Cisco Network Convergence System 1010

Next-Generation C + L-Band Open Line System
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Optical transport networks are evolving, and a new generation of open line systems are needed to address overall network trends. As coherent technology drives spectral efficiency closer to Shannon Capacity limits, L-Band spectrum usage is key to improving fiber capacity. Operators expect to move from C-Band to C + L-Band solutions without any service impact. 400G digital coherent optics are disrupting network architecture with long-haul reach in the footprint of a QSFP-DD pluggable. Optical networks will need to account for both digital coherent optics and high-performance transponders moving forward. Enhanced visibility of the fiber network along with operational simplification through end-to-end automation of the lifecycle of the network are also top of mind for operators. The Network Convergence System 1010 is Cisco’s next-generation open line system platform that aims to deliver on these goals and much more.

Product overview – NCS 1010

Cisco NCS 1010 is a 3 RU 300-mm-deep pizza box–style platform that offers one integrated line card slot. NCS 1010 runs carrier-class IOS XR software that enables complete automation of the network life cycle.

NCS 1010 provides the following key benefits:

- **Support for any coherent source - DCOs and performance transponders** – NCS 1010 provides an ingress EDFA to support openZR+ digital coherent optics that operate at −10dBm. With a coupler based add–drop structure, high-performance transponders at 72, 95, 140, and beyond GBaud/s rates with any power spectral density can be supported.

- **Scale** – NCS 1010 offers hitless migration from C-Band only to C+L-Band designs. Embedded channelized ASE loading provides consistency in performance from day-1 to full capacity growth. A 33-port twin-WSS architecture allows the ROADM terminals to scale express capacity or add-drop capacity.

- **Simplicity** – Integrated modules in the NCS 1010 shelf minimize fiber patching and field errors. NCS 1010 is designed to operate as one ROADM degree on a shelf. The inherent degree separation provides higher availability. Embedded software on the NCS 1010 turns up ROADM to ROADM line segments automatically to a state where ASE loading runs across the full spectrum. Built-in dynamic gain equalization in in–line amplifier provides better equalization and performance in C + L-Band designs along with better control of Raman Gain ripple.

- **Complete lifecycle automation** – IOS XR operating system software on NCS 1010 provides a rich suite of automation features that include zero-touch provisioning, open config YANG model support with NETCONF and gNMI, streaming telemetry, and gNOI support. Automated end-to-end turn-up of a NCS 1010 network is made possible with embedded control loops on the device. Automated connection verification checks for abnormal patch loss and validates fiber connectivity at ROADM locations. Operators are provided with enhanced visibility of their fiber network through a combination of probes based on OTDR, OSC, OCM, and coherent technology. Machine learning and neural network processing of this data allows for improving event detection.
Solution overview

Cisco’s C+L-Band Open Line System solution consists of the NCS 1010 shelf with an integrated line card for a ROADM degree or an in-line amplifier coupled with fixed filters or passive breakout panels for colorless add-drop or express interconnects.

The 3RU NCS 1010 shelf hosts active components such as ROADMs and amplifiers. The ROADM line card breaks out MPO interfaces into LC connectors using breakouts in rack-mounted panels for colorless add-drop or express interconnects. The operator can choose to combine colorless add-drop with fixed 75-, 100-, or 150-GHz add-drop using 1RU Athermal Arrayed Wave Guide filters.

NCS 1010 line cards come in the following flavors:

- Optical Line Terminal C-Band
- Optical Line Terminal C-Band with Raman amplifier
- Optical Line Terminal L-Band
- In-line Amplifier C-Band
- In-line Amplifier C-Band with 1x Raman amplifier
- In-line Amplifier C-Band with 2x Raman amplifiers
- In-line Amplifier L-Band

![Key hardware components](image-url)

**Figure 1.**
NCS 1010 solution components
NCS 1010 hardware overview

The NCS 1010 is a 3RU 300-mm rack-compliant shelf with front-to-back straight-through cooling and is completely front-access. Rail kits and brackets are available to mount onto 19", 21", or 23-inch racks. Fixed brackets on the NCS 1010 have thumbscrews to allow for fast deployment or replacement of the shelf. Each NCS 1010 has two redundant and field-replaceable 1KW AC or DC power supply units and two field-replaceable fan trays that operate at 5+1 redundancy. It also provides a field-replaceable controller card (Figure 2). The NCS 1010 has one SSD on the shelf controller and a second SSD on the shelf to maintain redundant copies of XR images and system configuration. Each NCS 1010 chassis provides one line card slot, and the line card is field replaceable.

A range of management, USB 3.0, and timing input/output ports are provided on the top right the NCS 1010 faceplate that can be used for DCN management, daisy chaining of shelves, console access, passive device management, user data channel, and timing distribution. NCS 1010 is hardware designed to support class C-compliant 1588v2 PTP timing support.

![NCS 1010 shelf components](image)

**Figure 2.**
NCS 1010 shelf components
NCS 1010 OLT

The Optical Line Terminal (OLT) provides the following key functions integrated into a line card: 25dBm variable gain preamplifier with switchable gain range, 23dBm variable gain booster amplifier, 2x33 port twin flex-grid Wavelength Selective Switch (WSS), embedded EDFA for ASE loading, embedded Fixed Gain EDFA for -10dBm digital coherent optics sources, embedded OTDR, connection verification Transmit Optical Sub Assembly, embedded OCM, FE/GE Optical Supervisory Channel with a 2x2 switch, embedded C+L-Band combiner, and optional built-in Raman amplification.

Key benefits:

- 33-port twin flex-grid WSS provides scale of a multidegree ROADM node both for colorless add-drop ports or express ports.
- Built-in ASE loading allows for easier turn-up of the network and consistency in performance from day-1 through the life of the network.
- 25dBm true variable-gain preamplifier with switchable gain range, 23dBm true variable-gain booster amplifier
- Dedicated fixed-gain EDFAs at the WSS add for -10dBm low-power digital coherent optics
- Connection verification on fiber patches from ROADM to passive breakout or add-drop modules and on ROADM-to-ROADM express connections. This allows for the user to verify if patching is set up correctly or allows patching to be discovered and reported to the user.
- The OLT design allows hitless C to C+L-Band upgrade
- Bidirectional OSC support for in-fiber communication between devices, user data channel support, and class C-compliant IEEE 1588v2 PTP timing transport. OSC is available for both C-Band and L-Band separately.
- Built-in bidirectional OTDR that can run inline with DWDM channels and take measurements in real time of loss and back reflection of both pairs of fiber in a link from both end points.
- Optical channel monitor with a 1x37 switch provides a spectrum-analyzer-like view of power distribution across the available spectrum at the WSS add ports and input and output of the PRE and BST amplifiers. This helps with troubleshooting the system and enables automatic turn-up of the ROADM through WSS attenuation and amplifier gain control loops.
OLT line card comes in three flavors: C-Band OLT, C-Band OLT with Raman, and L-Band OLT.

**Figure 3.**
NCS 1010 OLT-C functional layout

**NCS 1010 ILA**

In-Line Amplifier (ILA) provides the following key functions integrated into a line card: 24dBm preamplifier with switchable gain range, embedded dynamic gain equalization, embedded OTDR, embedded OCM, FE/GE Optical Supervisory Channel with a 2x2 switch, embedded C+L-Band combiner, and optional built-in Raman amplification.

Key features and benefits:

- Two independent “true variable-gain” EDFA blocks with identical characteristics. 23dBm total output power in fiber for both C and L-Bands. 24dBm output power @LINE-TX ports for both C and L-Band. Each integrated optical amplifier provides the following features:
  - Switchable gain ranges to provide optimized noise-figure across the whole gain range
  - Constant output power and constant gain mode
  - Nondistorting low-frequency transfer function
  - Fast transient suppression
  - Programmable tilt
  - Optical safety by signal loss detection, HW LOS signal generation and alarming at any input port, fast power down control, and reduced max output power in safe power mode.
  - Safety Class 1M at any optical port
- 4-port optical channel monitor that provides a spectrum-analyzer-like view of power distribution across the available spectrum at the input and output of the amplifiers. This helps with troubleshooting the system and enables automatic turn-up and gain control of the ILA.
• Embedded continuous dynamic gain equalization to compensate for gain ripple caused by Raman amplification or to apply suitable reemphasis for optimal performance of C+L-Band line systems.

• Bidirectional OSC support for in-fiber communication between devices, user data channel support, and class C-compliant IEEE 1588v2 PTP timing transport. OSC is available for both C-Band and L-Band separately.

• Built-in bidirectional OTDR that can run inline with DWDM channels and take measurements in real time of loss and back reflection of both pairs of fiber in a link from both end points.

ILA line cards come in four flavors – C-Band ILA, C-Band ILA with Raman amplification for one direction, C-Band ILA with Raman amplification for both directions, and L-Band OLT.

Figure 4.
NCS 1010 ILA-C functional layout

**Embedded Raman amplifier option**

NCS 1010 OLT and ILA come with an option for embedded Raman amplification. The counter-propagating Raman module has 5 pumps at 1424 nm, 1438 nm, 1457 nm, 1470 nm, and 1495 nm to support C+L-Band operation or only C-Band operation and provide 17-dB Raman ON/OFF gain over SMF fiber (0.2 dB/Km). A DFB laser is built in to check that the optical fiber path is closed and safe for Raman pump start. Separate PD monitors are available for the DFB probe and for ASE. automatic laser shutdown and automatic power reduction are supported to meet class 1M safety.
**NCS 1K breakout modules**

NCS 1010 offers a 4RU rack-mounted panel with 4x slots. The breakout panel has a pair of USB 3.0 connectors to connect to the NCS 1010 shelf and provides LED management and optical power monitoring on the breakout modules. An embedded USB hub allows for USB management of all 4x modules in the panel via additional internal USB 2.0 cables. The shelf supports fiber routing on either side and has adjustable cable management brackets. Bracket options are available for 19-, 21-, and 23-inch racks.

The NCS 1010 breakout shelf can accommodate the following modules:

- **NCS1K-BRK-24-BRK-24** breakouts an MPO16 cable into 24 LC pairs. The module consists of eight 1x3 couplers with PD monitors for ADD RX and MPO COM RX ports. The modules support bidirectional connection verification between OLT and breakout module. This module is used for colorless add-drop and, when 4x of these modules are paired with an OLT card, provides 90 channels of colorless add-drop.

- **NCS1K-BRK-16-BRK-16** breakouts an MPO16 cable into 16 LC pairs. The module consists of eight 1x2 couplers with PD monitors for ADD RX and MPO COM RX ports. The modules support bidirectional connection verification between OLT and breakout module. This module is used for colorless add-drop and, when 4x of these modules are paired with an OLT card, provides 30 channels of colorless add-drop.

- **NCS1K-BRK-8 modules-BRK-16** breakouts an MPO16 cable into 8 LC pairs with PD monitors for ADD RX and MPO COM RX ports. The modules support bidirectional connection verification between OLT and breakout module. This module is used for MPO breakout for express interconnect, colorless add-drop, or connection to other add-drop modules. One module provides for 9 degrees of ROADM express support on an NCS 1010 OLT.

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**Figure 5.**
NCS 1010 BRK-SA and modules
Key features and benefits:

- The NCS 1010 add-drop architecture is designed to be simple yet, scalable and easy to troubleshoot. The three breakout module options can be used to construct colorless add-drop or scale degrees as required.
- Intelligent passive modules with USB cables allow for inventory read from flash and provide power to the photodiodes and LEDs on the breakout module as well as manage these PDs and LEDs from the NCS 1010. This allows the NOC operators and field technicians to be better prepared to handle passive modules in the field.
- NCS 1K breakout modules have photodiodes that support tone detection on the COM MPO-RX and filter for connection verification tone frequency along with a 1x8 splitter to allow connection verification in both directions between OLT and add-drop for all fibers in an MPO cable. PDs on the breakout module ADD-rx ports can detect tones and are used for connection discovery or verification with the coherent transponder.
- Each port is provided with an LED to report port status. This can be used to help field technicians identify the correct port to operate in the field.

**NCS 1K MD32 filters**

NCS 1K MD32 add-drop modules are passive 1RU rack-mounted add-drop filters. The modules are available in ODD and EVEN 150-GHz spaced 32-channel options and can allow for 64x 400ZR/400ZRP designs or 32x 800ZR/ZRP designs in the future.

Photodiode monitors are provided for all the ports of MD32 add-drop filters, and this enables connection verification or discovery between the add-drop filter and the coherent transponder. A USB 2.0 port allows for inventory information management and power monitoring per the port on the NCS 1010.
NCS 1010 management and automation

The Cisco NCS 1010 provides comprehensive management capabilities to support Operations, Administration, Maintenance, and Provisioning (OAM&P) through IOS XR CLI, SNMP, syslog, and XML. In addition, iPXE for automated software download and zero-touch provisioning (ZTP) for automated configuration download are available for simplified installation. For machine-to-machine configuration and management of NCS 1004, 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 1010 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 1004 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.

NCS 1010 takes a hybrid approach where critical/basic control loops run in the embedded OS software (IOS XR) on each network element and enhanced control loops run on a centralized server in the form of Cisco Optical Network Controller (CONC). The control loops that run on the NCS 1010 include channel and optical XC management, node adjacency discovery with OSPF, OTDR traces and event reporting, span loss verification, Dynamic ASE loading, Raman Tuning, E2E Link performance tuner and simulator, automatic power control, and connection discovery. Enhanced control functions provided on the centralized controller include connection verification, network topology discovery and reporting, optical path computation, and machine learning OTDR events with localization over GIS maps. CONC offers a TAPI-based north-bound API for integration into the operator’s in-house tools.

**Figure 7.**
Two-node network topology visualization in CONC
Evolved Programmable Network Manager offers an element management solution for NCS 1010 performance and fault monitoring along with inventory, software, and database management.

Operators can use Cisco Optical Network Planner (CONP) to model NCS 1010 networks and generate rack layouts, bill of materials, fiber connectivity layouts, YANG configuration file, and optical performance results. Alien OCHNC circuits can be simulated for any Cisco or non-Cisco transponder over a NCS 1010 Open Line System. REST-based north-bound API is supported for operator integration. An Optical Path Computation Engine algorithm is common across CONP and CONC and ensures consistency in network modeling and design between planning and deployment phases.

Figure 8.
Overall architecture for automation and management
# Features and benefits

## Table 1. Benefits of NCS 1010 modules

<table>
<thead>
<tr>
<th>Feature</th>
<th>Benefit</th>
</tr>
</thead>
</table>
| **Optical Line Terminal (OLT)** | ● 33-port twin flex-grid WSS provides scale of a multidegree ROADM node both for colorless add-drop ports or express ports.  
● Built-in ASE loading allows for easier turn-up of the network and consistency in performance from day-1 through the life of the network.  
● 25dBm true variable-gain preamplifier with switchable gain range, 23dBm true variable-gain booster amplifier  
● Dedicated fixed-gain EDFA at the WSS add for ~10dBm low-power digital coherent optics  
● Connection verification on fiber patches from ROADM to passive breakout or add-drop modules and on ROADM-to-ROADM express connections. This allows for the user to verify if patching is set up correctly or allows patching to be discovered and reported to the user.  
● The OLT design allows hitless C to C+L-Band upgrade.  
● Bidirectional OSC support for in-fiber communication between devices, user data channel support, and class C-compliant IEEE 1588v2 PTP timing transport. OSC is available for both C-Band and L-Band separately.  
● Built-in bidirectional OTDR that can run inline with DWDM channels and take measurements in real time of loss and back reflection of both pairs of fiber in a link from both end points.  
● 34-port optical channel monitor that provides a spectrum-analyzer-like view of power distribution across the available spectrum at the WSS add ports and input and output of the PRE and BST amplifiers. This helps with troubleshooting the system and enables automatic turn-up of the ROADM through WSS attenuation and amplifier gain control loops. |
| **In-line Line Amplifier (ILA)** | ● Two independent “true variable-gain” EDFA blocks with identical characteristics. 23dBm total output power in fiber for both C and L-Bands. 24dBm output power @LINE-TX ports for both C and L-Bands. Each integrated optical amplifier provides the following features:  
   ○ Switchable gain ranges, to provide optimized noise-figure across the whole gain range  
   ○ Constant output power and constant gain mode  
   ○ Nondistorting low-frequency transfer function  
   ○ Fast transient suppression  
   ○ Programmable tilt  
   ○ Optical safety by signal loss detection, HW LOS signal generation and alarming at any input port, fast power down control, and reduced max output power in safe power mode  
   ○ Safety class 1M at any optical port  
● 4-port optical channel monitor that provides a spectrum-analyzer-like view of power distribution across the available spectrum at the input and output of the amplifiers. This helps with troubleshooting the system and enables automatic turn-up and gain control of the ILA.  
● Embedded continuous dynamic gain equalization to compensate for gain ripple caused by Raman amplification or to apply suitable preemphasis for optimal performance of C+L-Band line systems.  
● Bidirectional OSC support for in-fiber communication between devices, user data channel support, and class C-compliant IEEE 1588v2 PTP timing transport. OSC is available for both C-Band and L-Band separately.  
● Built-in bidirectional OTDR that can run inline with DWDM channels and take measurements in real time of loss and back reflection of both pairs of fiber in a link from both end points. |
| **Passive Breakout** | ● The NCS 1010 add-drop architecture is designed to be simple yet scalable and easy to troubleshoot. The three breakout module options can be used to construct colorless add-drop or scale degrees as required.  
● Intelligent passive modules with USB cables allow for inventory read from flash and to provide power to the photodiodes and LEDs on the breakout module as well as manage these PDs and LEDs from the NCS 1010. This allows the NOC operators and field technicians to be better prepared to handle passive modules in the field.  
● NCS 1K breakout modules have photodiodes that support tone detection on the COM MPO-RX and filter for connection verification tone frequency along with a 1x8 splitter to allow connection verification in both directions between OLT and add-drop for all fibers in an MPO cable. PDs on the breakout module ADD-rx ports can detect tones and are used for connection discovery or verification with the coherent transponder.  
● Each port is provided with an LED to report port status. This can be used to help field technicians identify the correct port to operate in the field. |
### Feature Benefit

**NCS 1010 commons features**
- 300-mm-compliant, front-to-back airflow
- Field-replaceable optical module/line card
- Field-replaceable 1KW AC or DC PSUs, fan tray
- Field-replacement controller card
- Redundant SSDs for copies of SW image and configuration
- Bluetooth and NFC support – support read-only UI on handheld devices
- Rail kits with thumbscrews for shelf replacement without any tools
- USB ports for passive device management – inventory, LEDs, optical power
- 1588v2 PTP timing support – GPNSS, 10 MHz, TOD inputs, and output ports
- Secure cryptoprocessors on shelf, controller, and optical module to ensure integrity of HW, SUDI certificate installed at manufacturing
- IOS XR software for zero-touch processing, vendor-neutral YANG models, streaming telemetry

### Products overview

#### Table 2. Product feature sets

<table>
<thead>
<tr>
<th>Product family</th>
<th>Platforms supported</th>
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</thead>
<tbody>
<tr>
<td><strong>Software compatibility</strong></td>
<td>IOS X.R 7.7.1 or above</td>
</tr>
<tr>
<td><strong>Physical dimensions</strong> (NCS 1010)</td>
<td>Occupies 3RU</td>
</tr>
<tr>
<td></td>
<td>Fits into 2-post 19-in., 300-mm ETSI, 23-in. racks</td>
</tr>
<tr>
<td><strong>Thermals</strong></td>
<td>Front-to-back air cooling</td>
</tr>
<tr>
<td></td>
<td>+5 to +40°C normal operation at 0 to 1800 meters</td>
</tr>
<tr>
<td></td>
<td>-5 to +55°C short operation for 96 hours</td>
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<td><strong>Line cards supported in 7.7.1</strong></td>
<td>OLT-C</td>
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<tr>
<td></td>
<td>OLT-C-R</td>
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<tr>
<td></td>
<td>ILA-C</td>
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<tr>
<td></td>
<td>ILA-C-R</td>
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<tr>
<td></td>
<td>ILA-C-2R</td>
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<tr>
<td><strong>Maximum power consumption</strong></td>
<td>OLT-C 142W</td>
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<tr>
<td></td>
<td>OLT-C-R 247W</td>
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<tr>
<td></td>
<td>ILA-C 99W</td>
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<td></td>
<td>ILA-C-R 204W</td>
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<td></td>
<td>ILA-C-2R 309W</td>
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<td></td>
<td>NCS1010-CNTLR-K9 70W</td>
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<tr>
<td></td>
<td>NCS1010-FAN 110W</td>
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<tr>
<td></td>
<td>Power supplies operate at 90% efficiency</td>
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<tr>
<td>Product family</td>
<td>Platforms supported</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **Typical power consumption** | OLT-C 96W  
OLT-C-R 147W  
ILA-C 68W  
ILA-C-R 119W  
ILA-C-2R 170W  
NCS1010-CNTLR-K9 40W  
NCS1010-FAN 35W  
Power supplies operate at 90% efficiency |
| **NCS 1010 common units** | 2x fan trays with 3x fans each and 5+1 redundancy  
1KW 36–72 Vdc DC redundant PSU  
1KW 90–140 Vac AC redundant PSU  
FRU controller with redundant SSD disks  
Management I/O ports:  
  ● 1x console  
  ● 3x RJ45  
  ● 1x TOD  
  ● 2x optical GE SFP - 1588v2 PTP  
  ● 2x optical GE SFP - 1588v2 PTP or UDC  
  ● 3x USB 3.0 ports  
  ● 1x GNSS, 1x 10MHz, 1x PPS |
| **Dimensions**            | NCS1010–SA= 17.5 in. wide x 8.7 in. deep x 5.1 in. tall  
NCS1010–DC–PSU= 2.9 in. wide x 8.9 in. deep x 1.1 in. tall  
NCS1010–AC–PSU= 2.9 in. wide x 8.9 in. deep x 1.1 in. tall  
NCS1010–FAN= 9.1 in. wide x 2.8 in. deep x 2.4 in. tall  
NCS1010–CNTLR–K9 2.3 in. wide x 9.9 in. deep x 3.3 in. tall  
NCS1K–OLT–C=(and other optical modules) 11 in. wide x 8.3 in. deep x 4.8 in. tall |
| **Weight**                | NCS1010–SA= 6.52 kg (empty chassis)  
NCS1010–DC–PSU 0.85 kg  
NCS1010–AC–PSU 0.85 kg  
NCS1010–FAN= 0.75 kg  
NCS1010–CNTLR–K9 0.8 kg  
NCS1K–OLT–C= 6.4 kg  
NCS1K–OLT–R–C= 7.3 kg  
NCS1K–ILA–C= 5 kg  
NCS1K–ILA–R–C= 5.6 kg  
NCS1K–ILA–2R–C= 6 kg |
<table>
<thead>
<tr>
<th>Product family</th>
<th>Platforms supported</th>
</tr>
</thead>
</table>
| **Availability features**   | - Online insertion and removal of the controller  
- Online insertion and removal of the optical line card  
- Headless mode of operation  
- Redundant SSD disks between shelf and controller card |
| **Manageability features**  | - iPXE and ZTP  
- Cisco IOS XR Software CLI  
- SNMP  
- Streaming telemetry  
- `NETCONF, RESTCONF, gRPC` with YANG data models incl. `OpenConfig, GNMI, GNOI`  
- EPNM 7.0 and later  
- CONC 2.0 and later  
- CONP 5.0 and later |
| **Control plane features**  | - Channel and optical XC management  
- Node adjacency discovery  
- OTDR traces and event reporting  
- Span loss verification  
- Dynamic ASE loading  
- Raman tuning  
- Link performance tuner and simulator  
- Automatic power control  
- Connection discovery  
- Connection verification (Cisco Optical Network Controller)  
- Network topology (Cisco Optical Network Controller)  
- Optical Path Compute Engine (Cisco Optical Network Controller) |
| **Routing features**        | - iBGP over OSC interface and eBGP over management interface  
- OSPF over OSC interface and management interface |
| **MTBF**                    | - NCS1010–SA= 487,640 hrs.  
- NCS1010–FAN= 14,722,040 hrs.  
- NCS1010–DC–PSU= 721,131 hrs.  
- NCS1010–AC–PSU= 721,131 hrs.  
- NCS1K–OLT–C= 294,460 hrs.  
- NCS1K–OLT–R–C= 231,520 hrs.  
- NCS1K–ILA–C= 460,930 hrs.  
- NCS1010–CNTLR–K9= 571,990 hrs. |
### Regulatory compliance

**Table 3. Regulatory compliance for ANSI and ETSI specifications**

<table>
<thead>
<tr>
<th>ANSI system</th>
<th>ETSI system</th>
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<tbody>
<tr>
<td><strong>Countries and regions supported</strong></td>
<td><strong>European Union</strong></td>
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<td>• Canada</td>
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<th><strong>EMC emissions</strong></th>
<th><strong>EMC immunity</strong></th>
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<tr>
<td>• ICES-003 Class A</td>
<td>• IEC/EN61000-4-2 Electrostatic Discharge Immunity</td>
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<tr>
<td>• AS/NZS CISPR 22 Class A</td>
<td>• IEC/EN61000-4-3 Radiated Immunity</td>
</tr>
<tr>
<td>• CISPR 22 Class A</td>
<td>• IEC/EN61000-4-4 EFT-B Immunity</td>
</tr>
<tr>
<td>• EN55022 Class A</td>
<td>• IEC/EN61000-4-5 Surge AC Port</td>
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<tr>
<td>• FCC 47CFR15 Class A</td>
<td>• IEC/EN61000-4-6 Immunity to Conducted Disturbances</td>
</tr>
<tr>
<td></td>
<td>• IEC/EN61000-4-11 Voltage Dips, Short Interruptions, and Voltage Variations</td>
</tr>
<tr>
<td></td>
<td>• KN35 Class A</td>
</tr>
<tr>
<td></td>
<td><strong>Safety</strong></td>
</tr>
<tr>
<td></td>
<td>• CE Low Voltage Directive (LVD): 2014/35/EC</td>
</tr>
</tbody>
</table>
### ANSI system | ETSI system
--- | ---
**Laser**  
- IEC60825-2 Ed.3.2 (2010) Safety of laser products Part 2: Safety of optical fiber communication systems

**Optical**  
- ITU-T G.691  
- ITU-T G.975

**Quality**  
- TR-NWT-000332, Issue 4, Method 1 calculation for 20-year Mean Time Between Failure (MTBF)

---

### Ordering information

**Table 4.** Ordering PID list for NCS 1010 hardware

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCS1010-CNTLR-K9=</td>
<td>NCS 1010 Controller</td>
</tr>
<tr>
<td>NCS1010-SA=</td>
<td>NCS 1010 Shelf Assembly</td>
</tr>
<tr>
<td>NCS1010-FAN=</td>
<td>NCS 1010 Shelf Fan Assembly</td>
</tr>
<tr>
<td>NCS1010-DC-PSU=</td>
<td>NCS 1010 DC Power Supply Unit</td>
</tr>
<tr>
<td>NCS1010-DC-CBL-ET=</td>
<td>NCS 1010 DC Cable - ETSI compliant</td>
</tr>
<tr>
<td>NCS1010-AC-PSU=</td>
<td>NCS 1010 AC Power Supply Unit</td>
</tr>
<tr>
<td>NCS1010-SYS</td>
<td>NCS 1010 Assemble to Order</td>
</tr>
<tr>
<td>NCS1010-FTF=</td>
<td>NCS 1010 Fan Tray Filter</td>
</tr>
<tr>
<td>NCS1010-ACC-KIT=</td>
<td>NCS 1010 Accessory Kit for 19-inch racks</td>
</tr>
<tr>
<td>NCS1010-23-KIT=</td>
<td>NCS 1010 Accessory Kit add-on for 23-inch racks</td>
</tr>
<tr>
<td>NCS1010-ETSI-KIT=</td>
<td>NCS 1010 Accessory Kit add-on for ETSI racks</td>
</tr>
<tr>
<td>NCS1010-USB-1M=</td>
<td>NCS 1010 USB Cable - 1 meter</td>
</tr>
<tr>
<td>NCS1010-USB-3M=</td>
<td>NCS 1010 USB Cable - 3 meters</td>
</tr>
<tr>
<td>NCS1K-OLT-C=</td>
<td>NCS 1010 Optical Line Terminal - C-band</td>
</tr>
<tr>
<td>NCS1K-OLT-R-C=</td>
<td>NCS 1010 Optical Line Terminal with Raman - C-band</td>
</tr>
<tr>
<td>NCS1K-ILA-C=</td>
<td>NCS 1010 In-Line Amplifier - C-band</td>
</tr>
<tr>
<td>NCS1K-ILA-R-C=</td>
<td>NCS 1010 In-Line Amplifier with 1x Raman - C-band</td>
</tr>
</tbody>
</table>
### Table 5. Orderng PID list for NCS 1010 software

<table>
<thead>
<tr>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF-NCS1K10-R771K9</td>
<td>NCS 1010 R7.7.1 Preloaded SW</td>
</tr>
<tr>
<td>ESS-ILA-RTU</td>
<td>NCS 1010 ILA Essentials RTU</td>
</tr>
<tr>
<td>ESS-OLT-1P-RTU</td>
<td>NCS 1010 OLT 1x WSS port Essentials RTU</td>
</tr>
<tr>
<td>ADV-ILA-RTU</td>
<td>NCS 1010 ILA Advantage RTU</td>
</tr>
<tr>
<td>ADV-OLT-1P-RTU</td>
<td>NCS 1010 OLT 1x WSS port Advantage RTU</td>
</tr>
<tr>
<td>ESS-ILA-SIA3</td>
<td>NCS 1010 ILA Essentials SIA for 3 years</td>
</tr>
<tr>
<td>ESS-OLT-1P-SIA3</td>
<td>NCS 1010 OLT 1x WSS port Essentials SIA for 3 years</td>
</tr>
<tr>
<td>ADV-ILA-SIA3</td>
<td>NCS 1010 ILA Advantage SIA for 3 years</td>
</tr>
<tr>
<td>ADV-OLT-1P-SIA3</td>
<td>NCS 1010 OLT 1x WSS port Advantage SIA for 3 years</td>
</tr>
</tbody>
</table>
Warranty

The following are the warranty terms:

- Hardware warranty duration: 5 years
- Software warranty duration: 1 year
- Hardware replacement, repair, or refund procedure: Cisco or our service center will use commercially reasonable efforts to ship a replacement part for delivery within 15 working days after receipt of the defective product at Cisco’s site. Actual delivery times of replacement products may vary depending on customer location.

Your formal warranty statement appears in the Cisco Information Packet that accompanies your Cisco product. Product warranty terms and other information applicable to Cisco products are available at www.cisco.com/go/warranty.

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Information about Cisco’s environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the “Environment Sustainability” section of Cisco’s Corporate Social Responsibility (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the “Environment Sustainability” section of the CSR Report) are provided in the following table:

<table>
<thead>
<tr>
<th>Sustainability topic</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information on product material content laws and regulations</td>
<td>Materials</td>
</tr>
<tr>
<td>Information on electronic waste laws and regulations, including products,</td>
<td>WEEE compliance</td>
</tr>
<tr>
<td>batteries, and packaging</td>
<td></td>
</tr>
</tbody>
</table>

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

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