Cisco Catalyst SD-WAN BFD

Table 1: Feature History

Feature Name	Release Information	Description
Automatically Suspend Unstable Cisco Catalyst SD-WAN BFD Sessions	Cisco IOS XE Catalyst SD-WAN Release 17.10.1a Cisco Catalyst SD-WAN Control Components Release 20.10.1	With this feature, you can automatically suspend an unstable Cisco Catalyst SD-WAN Bidirectional Forwarding Detection (BFD) session based on flap-cycle parameters or on Service-Level Agreement (SLA) parameters. You can also monitor the suspended BFD sessions and manually reset suspended BFD sessions. With this feature, you can automatically suspend an unstable Cisco Catalyst SD-WAN Bidirectional Forwarding Detection (BFD) session based on flap-cycle parameters or on Service-Level Agreement (SLA) parameters.

Information About Cisco Catalyst SD-WAN BFD

Within Cisco Catalyst SD-WAN, there are the following types of BFD:

- **Cisco Catalyst SD-WAN BFD**

    This type of BFD detects failures in the overlay tunnel and has the following characteristics:

- Is enabled by default and cannot be disabled

- Is typically enabled for the Cisco Catalyst SD-WAN Overlay Management Protocol (OMP)

- Besides link failures, Cisco Catalyst SD-WAN BFD also measures latency, loss, jitter, and other link statistics used by application-aware routing

  For more information on Cisco Catalyst SD-WAN BFD for measuring latency, loss, and jitter used by application-aware routing, see Application-Aware Routing.

- **BFD Support for Routing Protocols in Cisco Catalyst SD-WAN**

  This type of BFD supports BGP, OSFP, and EIGRP routing protocols in Cisco Catalyst SD-WAN.

  For more information on BFD for routing protocols, see BFD for Routing Protocols in Cisco Catalyst SD-WAN.

Information About Automatically Suspending BFD Sessions

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.10.1a and Cisco Catalyst SD-WAN Control Components Release 20.10.1

BFD sessions may experience flapping, meaning that the BFD session enters a down state and then returns to an up state. This can occur when one device that is part of the BFD session becomes unavailable and then returns to being available. When a BFD session flaps, applications running on that tunnel are disrupted. The unstable BFD session can be brought up, but due to the unstable connection, the BFD session can quickly become disrupted again. With this feature, you avoid the impact of application traffic getting steered unnecessarily from one overlay path to another path because of an unstable BFD session.

To avoid the cycle of BFD session flaps, Cisco Catalyst SD-WAN provides an automatic suspension mechanism for suspending BFD sessions based on the following parameters:

- **Flap cycle**

  A flap cycle is defined only as the following:

  - BFD session is in the up state

  - BFD session is in the down state

  - BFD session is coming back up

- **SLA threshold**

  An SLA threshold is the threshold by which the BFD session is added to the suspended list. An SLA threshold is a threshold value for a traffic metric, such as loss, latency, or jitter. If one of these metrics indicates that traffic performance has degraded to a point defined by a threshold, the BFD session state changes to suspended. These thresholds reflect the level of traffic performance specified in the SLA.

Note An SLA threshold is an optional configuration. If you configure a SLA threshold, configure higher metrics for loss, latency, and jitter, so the SLA threshold does not conflict with the SLA parameters as defined in the SLA classes. For more information on SLA classes, see the Cisco Catalyst SD-WAN Policies Configuration Guide.

Benefits of Automatically Suspending BFD Sessions

• Supports manual removal of the affected circuit or tunnel interface from the BFD suspended list.

• Provides monitoring of a suspended tunnel.

How Automatically Suspending BFD Sessions Works

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.10.1a and Cisco Catalyst SD-WAN Control Components Release 20.10.1

Configure the following BFD session parameters using a Cisco SD-WAN Manager device CLI template or a CLI add-on template:

Table 2: BFD Session Flap Cycle and SLA Parameters

Field	Description
enable-lr	Enable last resort upon BFD suspension. For more information on enabling a last resort on a tunnel interface, see last-resort-circuit.
duration	Duration of time for which the BFD session remains in the suspended state.
flapping-window	Time frame or window to detect the BFD session flap.
flap-count	Number of BFD session flaps after which the BFD session is suspended. The recommended **flap-count** is 3.
thresholds	SLA threshold triggering a BFD session to be suspended.

BFD Session Suspension Workflow

If a BFD session exceeds the flap-count value within the configured flapping-window interval, then the BFD session must remain suspended until the configured duration interval.

For a BFD session in the suspended state, the following occurs:

1. If a session reflaps or exceeds the threshold parameters defined, the session is moved back to suspended state and the duration is reset again.

2. If the session does not flap and is within the threshold range, the session is automatically removed out of the suspended state after the duration interval expires.

3. You can also manually remove suspended BFD sessions by using the **request platform software sdwan auto-suspend reset** command. For more information, see the Cisco IOS XE SD-WAN Qualified Command Reference Guide.

Regular SLA measurement and echo response or path maximum transmission unit (PMTU) control traffic only is sent across the suspended BFD session.

Note Data traffic is not sent across the overlay network when a BFD session is in the suspended state.

Note This feature does not manipulate the state of the BFD session.

Note As the BFD suspension feature is for forward data traffic, you should enable BFD suspension on the remote-end node to block the reverse data traffic to avoid dropping data traffic.

Restrictions for Automatically Suspending BFD Sessions

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.10.1a and Cisco Catalyst SD-WAN Control Components Release 20.10.1

- For a Cisco IOS XE Catalyst SD-WAN device with a single TLOC, automatic suspension of a BFD session may cause BFD sessions to be dropped.

- The last-resort circuit may not work for a single site unless all BFD sessions are down for a tunnel interface. The last-resort circuit is enabled only if all BFD sessions on the non last-resort circuit are suspended or down.

- Cisco SD-WAN Manager feature templates do not support configuration of automatic suspension of BFD sessions.

  Support is provided only for configuring BFD automatic suspension using a device CLI or a CLI add-on template.

- If duplicated traffic is sent on a different BFD session, the duplicated traffic may get routed through a BFD suspended session.

Configure Automatic Suspension of BFD Sessions Using a CLI Template

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.10.1a and Cisco Catalyst SD-WAN Control Components Release 20.10.1

For more information about using CLI templates, see CLI Add-On Feature Templates and CLI Templates.

Note By default, CLI templates execute commands in global config mode.

1. Enable BFD automatic suspension with or without last resort.

```
auto-suspend
    enable-lr
```

```
auto-suspend
    no enable-lr
```

Note Before enabling last resort for the BFD automatic suspension feature, you must enable the last-resort circuit on a tunnel interface.

For more information on last resort, see last-resort-circuit.

2. Configure the following flap parameters:

```
duration sec
    flapping-window sec
    flap-count flap-count
```

Note When using SLA-based BFD automatic suspension, **duration** should be more than the number of the **bfd multiplier** x the **bfd poll interval**. We recommend that you configure BFD automatic suspension duration to be more than 30 minutes.

3. (Optional) Configure SLA parameters.

```
thresholds
  color
  all
   jitter  jitter-value
   latency latency-value
   loss    loss-value
   !
```

Prior to enabling SLA thresholds, configure BFD session flapping parameters and duration.

Here is a complete configuration example for configuring BFD automatic suspension with last resort enabled.

```
auto-suspend
  enable-lr
  duration        3600
```

```
flapping-window 300
flap-count     1
thresholds
 color
  all
   latency 10
   loss    10
   jitter  10
```

Note If you enable **color all** and a specific **color**, the specific color takes precedence over the **color all** parameter. For more information on BFD colors, see bfd color.

Verify Automatic Suspension of BFD Sessions

Minimum supported releases: Cisco IOS XE Catalyst SD-WAN Release 17.10.1a and Cisco Catalyst SD-WAN Control Components Release 20.10.1

The following sample output from the **show sdwan bfd sessions suspend** command displays the total suspend count, indicating the number of times that the BFD session has been suspended:

```
Device# show sdwan bfd sessions suspend
                            SOURCE TLOC   REMOTE TLOC               DST PUBLIC   DST PUBLIC            RE-SUSPEND  SUSPEND      TOTAL   SUSPEND
SYSTEM IP       STATE       COLOR         COLOR         SOURCE IP   IP           PORT       ENCAP     COUNT       TIME LEFT    COUNT   DURATION
----------------------------------------------------------------------------------------------------------------------------------------------
172.16.255.14   up          lte           lte           10.1.15.15  10.1.14.14   12426      ipsec     0           0:00:19:52   18      0:00:00:07
```

The following columns are added for analyzing BFD session suspension metrics: RE-SUSPEND COUNT, SUSPEND TIME LEFT, TOTAL COUNT, and SUSPEND DURATION.

The following sample output from the **show sdwan bfd sessions alt** command displays if a suspended flag has been added to a BFD session and other BFD session metrics:

```
Device# show sdwan bfd sessions alt
*Sus = Suspend
*NA  = Flag Not Set
                                  SOURCE TLOC   REMOTE TLOC               DST PUBLIC   DST PUBLIC
SYSTEM IP       SITE ID   STATE   COLOR         COLOR         SOURCE IP   IP           PORT       ENCAP   BFD-LD   FLAGS   UPTIME
-------------------------------------------------------------------------------------------------------------------------------------
172.16.255.14   400       up      3g            lte           10.0.20.15  10.1.14.14   12426      ipsec   20004    NA      0:19:30:40
172.16.255.14   400       up      lte           lte           10.1.15.15  10.1.14.14   12426      ipsec   20003    Sus     0:00:02:46
172.16.255.16   600       up      3g            lte           10.0.20.15  10.0.106.1   12366      ipsec   20002    NA      0:19:30:40
172.16.255.16   600       up      lte           lte           10.1.15.15  10.0.106.1   12366      ipsec   20001    NA      0:19:20:14
```

The following columns are added for BFD suspension: BFD-LD and FLAGS.

Local discriminator (LD) is a unique identifier for all BFD sessions. The value for LD must be a nonzero value. LD is an internal value that Cisco Technical Assistance Center (TAC) uses for troubleshooting BFD sessions.

A BFD session flag, Sus, is added for identifying BFD sessions that are suspended.

The following sample output displays the BFD sessions for which the Sus flag is added to the BFD session:

```
Device# show sdwan bfd history
                                          DST PUBLIC    DST PUBLIC                             RX      TX
SYSTEM IP       SITE ID   COLOR   STATE   IP            PORT       ENCAP  TIME                 PKTS    PKTS    DEL   FLAGS
-----------------------------------------------------------------------------------------------------------------------------
172.16.255.16   600       lte     up      10.0.106.1    12366      ipsec  06/03/22 02:51:06    0       0       0     [ ]
172.16.255.16   600       lte     up      10.0.106.1    12366      ipsec  06/03/22 02:52:04    153     154     0     [Sus]
172.16.255.16   600       lte     down    10.0.106.1    12366      ipsec  06/03/22 03:00:50    1085    1085    0     [Sus]
```

The following sample output displays a BFD session summary, including which BFD sessions are up, down, flapped, or that have been suspended:

```
Device# show sdwan bfd summary
sessions-total          4
sessions-up             4
```

```
sessions-max            4
sessions-flap           4
poll-interval           60000
sessions-up-suspended   1
sessions-down-suspended 0
```

The following fields are added for BFD session suspension: `sessions-flap`, `sessions-up-suspended`, and `sessions-down-suspended`.