ılıılı
CISCO
The bridge to possible

Cisco Transport Node Controller and Transport Shelf Controller Cards

Contents

Product overview

The Cisco Network Convergence System (NCS) 2000 Series, the Cisco ONS 15454 Multiservice Transport Platform (MSTP), and the Cisco Carrier Packet Transport platform share a common set of controller cards which perform system initialization, provisioning, alarm reporting, maintenance, diagnostics, IP addressing, Data-Communications-Channel (DCC) termination, monitoring of system input voltage, system fault detection, and multishelf management connections. The line cards include the:

- Cisco ONS 15454 Transport Node Controller (TNC) Card
- Cisco ONS 15454 Transport Shelf Controller (TSC) Card
- Cisco ONS 15454 Enhanced Transport Node Controller (TNCE) Card
- Cisco ONS 15454 Enhanced Transport Shelf Controller (TSCE) Card
- Cisco NCS 2000 Series Transport Node Controller (TNCS) Card
- Cisco NCS 2000 Series Transport Node Controller with OTDR (TNCS-O) Card
- Cisco NCS 2000 Series Transport Node Controller2 (TNCS2) Card
- Cisco NCS 2000 Series Transport Node Controller2 with OTDR (TNCS-2O) Card

The TNC, TNCE, TNCS, TNCS2, TNCS-O and TNCS-2O cards feature two Optical Service Channel (OSC) ports that support a Supervisory Data Channel (SDC), distribution of synchronous clocking, and a 100-Mbps User Data Channel (UDC). The TNCE, TSCE, TNCS,TNCS2, TNCS-O and TNCS-2O cards support Synchronous Ethernet (SyncE)/Source-Specific Multicast (SSM). This is summarized in Table 1.

Table 1.   Controller Card Feature Differentiation

Controller Card	Include Two OSC Ports
TSC	No
TSCE	No
TNC	Yes
TNCE	Yes
TNCS	Yes
TNCS-O	Yes
TNCS2	Yes
TNCS-2O	Yes (4)

Common features

All controller card versions incorporate a highly stable Stratum 3 internal timing reference to provide system timing based on input received from an external BITS source. Synchronous status messaging helps the system select the best timing sources, and a holdover mode maintains timing accuracy when preprovisioned synchronization references are not available.

Nonvolatile database storage for communication, provisioning, and system control is provided, allowing full database recovery and survivability with complete system power loss. In addition, short-term clock recovery is also supported, reducing the need to reset the calendar after a brownout or complete power outage. A memory module is built into each ONS 15454 MSTP and NCS 2000 Series chassis and synchronized with the memory of the cards, thereby providing a backup to the node IP address, software package, and circuit database. This synchronization provides faster time to recovery when the node is used in simplex mode during a control-card replacement.

The cards have two built-in interface ports for accessing the system: an RJ-45 connector and an RS-232 (Not available for TNCS2 and TNCS-2O). The RJ-45 port provides 10BASE-T Ethernet connectivity to the system, providing local and remote access to the craft-management system, Cisco Transport Controller, through a common web interface. You can also use this port for interconnection to customer Operations Support Systems (OSSs) and Network Management Systems (NMSs), providing integration to external Element Management Systems (EMSs), NMSs, and OSSs.

The cards provide enhanced security by allowing you to configure the front panel and chassis Ethernet interfaces as regenerators or provision them with individual IP and MAC addresses for segregated craft and DCC access. The RS-232 port provides a serial ASCII interface for local craft access using VT100 emulation so that you can enter Transaction Language 1 (TL1) commands directly over a Telnet session without the assistance of a browser.

The front panels of the cards multicolored LEDs for a quick view of the card activity status, raised network alarms, shelf voltage input, LAN interface, and synchronization. Two front-panel buttons allow you to quiet an active external audible alarm (alarm-cutoff button) or test the working state of system LEDs.

TNC, TNCE, TNCS and TNCS2 Common features

TNC, TNCE and TNCS card versions can provide system timing based also on incoming SONET or SDH optical signal. TNCS2 supports only Fast and Gigabit Ethernet on OSC ports

TNC, TNCE and TNCS card versions integrate Optical Service Channel (OSC) functionality: Each ONS 15454 TNC, TNCE, or TNCS card can be configured with one or two SFP ports to provide the OSC termination. In addition to OC-3/STM-1, the OSC can be configured with Fast Ethernet or Gigabit Ethernet for increased bandwidth and compatibility in future packet transport architectures.

Figure 1.
Cisco ONS 15454 TNC Card

Figure 2.
Cisco NCS 2000 TNCS2 card

In the Cisco Network Convergence System 2015 (NCS 2015), Network Convergence System 2006 (NCS 2006), Cisco ONS 15454 M6 Multiservice Transport Platform (MSTP), and Cisco Carrier Packet Transport (CPT) 600, the cards can be equipped as active and standby, providing 1:1 equipment protection. In the Cisco Network Convergence System 2002 (NCS 2002), Cisco ONS 15454 M2 MSTP, and Cisco Carrier Packet Transport (CPT) 200, a single card is used in simplex mode.

TNCS-O and TNCS-2O Features

TNCS-O card cards can be equipped as active and standby, providing 1:1 equipment protection in Cisco Network Convergence System 2015 (NCS 2015) and Network Convergence System 2006 (NCS 2006) or Cisco ONS 15454 M6 Multiservice Transport Platform (MSTP).

Figure 3.
Cisco ONS 15454 TNCS-O Card

Each TNCS-O Line Card supports 2x OTDR/OSC embedded ports:

- 1 OTDR per Degree with up to 4 Degrees per chassis – Dedicated OTDR
- Digital – Bit Stream instead of High Power Optical Pulse
- In Band – Take measurements directly @ 1518nm, no extrapolations
- Bi-directional operation – Tests both fibers and both directions of the fiber with a single device
- 1 x Fast Ethernet 1518 nm OSC per Degree with up to 4 Degrees per chassis

Each TNCS-2O Line Card supports 2x OTDR/OSC embedded ports and 2x OSC ports:

- 1 OTDR per Degree with up to 4 Degrees per chassis – Dedicated OTDR
- Digital – Bit Stream instead of High Power Optical Pulse
- In Band – Take measurements directly @ 1518nm, no extrapolations
- Bi-directional operation – Tests both fibers and both directions of the fiber with a single device
- 1 x Fast/Gigabit Ethernet 1518 nm OSC per Degree with up to 4 Degrees per chassis
- 2x OSC ports for generic OSC mode of operation without OTDR

OTDR Functionality

Optical Time Domain Reflectometry is used to provide information about basic characteristic of the Optical fiber among Optical nodes, like Insertion Loss and concentrate point of reflection.

OTDRs are widely used for detecting fiber anomalies, such as fiber-to-fiber connection losses and reflectance. They can be fusion splices, butt joints and connectors. Typically an OTDR instrument transmits a pulse along an optical fiber (the Pulse method). A portion of the light of the pulse is returned toward the transmitter from each point along the optical fiber. Such returns are produced both from the natural light backscattering (Rayleigh Scattering), and from localized Fresnel reflection from fiber-to-fiber connections.

By measuring the amount of light returned back at a given delay from pulse injection into the fiber, and comparing this light pulse with the original probe signal injected into the fiber, it is possible to detect many fiber characteristics and anomalies, such as fiber Insertion Loss (dB/km) and fiber-to-fiber Connections Loss and Reflection Loss (dB).

This technique, however, requires laser pulses with relatively high peak power, which do not fit very well with the objective of integrating OTDR capabilities into TNCS-O. For this reason a different measurement strategy has been selected, the correlation method.

In the correlation method, a Pseudo Noise Bit Sequence is transmitted in the fiber instead of just an optical pulse. The reflected light is sampled against time and mathematically correlated with the original probe sequence. Similar to the Pulse method, the correlation of transmitted and received signals at a given time delay provides information about losses and reflections. The correlation method allows for better noise filtering, providing a significant noise advantage respect to pulse method (12 dB measured). Also, since pulse probe energy spreads along a bit stream, this method better adapts to the typical lasers used in pluggable interfaces, which can provide lower TX Power. OTDR signals operate at 1518nm offering bi-directional operations, allowing so Tests both fibers and both directions of the fiber with a single device.

Different event accuracy of OTDR is available for 4 "fiber zones" that are selectable by the user and defined in the following table.

Zone	Accuracy (Meters)
Zone 1 (Up to 1Km)	+/- 1m
Zone 2 (Up to 25Km)	+/- 2m
Zone 3 (Up to 80Km)	+/- 10m
Zone 4 (Above 80Km)	+/- 20m

Reported accuracy could be reduced in presence of high reflectance event in the zone under measurement. A dedicated GUI panels is available in CTC to provide FCAPS functionality for OTDR.

Features and benefits

The Cisco ONS 15454 TNC, TSC, TNCE, TSCE, NCS 2000 Series TNCS, TNCS2, TNCS-O and TNCS-2O cards provide the following features:

- Integrated multishelf management: The ONS 15454 TNC, TNCE, TSC, TSCE, TNCS and TNCS2 cards - coupled with the External Connection Unit (ECU) of the ONS 15454 M6, NCS 2006, or NCS 2015 - can support up to 50 subtended shelves (if chassis is NCS2006 or 15454-M6) or 10 subtended shelves (if chassis is NCS2015) in a cascade configuration without using an external switch or separate Ethernet switch card.

- Eighty-four Section DCC (SDCC) and multiplex section DCC (MSDCC) terminations allow the interconnection of multiring and linear systems on a single-shelf assembly, reducing networking costs.*

- Eighty-four SDCC tunnels or SDCC-to-Line DCC (LDCC) tunnels provide interface flexibility for transparent transport of third-party DCC overhead channels.*

- Integrated system input-voltage monitoring facilitates proactive identification of DC power-system problems.

- Time-and-date clock recovery after brownout or power loss prevents clock reprogramming.

- A complete shelf lamp test through a faceplate pushbutton simplifies technician LED maintenance testing for TNC, TNCE, TNCS, TNCS-O controller cards.

- Local and remote craft user access allows technicians to access nodes from anywhere.

- Local audible alarm cutoff squelches office audible or visual alert systems.

- Through the Cisco ONS 15454 M6 External Connection Unit (ECU), the cards support connection to up to six subtended shelves or to the primary shelf.

- The cards support up to 24 dry-contact external alarms.

---

* Please consider that this is not available on TNCS-O, TNCS2 and TNCS2-O

Feature availability

Table 2 outlines the feature availability supported on the Cisco ONS 15454 TNC, TSC, TNCE, TSCE, NCS 2000 Series TNCS, TNCS2, TNCS-O and TNCS-2O cards.

Table 2. Feature availability

Feature	Availability TNC, TNCE, TNCS, TNCS2*	Availability TNCS-O, TNCS-2O
DCC terminations	84 SDCC and MSDCC terminations	
DCC tunnels	28 SDCC tunnels or LDCC terminations • OC-3/STM-1: • DCC D1-D3 = 194 kbps implemented • DCC D4-D12 = 576 kbps implemented • UDC/VoIP 100 kbps (Packet over SONET into VC-4 payload) Gigabit Ethernet (the 1-Gbps payload is shared) • Data Communications Network (DCN) variable bandwidth (maximum: 100 Mbps) • VoIP/UDC variable bandwidth (maximum: 100 Mbps)	
Generic Communications Channel (GCC)	160 GCCs GCC0 may be ~350 kbps (OTU1), ~1.3 Mbps (OTU2), 5.2 Mbps (OTU3), ~12 Mbps (OTU4)	
BITS timing	1.544 MHz, 2.048 MHz, 6.312 MHz, 64 kHz, and 10 MHz	
Optical Service Channel (OSC)	Two SFP ports Port 1 can be OC-3/STM-1, Fast Ethernet, or Gigabit Ethernet Port 2 can be Fast Ethernet or Gigabit Ethernet	Two LC-LC Port FE Two LC-LC ports and Two SFP ports on TNCS-2O similar to TNCS2
SFP options	ONS-SC-OSC-ULH= SFP: OC-3/STM-1 or Fast Ethernet OSC SFPs Ultra Long-Haul (ULH): Commercial temperature ONS-SE-155-1510= SFP: OC-3/STM-1, Coarse Wavelength-Division Multiplexing (CWDM), 1510 nm, EXT ONS-SC-Z3-1510= SFP: OC-48/STM-16 or Gigabit Ethernet, CWDM, 1510 nm	None

* TNCS2 does not support DCC terminations and DCC tunnels

Product specifications

Tables 3 and 4 outline the specifications for the Cisco ONS 15454 TNC, TSC, TNCE, TSCE, NCS 2000 Series TNCS, TNCS2, TNCS-O and TNCS-2O cards.

Table 3. Product specifications

Compliance	
Countries	Canada
	European Union
	Hong Kong
	Japan
	Korea
	Mexico
	United States
	Australia
	China
	European Union
	Hong Kong
	Korea
	Mexico
	New Zealand
	Singapore
Electromagnetic Compliance (EMC) - Class A	ETSI 300-386-TC Telcordia Technologies Network Equipment Building Standards (NEBS) GR-1089-CORE, Issue 3 (Level 3, Type 2 and Type 4)
	CISPR 22, CISPR 24
	IC ICES-003 Issue 3, 1997
	FCC 47CFR15
	EN55022, EN55024
Product safety	Telcordia Technologies NEBS GR-1089-CORE, Issue 3 Level IEC 60950-1/EN 60950-1, 1st Edition UL and cUL/CSA 60950-1 1st Edition (Level 3, Type 2 and Type 4)
Environmental	Telcordia Technologies NEBS GR-63-CORE, Level 3
	ETS 300 019-2-1 (Storage, Class 1.1)
	ETS 300 019-2-2 (Class 2.3)
	ETS 300 019-2-3 (Class 3.1E)
Customer requirements	AT&T Network Equipment Design Specification (NEDS)
	Verizon TCG Checklist
	MCI/Worldcom ESD

Table 4.   Product specifications (All Cards)

Attribute	Value
Hardware Components	
Processor speed	1 GHz
Nonvolatile memory (Flash)	4 GB; 8GB for TNCS-2 and TNCS-2O
Volatile memory (synchronous dynamic RAM)	1 GB; 4GB for TNCS-2 and TNCS-2O
Physical Card Interfaces	
LAN	RJ-45 and 10/100/1000BASE-T Ethernet
Craft	DB-9, RS-232 serial, and Data Terminal Equipment (DTE) (not supported with TNCS2 and TNCS-2O)
TL1	9.6 K baud
Management	
Card LEDs	
Failure (FAIL)	Red
Status (ACT/STBY)	Green/yellow
System LEDs	
Critical (CRIT)	Red
Major (MAJ)	Red
Minor (MIN)	Yellow
Remote (REM)	Red
Synchronization (SYNC)	Green
Alarm cutoff (ACO)	Green
Power A (PWR-A)	Green/amber/red
Power B (PWR-B)	Green/amber/red
Port LEDs	
LAN link (LINK)	Green
LAN activity (ACT)	Amber (flash)

Attribute	Value
Input Voltage Monitoring (per input)	
For -48 VDC nominal systems • Less than -40.5 VDC • -40.5 to -56.7 VDC • Greater than -56.7 VDC **For -60 VDC nominal systems** • Less than -50.0 VDC • -50.0 to -72.0 VDC • Greater than -72.0 VDC	GR-499-CORE and ETS 300 132-2 • Major alarm, red LED • Normal, green LED • Major alarm, red LED ETS 300 132-2 Annex A • Major alarm, red LED • Normal, green LED • Major alarm, red LED
Power	
Maximum	70W
MTBF	
NCS2K-TNCS-2O-K9=	381,880 hrs
NCS2K-TNCS-2-K9=	398,920 hrs
NCS2K-TNCS-O-K9=	337,100 hrs
NCS2K-TNCS-K9=	340,510 hrs
15454-M-TNC-K9=	384,170 hrs
15454-M-TSC-K9=	406,580 hrs
15454-M-TNCE-K9=	147,796 hrs
15454-M-TSCE-K9=	161,030 hrs
Physical	
Size (H x W x D)	Single card slot: 12.65 x 0.72 x 9.00 in. (32.13 x 1.83 x 22.86 cm)
Weight	2.05 lb (0.93 kg)
Operating Environment	
Temperature	23 to 131°F (-5 to 55°C)
Humidity	5 to 95%, noncondensing
Storage Environment	
Temperature	-40 to 185°F (-40 to 85°C)
Humidity	5 to 95%, noncondensing

System requirements

Table 5 outlines the system requirements for the Cisco ONS 15454 TNC, TSC, TNCE, TSCE, and Cisco NCS 2000 Series TNCS cards.

Table 5. System requirements

Component	NCS 2015	NCS 2006 ONS 15454 M6	NCS 2002 ONS 15454 M2	CPT 600	CPT 200
Processor Configuration	1+1 or single	1+1 or single	single	1+1 or single	single
Chassis and Software					
TNC/TSC	–	Release 9.2.0 or later	Release 9.2.0 or later	Release 9.2.0 or later	Release 9.2.0 or later
TNCE/TSCE	–	Release 9.3.0 or later	Release 9.3.0 or later	Release 9.3.0 or later	Release 9.3.0 or later
TNCS	10.5 or later	–	–	–	–
TNCS-O	10.5.1 or later	10.5.1 or later	–	–	–
TNCS2	11.0 or later	11.0 or later	11.0 or later	–	–
TNCS-2O	11.0 or later	11.0 or later	11.0 or later	–	–
Shelf-slot compatibility	1 and 17	1 and 8	1	1 and 8	1

OTDR specifications

Table 6. OTDR Optical specifications are presented below for TNCS-O and TNCS-2O line cards

OTDR Optical Specification	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

OTDR Optical Specification	Notes	Value	Metric
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
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

OTDR Optical Specification	Notes	Value	Metric
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

Ordering information

Table 7 lists the ordering information for the Cisco ONS 15454 TNC, TSC, TNCE, TSCE, and NCS 2000 Series TNCS cards. To place an order, visit the Cisco Ordering Home Page and refer to Table 5. To download software, visit the Cisco Software Center.
https://www.cisco.com/cisco/software/type.html?mdfid=278281788&i=rm.

Table 7. Ordering information

Product Description	Part Number
NCS 2000 Transport Node Controller w/2xOTDR/OSC, version 2	NCS2K-TNCS-2O-K9=
NCS 2000 Transport Node Controller, version 2	NCS2K-TNCS-2-K9=
NCS 2000 Transport Node Controller w/2x OTDR/OSC	NCS2K-TNCS-O-K9=
Transport Node Controller for NCS 2002, 2006 and 2015 chassis	NCS2K-TNCS-K9=
Transport Node Controller for M2, M6 chassis	15454-M-TNC-K9=
Transport Shelf Controller for M2, M6 chassis	15454-M-TSC-K9=
Enhanced Transport Node Controller for M2, M6, CPT200, CPT600	15454-M-TNCE-K9=
Enhanced Transport Shelf Controller for M2, M6, CPT200, CPT600	15454-M-TSCE-K9=

Cisco Services

Cisco offers a wide range of services programs to help accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, promoting high levels of customer satisfaction. Cisco Services can help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

Cisco Capital

Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments. Learn more.

For more information

For more information about the Cisco Optical Solution, visit https://cisco.com/en/US/products/hw/optical/ps2006/index.html or contact your local Cisco account representative.

Document history

New or Revised Topic	Described In	Date
Revision of doc to include OTDR specification	Included as table 6	3rd Nov 2022