

Cisco Network Convergence System 1001 OTDR Line Card

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NCS 1001 provides unmatched levels of automation and visibility for point-to-point metro optical line systems. Cisco has enhanced this further with the introduction of inline and real-time OTDR-based reporting. The OTDR line card will allow users to scan the fiber at will to profile fiber loss and detect ORL, reflection, and attenuation events.

Product features and benefits

The Cisco® NCS 1001 OTDR Line Card (Figure 1) occupies one slot in the 1RU NCS 1001 Line System platform. The module provides two bidirectional OTDRs and corresponding filters to combine the OTDR signals with the OSC and C-Band channels.

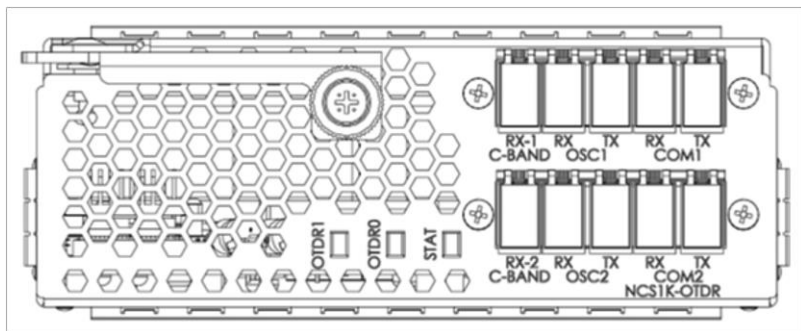


Figure 1.
Cisco NCS 1001 OTDR Line Card front view

The Cisco NCS 1001 OTDR Line Card provides the following benefits:

- Bidirectional OTDR up to 100 km. The OTDR operates inline and in real time with no interruption to traffic.
- Embedded filter for combining OTDR with OSC and C-Band channels.
- Multiple deployment models can be supported—terminal, ILA, and standalone.
- Compact one-third of an RU. Up to 6x OTDRs in one RU.
- Auto-mode and expert modes available depending on what the user requires.

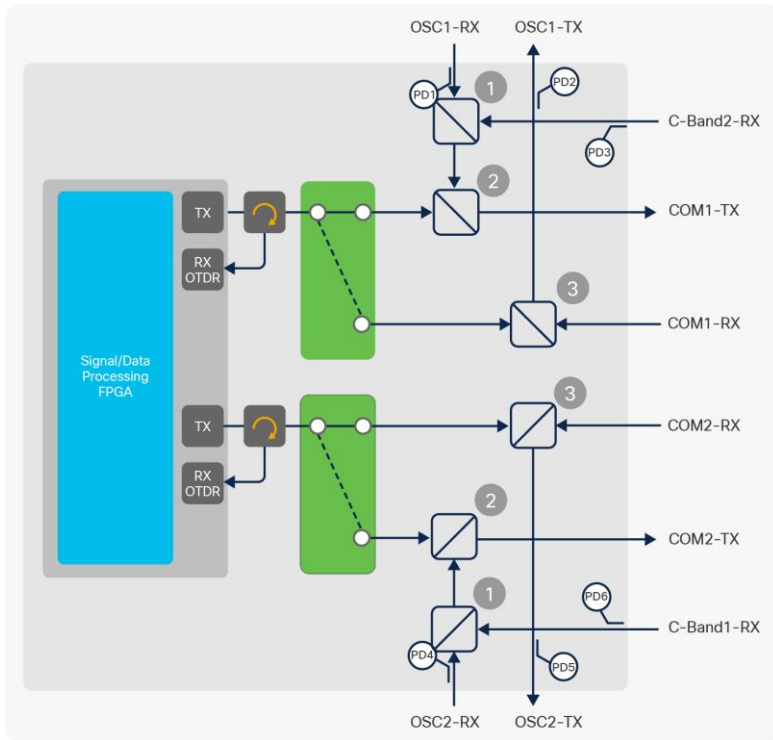


Figure 2.
Cisco NCS 1001 functional block diagram

Use cases

The Cisco NCS 1001 OTDR can be used in the following configurations:

- Terminal node with unprotected or protected amplifiers at the end points of a point-to-point link. Figure 3 illustrates how the OTDR line card connects into a protected terminal node that has two amplifier modules.
- Inline Amplifier Node with two amplifiers modules—one for each direction. Figure 4 shows how the OTDR line card connects to the two amplifier modules.
- Standalone for use with any third-party line system.

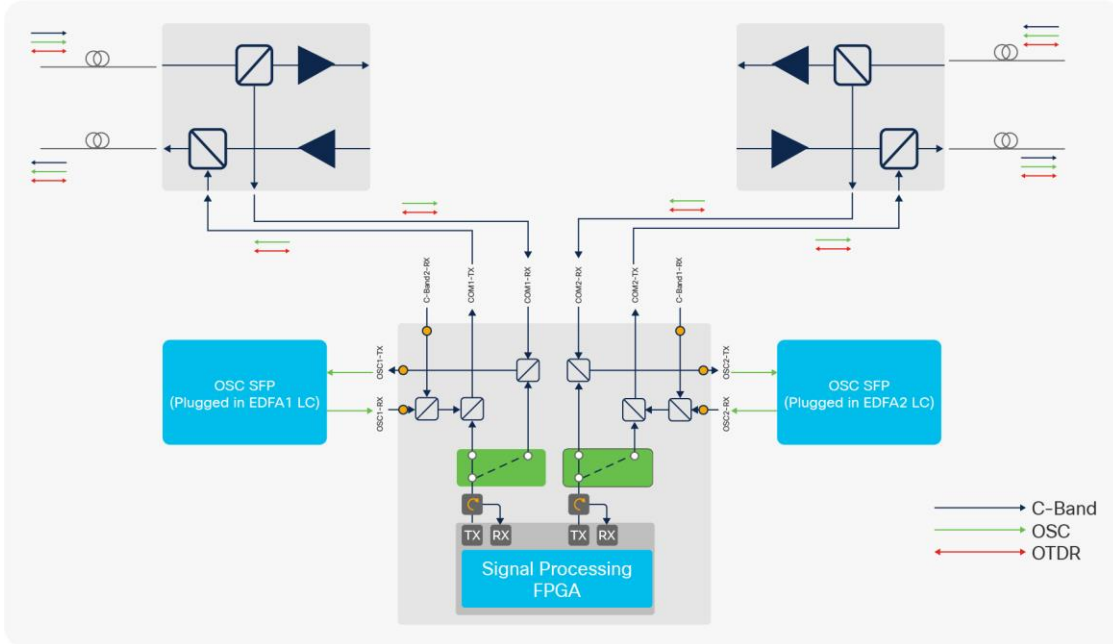


Figure 3.
NCS 1001 protected terminal node use case for OTDR

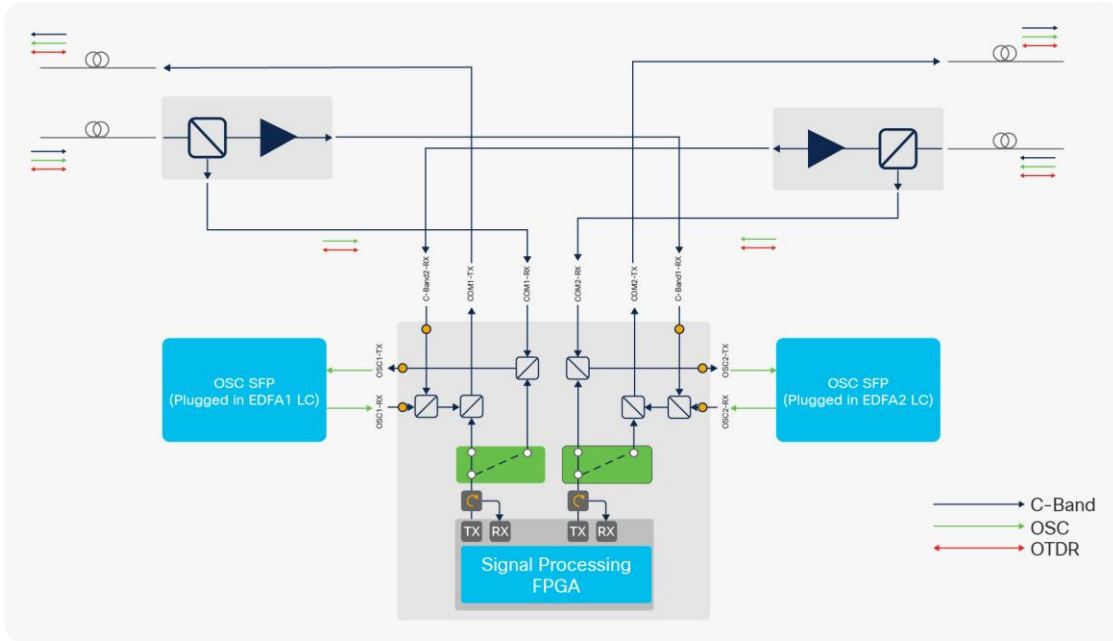


Figure 4.
NCS 1001 ILA node use case for OTDR

Management

The Cisco NCS 1001 provides comprehensive management capabilities to support Operations, Administration, Maintenance, and Provisioning (OAM&P) capabilities through IOS-XR CLI, SNMP, Syslog, and XML. For machine-to-machine configuration and management of NCS 1001, NETCONF, RESTCONF, and gRPC transport protocols with JSON, XML, and GPB encoding are provided. OpenConfig protocols for management GNMI and operations GNOI are also supported. The NCS 1001 provides a set of native YANG models as well as the ability to map into any industry standard or customer-defined YANG data models. For monitoring, NCS 1001 provides a streaming telemetry feature that relies on a push mechanism to disseminate user-selected PM and status information at user specified frequencies at granular 10-second intervals. This improves monitoring speed and scale compared to traditional pull-based mechanisms such as SNMP. The telemetry infrastructure also allows for events such as alarms and port-state changes to be notified.

Auto and expert modes

The auto mode allows the user to run a scan measurement without specifying the fiber distance or zone where this measurement has to be performed. The system will automatically tune the granularity of the measurement to provide the best result. The auto mode includes two training phases: ORL training and OTDR training. This training is under system control and occurs without user intervention. Results of the training phases shall be available through show commands.

The expert mode allows the user to have full control over OTDR parameters. The expert mode enables expert users who understand how best to set the configuration parameters, which include reflection sensitivity, loss sensitivity, total loss (dB), capture start point (km), capture end point (km), measurement time (s), pulse width (us), and fiber resolution (m).

Performance monitoring

The Cisco NCS 1001 supports performance monitoring of optical parameters. Calculation and accumulation of the performance-monitoring data are supported in 30-second, 15-minute, and 24-hour intervals as per G.7710.

After each OTDR scan, ORL measured over the span and fiber end are reported, as well as a list of events. Each event type includes measurement information on loss, reflection, location (km), accuracy (m), and magnitude (dB). The system can save up to 50 events in total and 20 last scans for each slot. Measurement data from OTDR scans can also be exported by the user through an .SOR file. Alarms/SYSLOGs are raised for high ORL, reflection, or Loss after a scan. In case an OTDR scan fails, a SYSLOG message is raised with the corresponding reason for the failure.

The NCS 1001 provides a set of port and system LEDs for a quick visual check of the operational status. The various LEDs are described in detail in Table 4.

Feature summary

The following table summarizes the features of the NCS 1001.

Table 1. Optical specifications

Item	Notes	Value	Metric
OTDR operation bandwidth		1518 nm	nm
OTDR dynamic (maximum supported attenuation: span loss plus concentrated loss)	Central office	1.8	dB
	Raman application	7.3	dB
	Regional	16.3	dB
	Long haul	20.3	dB
Operating range	Central office	1 to 1000	mt
	Raman application	1 to 25	km
	Regional	25 to 80	km
	Long haul	80 to 100	Km
EVENT reporting			
Distance resolution	Central office	1	mt
	Raman application	2	mt
	Regional	4	mt
	Long haul	5	mt
Attenuation EVENT reporting			
Attenuation event sensitivity settable (min-max measurement event)	Central office	0.5 - 5	dB
	Raman application	0.6 - 5	dB
	Regional	1.5 - 5	dB
	Long haul	1.5 - 5	dB
Range of attenuation of measurable events (single event)	Central office	1 - 1.8	dB
	Raman application	0.6 - 5	dB
	Regional	1.5 - 5	dB
	Long haul	1.5 - 5	dB
Event loss measurement accuracy	Central office	<0.5	dB
	Raman application	<0.5	dB
	Regional	<0.5	dB
	Long haul—assuming total 20-dB loss (span and events)	<0.5	dB

Item	Notes	Value	Metric
Reflection EVENT reporting			
Reflection event sensitivity settable range (min-max measurement event)	Central office	-14 to -40	dB
	Raman application	-14 to -40	dB
	Regional	-14 to -40	dB
	Long haul	-14 to -40	dB
Range of reflection amplitude of measurable events (single event)—high reflection range	Central office	-14 to -35	dB
	Raman application	-14 to -35	dB
	Regional	-14 to -35	dB
	Long haul	-14 to -35	dB
Range of reflection amplitude of measurable events (single event)—low reflection range	Central office	-35 to -45	dB
	Raman application	-35 to -45	dB
	Regional	-35 to -40	dB
	Long haul	-35 to -40	dB
Event reflection measurement accuracy—high reflection range	Central office	±2	dB
	Raman application	±2	dB
	Regional	±3	dB
	Long haul	±5	dB
Event reflection measurement accuracy—low reflection range	Central office	±3	dB
	Raman application	±3	dB
	Regional	±4	dB
	Long haul	±6	dB

Table 2. Filter specifications

Item	Notes	Value	Metric
OSC + C-Band (1)	OSC	1600 to 1620	nm
	C-Band	1528 to 1570	nm
OSC + OTDR + C-Band (2)	OSC	1600 to 1620	nm
	OTDR	1500 to 1520	nm
	C-Band	1528 to 1570	nm
OSC + OTDR (3)	OTDR	1500 to 1520	nm
	OSC	1600 to 1620	nm
IL path	OSC-RX to COM-TX	1.9	dB
	C-Band to COM-TX	1.6	dB
	COM-RX to OSC-TX	1.7	dB

Item	Notes	Value	Metric
In-band insertion loss ripple		0.4	dB
Isolation	COM-RX to OSC-TX	15	dB

Table 3. Dead zone specifications

Item	Notes	-14	-16	-20	-25	-30	-35	-40	-45
Reflective dead zone (m)	Central office—1 km	8	8	8	8	2	2	2	2
	Raman application—25 km	60	60	60	60	60	60	60	30
	Regional—80 km	550	550	550	550	500	250	220	220
	Long haul—100 km	3000	3000	3000	2000	1000	1000	1000	-
Attenuation dead zone (m)	Central office (with long-tail compensation)	17	17	15	13	10	9	9	8
	Central office (without long-tail compensation)	500	500	500	60	50	40	30	20
	Raman application (with long-tail compensation)	215	200	185	170	155	140	140	140
	Raman application (without long-tail compensation)	800	800	500	300	250	250	200	200
	Regional	1400	1400	1350	1350	1250	550	350	300
	Long haul	4200	4200	4100	3600	2200	2100	1800	1600

Regulatory compliance

Table 3 lists regulatory compliance information for the trunk card. Note that all compliance documentation may not be completed at the time of product release. Please check with your Cisco sales representative for countries other than Canada, the United States, and the European Union.

<ul style="list-style-type: none"> EMC (Immunity) 	<ul style="list-style-type: none"> IEC/EN61000-4-2 Electrostatic Discharge Immunity IEC/EN61000-4-3 Radiated Immunity IEC/EN61000-4-4 EFT-B Immunity IEC/EN61000-4-5 Surge AC Port IEC/EN61000-4-6 Immunity to Conducted Disturbances IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations KN 24
<ul style="list-style-type: none"> EMC (ETSI/EN) 	<ul style="list-style-type: none"> EN 300 386 Telecommunications Network Equipment (EMC) EN55022 Information Technology Equipment (Emissions) EN55024/CISPR 24 Information Technology Equipment (Immunity) EN50082-1/EN61000-6-1 Generic Immunity Standard EN61000-3-2 Power Line Harmonics EN61000-3-3 Voltage Changes, Fluctuations, and Flicker

Safety	
<ul style="list-style-type: none"> • CSA C22.2 #60950-1—Edition 7, March 2007 • UL 60950-1—Edition 2, 2014 	<ul style="list-style-type: none"> • IEC 60950-1 Information technology equipment - Safety - Part 1: General requirements - Edition 2 (2005) + Amendment 1 2009 + Amendment 2 2013 • EN 60950-1: Edition 2 (2006) Information technology equipment - Safety - Part 1: General requirements + A11:2009 + A1:2010 + A12:2011 + A2:2013 • CE Safety directive: 2006/95/EC
Laser	
<ul style="list-style-type: none"> • 21CFR1040 (2008/04) (Accession Letter and CDRH Report) Guidance for Industry and FDA Staff (Laser Notice No. 50), June 2007 	<ul style="list-style-type: none"> • IEC 60825-1: 2007 Edition 2.0 Safety of laser products - Part 1: Equipment classification, requirements, and user guide • IEC60825-2 Edition 3.2 (2010) Safety of laser products - Part 2: Safety of optical fiber communication systems
Optical	
<ul style="list-style-type: none"> • ITU-T G.691 	<ul style="list-style-type: none"> • ITU-T G.975

Table 4 provides card specifications, Table 5 provides ordering information.

Table 4. NCS 1001 specifications

Management	
OTDR o/1 LED <ul style="list-style-type: none"> • Activity present • Alarm present • No activity 	Green blinking Yellow Blank
Status LEDs <ul style="list-style-type: none"> • The unit is operating correctly. • The unit has one or more errors detected. • Power is not applied to the unit. 	Green Yellow Off
Power	
<ul style="list-style-type: none"> • Maximum 	40 W
Physical	
Dimensions	4.2" wide x 9.4" deep x 1.5" tall
Weight	0.5 Kg
Storage temperature	-28°C to 70°C (-20°F to 158°F)
Operating temperature <ul style="list-style-type: none"> • Normal 	0°C to 40°C (32°F to 104°F)
Relative humidity <ul style="list-style-type: none"> • Normal • Short-term¹ 	5% to 85%, noncondensing 5% to 90%, but not to exceed 0.024 kg water/kg of dry air
¹ Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year (a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period).	

Table 5. Ordering information

Part Number	Description
NCS1K-OTDR=	NCS 1000 Optical Time Domain Reflectometer module

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