Configure OTDR

This chapter describes how to configure the Optical Time Domain Reflectometer (OTDR) module in NCS 1010.

OTDR

OTDR functionality in NCS 1010 OLT and ILA nodes

The NCS 1010 OLT and ILA nodes have an in-built bidirectional Optical Time Domain Reflectometer (OTDR) functionality that can capture the real-time measurements of loss and back reflection of the fiber pair linked to the TX and RX ports.

Port switching capabilities of OTDR

For the OLT device, the OTDR port can switch between LINE-TX and LINE-RX ports. For the ILA device, the OTDR port can switch among LINE-1-TX, LINE-1-RX, LINE-2-TX, and LINE-2-RX ports.

SOR file

You can view the OTDR measurement results in the Standard OTDR Record (SOR) file. The SOR file contains the fiber trace details such as the distance, reflectance, loss, and fiber attenuation measurements. You can export the SOR file from NCS 1010 using the command: **scp username@device-ip:filename_with_source_location destination-location** .

Example:

```
scp test@192.168.0.1:/harddisk:/otdr/ios_OTDR_Ots0_0_0_0_RX_20230301-101927.sor /users/test/
```

Benefits of OTDR

The OTDR offers several key benefits, including:

- **Quality of the Fiber:** Assesses the quality of the fiber during system installation, before any traffic is active.

- **Monitoring During Operation:** Monitors the fiber during system operation (live traffic) and check the fiber during cable cuts and repairs.

- **Attenuation Measurement:** Measures the attenuation (dB) of the entire fiber link and the attenuation of individual sections of fiber.

- **Distance and Magnitude of Losses:** Determine the distance and magnitude of insertion loss and reflection loss.

- **Fiber Events Detection:** Identify fiber events such as concentrated loss events, reflection events, events at the end of the fiber, and discontinuities or defects on the fiber such as fiber pinch, and fiber cut, loss events such as loss due to fiber splicing, patch panel, and coupler connections.

OTDR modes

In NCS 1010, OTDR works in two three modes:

- Auto

- Expert

Auto

The device automatically selects the optimal values for OTDR pulse width, scan duration, capture start time, and capture end time parameters. This is the default mode and does not require explicit configuration. However, you can manually configure the other scan parameters if needed.

Expert

You must manually configure all OTDR scan parameters with the valid values that are required for the OTDR measurement. Automatic adjustments are not performed in this mode.

Configure the OTDR scan parameters

Use this task to configure the various parameters for the OTDR scan. If not configured, the NCS 1010 device uses the default values for OTDR scan parameters.

Procedure

Step 1   Enter the OTS controller configuration mode for the port you want to configure the OTDR parameters.

Example:

```
RP/0/RP0/CPU0:ios#config
RP/0/RP0/CPU0:ios(config)#controller ots 0/0/0/0
```

Step 2   Enter the OTDR mode.

If you want to configure the	then run the command
Expert mode	`RP/0/RP0/CPU0:ios(config-Ots)#otdr scan-mode expert`
Auto mode	The Auto mode is the default mode and does not require explicit configuration.

Step 3 Set the required parameters for OTDR scan. See for the complete list of OTDR parameters.

Example:

```
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx auto reflectance-threshold -50
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx auto splice-loss-threshold 200
RP/0/RP0/CPU0:ios(config-Ots)#otdr rx expert pulse-width 6000
RP/0/RP0/CPU0:ios(config-Ots)#commit
```

Step 4 Commit the changes and exit the configuration mode.

Example:

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

OTDR scan parameters

This table provides an overview of key OTDR parameters, including their definitions, measurement units, range of values and the default values.

Table 1: OTDR scan parameters in Auto mode

Parameter	Description	Unit	Range	Default
otdr { rx | tx} auto reflectance-threshold *<value>*	Threshold beyond which a reflective anomaly is reported as an event in the Rx or Tx direction.	dB	–50 to –10	–40
otdr { rx | tx} auto splice-loss-threshold *<value>*	Threshold beyond which a loss anomaly is reported as an event in Rx or Tx direction.	dB	0.2 to 5	0.35
otdr { rx | tx} auto excess-reflection-threshold *<value>*	Threshold beyond which a reflective event is reported as an excessive reflection event in the Rx or Tx direction.	dB	–50 to –10	–20
otdr { rx | tx} auto back-scattering *<value>*	The back scattering value in the Rx or Tx direction.	dB	–90 to –70	–81.87

Parameter	Description	Unit	Range	Default
otdr { rx | tx} auto refractive-index *<value>*	The refractive-index value in the Rx or Tx direction.	-	1.000 to 2.000	1.4682
otdr { rx | tx} auto end-of-fiber-loss-threshold *<value>*	Threshold based on which the OTDR identifies the fiber's end, distinguishing it from other components like splices or connectors.	dB	5–99	5.5

Table 2: OTDR scan parameters in Expert mode

Parameter	Description	Unit	Range	Default
otdr {rx | tx} expert pulse-width *<value>*	Pulse width to be used during the expert scan in the Rx or Tx direction.	ns	5–20000	20
otdr {rx | tx} expert capture-end*<value>*	OTDR capture endpoint during the expert scan in the Rx or Tx direction.	cm	0–15000000	15000000
otdr {rx | tx} expert capture-start *<value>*	OTDR capture start point during expert scan in the Rx or Tx direction	cm	0–10000000	0
otdr {rx | tx} expert scan duration*<value>*	OTDR scan duration during expert scan in the Rx or Tx direction.	Seconds	0–180	60

Verify the OTDR measurements

Use this task to view the OTDR scan measurement results.

Procedure

Use the command **show controllers ots** *R/S/I/P* **otdr-info** *direction* to view the OTDR scan measurements.

This sample displays the OTDR scan information in the Rx direction.

```
RP/0/RP0/CPU0:ios#show controllers ots 0/0/0/0 otdr-info rx
Wed Feb  9 05:55:19.791 UTC
     Scan Direction: RX
     Scan Status: Data Ready
     SOR file: /harddisk:/otdr/IOS_NCS1010_OTDR_Ots0_0_0_0_RX_20220209-055045.sor
     Total Events detected: 11
     Scan Timestamp: Wed Feb  9 05:50:45 2022 UTC
     Event Type Legend:  NR:Non-Reflective  R:Reflective  FE:Fiber-End  ER:Excess-Reflection
    Event# | Detected Event(s) | Location(km) | Accuracy(m) | Magnitude(dB)| Attenuation/km(dB)
    1      | R                 | 50.4709      | 52.47       | -39.87       | 0.18
    2      | NR                | 50.4709      | 52.47       | 1.17         | 0.18
```

```
3        | R                  | 100.9261   | 102.92     | -37.73     | 0.21
4        | NR                 | 100.9261   | 102.92     | 1.01       | 0.21
5        | R                  | 105.9500   | 107.94     | -38.52     | 0.24
6        | NR                 | 105.9500   | 107.94     | 0.85       | 0.24
7        | R                  | 112.7458   | 114.74     | -40.56     | 0.00
8        | NR                 | 112.7458   | 114.74     | 1.48       | 0.00
9        | NR                 | 117.9873   | 119.98     | 0.66       | -0.02
10       | R FE               | 120.1206   | 122.12     | -35.55     | 0.00
11       | NR FE              | 120.1206   | 122.12     | 21.65      | 0.00
```

After upgrading the FPD of the line card, the results of previous OTDR scans may not be available using the CLI command **show controllers ots** *Rack/Slot/Instance/Port* **otdr-info** *direction*. However, you can get the results of previous OTDR scans in the form of .SOR files that are stored in the hard disk.

Excessive Reflection (ER) and Excess Attenuation (EA) events and alarms can be dynamically raised or cleared by modifying their respective threshold values. However, Fiber End (FE) and Reflectance (R) events can be raised or cleared by changing the respective thresholds and re-running the OTDR scan.

See Examples for OTDR scan measurement results, on page 6 for various examples.

Start the OTDR scan

NCS 1010 software does not support automatic start of OTDR scan. Use this task to start the OTDR scan manually to perform the following procedures:

1. Identify the defect after the fiber has been cut.

2. Check the fiber quality after correcting the fiber defect.

3. Initiate an OTDR scan at the time of installation.

Procedure

Step 1   Use the **otdr-start controller ots** *R/S/I/P direction* to start the OTDR scan manually.

Example:

```
RP/0/RP0/CPU0:ios#otdr-start controller ots 0/0/0/0 rx
Wed Feb  9 05:49:39.178 UTC
OTS OTDR Scan Started at RX
RP/0/RP0/CPU0:ios#
```

The following example illustrates a rejected OTDR start request. Once an OTDR scan request has been rejected, it will not automatically run after the lock is released. You will need to create a new request to start the OTDR scan again. These examples show that OTDR scan is locked by Raman tuning:

Step 2   If you want to request a manual OTDR scan operation without negotiating with the peer, add the `force` option.

Example:

```
RP/0/RP0/CPU0:ios#otdr-start controller ots 0/0/0/0 rx force
Wed Sep 4 08:78:34.186 UTC
OTS OTDR Scan Started at RX
RP/0/RP0/CPU0:ios#
```

The forced **otdr-start** command can fail immediately in the following scenarios:

Stop the OTDR scan

Use this task to stop the OTDR scan manually.

Procedure

Use the command **otdr-stop controller ots** *R/S/I/P direction*Stop the OTDR scan manually.

Example:

```
RP/0/RP0/CPU0:ios#otdr-stop controller ots 0/0/0/0 rx
Wed Feb  9 06:03:37.406 UTC
OTS OTDR Scan Stopped at RX
RP/0/RP0/CPU0:ios#
```

Examples for OTDR scan measurement results

See OTDR scan status, on page 6 for a list of the different OTDR scan statuses and their definitions.

OTDR scan status

This table explains the various status of the OTDR measurements that are displayed for the **show olc controller ots R/S/I/P otdr-status** and **show controller ots R/S/I/P otdr-info** commands.

Table 3: OTDR scan status

Scan status	Description
Measuring	OTDR scan is currently in progress.
Data Processing	OTDR scan has completed and the data is ready for review
Data Ready	OTDR scan is stopped by the user, when it is in progress.
Stopped	OTDR is processing data just before populating the event table.

Scan status	Description
Error	The OTDR status may occasionally enter an Error state for various unpredictable reasons. One possible cause is a timeout event, which occurs if the scan is not completed within five minutes. In such cases, no SOR files or event table is generated. It is important to note that this is a rare occurrence. You can still initiate the OTDR scan to obtain the scan results.

This table explains the various OTDR scan statuses that are applicable for manual and autoscan.