Configuring Link-State Tracking

This chapter describes how to configure Link-State Tracking on the Cisco NX-OS device.

This chapter includes the following sections:

Link-State Tracking

Link-State Tracking is a mechanism that binds multiple interface link states to ensure redundancy and network stability. It is particularly useful in environments with server NIC adapters in a primary-secondary relationship, allowing seamless transition to secondary links if the primary fails.

- **Uplink and Downlink Interfaces**: Interfaces are categorized as uplink (connected to distribution switches or routers) or downlink (connected to servers or end devices).
- **Failover Mechanism**: If all uplink interfaces in a group fail, the downlink interfaces are automatically disabled, triggering a failover to secondary links.

How Link-State Tracking Works

Summary

Link-state tracking involves grouping interfaces into uplink and downlink categories and monitoring their connectivity to maintain network availability.

This process ensures that network connectivity is maintained by automatically redirecting traffic and administratively controlling interface states in response to link failures.

Workflow

These stages describe how link-state tracking works.

1. Interfaces are grouped into link-state groups, categorized as either uplink or downlink interfaces.
   - Uplink interfaces typically connect to distribution switches or routers, while downlink interfaces connect to end devices like servers.
2. The system continuously monitors the link state of uplink interfaces.
   - If at least one uplink interface is active, the downlink interfaces remain in the "link-up" state.
   - If all uplink interfaces fail, downlink interfaces will transition to the **trackedPortDown** state. This indicates that the interface has been administratively disabled by the link-state tracking feature.
3. When uplink connectivity is lost, the system initiates a failover to redirect traffic to secondary interfaces.
   - This ensures that the network remains operational despite link failures.
4. Downlink interfaces can be recovered by either removing the failed uplink interfaces from the group or disabling the link-state group entirely.
   - After uplink connectivity is restored, the downlink bringup delay timer stabilizes the transition of downlink interfaces to an active state. The default downlink bringup delay timer value is 60 seconds. The maximum configurable value is 600 seconds.

In a typical setup, servers connect to two switches (primary and secondary) using uplink and downlink interfaces.

If the primary switch loses connectivity, the system automatically switches traffic to the secondary switch, maintaining network availability

Guidelines and Limitation for Link-State Tracking

- You can add an interface to only one link-state group at a time. You cannot include it in both an upstream and downstream group.

Note If an interface is configured as both an uplink and a downlink in the same group, an error will be generated.

- A maximum of 64 link-state groups can be created. Group names must not exceed 64 characters.
- Currently, only physical and breakout interfaces are supported. SVIs and port channels are not supported.
- Do not enable link-state tracking on individual interfaces that are part of a downlink EtherChannel interface.
- Duplicate entries for uplinks or downlinks within a group are not allowed. Each interface must be unique within its group.
- Subinterfaces are not supported for link-state tracking.

Configure Link-State Tracking

This section provides a step-by-step guide to configure Link-State Tracking on Cisco Nexus 9000 Series NX-OS devices.

Before you begin

Ensure that all interfaces intended for use in link-state groups are operational and not administratively shut down.

Procedure

Step 1 Use the **configure terminal** command to enter global configuration mode.

Example:

```
switch# configure terminal
```

Step 2 Use the **link state group** *group-name* command to create a link-state group and enable link-state tracking.

Example:

```
switch(config)# link state group <group-name>
```

To remove the entire link-state group configuration:

```
switch(config)# no link state group <group-name>
```

Replace <*group-name*> with the desired group name (e.g., group-1).

```
switch(config)# link state group group-1
            switch(config-link-state)#
```

Note
Group names can be a maximum of 64 characters long.

Step 3 Use the **downlink bringup delay** *seconds* command to configure the delay before downstream interfaces are brought back up after uplink connectivity is restored.

Example:

```
switch(config-link-state)# downlink bringup delay ?
            <1 - 600> Timer in seconds
```

To remove the downlink bringup delay timer configuration:

```
switch(config-link-state)# no downlink bringup delay
```

The default value is 60 seconds. The configurable range is 1 to 600 seconds.

```
switch(config-link-state)# downlink bringup delay 60
```

Step 4 Use the **interface** *interface-id* command to specify the interface or range of interfaces to configure.

Example:

```
switch(config)# interface <interface-id>
```

Replace <*interface-id*> with the specific interface or range of interfaces to configure (e.g., Ethernet1/1).

```
switch(config)# interface Ethernet1/1
            switch(config-if)#
```

Step 5 Use the **link state group** *group-name* **type** {uplink | downlink} command to assign the interface to a link-state group as an uplink or downlink.

Example:

```
switch(config-if)# link state group <group-name> type {uplink | downlink}
```

To remove an interface from a link-state group:

```
switch(config-if)# no link state group <group-name> type {uplink | downlink}
```

Replace <*group-name*> with the group name created earlier.

Use *uplink* for interfaces connected to distribution switches or routers.

```
switch(config-if)# link state group group-1 type uplink
```

Use *downlink* for interfaces connected to end devices like servers.

```
switch(config-if)# link state group group-1 type downlink
```

Note
A single link-state group can have a maximum of 64 uplink interfaces and 64 downlink interfaces, for a total of 128 interfaces.

Step 6 Use the **end** command to exit configuration mode.

Example:

```
switch(config-if)# end
```

Monitor the Link-State Tracking

To monitor and verify the configuration and status of Link-State Tracking, follow these steps:

Procedure

Step 1 Use the **show link state group all** command to display detailed information about the link-state group.

Example:

```
switch# show link state group all
Link State Group: group-1
Status: Up
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 2
Last disabled: Sat Mar 1 17:10:26 2025
Downlink Delay Timer: 60
```

Displays detailed information about the link-state group, including:

- Group status (Up/Down/Pending)
- Uplink and Downlink interfaces
- Number of times the group was disabled

- Last disabled timestamp
- Downlink bringup delay timer

`show link state group <name>` displays detailed information about a specific group.

Step 2 Use the **show run int eth <port>** command to display the running configuration of a specific interface and verify if it is part of an uplink or downlink group.

Example:

```
switch# show run int eth 1/1
!Command: show running-config interface Ethernet1/1
!Running configuration last done at: Sat Mar 1 17:10:26 2025
!Time: Sat Mar 1 17:15:42 2025
version 10.4(4o)
Bios: version 01.07
interface Ethernet1/1
  link state group group-1 type uplink
  no shutdown
```

Step 3 Use the **show system internal ethpm info interface eth <port>** command to display detailed internal information about a specific interface, including its administrative and operational states, link state group membership, and other diagnostic data to verify its role as an uplink or downlink interface.

Example:

```
switch# show system internal ethpm info interface eth1/1
Ethernet1/1 - if_index: 0x1A000000
Backplane MAC address: d0:09:c8:63:65:90
Router MAC address:    d0:09:c8:63:65:8f

Admin Config Information:
  state(up), mode(trunk), speed(1 Gbps), duplex(Full), medium_db(0), fec(auto),
port-type-fabric(not-fabric) port-type-external(not-external) dfe-adaptive-tuning (1)
  layer(L2), dce-mode(edge), description(LACP Link to Switch-B), transmit-reset-skip(0)
  mac-up-timer(0), max-bringup-timer(0), active-jitter-mgmt(0), media-type(none) link loopback(off)
  auto neg(on), auto mdix(on), beacon(off), num_of_si(0)
  config auto neg(on) openflow(0) switchport_isolated(0)
  medium(broadcast), snmp trap(on), MTU(1500),
  flowcontrol rx(off) tx(off), link debounce(100),link debounce(link-up 0)
  storm-control bcast:100.00% mcast:100.00% ucast:100.00%
  storm-control bcast level1:100.00% bcast level2:100.00%  mcast level1:100.00% mcast level2:100.00%
 ucast level1:100.00% uncast level2:100.00%
  storm-control pps bcast:4294967295 mcast:4294967295 ucast:4294967295
  storm-control mcast:200 ucast:200
   span mode(0 - not a span-destination)
  trans mode(not a trans-port)
  Flexlink mode(disabled), Active Interface(none), Backup Interface(none), cfg_instance(0)
  delay(1), bw(1000000), rate-mode(dedicated)
  eee(n/a), eee_lpi(Normal), eee_latency(Constant)
  fabricpath enforce (DCE Core)(0)
  load interval [1-3]: 30, 300, 0 (sec).
  pkt timestamping: state =0, ingress_source_id=0, egress_source_id=0 .
  Link-sync group id 0
  Priority Extend -1
  Ethertype 0x8100
  Slowdrain Congestion : mode core timeout[500], mode edge [500]
  Slowdrain Pause : mode core enabled [n] timeout[0]
  Slowdrain Pause : mode edge enabled [n] timeout[500]
  MAC-addr IPv6-extract:0
  Buffer Boost:0 Speed Group:0, MAC Learn: Enabled
  shut lan (disabled)
  virtual-ethernet-bridge (Disabled)
```

```
  link state group name: group-1
hash-mode gtp-inner-v4 (Disabled)
```

Displays detailed information about:

- Internal port status and administrative configurations.
- Information about the link state group, including whether the group name has been cleared.
- Ensures that stale group information is not displayed by resetting the group name in the port configuration.

Step 4 Use the **show system internal dme running-config all dn sys/linkstate** command to display internal details about the link-state group configuration.

Example:

```
show system internal dme running-config all dn sys/linkstate
{
    "linkStateGroup": {
        "attributes": {
            "groupName": "group-1",
            "uplinkIntfList": ["eth1/1"],
            "downlinkIntfList": ["eth1/2"],
            "status": "up",
            "numDisabled": 2,
            "lastDisabledTimestamp": "2025-03-01T17:10:26"
        }
    }
}
```

Step 5 Use the **show interface brief** command to display a summary of interface statuses, including link state.

Example:

```
switch# show interface ethernet 1/1,ethernet 1/2 brief
--------------------------------------------------------------------------------
Ethernet        VLAN    Type Mode   Status  Reason                 Speed     Port
Interface                                                                    Ch #
--------------------------------------------------------------------------------
Eth1/2          --      eth  routed down    trackedPortDown          auto(D) --
Eth1/1          --      eth  routed down    Administratively down    auto(D) --
```

Link-State Tracking Configuration Examples

Link-State Tracking Configuration Examples — concept overview.

Link-State Tracking Configuration Examples

Adding and configuring link-state tracking groups and interfaces.

1. Configuring link-state tracking groups and verifying configurations

```
switch(config)# link state group track-group-1
switch(config-link-state)#
switch(config-link-state)# exit

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Pending
```

```
Uplink Interfaces:
Downlink Interfaces:
Number of times disabled: 0
Last disabled: Thu Jan 01 00:00:00 1970
Downlink bringup delay timer: 60
```

2. Adding uplink interfaces to link-state tracking groups and verifying configurations

```
switch(config)# int ethernet 1/1
switch(config-if)# link state group track-group-1 type ?
  downlink  Interface associate as downlink
  uplink    Interface associate as uplink
switch(config-if)# link state group track-group-1 type uplink
switch(config-if)# exit

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Pending
Uplink Interfaces: Eth1/1
Downlink Interfaces:
Number of times disabled: 0
Last disabled: Thu Jan 01 00:00:00 1970
Downlink bringup delay timer: 60
```

3. Adding downlink interfaces to link-state tracking groups and verifying configurations

```
switch(config)# interface ethernet 1/2
switch(config-if)# link state group track-group-1 type downlink
switch(config-if)# exit
```

4. Readding downlink interfaces to link state tracking group

```
switch(config-if)# interface ethernet 1/2
switch(config-if)# link state group track-group-1 type downlink

switch#show link state group track-group-1
Link State Group: track-group-1
Status: Pending
Uplink Interfaces:
Downlink Interfaces: Eth1/2
Number of times disabled: 0
Last disabled: Thu Jan 01 00:00:00 1970
Downlink bringup delay timer: 60
```

5. Readding uplink interfaces to link state tracking group

```
switch(config-if)# interface ethernet  1/1
switch(config-if)# link state group track-group-1 type uplink
switch(config-if)# exit

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Up
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 0
Last disabled: Thu Jan 01 00:00:00 1970
Downlink bringup delay timer: 60
```

Removing interfaces and resetting link-state tracking parameters.

1. Removing the custom downlink bringup delay timer and verifying the default timer

```
switch(config)# link state group track-group-1
switch(config-link-state)# no downlink bringup delay
switch(config-link-state)# exit
```

```
switch(config)# show link state group track-group-1
Link State Group: track-group-1
Status: Up
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 1
Last disabled: Wed May 21 06:04:01 2025
Downlink bringup delay timer: 60 ------------------> default downlink bringup delay
 timer
```

2. Removing uplink interfaces from the link state tracking group

```
switch(config)# interface ethernet 1/1
switch(config-if)# no link state group track-group-1 type uplink
switch(config-if)# exit

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Pending
Uplink Interfaces:
Downlink Interfaces: Eth1/2
Number of times disabled: 1
Last disabled: Wed May 21 06:04:01 2025
Downlink bringup delay timer: 60
```

3. Removing downlink interfaces from the link state tracking group

```
switch(config)# interface ethernet 1/2
switch(config-if)# no link state group track-group-1 type downlink

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Pending
Uplink Interfaces:
Downlink Interfaces:
Number of times disabled: 0
Last disabled: Thu Jan 01 00:00:00 1970
Downlink bringup delay timer: 60
```

Verifying link-state tracking group status and behavior.

1. Verifying link-state tracking groups status as Up

```
switch# show link state group track-group-1
Link State Group: track-group-1
Status: Up
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 0
Last disabled: Thu Jan 01 00:00:00 1970
Downlink bringup delay timer: 60
```

2. Verifying group status and downlink behavior after shutting down uplink interface

```
switch(config-link-state)# interface ethernet 1/1
switch(config-if)# shutdown

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Down
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 1.  ------> No. of  time disabled should increase by
```

```
 1
Last disabled: Wed May 21 06:04:01 2025        ——> last disabled timestamp
Downlink bringup delay timer: 60

switch(config-if)# show interface ethernet 1/1,  ethernet 1/2 brief
--------------------------------------------------------------------------------
Ethernet        VLAN    Type Mode   Status  Reason                 Speed     Port
Interface                                                                    Ch #
--------------------------------------------------------------------------------
Eth1/2          --      eth  routed  down    trackedPortDown          auto(D)   --
Eth1/1          --      eth  routed  down    Administratively down    auto(D)   --
```

3. Verifying group status and downlink behavior after enabling uplink interface

```
switch(config-link-state)# int ethernet 1/1
switch(config-if)# no shutdown

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Up
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 1
Last disabled: Wed May 21 06:04:01 2025
Downlink bringup delay timer: 5

switch(config)# show int ethernet 1/1,  ethernet 1/2 brief
--------------------------------------------------------------------------------
Ethernet        VLAN    Type Mode   Status  Reason                 Speed     Port
Interface                                                                    Ch #
--------------------------------------------------------------------------------
Eth1/2          --      eth  routed  up      none                   400G(D) --
Eth1/1          --      eth  routed  up      none                   400G(D) --
```

4. Configuring the downlink bringup delay timer and verifying

```
switch(config)# link state group track-group-1
switch(config-link-state)# downlink bringup delay 300
switch(config-link-state)#
switch(config-link-state)# exit

switch# show link state group track-group-1
Link State Group: track-group-1
Status: Up
Uplink Interfaces: Eth1/1
Downlink Interfaces: Eth1/2
Number of times disabled: 1
Last disabled: Wed May 21 06:04:01 2025
Downlink bringup delay timer: 300 ------>  configure downlink bringup delay
timer
```