Internode Topology Discovery and Communication

Table 1: Feature History

Feature Name	Release Information	Feature Description
Automatic topology discovery	Cisco IOS XR Release 25.1.1	NCS 1014 now supports topology discovery using the OSC links created through the EDFA2 card. To establish the OSC link between two nodes, you need to configure the OSC pluggable to be operational and the OSPFv2 protocol on both the near-end and far-end nodes. By connecting the NCS 1014 to OSPF networks, the NCS 1014 network information is automatically communicated across multiple nodes.

NCS 1014 link topology discovery

Automatic network topology discovery

Network topology discovery is automatic when you use an OSC channel created through the EDFA2 card. By connecting the NCS 1014 to Open Shortest Path First (OSPF) networks, NCS 1014 network information is automatically communicated across multiple LANs and WANs. In a network utilizing an OSC channel, all nodes can communicate with each other through this channel.

Understanding OSPF

OSPF is a link-state Internet routing protocol. Link-state protocols monitor their links with adjacent routers and assess the status of their connections to neighbors. These protocols advertise their directly connected networks and active links. Each link-state router compiles these link-state advertisements to form a topology of the entire network or area. From this database, the router calculates a routing table by constructing a shortest path tree. Routes are recalculated when topology changes occur. NCS 1014 supports only OSPFv2.

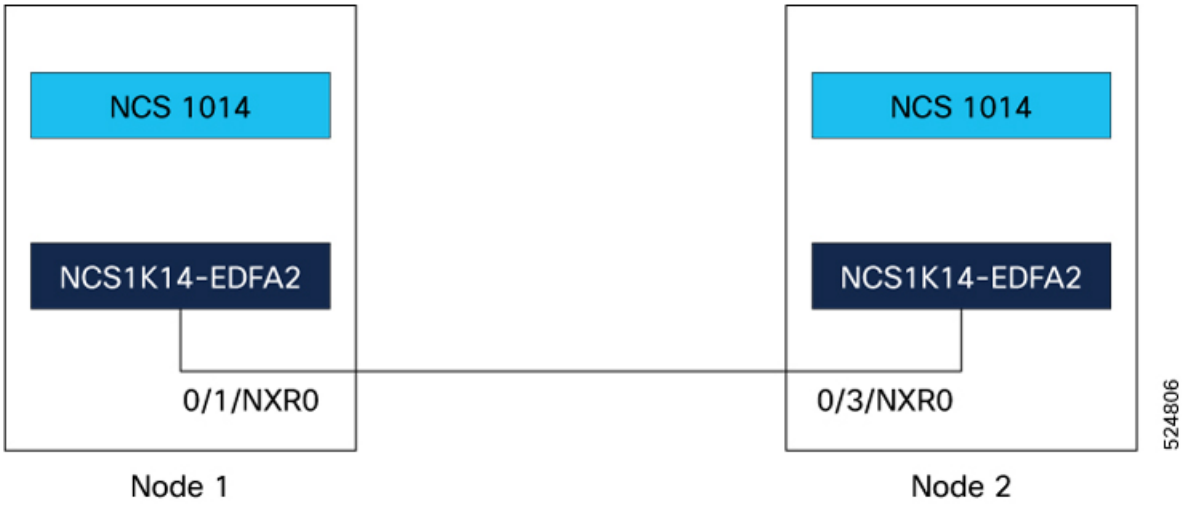
OSPF protocol in NCS networks

NCS 1014 uses the OSPFv2 protocol within internal NCS networks for node discovery, circuit routing, and node management. Enabling OSPFv2 on the NCS allows the NCS topology to be communicated to OSPF routers on a LAN. This eliminates the need to manually input static routes for NCS subnetworks. OSPF divides networks into smaller regions, called areas, each with a unique ID number, known as the area ID. Every OSPF network includes one backbone area called "area 0," and all other OSPF areas must connect to area 0.

Configure OSPF on the nodes for automatic topology discovery

Use this task to configure OSPFv2 on the near end and far end nodes of the topology shown in this image.

Figure 1: Sample two node topology



OSPFv2 supports only IPv4 addressing.

Figure 2: Two-node topology where OSC link is established

Procedure

Step 1 Configure the interfaces.

a) Use the **interface Loopback** command to configure the loopback interface IPv4 address, which is the primary loopback address that you want to reuse for all areas.

Example:

Node 1:

```
  RP/0/CPU0:ios(config)# interface Loopback 0
RP/0/CPU0:ios(config-if)# ipv4 address 10.10.10.10 255.255.255.255

  RP/0/CPU0:ios(config-if)# no shut
  RP/0/CPU0:ios(config-if)# exit
```

Node 2:

```
  RP/0/CPU0:ios(config)# interface Loopback 0
RP/0/CPU0:ios(config-if)# ipv4 address 10.10.10.11 255.255.255.255

  RP/0/CPU0:ios(config-if)# no shut
  RP/0/CPU0:ios(config-if)# exit
```

b) Use the interface GigabitEthernet command to configure the Gigabit Ethernet interface for the OSC link.

Example:

Node 1:

```
  RP/0/CPU0:ios(config)# interface GigabitEthernet 0/1/0/5
  RP/0/CPU0:ios(config-if)# ipv4 point-to-point
  RP/0/CPU0:ios(config-if)# ipv4 unnumbered Loopback0
  RP/0/CPU0:ios(config-if)# no shut
  RP/0/CPU0:ios(config-if)# exit
```

Node 2:

```
  RP/0/CPU0:ios(config)# interface GigabitEthernet 0/3/0/5
  RP/0/CPU0:ios(config-if)# ipv4 address 10.1.1.2 255.255.255.0
  RP/0/CPU0:ios(config-if)# no shut
  RP/0/CPU0:ios(config-if)# exit
```

Step 2 Configure the OSPF process:

a) Use the **router ospf** *process-name* to enable OSPF routing.
b) Use the **distribute link-state** keyword to distribute OSPF link-state data.
c) Use the **segment-routing mpls** keyword to enable MPLS-based segment routing for the OSPF process.

This step is optional.

d) Use the **network point-to-point** keyword to configure an interface OSPF network type to point-to-point.
e) Use the **area** keyword to configure an OSPF area.

Example:

Node 1 and 2:

```
RP/0/RP0/CPU0:ios(config)# router ospf 1
                        RP/0/RP0/CPU0:ios(config-ospf)#distribute link-state
                        RP/0/RP0/CPU0:ios(config-ospf)#segment-routing mpls
                        RP/0/RP0/CPU0:ios(config-ospf)#area 0
```

Step 3 Add the configured interfaces to the OSPF area.

Example:

Node 1:

```
RP/0/RP0/CPU0:ios(config-ospf-ar)# interface Loopback 0
                        RP/0/RP0/CPU0:ios(config-ospf-ar-if)# exit
                        RP/0/RP0/CPU0:ios(config-ospf-ar)# interface GigabitEthernet 0/1/0/5
```

Node 2:

```
RP/0/RP0/CPU0:ios(config-ospf-ar)# interface Loopback 0
                        RP/0/RP0/CPU0:ios(config-ospf-ar-if)# exit
                        RP/0/RP0/CPU0:ios(config-ospf-ar)# interface GigabitEthernet 0/3/0/5
```

Step 4 Exit the OSPF area configuration mode and commit your configuration.

Example:

Node 1 and 2:

```
RP/0/RP0/CPU0:ios(config-ospf-ar-if)# exit
                        RP/0/RP0/CPU0:ios(config-ospf-ar)# exit
                        RP/0/(config-ospf)# exit
                        RP/0/RP0/CPU0:ios(config)# commit
                        RP/0/RP0/CPU0:ios(config)# exit
```

View the topology information

Use this task to view the topology information.

Procedure

Step 1 Use the command **show olc internal** *slot id port id* **topo-link** to view the topology information.

Example:

```
RP/0/RP0/CPU0:ios# show olc internal slot 0 port 0 topo-link
                        Thu Feb 20 19:53:52.277 IST
                        Self RID: 172.16.0.1
                        Node Type: OLT
                        <OLT><172.16.0.1><0x6a> --- <OLT><192.168.0.1><0x69>
```

If no neighbors are discovered, an alarm will be triggered at the OSC port.

Example:

```
RP/0/RP0/CPU0:ios#show alarms brief system active
                        Thu Feb 20 19:54:31.266IST

------------------------------------------------------------------------------
                        Active Alarms

------------------------------------------------------------------------------
                        Location  Severity   Group       Set Time                  Description
                        0/1/NXR0  Minor      Software   02/20/2025 19:54:31 IST    Ots0/1/0/0 -
Neighbour not found

RP/0/RP0/CPU0:ios#show alarms brief system
                        Thu Feb 20 19:44:35.212 UTC
```

```
------------------------------------------------------------------------------
                      Active Alarms

------------------------------------------------------------------------------
                      Location  Severity   Group       Set Time                  Description
                      0/3/NXR0  Minor      Software    02/20/2025 19:14:35 IST   Ots0/3/0/0 -
Neighbour not found
```

Step 2 Use the command ***show ip ospf neighbor*** to display OSPF neighbor information on a per-interface basis.

Example:

```
                      RP/0/RP0/CPU0:ios#show ip ospf neighbor
                      Thu Feb 20 19:53:53.324 IST

                      * Indicates MADJ interface
                      # Indicates Neighbor awaiting BFD session up

                      Neighbors for OSPF 1

                      Neighbor ID     Pri   State           Dead Time   Address         Interface
                      192.168.0.1     1     FULL/  -        00:00:30    192.168.0.1
GigabitEthernet0/0/0/5
                      Neighbor is up for 00:00:56

                      Total neighbor count: 1
```

Step 3 Use the **show ip interface brief** command to view a summary of the router interfaces.

Example:

```
                      RP/0/RP0/CPU0:ios#show ip interface  brief
                      Thu Feb 20 19:53:54.653 IST

                      Interface                      IP-Address      Status          Protocol
Vrf-Name
                      Loopback0                      10.10.10.10       Up              Up
default
                      GigabitEthernet0/0/0/5         10.10.10.11       Up              Up
default
                      GigabitEthernet0/0/0/5         172.16.0.1        Down            Down
default
                      MgmtEth0/RP0/CPU0/0            10.0.230.189      Up              Up
default
                      MgmtEth0/RP0/CPU0/1            unassigned      Shutdown          Down
default
                      PTP0/RP0/CPU0/1                unassigned      Shutdown          Down
default
                      RP/0/RP0/CPU0:ios#
```

View the topology information