document provides a configuration example to filter the attach-bit (ATT-bit). When you use Intermediate System-to-Intermediate System (IS-IS) as the routing protocol in a network, the Level 1 (L1)/Level 2 (L2) router (R2) sets the ATT-bit on its L1 Link State Packets (LSPs). An L1/L2 router sets the ATT-bit automatically. The purpose of an ATT-bit is to accomplish Inter-Area Routing. When an L1/L2 router is connected to more than one area, it sets the ATT-bit on its L1 LSP. If multiple L1/L2 routers exist, then routers in L1 choose the nearest L1/L2 router.

In some cases it might not be desirable for an L1/L2 router to always set the ATT-bit. For example, in the topology shown in the Network Diagram section, R2 is the L1/L2 router. It forms an L2 adjacency with two different areas – 49.0003 and 49.0004. As shown, there is a connection to an ISP in Area 49.0003 only. You do not want R2 to set the ATT-bit in its L1 LSPs when the connection to area 49.0003 is down. The default behavior is that the R2 continues to set the ATT-bit even when it loses the connection with Area 49.0003. This is because it is still an L1/L2 router and it has peering with more than one area. This document provides a configuration example of how to filter an L1/L2 router (R2) from setting the ATT-bit in its L1 LSPs.

Note: For communication between 49.0001 and 49.0004, you need to redistribute L2 routes into the L1 domain in the absence of an ATT-bit.

Prerequisites

Requirements

Cisco recommends that you have knowledge of IS-IS. Connectionless Network Service (CLNS) routing must be enabled globally and under required interfaces. You will use CLNS filter-set and hence CLNS routing has to be enabled.

Components Used

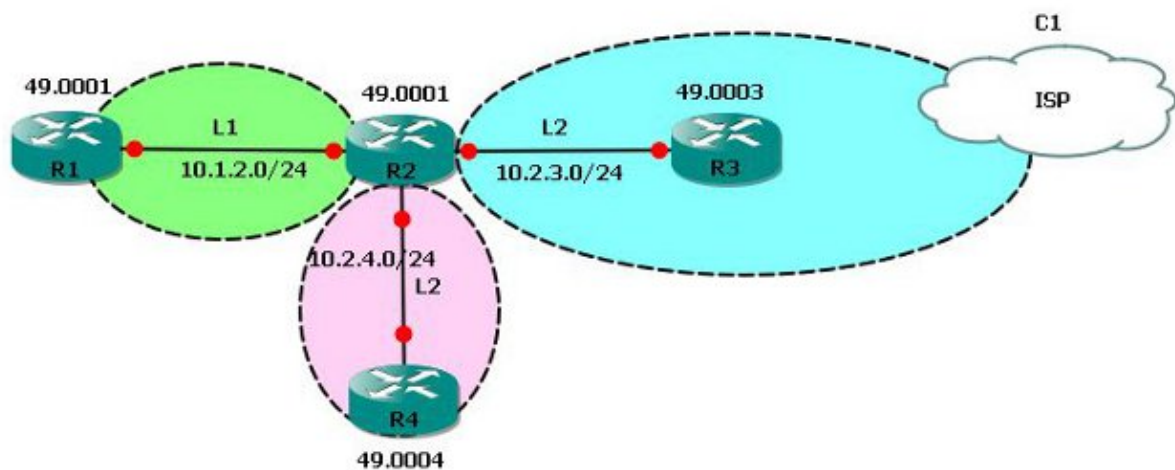
This document is not restricted to specific software and hardware versions.

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Configure

Network Diagram

A simple topology is shown here. The requirement is that you do not need an L1/L2 (R2) router in order to set the ATT-bit once it's connection to Area 49.0003 goes down.



Requirements

Basic IS-IS is already configured as per the topology. The network requirement is that R2 must no longer set the ATT-bit in its L1 database if it does not know about 49.0003 (the backbone area).

Default Behavior

R2 is the L1/L2 router and has peering with multiple area routers.

```
R2#show isis neighbors
```

```
Tag 1:
```

System Id	Type	Interface	IP Address	State	Holdtime	Circuit Id
R1	L1	Et0/0	10.1.2.1	UP	29	R2.01
R3	L2	Et0/1	10.2.3.3	UP	7	R3.01
R4	L2	Et0/2	10.2.4.4	UP	9	R4.01

In the topology, since R2 is the L1/L2 router it sets the ATT-bit and provides a default route to R1 (Area 49.0001).

This can be seen in R2's L1 database.

```
R2#show isis database level-1
```

```
Tag 1:
```

```
IS-IS Level-1 Link State Database:
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
R1.00-00	0x0000000D	0x99B7	1178	0/0/0
R2.00-00	* 0x00000016	0x3274	1190	1/0/0 <<<<< ATTach
bit Set.				
R2.01-00	* 0x00000008	0xE4BF	1181	0/0/0

If the interface between R2 and R3 is shut, the R2 does not have a connection to the backbone area and hence must not advertise the ATT-bit in its L1 LSP database as per our requirement.

```
!
R2(config)#int eth 0/1
R2(config-if)#shutdown
!
```

After the interface towards R3 (Eth0/1) is shut, it no longer peers with R3.

```
R2#show isis neighbors
Tag 1:
System Id      Type Interface  IP Address      State Holdtime Circuit Id
R1              L1 Et0/0         10.1.2.1        UP      21         R2.01
R4              L2 Et0/2         10.2.4.4        UP       9         R4.01
```

However, R2 still advertises the ATT-bit and R1 still receives a default route via R2. This is undesirable in this network topology.

```
R2#show isis database level-1
Tag 1:
IS-IS Level-1 Link State Database:
LSPID          LSP Seq Num  LSP Checksum  LSP Holdtime  ATT/P/OL
R1.00-00       0x0000000D   0x99B7        974            0/0/0
R2.00-00     * 0x00000017 0x76D5      1188         1/0/0 <<< ATTach
bit still set !
R2.01-00       * 0x00000008 0xE4BF        977            0/0/0
```

```
R1#show ip route 0.0.0.0
Routing entry for 0.0.0.0/0, supernet
  Known via "isis", distance 115, metric 10, candidate default path, type level-1
  Redistributing via isis 1
  Last update from 10.1.2.2 on Ethernet0/0, 00:29:20 ago
  Routing Descriptor Blocks:
    * 10.1.2.2, from 10.2.4.2, 00:29:20 ago, via Ethernet0/0
      Route metric is 10, traffic share count is 1
```

As is shown in the previous examples, the default behavior is undesirable in regards to network requirements. Bring the interface Eth0/1 on R2 (connection to R3) back UP. Here is when you can use IS-IS ATT-bit filtering with the CLNS feature-set.

CLNS Routing Configuration

In order to configure CLNS routing, complete these steps:

1. Enable CLNS routing globally:

```
!
R1(config)#clns routing
R2(config)#clns routing
R3(config)#clns routing
R4(config)#clns routing
!
```

2. Enable CLNS routing on all the IS-IS enabled interfaces.

```
R1(config-if)#clns router isis 1 <<< Here, 1 is the IS-IS tag.
```

CLNS Verification

Once CLNS is configured, check to see if R2 learns about the CLNS route.

```
R2#show clns route
```

```
C 49.0001.0000.0000.2222.00 [1/0], Local IS-IS NET
C 49.0001 [2/0], Local IS-IS Area

i 49.0003 [110/10]
    via R3, Ethernet0/1
i 49.0004 [110/10]
    via R4, Ethernet0/2
```

ATT-bit Filtering Configuration

In order to configure ATT-bit filtering, complete these steps:

1. Create the CLNS filter set.

```
!
clns filter-set ATT-BIT permit 49.0003
!
```

2. Create the route-map.

```
!
route-map ATT permit 10
  match clns address ATT-BIT
!
```

3. Configure the route-map under the IS-IS process on R2.

```
!router isis 1

  set-attached-bit route-map ATT
!
```

Verify

Use this section to confirm that your configuration works properly.

The Output Interpreter Tool (registered customers only) supports certain **show** commands. Use the Output Interpreter Tool in order to view an analysis of **show** command output.

With this configuration in place, the L1/L2 router R2 must NOT set the ATT-bit in the L1 database if the CLNS route to 49.0003 is lost.

When there is connectivity to the backbone, the CLNS route to 49.0002 exists on R2.

```
R2#show clns route 49.0003
```

```
Routing entry for 49.0003
  Known via "isis 1", distance 110, metric 10, Dynamic Entry
  Routing Descriptor Blocks:
    via R3, Ethernet0/1
      isis 1, route metric is 10, route version is 22
```

Since the CLNS route exists, R2 must set the ATT-bit:

```
R2#show isis database level-1
```

```
Tag 1:
```

```
IS-IS Level-1 Link State Database:
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
R1.00-00	0x0000000B	0x9DB5	815	0/0/0
R2.00-00	* 0x00000012	0x3A70	954	1/0/0
R2.01-00	* 0x00000007	0xE6BE	950	0/0/0
R4.00-00	0x00000003	0x7201	0 (756)	0/0/0
R4.01-00	0x00000002	0x6D06	0 (676)	0/0/0

Shut down the interface between R2 and R3.

```
R2#show clns route 49.0002
```

```
Routing entry for 49.0002
```

```
Known via "isis 1", distance 110, metric 10, Dynamic Entry
```

```
Routing Descriptor Blocks:
```

```
via R3, Ethernet0/1, (Interface down), (Adjacency down) <<<<< Interface goes Down
```

```
isis 1, route metric is 10, route version is 23 (Aging out: 23/24) <<< The route  
is aging out
```

After the timeout, the route does not exist in the CLNS routing table.

```
R2#show clns route 49.0002
```

```
R2#
```

Check the database on R2.

```
R2#show isis database 11
```

```
Tag 1:
```

```
IS-IS Level-1 Link State Database:
```

LSPID	LSP Seq Num	LSP Checksum	LSP Holdtime	ATT/P/OL
R2.00-00	* 0x00000017	0xD6A7	1133	0/0/0 <<<< ATT bit not set.
R2.01-00	* 0x0000000E	0x79C9	901	0/0/0
R1.00-00	0x00000010	0xF74D	592	0/0/0

As seen in the database, R2 does not set the ATT-bit even though it still is an L1/L2 router.

```
R1#show ip route 0.0.0.0
```

```
% Network not in table
```

This is one way by which you can filter the ATT-bit as per the requirements.

Troubleshoot

There is currently no specific troubleshooting information available for this configuration.