Span Loss

Table 1: Feature History

Feature Name	Release Information	Feature Description
Span loss measurement	Cisco IOS XR Release 25.1.1	NCS 1014 measures span loss between two nodes. The measurement is performed using the OSC links created between the nodes by configuring the OSC pluggable to be operational and OSPFv2 protocol on the EDFA2 card on the nodes. These measurements are essential during network changes, like equipment installation or fiber repairs.
		You can configure both minimum and maximum span loss thresholds. If the received span loss exceeds the maximum threshold or falls below the minimum threshold, the system will trigger a SPAN-LOSS-OUT-OF-RANGE alarm.
		CLI commands are:
		• **optical-line-control**
		• **controller Ots** *R/S/I/P* **span-loss min** *value*
		• **controller Ots** *R/S/I/P* **span-loss min** *value*

Span loss

Span loss is the optical signal loss over a fiber span between two network nodes. It is measured by comparing power levels at the transmitting (Tx) and receiving (Rx) ports, typically in decibels (dB). If span loss exceeds thresholds, alarms like "Span Loss Value Out Of Range" are triggered.

Span loss calculations

The span loss calculation is an automatic process for determining span losses between NCS 1014 nodes. The span loss verification algorithm calculates span loss by comparing power measurements at the line TX/RX port at the far-end and the line RX/TX port at the near end. If the span loss is not within configured thresholds, the algorithm raises the "Span Loss Value Out Of Range" alarm.

Span loss reporting

The span loss application periodically reports the span loss value for a span every few seconds. If there are changes in span loss, such as those caused by variations in fiber loss, the application typically updates the span loss value between 10 to 30 seconds after the value has stabilized.

Span loss verification reports these values:

- **OSC span loss**
- **Signal span loss**
- **Span loss**

OSC span loss

RX OSC span loss: This is the difference between the received OSC signal power at the near end and the transmitted OSC signal power at the far-end. It refers to the fiber entering the LINE RX port.

TX OSC span loss: This is the difference between the transmitted OSC signal power at the near end and the received OSC signal power at the far-end. It refers to the fiber exiting the LINE TX port.

Signal span loss

RX signal span loss: This is the difference between the received C-band signal power at the near end and the transmitted C-band signal power at the far-end. It refers to the fiber entering the LINE RX port.

TX signal span loss: This is the difference between the transmitted C-band signal power at the near end and the received C-band signal power at the far-end. It refers to the fiber exiting the LINE TX port.

Span loss

RX span loss: This measurement is the difference between the received total power at near-end and transmitted total power at far-end.

TX span loss: This measurement is the difference between the transmitted total power at near-end and received total power at far-end.

Configure span loss thresholds

Use this task to configure span loss thresholds

Before you begin

Establish the OSC link using OSPFv2.`

Procedure

Step 1   Use the commands **optical-line-control** and **controller ots** *R/S.I/P* to enter the optical applications configuration mode and select the controller on which the span loss thresholds need to be configured.

The span loss can be configured only controller ots on R/S/I/0.

Example:

```
RP/0/RP0/CPU0:ios(config)#optical-line-control
RP/0/RP0/CPU0:ios(config-olc)#controller ots 0/0/0/0
```

Step 2   Use the keywords **span-loss min** *value* and **span-loss max** *value*, to configure the minimum and maximum span loss threshold values.

Example:

```
RP/0/RP0/CPU0:ios(config-olc-ots)#span-loss min 0
RP/0/RP0/CPU0:ios(config-olc-ots)#span-loss max 420
```

The example sets the minimum threshold to 0.0 dB and the maximum threshold to 42.0 dB.

The system raises a SPAN-LOSS-OUT-OF-RANGE alarm when 'Rx span loss' is greater than the maximum threshold or lesser than the minimum threshold.

Step 3   Commit the changes and exit all the configuration modes.

Example:

```
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
RP/0/RP0/CPU0:ios(config-olc-ots)#exit
RP/0/RP0/CPU0:ios(config-olc)#exit
RP/0/RP0/CPU0:ios(config)#
```

View the span loss measurements

Use this task to view the various span loss measurements.

Procedure

Use the **show olc span-loss** command to view the various span loss measurements.

Example:

```
RP/0/RP0/CPU0:ios#show olc span-loss
                  Wed Feb 19 14:20:12.542 IST

                  Controller                          : Ots0/0/0/0
                  Neighbour RID                       : 192.0.2.20
                      Rx Span Loss                        : 12.92 dB
                      Rx OSC Span Loss                    : 13.41 dB
                      Rx Signal Span Loss                 : 12.95 dB
                      Tx Span Loss                        : 13.67 dB
                      Tx OSC Span Loss                    : 14.52 dB
                      Tx Signal Span Loss                 : 13.65 dB
```

The entries, highlighted in bold, show the span loss measurements.

Verify span loss configurations

Use this task to verify the span loss configurations.

Procedure

Verify the configured values using the **show running-config optical-line-control controller ots** command.

Example:

```
RP/0/RP0/CPU0:ios##show running-config optical-line-control controller ots 0/0/0/0
                  Wed Oct  2 15:57:22.576 UTC
                  optical-line-control
                  controller ots 0/0/0/0
                  span-loss max 420
                      span-loss min 0
                  !
                  !
```

The entries, highlighted in bold, show the values of span loss thresholds configured.

Signal span loss control

The signal span loss control is a funtionality that

- enables you to set the expected and threshold values for span loss in a link,

- monitors changes in the signal span loss in RX direction, and

- raises span loss alarms.

Table 2: Feature History

Feature Name	Release Information	Feature Description

MOLS2.0 Signal Span Loss Control Enhancement	Cisco IOS XR Release 25.4.1	The enhanced signal span loss control enables you to set the expected and threshold values for managing RX signal span loss. The enhancement enables the line system to:
		
		• monitor the change in RX signal span loss value,
		
		• compare the current and expected RX signal span loss values,
		
		• check if the span loss difference is within the set threshold values, and
		
		• raise the relevant alarms, if the span loss difference is more than the threshold values.
		
		New CLI parameters added for span-loss attribute on the LINE OTS controller are:
		
		• **rx-expected-span-loss**
		
		• **rx-exp-rel-thr-deg <10…420>**
		
		• **rx-exp-rel-thr-fail <10...420>**
		
		To enable the expected RX signal span loss:
		
		`rx-expected-span-loss`
		
		To disable the expected RX signal span loss:
		
		`no span-loss rx-expected-span-loss`
		
		Modified YANG models are:
		
		• Native YANG Model - **Cisco-IOS-XR-olc-cfg.yang**
		
		• Open Config model - **openconfig-transport-line-common.yang**
		
		New alarms are introduced:
		
		• **OLC_SPAN_LOSS_FM_RX_SIGNAL_DEGRADE** - Rx signal span loss degraded
		
		• **OLC_SPAN_LOSS_FM_RX_SIGNAL_FAIL** - Rx signal span loss failed

Note In R2541, signal span loss control is supported only in the RX direction in the link.

Signal span loss baseline and thresholds

A signal span loss baseline is the currently measured signal span loss value in the optical link that is

- stored automatically when you configure the expected span loss during initial setup, and

- updated when you reconfigure the expected span loss after fiber repair or link design changes.

- used as the reference for evaluating threshold alarms.

Expected signal span loss is the span loss that you find ideal for the network design.

Measured signal span loss refers to the RX signal span loss that is measured immediately after the RX expected span loss is configured for the network.

Signal span loss thresholds

Signal span loss thresholds define the expected degrade and fail ranges. If the measured RX signal span loss falls outside these thresholds, a corresponding alarm is triggered. The two signal span loss thresholds are:

- **RX signal span loss degrade**: Sets the degrade threshold range for the measured RX signal span loss. The threshold range is calculated based on the configured expected signal span loss. When the measured RX signal span loss falls outside of this range, the system triggers the RX signal span loss degrade alarm. The RX signal degrade threshold can be changed with a new expected signal span loss.

- **RX signal span loss fail**: Sets the fail threshold range for the measured RX signal span loss. The threshold range is calculated based on the configured expected signal span loss. When the measured RX signal span loss falls outside of this range, the system triggers the RX signal span loss fail alarm. The RX signal fail threshold can be changed with a new expected signal span loss.

Key characteristics of signal span loss baseline and thresholds

- saves the newly measured RX signal span loss as a baseline value each time the expected span loss value is changed.

- enables configuration of span loss degrade and fail thresholds on Line OTS controller.

- compares the prevailing RX signal span loss and the configured RX expected signal span loss values whenever there is a change in RX signal span loss value.

✎

Note   Initially, the RX expected signal span loss value is set based on the planning tool design or updated to reflect the newly measured span loss after a fiber cut and repair.

Setting expected span loss degrade and fail

In your network,

1. If RX expected signal span loss is set to **11.0 dB**, the system measures the immediate RX signal span loss and saves this value as the baseline.

2. **RX span loss degrade range = RX expected span loss ± RX expected span loss degrade**

If RX expected span loss degrade threshold is set to **6.0 dB,** the system defines the acceptable degrade range as ±**6.0 dB** around the expected signal span loss. Therefore, the valid degrade threshold range is from **5.0 to 17.0 dB**. If the measured RX signal span loss is more than **5.0 dB** and less than **17.0 dB**, then there is no degrade alarm. If the measured RX signal span loss falls outside this range, a degrade alarm is triggered.

3. **RX span loss fail range = RX expected span loss ± RX expected span loss fail**

If RX expected span loss fail threshold is set to **5.0 dB**, the system defines the acceptable fail range as ±**5.0 dB** around the expected signal span loss. Therefore, the valid fail threshold range is from **6.0 to 16.0 dB**. If the measured RX signal span loss is more than **6.0 dB** and less than **16.0 dB**, then there is no fail alarm. If the measured RX signal span loss falls outside this range, a fail alarm is triggered.

Note The degrade and fail alarms have a hysteresis of **0.5 dB**. For example, if the fail threshold is **5 dB** and the alarm is active, the alarm will clear only when the difference between the expected and measured span loss drops below **4.5 dB**.

Note The degrade and fail alarms are mutually exclusive. If the span loss fail threshold is crossed, the degrade alarm is cleared and the fail alarm is raised.

Configure RX signal span loss for MOLS 2.0

This procedure enables you to set the expected and threshold values for RX signal span loss.

Follow these steps to configure the span loss baseline and its thresholds to monitor span loss.

Before you begin

• Line system is physically connected, powered on, and its components are provisioned.

• Fiber type is provisioned.

• Amplifier APC is enabled.

Enter the configuration mode using the `configure` command.

Procedure

Step 1 Enter optical applications configuration mode and select the controller using **optical-line-control controller ots** *R/S/I/P*

The span loss can be configured only on OTS controller R/S/I/0.

Example:
```
RP/0/RP0/CPU0:ios#configure
Mon Sep 18 13:11:53.812 UTC
RP/0/RP0/CPU0:ios(config)#optical-line-control controller Ots 0/0/0/0
```

Step 2   Enable the expected span loss value using **span-loss rx-expected-span-loss**.

Example:

```
RP/0/RP0/CPU0:ios(config-olc-ots)#span-loss rx-expected-span-loss 65
```

The RX expected span loss is configured as **6.5 dB** and the measured span loss is stored automatically as the baseline.

Step 3   Set the degrade and fail threshold values for expected Rx signal span loss.

Example:

Note
By default, **span-loss rx-exp-rel-thr-deg** and **span-loss rx-exp-rel-thr-fail** are set to **3.0 and 5.0 dB** respectively.

```
RP/0/RP0/CPU0:ios(config-olc-ots)#span-loss rx-exp-rel-thr-deg 40
RP/0/RP0/CPU0:ios(config-olc-ots)#span-loss rx-exp-rel-thr-fail 60
RP/0/RP0/CPU0:ios(config-olc-ots)#commit
```

The OTS controller commands consider the inputs to one decimal place for the parameter values. Here, the system sets the **span-loss rx-exp-rel-thr-deg** as **4.0 dB** and **span-loss rx-exp-rel-thr-fail** as **6.0 dB**.

Step 4   Verify the saved baseline, threshold, and current values using **show olc span-loss baseline**.

Example:

```
RP/0/RP0/CPU0:ios#show olc span-loss baseline controller ots 0/0/0/0

Controller                                 : Ots0/0/0/0
Neighbour RID                              : 1.1.1.2
Baseline Timestamp                         : 2025-06-17 18:00:07

Rx Expected Span Loss Rel Thr Deg          : 4.00 dB
Rx Expected Span Loss Rel Thr Fail         : 6.00 dB
Rx Expected Span Loss                      : 6.50 dB
Rx Signal Span Loss                        : 6.56 dB
Rx Calibration Baseline Signal Span Loss   : 6.53 dB
```

Step 5   (Optional) Disable the expected span loss setting.

Example:

```
RP/0/RP0/CPU0:ios(config-olc-ots)# no span-loss rx-expected-span-loss
```

Disabling this setting clears all outstanding alarms but retains the **calibration-baseline-span-loss** value.

The system uses the configured threshold values to monitor span loss. Alarms are triggered if loss exceeds the set thresholds.

What to do next

Review alarm status, monitor signal degradation, and adjust baseline values as needed.