



# CENTAURI

## Product Manual



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## **Welcome!**

Thank you for choosing the CENTAURI Wireless Laser Communication device from Transcelestial Technologies Pte. Ltd.

This Installation Guide provides essential safety information and all the information you need to deploy CENTAURI properly.

You must follow the instructions included in this guide carefully.

Correct operation of CENTAURI will ensure that you get the most benefit from CENTAURI's technical capabilities, as well as maintaining your warranty.

Any statements regarding the safety of CENTAURI or its performance apply only when operating instructions are followed.

If you have any questions or need further assistance, please contact us at <https://support.transcelestial.com>.

# **IMPORTANT!**

## **PLEASE READ ALL SAFETY INSTRUCTIONS CAREFULLY BEFORE INSTALLATION!**



## Supplier's Declaration of Conformity

Transcelestial Technologies PTE LTD  
101 Eunos Ave 3  
#06-03/04/05 TSL Building  
Singapore 409835

Regn. No. - 2016334646G



### SUPPLIER'S DECLARATION OF CONFORMITY

This Declaration of Conformity is hereby issued according to  
Chapter 1, Subpart A, Part 2 of Title 47 of the Code of Federal  
Regulations by:

#### TRANSCESTIAL TECHNOLOGIES PTE LTD

101 Eunos Avenue 3  
#06-03/04 TSL Building  
Singapore 409835

#### **CENTAURI XXX**

Complies with the applicable requirements of FCC Rule Part 15/Part 18  
*(where "X" is any alphanumeric character or blank that represents a different model variant)*

#### U.S. CONTACT INFORMATION:

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By:

Dr. Mohammad Danesh

Date:

23 / 12 / 2022

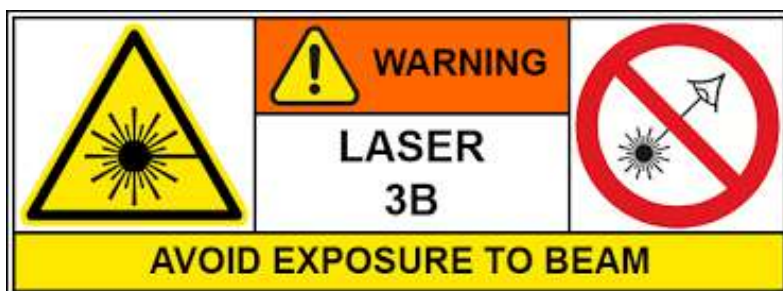




## IMPORTANT! Laser Safety Information

CENTAURI provides high-speed Layer 1 data connectivity using a Class 3B laser to connect two devices with a line of sight to each other in a point-to-point link.

Class 3B lasers can be dangerous if not used properly. The following information is provided for your reference and in compliance with IEC/EN 60825.1-2014.



### **Emitted Wavelength 808nm**

Max. output power: < **375 mW** (0.375 watt)

Frequency: **5-15 Hz** | On-time: **100ms** | Duty cycle: **50%**

Output: **Pulse Wave (PW)**

Laser Classification: **Class 3B, "Warning - Invisible Laser Radiation"**

### **Emitted Wavelength 1550nm**

Average power: **235 mW** (0.235 watt)

Output: **Continuous Wave (CW)**

Laser Classification: **Class 3B, "Warning - Invisible Laser Radiation"**

---

## **Laser hazards**

### **Eye injury from beam**

Do not look into the aperture of the device. Do not use binoculars or aiming telescopes to view the direct or reflected beam.

The Nominal Ocular Hazard Distance (NOHD) for this device is 33 m / 108 ft.

The Extended Nominal Ocular Hazard Distance (ENOH) for this device is 150 m / 492 ft from in front of the laser aperture. At this distance the 1550 nm beam diameter is 3.1 cm / 1.22 in.

### **Skin heating & materials damage**

Do not point laser beam at skin or materials at close range. Higher-powered Class 3B lasers may cause heat damage or burns.



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## Safe use guidance

This is a medium-powered laser that should be used with caution. Always be aware of the beam's location.

### Not a laser pointer

This device emits invisible laser radiation and is intended for outdoor use as a point-to-point communications device. The laser is not intended for pointing applications.

### Clear line of sight

Make sure there are no objects in the path of the laser between two devices in the laser communications link, or within the laser hazard zones in front of any device, that could reflect or deflect the laser.

### Device installation

Install in a secure, access-controlled area where manual lock and key, electric security measures, or security personnel physically restrict access to the installation location. Access can also be limited further by installing CENTAURI at a height above human eye line.

Place additional laser hazard warning signs in visible locations near the device. Do not place any device inside any other enclosure. Do not cover with fabric or other materials. Do not remove warning labels from device. Do not attempt to service the device. Doing so may result in exposure to laser radiation and will also void the product warranty.

### Laser safety eyewear

Laser safety eyewear is suggested for Class 3B lasers above roughly 50 milliwatts. We recommend operators wear laser safety eyewear during installation of Centauri. The optical density of the safety glasses should be rated 2+ at 808 nm and 2+ at 1550 nm.

---

## Manufacturer

Transcelestial Technologies Pte. Ltd.

101 Eunos Avenue 3 #06-03/04

Singapore 409835

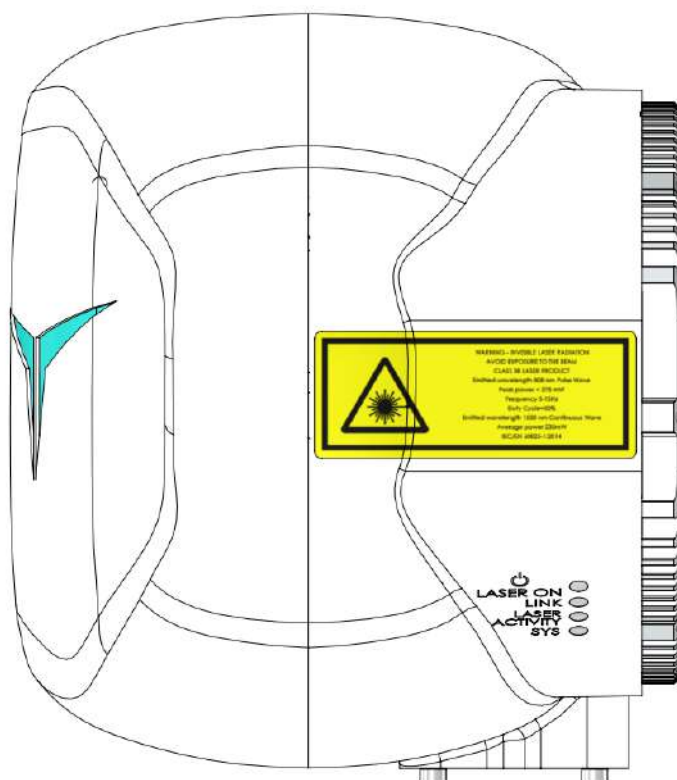
## Laser Safety Labels

The following labels are affixed to Centauri and provide important information to operators. Do not remove these labels from the device.

### Laser Hazard and Explanatory Label



### Laser Hazard and Explanatory Label Position (Rear of Device)



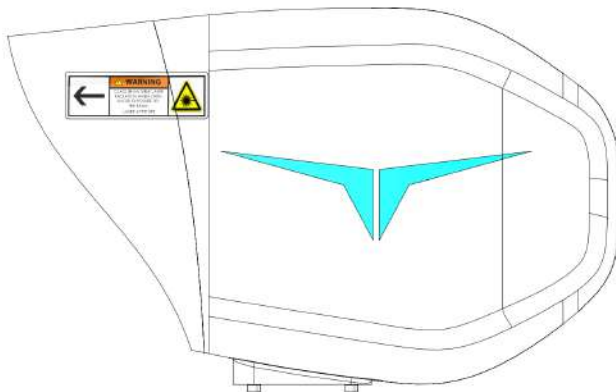


### Laser Panel and Aperture Labels

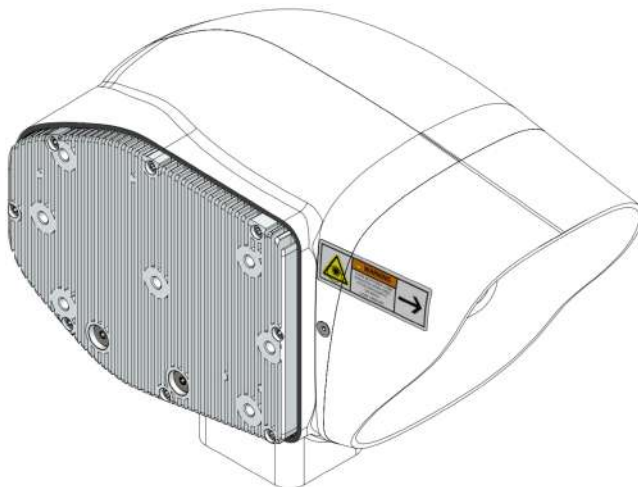
There is one of these labels affixed to either side of CENTAURI on either side of the device, indicating the position of the laser aperture



### Left side position of the aperture label



### Right side position of the aperture label





## NOHD, ENOHD, Beam sizes over distance

The Nominal Ocular Hazard Distance (NOHD) for CENTAURI is 33 m / 108 ft.

The Extended Nominal Ocular Hazard Distance (ENOHD) for CENTAURI is 150 m / 492 ft from in front of the laser aperture. At this distance the 1550 nm beam diameter is 3.1 cm / 1.22 in.

| Beacon Laser (808nm) - Pulsed | Distance      | Beam Dimensions   |                    |
|-------------------------------|---------------|-------------------|--------------------|
| NOHD                          | 2 m / 6.5 ft  | H: 9 cm / 3.5 in  | W: 23 cm / 9.0 in  |
| ENOHD                         | 5 m / 16.4 ft | H: 23 cm / 9.0 in | W: 60 cm / 23.6 in |

| Data Laser (1550nm) - Continuous Wave | Distance       | Beam Diameter    |
|---------------------------------------|----------------|------------------|
| NOHD                                  | 33 m / 108 ft  | 0.7 cm / 0.28 in |
| ENOHD                                 | 150 m / 492 ft | 3.1 cm / 1.22 in |

**i** Note: The beacon laser is emitted in an oval pattern, which is why we provide measurements for height and width of the beam. The data laser is circular, which can be measured by the diameter of the beam.

There is a very low risk of harm from exposure to the laser beams at distances beyond 150m for the 1550 nm laser and 5m for the 808 nm laser. With the proper use of protective eyewear, risk of exposure can be virtually eliminated at points within the “high power laser” and “laser hazard zone.”



## Operators: Steps to reduce risk of exposure

The following steps should be taken to reduce the risk of exposure to the device lasers, with special attention paid during the installation and deployment of CENTAURI.

### IMPORTANT!

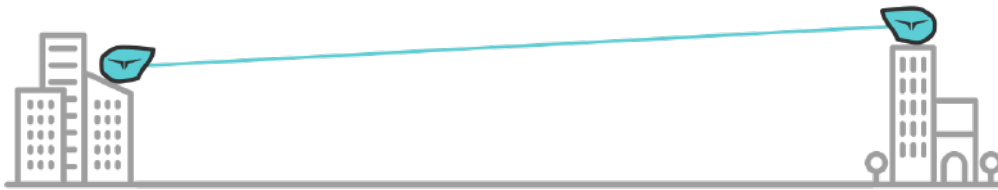
1. Make sure that the line of sight between CENTAURI devices is clear and that there is no risk of any person being directly or indirectly exposed to the lasers in the high power zone.
2. Make sure there are no objects in the path of the laser or within the laser hazard zone that could reflect or deflect the laser, thereby risking exposing a person to the reflected laser light.
3. **Always install CENTAURI in a secure/restricted/controlled area**, which prevents access by unauthorized persons.
4. Make sure that the laser hazard warning stickers on the device are clearly visible.
5. Do not place CENTAURI inside any other enclosure;
6. Do not cover the device with fabric or other materials;
7. Do not remove the warning stickers from the device.
8. Do not open the device enclosure.
  - a. There are no user-serviceable parts or components inside the device.
  - b. Opening the enclosure of the device will void the product warranty.
  - c. Return the device to Transcelestial for servicing, returns and/or exchanges.
9. Do not use binoculars or aiming telescopes to view the direct or reflected beams emitted by the device.
10. Place additional hazard warning signs in visible locations near the device. For example, at the bottom of a lattice tower if CENTAURI is mounted above eye level on the tower.
11. We recommend that operators wear laser safety glasses during the installation of CENTAURI.
  - a. For effective protection, the optical density of the safety glasses should be rated 2+ at 808 nm and 2+ at 1550 nm.
  - b. For example [ThorLabs LG2 Series Certified Laser Safety Glasses](#).



## Minimum link operating distance

CENTAURI is a specifically calibrated point-to-point communication device.

CENTAURI provides a high-speed data link between two devices positioned anywhere between 50m to 3000 meters from each other.



Because CENTAURI is calibrated to operate on links of above 50m at the factory, attempting to setup a link at distances below 50 meters could cause damage to the optical components inside the device (and void the product warranty).

On the DMD (Device Management and Deployment) app, the user is only allowed to enter a distance value between 50m and 3000m. Please keep to these distances. Contact Transcelestial if there are other requirements beyond these supported distances and we will advise accordingly.

## **BE SURE TO ENTER ACCURATE DISTANCES WHEN SETTING UP LINKS**

When prompted to enter the distance of your link by CENTAURI device management software, please provide accurate information. We suggest that to be safe, distances entered should be accurate to within +/- 10 m / 30 ft for shorter distance links (~300m/980ft) and +/- 50m / 150ft for longer links (~2km+).

Failure to enter a reasonably accurate link distance may result in damage to the optical components in the device!



## What's in the box?

CENTAURI is intended for use in pairs, which connect to each other to form a single communication link. For each CENTAURI device, Transcelestial provides one (1) box which contains the CENTAURI device. A separate box contains the accessories used to mount CENTAURI on poles up to 4 inches diameter.

### Box 1: CENTAURI device and components

- CENTAURI (1G or 10G)
- I/O Chamber Cover (with cable conduit connector)
- 4 x Screws with seal washer (M4x14)
- Auxiliary DC Power Connector
- Beam Stop



Figure 1: CENTAURI package, box 1

### Box 2: CENTAURI mount (for up to 4 inch poles)

- Mounting Part A
- Pole Clamp A x 2
- Pole Clamp B x 2
- 4 x Square-Neck Carriage Bolts (5/16"-18 Thread Size, 6" Long)
- 8 x Serrated Flange Locknuts (5/16"-18 Thread Size)
- 4 x Bolts with Captured Washers (M8 X 16)
- 1 x M8 x 30 Set screw
- 1 x M8 Nut
- Interlock Circuit Module



Figure 2: CENTAURI package, box 2



## Installation requirements

### 1. Line of sight between CENTAURI devices

- a. CENTAURI creates a wireless laser connection between two CENTAURI devices.
- b. The most important requirement is to ensure there is **CLEAR LINE OF SIGHT** between both devices in a link.
- c. This means there should be no obstructions (permanent or temporary) that could intervene and block the connection between the two devices after CENTAURI is deployed.
- d. As an example, avoid installing CENTAURI near any large plants or trees that might grow to block the line of sight between devices or which could become obstacles as they move and sway during heavy winds.
- e. Other locations to avoid placing in between CENTAURI devices include positions near any object that could reflect or generate excessive heat, such as kitchen exhaust vents, or sources of steam, smoke and other particulate matter like chimneys.

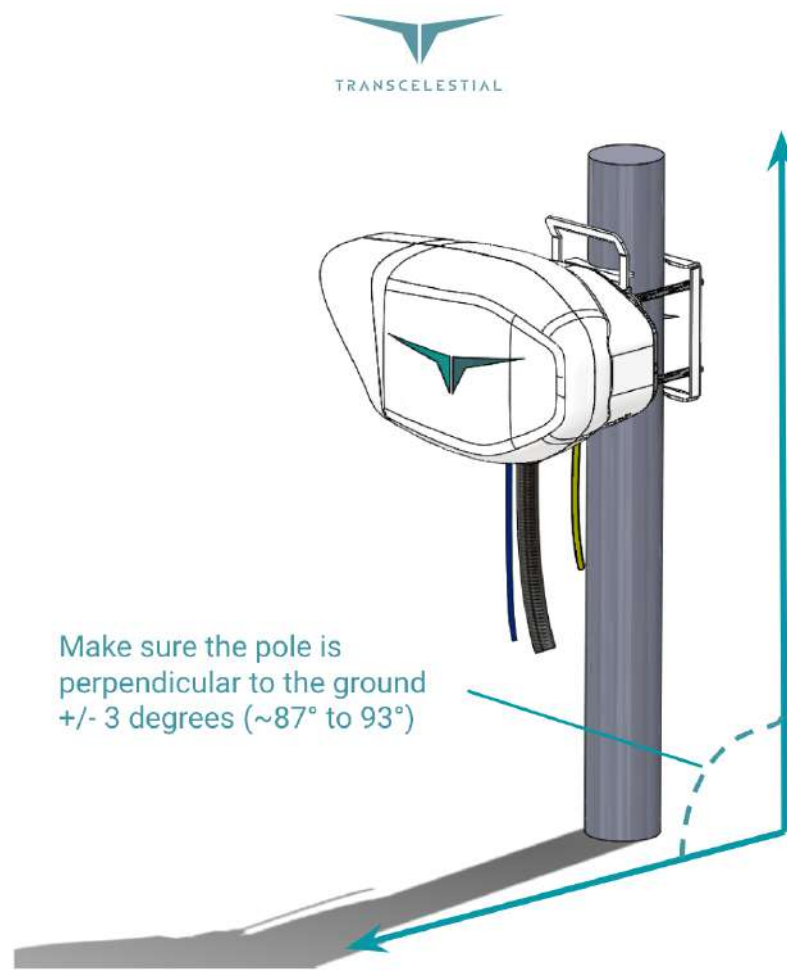
### 2. Avoid installation directly in front of or close to sources of EMI

- a. We conduct extensive Electromagnetic Interference (EMI) resistance and resilience testing so that CENTAURI is rated to withstand significant amounts of interference while still functioning normally.
- b. We specifically recommend that CENTAURI be installed in a way that it is not directly in front of other EM emitting devices, like 4G/5G antennas, RF or mmWave transmitters.
- c. This recommendation is made based on prior experience in situations where the RF Tx power of other equipment installed on site is set well above thresholds set forth in prevailing regulations.
- d. In general, we recommend that you follow the corresponding vendors' guidance for minimum safe working distances and their recommendations for placement of other equipment when considering installation locations for CENTAURI.

### 3. Suitable mounting support

CENTAURI is built to function optimally when installed on poles meeting the following specifications:

- a. Single vertical, circular mounting pole with an outer diameter measuring 3 to 4 inches (7.62 cm to 10.16 cm).
- b. Accepted tilt relative to vertical alignment of < 3.0 degrees.



- c. CENTAURI should be mounted less than 1 meter (~39 inches) from one of the pole's fixed attachment points. This will help minimise the impact of pole vibration and sway to CENTAURI's performance. See figure, below.
- d. You may also refer to this "[Site survey tool and site selection best practices guide](#)" for additional information on mounting solutions recommended by Transcelestial.



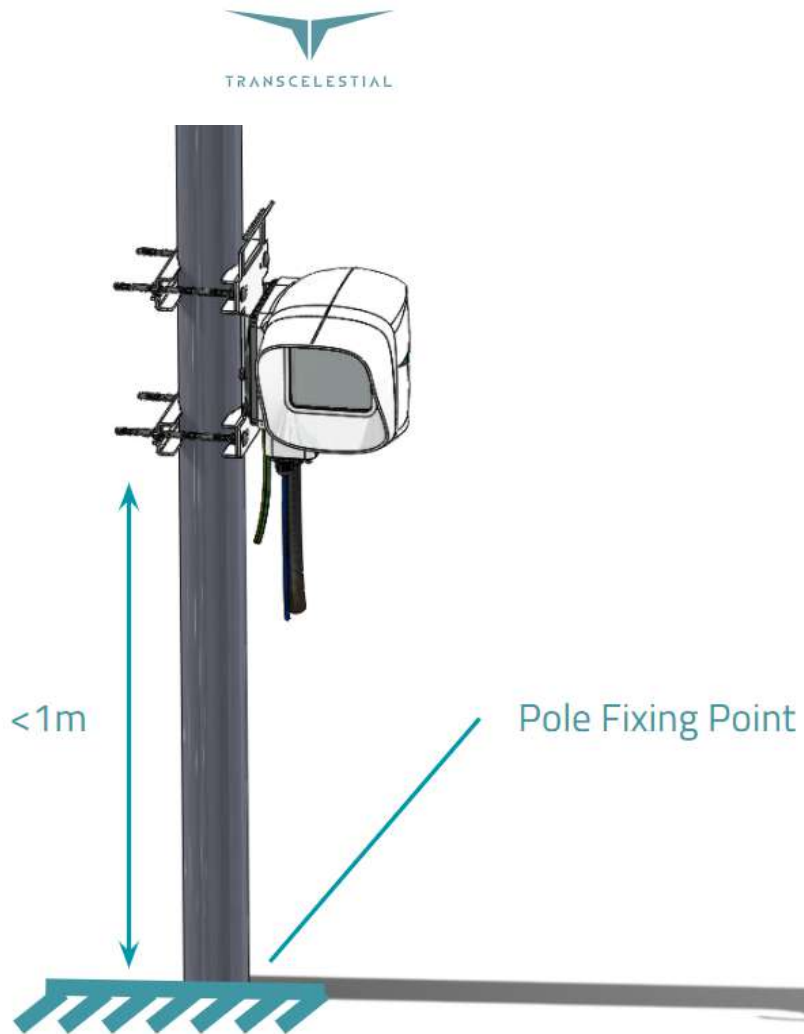


Figure 4: Maximum mounting height

#### 4. Tools required for installation

- a. 13mm Wrench (pole mounting tool)
- b. TORX T20 Screwdriver (pre-assembly tool)
- c. 29mm Wrench (cable conduit tool)
- d. Phillips Screwdriver No.1 (for the transportation lock)
- e. Small flat head screwdriver (3mm) (DC adapter/interlock module)

#### 5. Cables, connectors, and conduit

- a. The I/O port cover has two different sized openings for use when routing cables into the I/O port.
- b. We recommend using the larger 20mm opening for the fibre and DC power cable to fit the standard of Adaptaflex PAFS Plastic Flexible Conduit 20mm Conduit.
- c. The smaller opening is intended for use in routing the Ethernet cable to the CENTAURI RJ45 (POE + Management) port.



- d. Outdoor, shielded Category 6 (CAT6A) LAN cable is required for Power over Ethernet (PoE), and for monitoring CENTAURI via the RJ45 management port.
  - i. Cat 6 wire is suitable for runs up to a maximum of 55m for CENTAURI 10G devices.
  - ii. Cat 6A is suitable for runs up to a maximum of 100m for 10GB.
  - iii. If the PoE source is greater than the distances above, you will need to install a PoE amplifier in between your switch and CENTAURI in order to ensure sufficient power is available.
- e. Shielded RJ-45 connectors should be used for all Ethernet connections.
- f. 48V DC power cable may also be used to power CENTAURI.
- g. For the data connection, duplex single mode fiber with LC connectors is required.
- h. The maximum length of the fiber connection should be within the limits established for the SFP/SFP+ adapter used.
- i. For grounding, **we recommend using AWG 10 grounding wire** connected to a ring terminal with hole larger than 8mm (for M8 screws).

## 6. Power over Ethernet (PoE) or DC power

- a. CENTAURI may be powered by an ethernet cable supplying PoE supporting 802.3at or 802.3bt (if the window heater is used)
- b. As noted above:
  - i. Cat 6 wire is suitable for runs up to a maximum of 55m for CENTAURI 10G devices.
  - ii. Cat 6A is suitable for runs up to a maximum of 100m for 10GB.
  - iii. If the PoE source is greater than the distances above, you will need to install a PoE amplifier in between your switch and CENTAURI in order to ensure sufficient power is available.
- c. Running CENTAURI on DC power requires the use of the DC Adapter Module (included).

## 7. Network connection

- a. Management of CENTAURI is provided via the onboard RJ45 Gbe port.
- b. The management port is physically separated from the CENTAURI's data link connection (SFP/SFP+).
- c. For proper alignment of CENTAURI, the device may be accessed directly by a laptop, or by a laptop connected to a network switch or wifi router which is also connected to CENTAURI (on the same network).
- d. You will need to use the CENTAURI Device Management and Deployment App to properly align the device.



- e. For IP Address assignment, you may use DHCP to obtain an IP address or you may choose to assign a static IP address to CENTAURI. This option is selected from within the CENTAURI deployment app.
- f. For [monitoring using Transcelestial's cloud-based monitoring tools](#), CENTAURI devices must be connected to a router or switch configured to allow remote access to the device. Remote access is conducted over a Virtual Private Network (VPN) connection using enterprise-grade security. All data transmission from the device to Transcelestial's infrastructure is encrypted, end-to-end.
- g. Transcelestial also supports [observability using SNMP V3](#).

## 8. In-lab connection test and “pre-staging”

- a. You may want to consider pre-staging CENTAURI by setting it up in a lab, demo or office setting, prior to deploying CENTAURI in a live, outdoor site.
- b. This would not be a live link and it is not necessary to turn on the laser or attempt to go through a full deployment process.
- c. However, pre-staging will allow you to pre-test all switches, PoE connections, and to test that you can connect to CENTAURI to perform basic alignment, using [one of the methods described later in this guide](#).
- d. This is also a good time to install any firmware or software updates, if needed.

## Overview of CENTAURI

Please familiarise yourself with the CENTAURI device and mounting bracket, pictures of which are shown below.

## 1. Front view

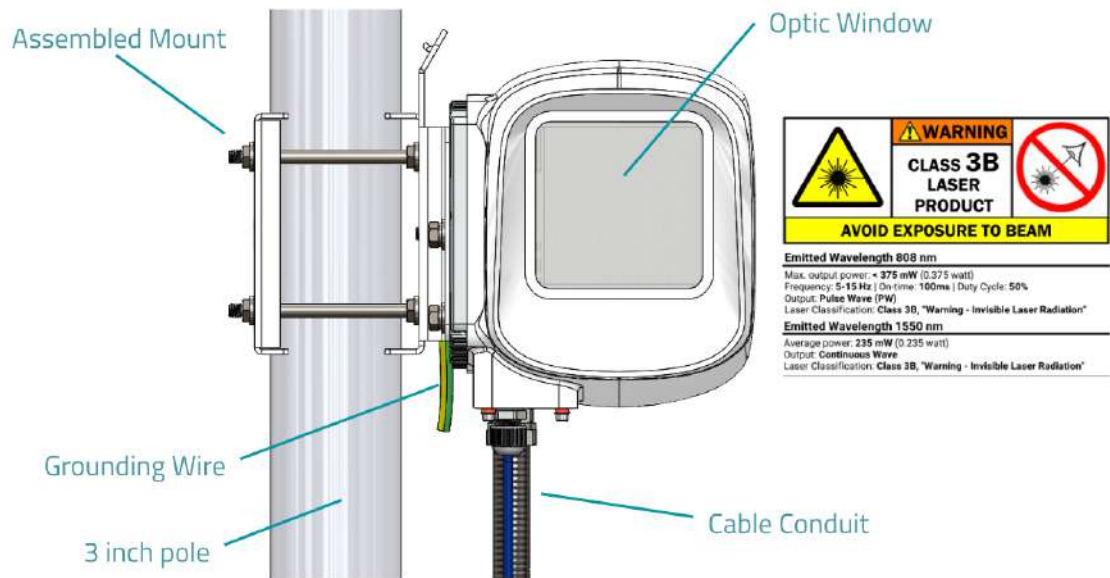


Figure 5: CENTAURI front view

## 2. Side view



Figure 6: CENTAURI side view

### 3. Mounting side and I/O chamber view

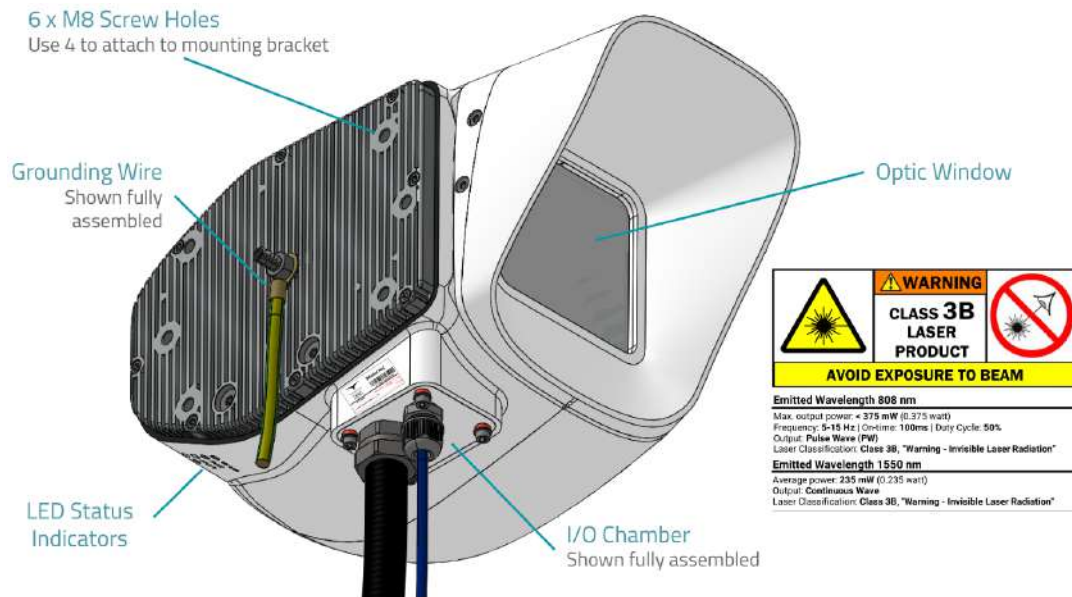


Figure 7: CENTAURI mounting side and I/O Chamber View

### 4. I/O chamber detailed view

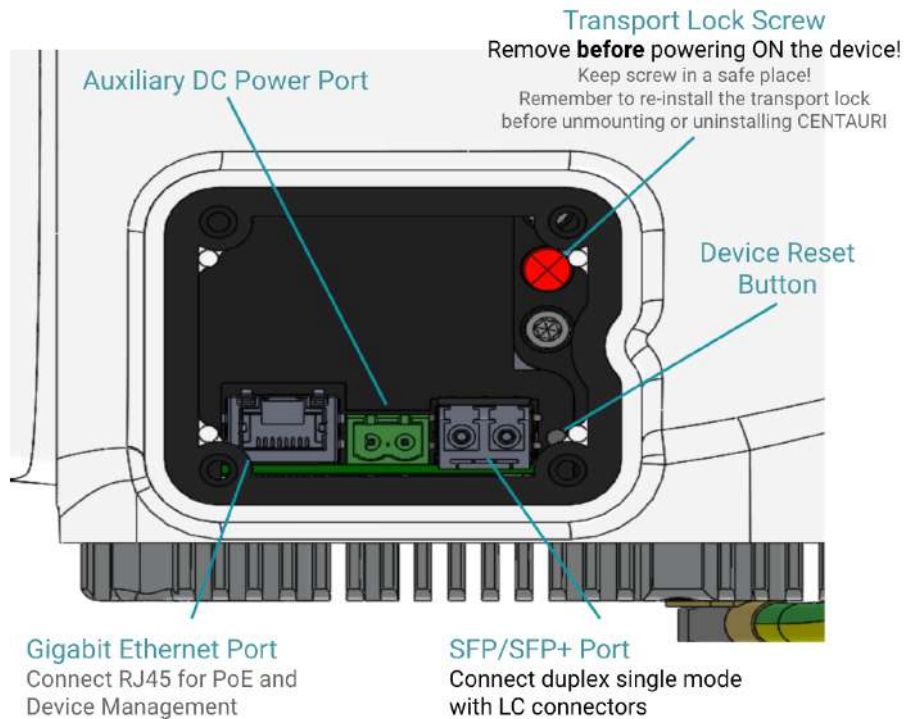


Figure 8: I/O Chamber detailed view

## 5. LED indicator lights

CENTAURI has four (4) LEDs on the external enclosure, which serve to provide visual indicators of several system components. The figure below explains what the different LED states mean.


| LED STATUS INDICATORS   |           |   |  |  |
|---|-----------|---|--|--|
| INDICATOR   | LED COLOR | SOLID   | FLASHING   | NO LIGHT   |
| <br>LASER ON | ●*        | Device Power <b>ON</b><br>Lasers Enabled                    | NA   | Device Power <b>OFF</b><br>Lasers Disabled                   |
| LINK  | ●         | Device Link is <b>UP</b>                                    | NA   | Insufficient Power to Link                                   |
| LASER ACTIVITY  | ●         | Laser Enabled and Active<br><br>External SFP/SFP+ CONNECTED | <b>Slow</b><br>Device initialising; Lasers Enabled;<br><br><b>Fast</b><br>Laser Enabled & Active;<br><br>External SFP/SFP+ or Fibre <u>NOT</u> CONNECTED | Laser Disabled<br><br>External SFP/SFP+ <u>NOT</u> CONNECTED |
| SYSTEM  | ●         | System <b>OK</b>  | <b>Slow</b><br>Device initialising<br><br><b>Fast</b><br>System checks failed; See <a href="#">Troubleshooting</a>                                       | Device offline, unreachable or OFF                           |

Figure 9: LED Indicator status

\* Device manufactured before February 2023 may use a Green (●) LED in this position.

The image below shows the configuration and location of the LEDs on the CENTAURI enclosure.



Figure 10: Indicator LEDs on enclosure

## 6. Beam stop

While the laser beam may be turned on or off from within the CENTAURI DMD App, the device is also supplied with a beam stop that may be used to temporarily block the laser emissions from CENTAURI's front aperture.



Figure 11: Beam stop installed on aperture of device

When not in use, the beam stop should be permanently installed as shown in the image below. The beam stop will be safely tethered to CENTAURI with the



metal lanyard supplied with the device. Neither the beam stop nor the metal lanyard affects CENTAURI's operational performance when not in use and stored as shown in the photo below.



Figure 12: Beam stop stored on mount when not in use

Note that the beam stop is not intended to be installed on the aperture window of CENTAURI, permanently. Placing the beam stop in position over the aperture window on a CENTAURI device during operation and when linked to another device will cause link downtime.

**NOTE:** Some early versions of CENTAURI shipped without beam stops included in the packaging or the accessories box. If, for any reason, you do not have a beam stop for use with the device being installed, [please contact Transcelestial](#) and we will arrange for shipment of a replacement.



## Supplying power to CENTAURI

There are several different options for powering CENTAURI, using either Power over Ethernet (PoE) or DC supply.

### 1. PoE (802.3at/bt) from switch

The simplest configuration involves using CENTAURI's RJ45 port to supply PoE from a PoE-capable switch. The same CAT6A STP cable that supplies PoE may also be used for device monitoring and management data. The PSE must be 802.3at compliant, capable of delivering up to 25W of power to the device. If the window heater function is needed, the PSE must be 802.3bt compliant, capable of delivering up to 32W of power to the device.

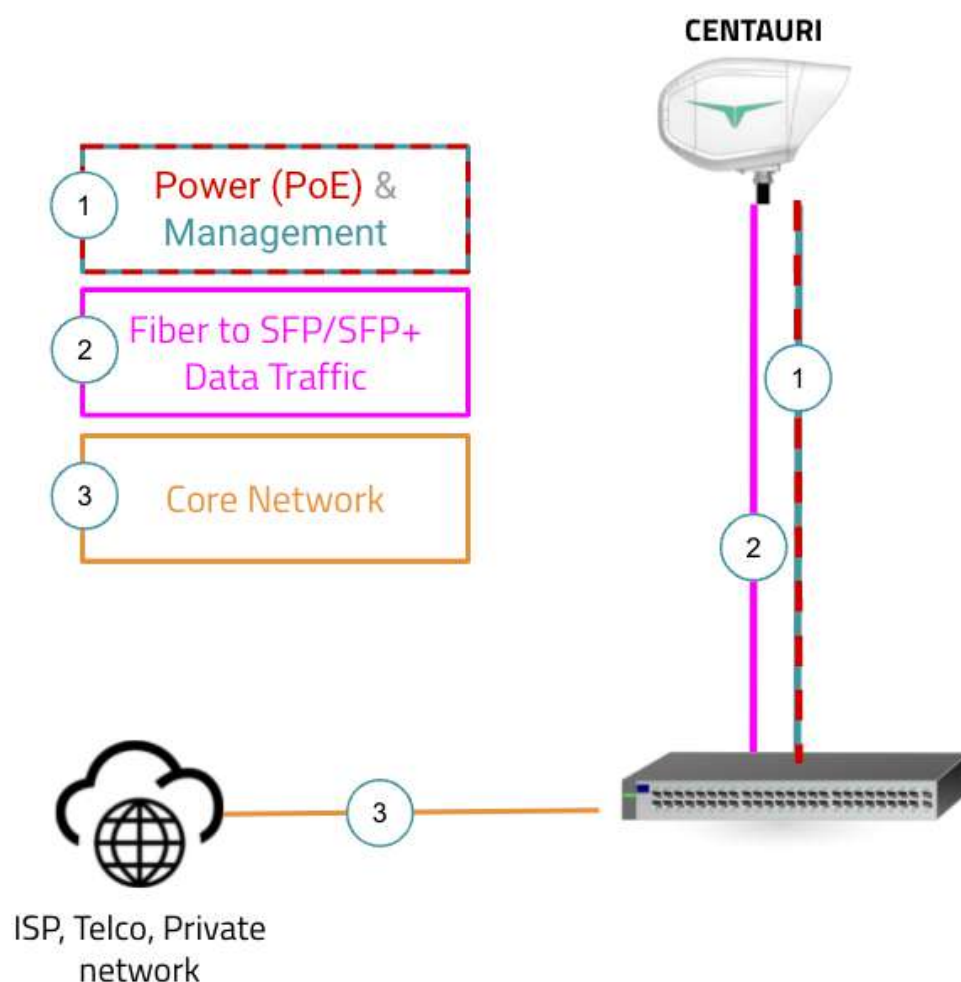


Figure 13: Powering CENTAURI using PoE from switch

## 2. PoE (802.3at/bt) using a PoE injector

A second option is to provide power to CENTAURI using a PoE injector. Management data access is achieved through CAT6A from the switch to the PoE “LAN In” port on the injector. CAT6A from injector to CENTAURI’s RJ45 port serves for both PoE and Management data access. As above, the PSE must be 802.3at compliant, capable of delivering up to 25W of power to the device. If the window heater function is needed, the PSE must be 802.3bt compliant, capable of delivering up to 32W of power to the device.

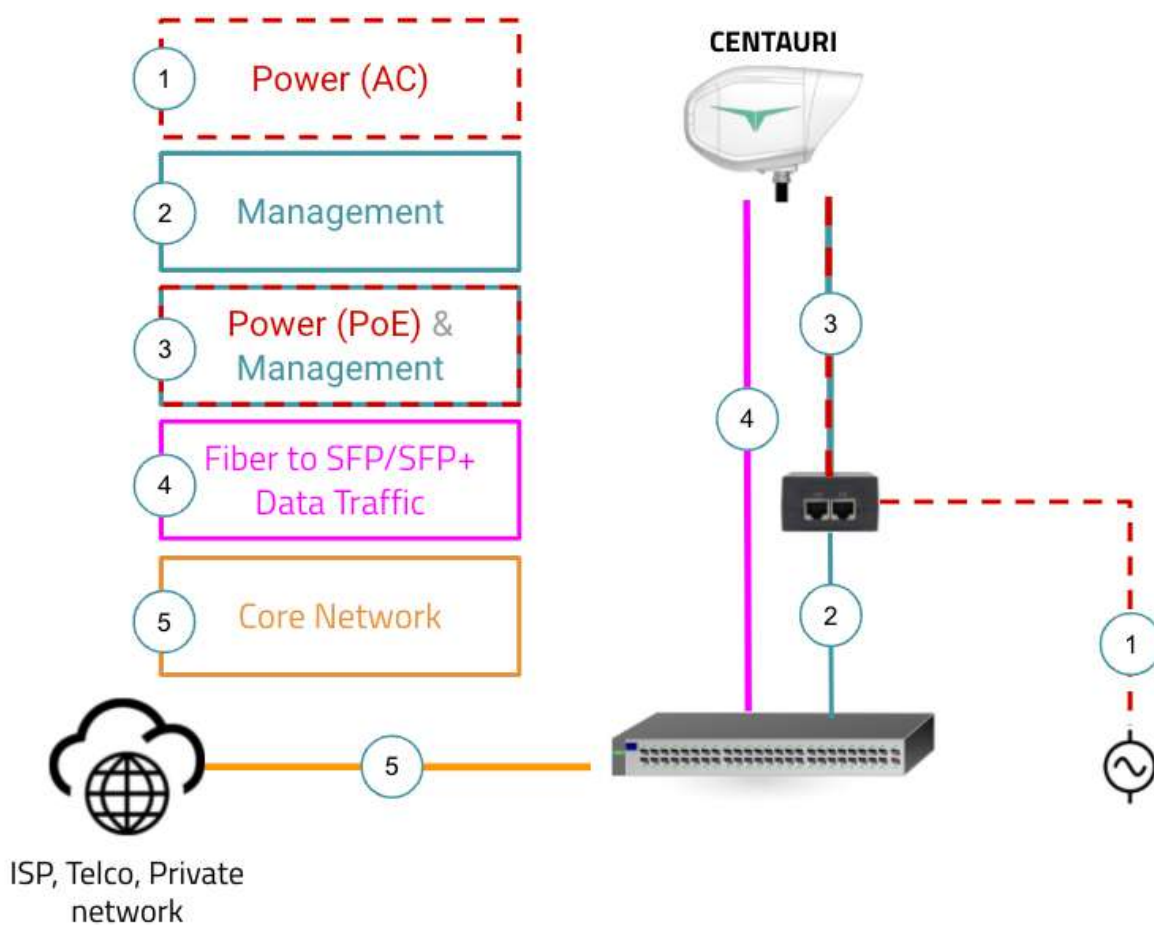


Figure 14: Supplying power to CENTAURI with a PoE injector

### 3. DC power

As noted above, CENTAURI can also accept connection to a DC power source, which may be used as the primary power supply to the device.

**NOTE:** When both PoE and DC power are connected, there is power redundancy for the device, with DC always being the primary power source for CENTAURI. When DC power fails the device will reboot and then use PoE as a backup when available.

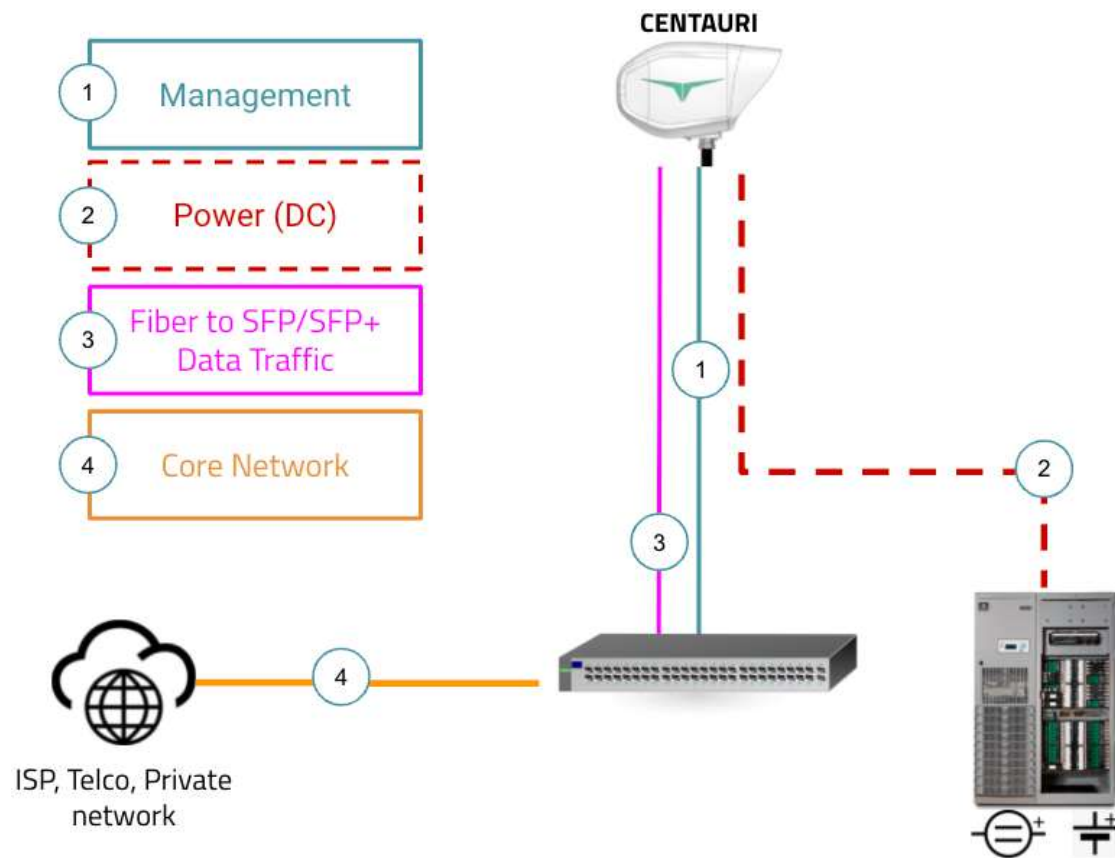


Figure 15: Connecting DC power to CENTAURI



## Installation

Please read all instructions carefully, before proceeding with the installation of CENTAURI.

Ensure that you have all the tools you need on hand, and that you have selected and prepared the installation site as described in the [INSTALLATION REQUIREMENTS](#) section of this guide.

### IMPORTANT!

**DO NOT install CENTAURI when it is raining!**

Optimal results are best achieved when CENTAURI is installed in clear, dry conditions!

#### 1. Before you begin

- 1.1. Check that the shock indicator sticker on CENTAURI's packaging is still clear.

Transport Shock Sticker  
Indicator is "CLEAR"  
Proceed with Installation.  
Handle Device With Care!



Figure 16: Transport shock sticker indicator showing CLEAR

- 1.2. If the shock sticker has turned red, for any reason, please contact us as soon as possible.



Transport Shock Sticker  
Indicator is "RED"  
**CONTACT US**  
As Soon As Possible!



Figure 17: Transport shock sticker indicator showing RED

- 1.3. Take note of the serial number of the device as you install it in each location. The serial number can be found on the white product label on the outside of the CENTAURI box, and on a label affixed to the device's enclosure, above the optic window.

## 2. Cable installation

- 2.1. The figure below illustrates the I/O chamber cover and cable connection conduits for CENTAURI.



Figure 18: I/O chamber cover preparation



- 2.2. Connect a 20 mm cable conduit to the cable conduit connector as part of the I/O chamber cover. This is the larger, metal pass-through on the I/O chamber cover.
- 2.3. Pass the duplex single-mode fibre cable through the cable conduit connector.
- 2.4. If using DC Power, pass the DC Power cable through the conduit connector along with the single-mode fibre cable.
- 2.5. Unscrew the RJ45 cable gland retaining nut (the smaller, nylon pass-through) and pass the Cat6 LAN cable through it. Then, crimp the RJ45 connector to the end of the LAN cable.
- 2.6. The interlock circuit module must be installed via the 4-pin DC power connector plug, as shown below. If you require assistance or have questions regarding the installation and operation of the interlock circuit module, please [contact us](#).



Figure 17: Cable installation.

- 2.7. The DC Power and Fibre are passed through the large 20 mm conduit hole in the I/O chamber cover. LAN cable for connecting PoE via the management port passes through the smaller cable gland on the I/O chamber cover.



### 3. Grounding cable installation

- 3.1. Carefully remove CENTAURI from its packaging box.
- 3.2. Install one M8x30 set screw in the central hole on CENTAURI's mounting plate and heatsink. This is the proper grounding point for CENTAURI.

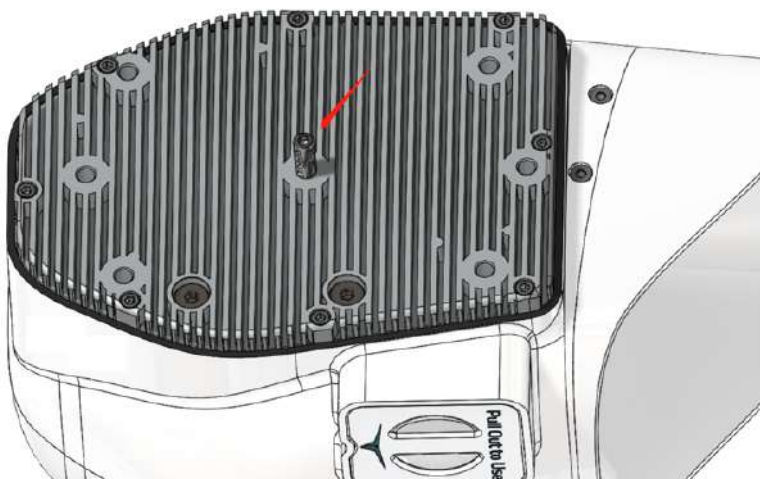


Figure 18: Grounding point location on device backplate

- 3.3. The grounding point is also identified by the stamped imprint of the earthing symbol next to the hole in the middle of the mounting plate.

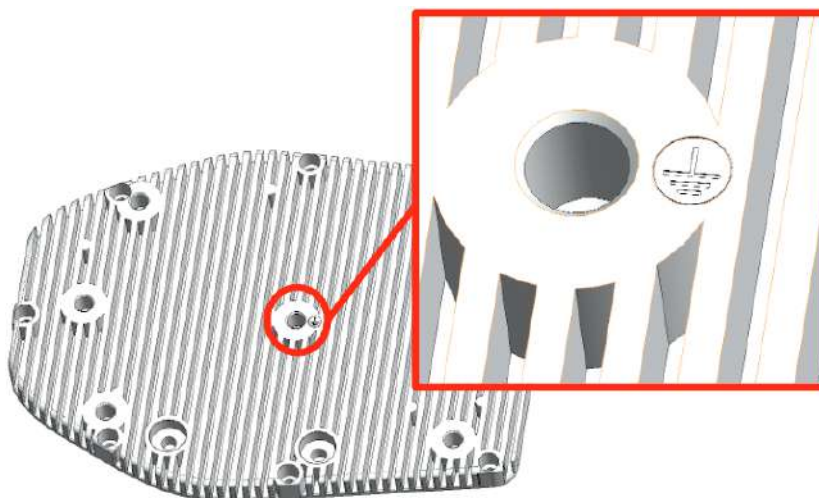


Figure 19: Earthing stamp at grounding point location



- 3.4. Next, install the grounding ring terminal and secure the connection with an M8 nut. The grounding cable should be **10 AWG**.

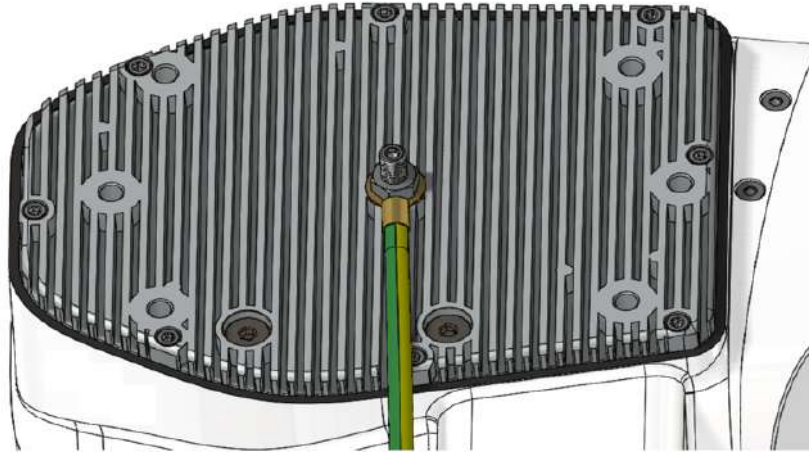


Figure 20: Securing the grounding cable

## 4. Mount assembly and basic installation

The CENTAURI Mount assembly is designed to work best with cylindrical mounting poles. We recommend using a mounting pole that is between 7.6 cm (3.0") and 10.2 cm (4.0") in diameter.

- 4.1. Assemble 2 Pole Clamps B on to the Mount Part A



Figure 21: Assembling the mounting bracket



- 4.2. Attach Mount Part A to CENTAURI's heatsink with 4 X M8 bolts. Line up the hole in the centre of the mounting bracket with the grounding wire attachment point. This will assist in aligning the mounting holes on CENTAURI with the slots in the mounting bracket.

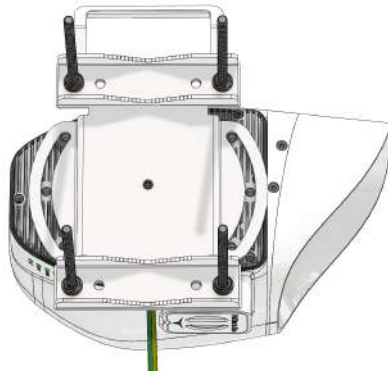


Figure 21: Mount installation on CENTAURI

- 4.3. Carefully adjust the pitch angle to point CENTAURI towards the intended location of the other device in the link.
- 4.4. **IMPORTANT!** If CENTAURI will be pointing upward from its installed location, attach the four M8 screws as shown in the figure below:

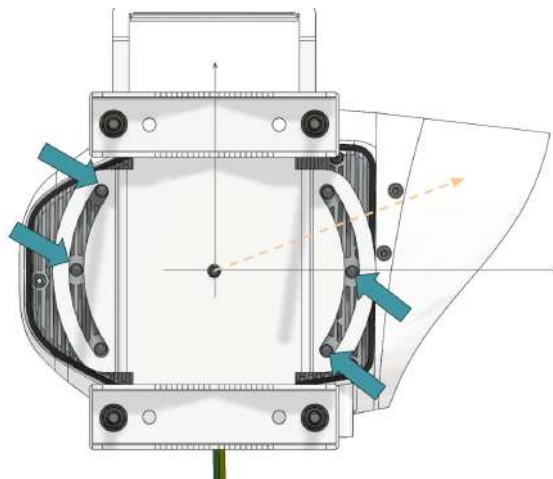


Figure 22: Pitch adjustment with mount: CENTAURI pointing upward

- 4.5. If CENTAURI will point downwards from its mounting location to the location of the other linked device, mount the four M8 screws as shown below.

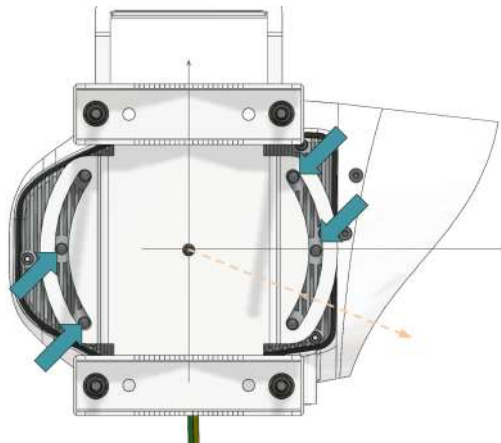


Figure 23: Pitch adjustment with mount - Down position

- 4.6. Once you have finger tightened the pitch control nuts, you may attach the pole clamp assembly brackets to the long bolts on the CENTAURI mount.

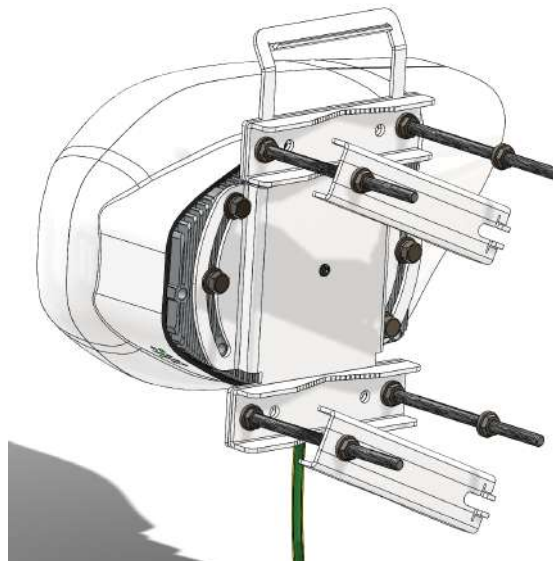


Figure 24: Pole clamp assembly

- 4.7. You are now ready to install CENTAURI on a suitable pole and begin the coarse alignment process.
- 4.8. Carefully carry CENTAURI to its installation location using the built-in handle at the top of the Mount assembly.

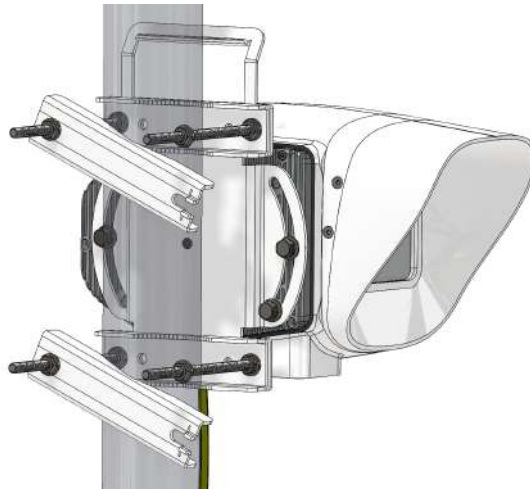


Figure 25: CENTAURI with Mount assembly installed

## 5. Pole installation and coarse alignment

- 5.1. CENTAURI should be mounted on a pole by attaching and lightly tightening the nuts on the long screws. You should be able to move CENTAURI on the pole, as well as change the pointing angle of the device.

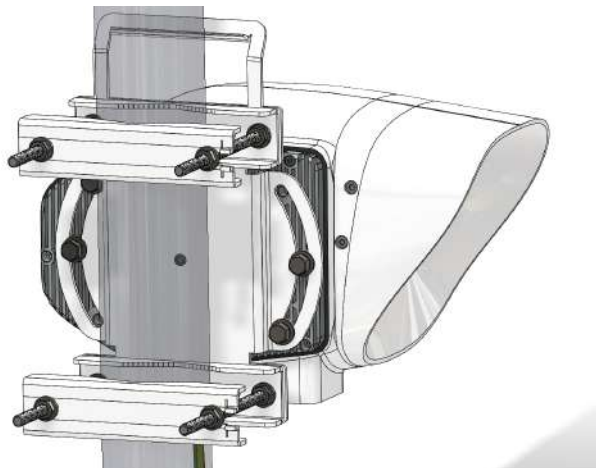


Figure 26: CENTAURI mounted on pole

- 5.2. Aim CENTAURI in the direction of the location of the intended paired device by changing the pointing angle (elevation adjustment), or by rotating the mount on the pole (azimuth adjustment).

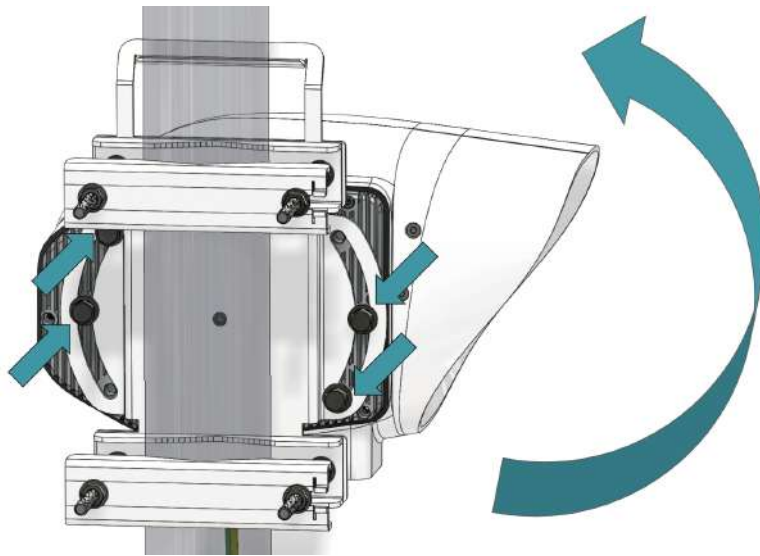


Figure 27: Elevation adjustment

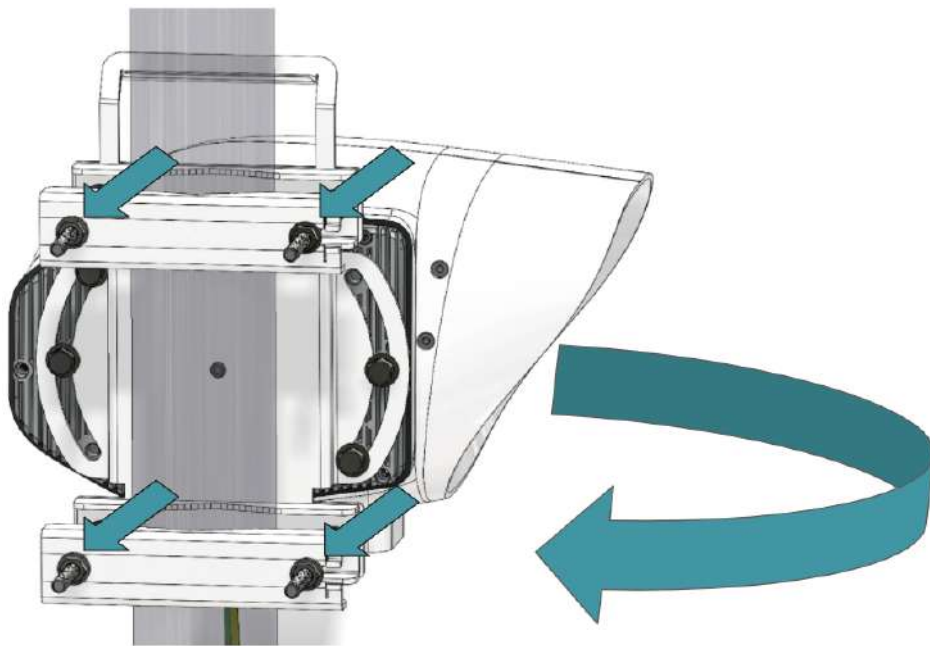


Figure 28: Azimuth adjustment

## 6. Remove the I/O cover

- 6.1. If installed, carefully remove the I/O cover from the device.

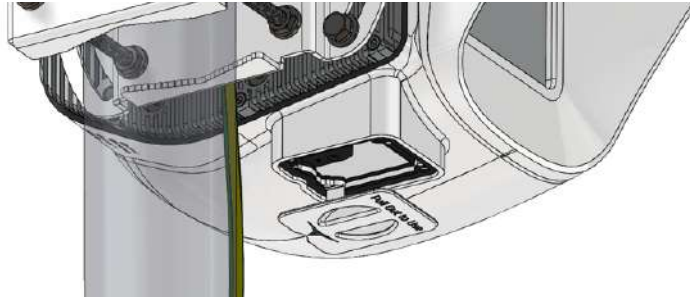


Figure 29: I/O chamber plastic cover removal

## 7. Transport lock removal

- 7.1. Before proceeding with powering on CENTAURI and performing alignment, be sure to remove the transport lock.
- 7.2. The transport lock is a screw that is located inside the I/O port. See the figure below for guidance.

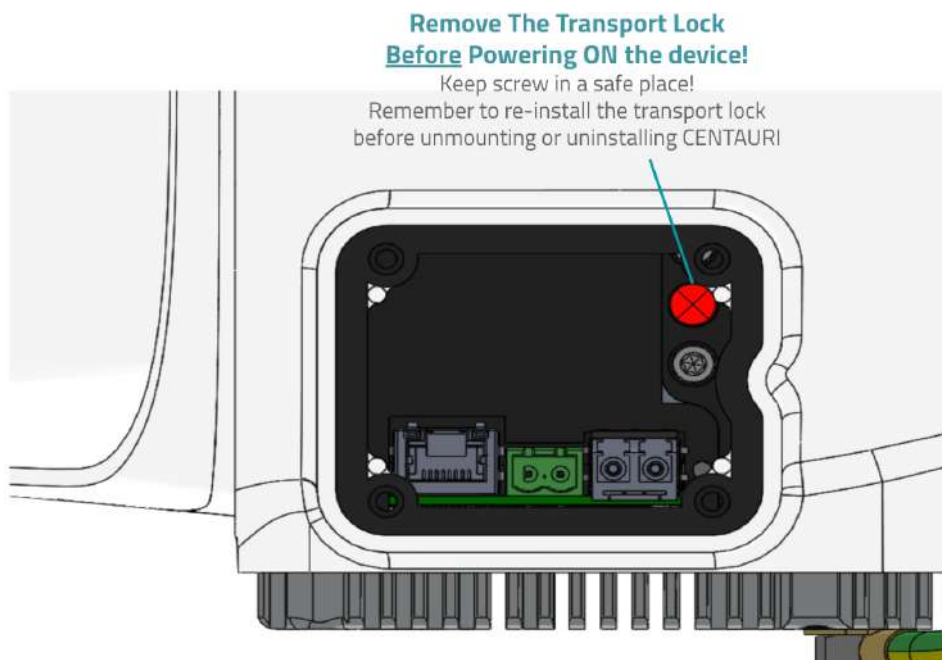


Figure 30: Transport lock location inside I/O chamber



## **IMPORTANT!**

**Please keep the transport lock screw in a safe place,  
after removal!**

The transport lock screw must be reinstalled in the event that you need to unmount and move or relocate CENTAURI.

## **WARNING!**

**Failure to reinstall the transport lock before transporting or  
shipping centauri will void the warranty!**

### **8. Performing a factory reset**

- 8.1. You may perform a factory reset by pressing and holding the factory reset button for 5 or more seconds.
- 8.2. The factory reset button is located inside the I/O compartment of CENTAURI, as noted in the figure below.
- 8.3. When activated, the reset process takes approximately two (2) minutes to run to full completion.

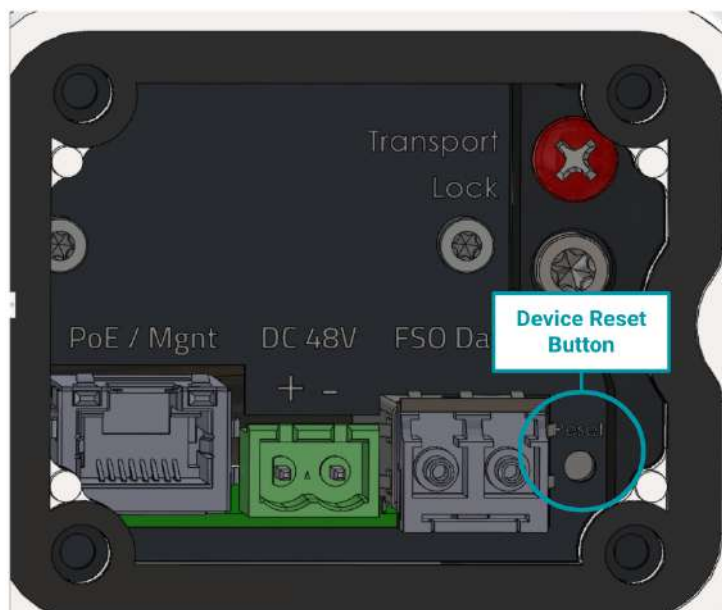


Figure 31: Factory Reset Button Location inside the I/O chamber

## 9. Connecting cables to CENTAURI

- 9.1. Plug an SFP for CENTAURI 1 or SFP+ for CENTAURI 10 into the SFP/SFP+ port.

### **IMPORTANT!**

**The SFP specification must match the transceiver distance and wavelength connected to the router or switch at the other end of the duplex single mode fiber.**

- 9.2. Connect the ethernet cable to the RJ45 port inside the I/O Chamber of the device (left socket in the figure, below).
- 9.3. Connect the duplex fiber to the SFP/SFP+ transceiver (right socket in the figure, below).
- 9.4. If using DC power with the interlock circuit, connect this cable to the green connector (middle socket in the figure below).

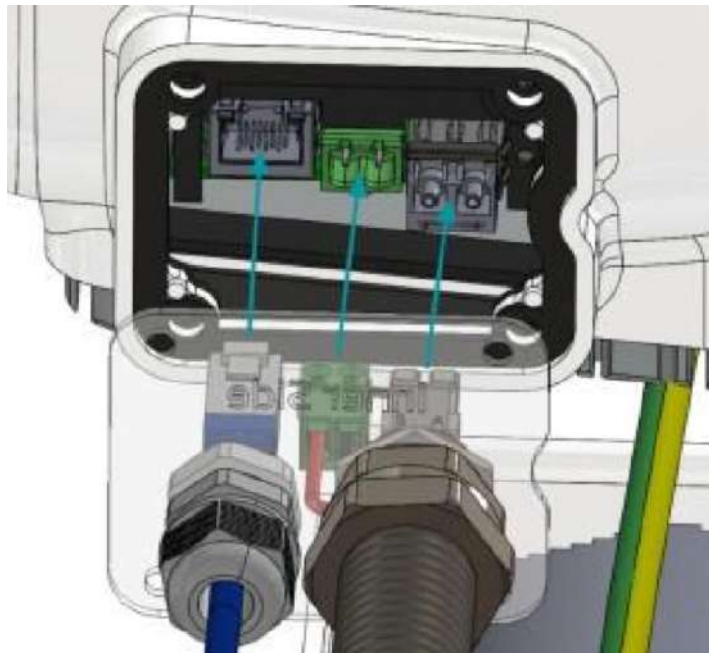


Figure 32: Connecting cables to CENTAURI



- 9.5. Position the I/O chamber cover over the opening, and install the four seal screws for the I/O chamber.

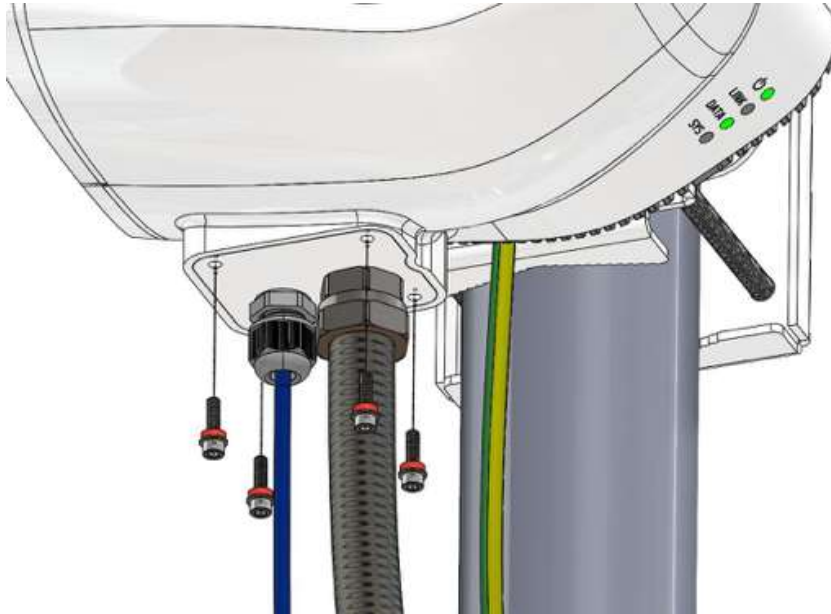


Figure 33: I/O chamber installation

- 9.6. Tighten the screws so that the cover sits flush with the edge of the enclosure. This will help maintain a waterproof seal.

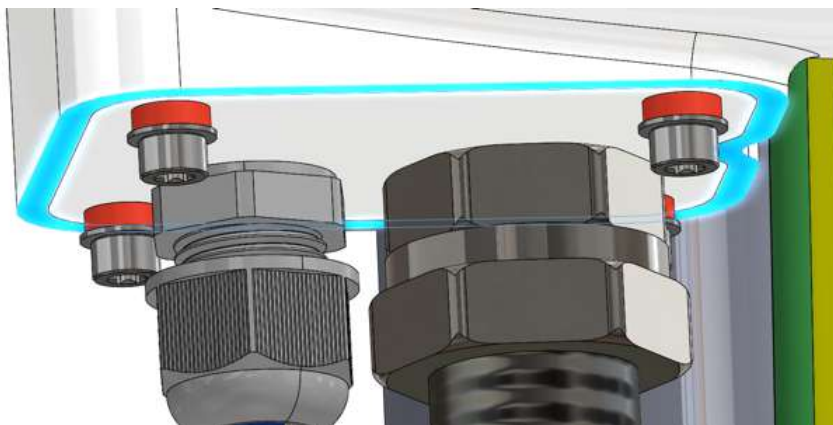


Figure 34: Correct waterproof sealing



- 9.7. To complete the installation, tighten the Ethernet cable gland.

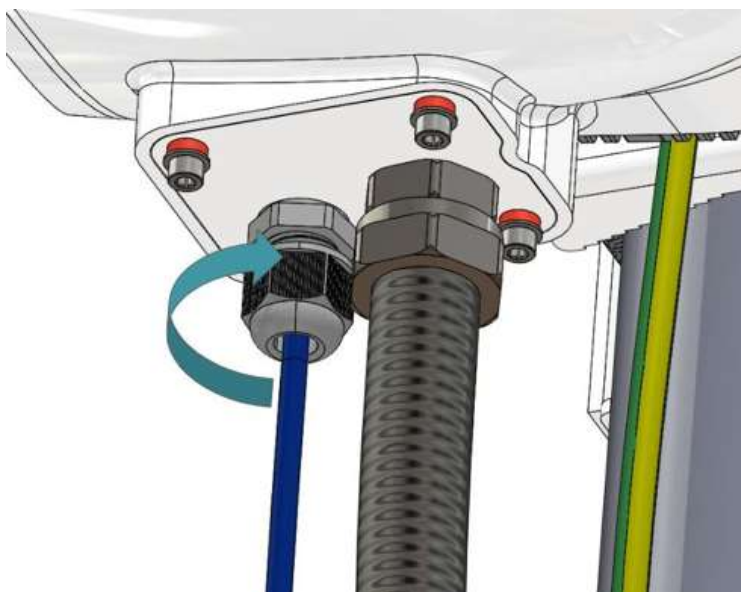



Figure 35: Tightening the Ethernet cable gland.

## 10. Power on CENTAURI

- 10.1. Now that CENTAURI is installed in its intended location, and all cables have been connected, you may connect the Ethernet cable to the PoE supply port on your switch, or connect the DC power cable to its intended power source.
- 10.2. The  LED should turn **green** as the device is powered on.

## 11. Performing basic alignment with the DMD app

### 11.1. Preparing for basic alignment

- 11.1.1. Basic alignment involves using the [CENTAURI DMD App](#) to help guide operators through the process of alignment - at either end of the link - so that the devices at each endpoint in the link can see and connect to each other.
- 11.1.2. Once mounted, CENTAURI must be connected to a power source. See [power options](#) for details.
- 11.1.3. The methods for connecting to CENTAURI for access to the DMD app are presented in the [DMD User Manual](#).

### 11.2. Coarse alignment overview

- 11.2.1. Check that CENTAURI's  LED is **on** ([LED Indicator Lights](#)).



- 11.2.2. Check that the SYS LED is **off** and **not blinking**. If the SYS LED indicator is blinking it may indicate a problem with the device. See [Troubleshooting](#) for more information.
- 11.2.3. You must use the CENTAURI Device Management and Deployment app to perform the alignment of both CENTAURI devices in a link. See [CENTAURI Device Management and Deployment \(DMD\) app](#).
- 11.2.4. If you are aligning the first device in your link, you will need to follow the instructions in the app to point the first device at the location where the second device in the link will be installed. The [CENTAURI DMD App](#) will guide you through this process.
- 11.2.5. Once the first device is aimed at the correct location, carefully tighten all mounting bolts, ensuring that the aiming position does not move from the intended location, using the app's camera view to monitor any movement.
- 11.2.6. Now that the first device is set up, move to the location of your second device and follow all steps for installing the second device, from [cable installation](#) to [Power on CENTAURI](#).
- 11.2.7. When performing alignment for the second device in the link, you will start by aiming the device towards the location of the first device you set up.
- 11.2.8. Then, you will need to position the second device so that the flashing beacon from the first device is centred in the targeting reticle of the camera view in the app. The [CENTAURI DMD App](#) will guide you through this process.
- 11.2.9. Once the second device is aligned, you can carefully tighten the mounting bolts for the second device, again ensuring that the aiming position does not change as you tighten the mount.
- 11.2.10. The DMD App will complete the initial setup of the link between the two CENTAURI devices.
- 11.2.11. Once the basic alignment is complete, the link may need to be calibrated or "fine-tuned." To proceed with fine-tuning of the link, and/or to setup monitoring and device management access, you



will need to connect CENTAURI to a switch using the management port (RJ45), either directly or via a PoE injector. See [POWER OPTIONS](#), above, for illustrations.

- 11.2.12. You will find more detailed instructions on using the CENTAURI deployment app here: [DMD User Manual](#).

## Device Management and Deployment (DMD) App

1. Basic instructions for use of the CENTAURI Device Management and Deployment App can be found in the user manual for the app.
2. The manual can be downloaded from this link: [DMD User Manual](#).
3. Refer to the [DMD user manual](#) for technical requirements, setup instructions, and proper usage of the DMD app to perform setup, configuration, deployment and alignment of CENTAURI.
4. **NOTE:** The DMD App works best when accessed using a LAPTOP. The app is not specifically designed for use with mobile devices, at this time.

### **IMPORTANT!**

**When performing alignment of CENTAURI, the DMD App should be used in full-screen mode, only.**

Changing the window size during the alignment process will result in inaccurate alignment due to limitations of the camera software used in the device.

5. CENTAURI is a rapidly evolving product and there are many improvements and fixes being brought into service on a frequent basis.

### **IMPORTANT!**

**To ensure you benefit from the latest features and improvements, we strongly recommend that CENTAURI updated to the latest stable release of software, before beginning deployment.**



## Monitoring CENTAURI

### 1. Monitoring overview

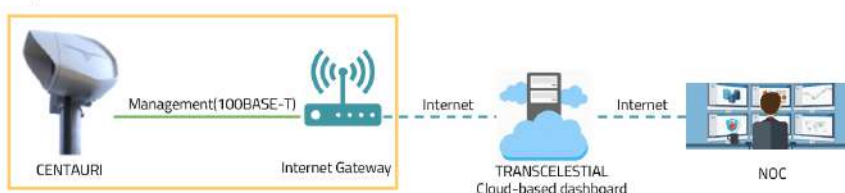
- 1.1. The CENTAURI device is a Layer 1 device, equivalent to a passive fiber optic cable that connects two network elements using SFP/SFP+. From an operations point of view the metrics relevant to monitoring the connection are the same as those for SFP/SFP+:
  - 1.1.1. Received power (Rx)
  - 1.1.2. Transmitted power (Tx), and
  - 1.1.3. Loss of Signal (LOS) (also known as "Link Status").
- 1.2. CENTAURI does not provide visibility to the actual data being transmitted or received across the laser link. The device management port allows access only to telemetry related to the internal hardware components, along with the key metrics of Received power (Rx), Transmitted power (Tx), and Link Status (Up/Down). This is sufficient for assess the quality and status of the connection between two linked CENTAURI devices. We do not envision adding Layer 2 or 3 capabilities to CENTAURI for the data link (laser link) in the foreseeable future.
- 1.3. The monitoring dashboard will alert the operations team with a WARNING if the power drops below the Warning Threshold for more than 10 seconds, which could happen due to extreme environmental conditions such as heavy rain, heavy fog, etc. The link should be closely monitored when this happens.
- 1.4. The monitoring dashboard will alert the operations team with an ALARM if the power drops below the Alarm Threshold for more than 10 seconds, which means that the link may experience a Loss of Signal (LOS) and the network equipment connected over the link may not be able to connect to each other. The link should recover as soon as the environmental conditions normalize. In the rare situation that it does not, you should contact Transcelestial as soon as possible.

| Threshold Type                   | CENTAURI 1G | CENTAURI 10G |
|----------------------------------|-------------|--------------|
| Warning Threshold (close to LOS) | -30 dBm     | -22 dBm      |
| Alarm Threshold (LOS)            | -35 dBm     | -25 dBm      |

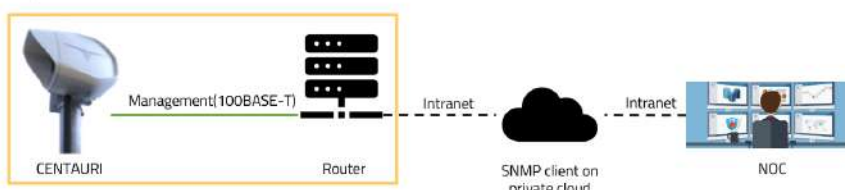
## 2. Monitoring Architecture

- 2.1. There are two (2) different options available for monitoring CENTAURI. Transcelestial currently provides a cloud-hosted dashboard (out-of-band), and support for SNMP v3 (read-only) is available, to support monitoring via many standard network monitoring tools.

Option 1: Cloud-based Dashboard (Out-of-Band)



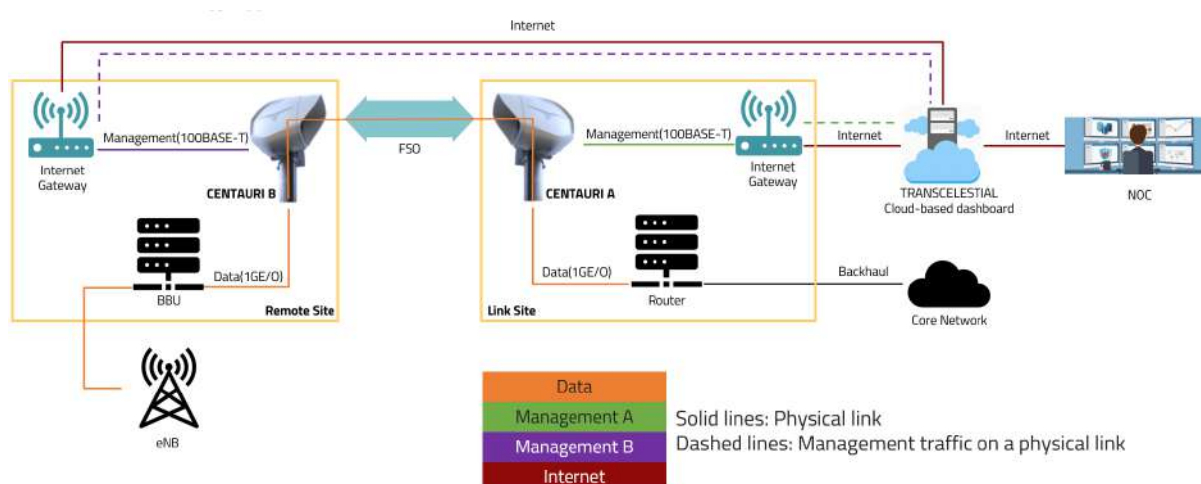
Option 2: Standalone Dashboard (SNMP)



## 3. Cloud-based Dashboard Options

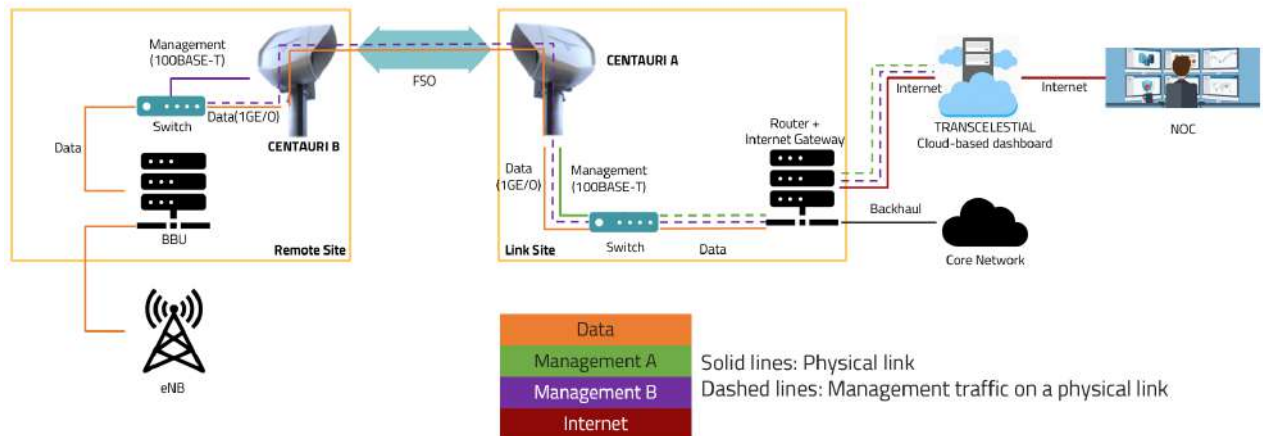
### 3.1. Option 1a (Cloud dashboard, out-of-band)

- 3.1.1. Management port must be connected to an internet gateway (LTE router/Telco's own gateway), which sends monitoring data from CENTAURI to the Transcelestial cloud-based dashboard, over the network.



### 3.2. Option 1b (Cloud dashboard, in-band)

- 3.2.1. Management and Data ports must be connected to a switch which will connect to a Router + Telco's own gateway on the link site. CENTAURI transmits monitoring data to the Transcelestial cloud-based dashboard, over the internet.



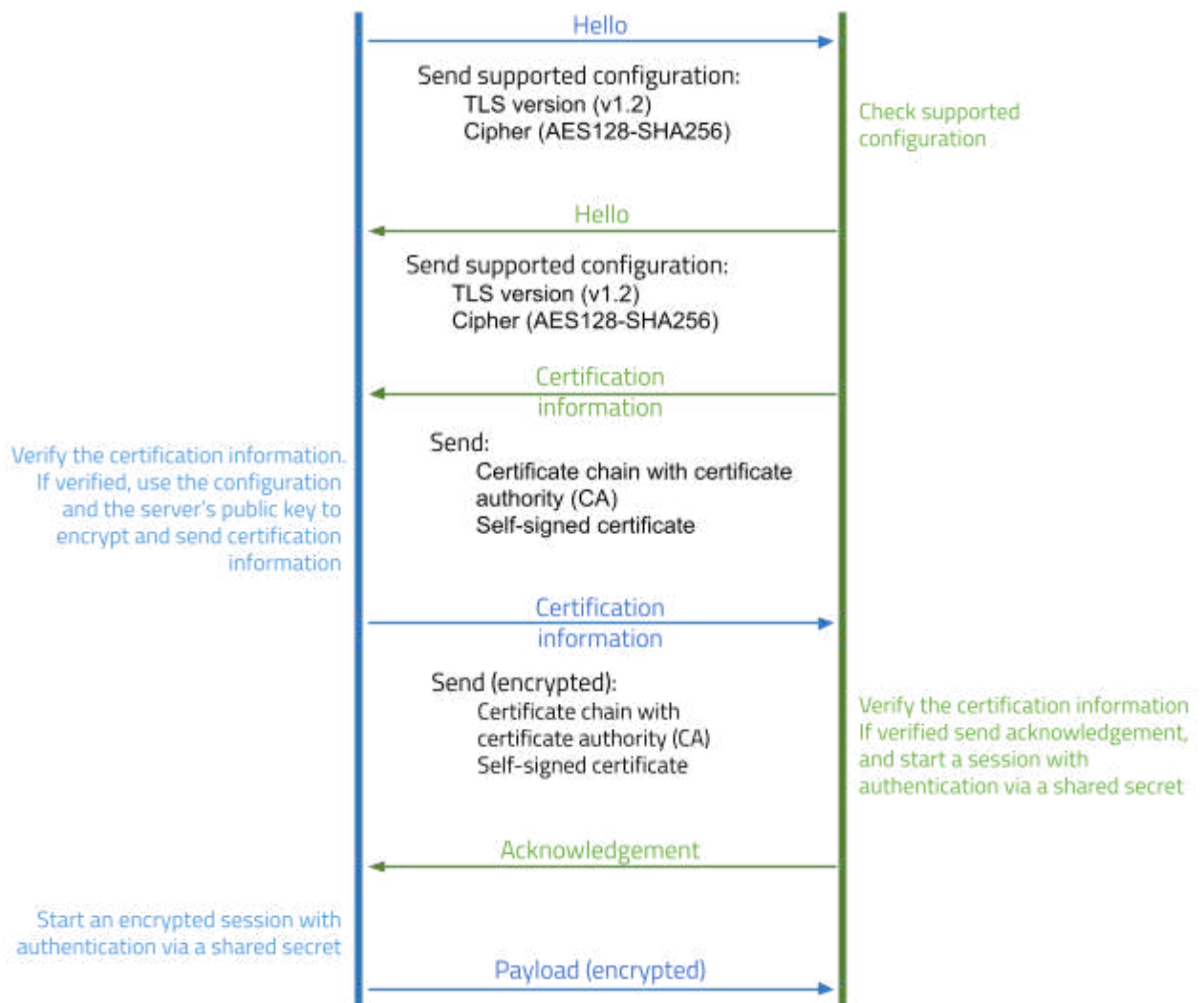
### 3.3. Cloud Dashboard Connection Flow

- 3.3.1. The CENTAURI device needs to establish a connection with the Transcelestial cloud-based dashboard server, over the internet.
- 3.3.2. Secure data transfer is conducted using SSL/TLS over HTTPS.
- 3.3.3. A high-level diagram of how CENTAURI connects to the server is explained in the sections above. The detailed call flow between the CENTAURI and the monitoring server is illustrated below.

## CENTAURI



## TRANSCESTIAL cloud-based dashboard

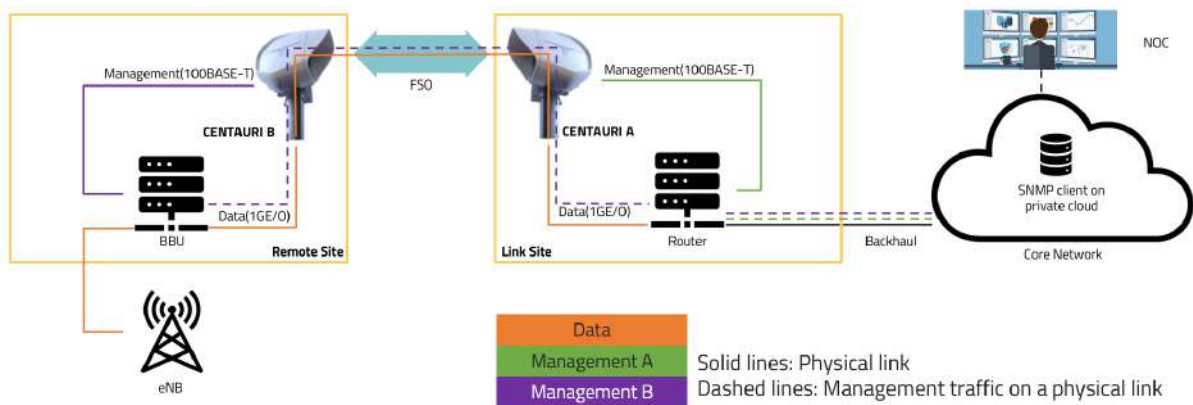




## 4. Monitoring with SNMP

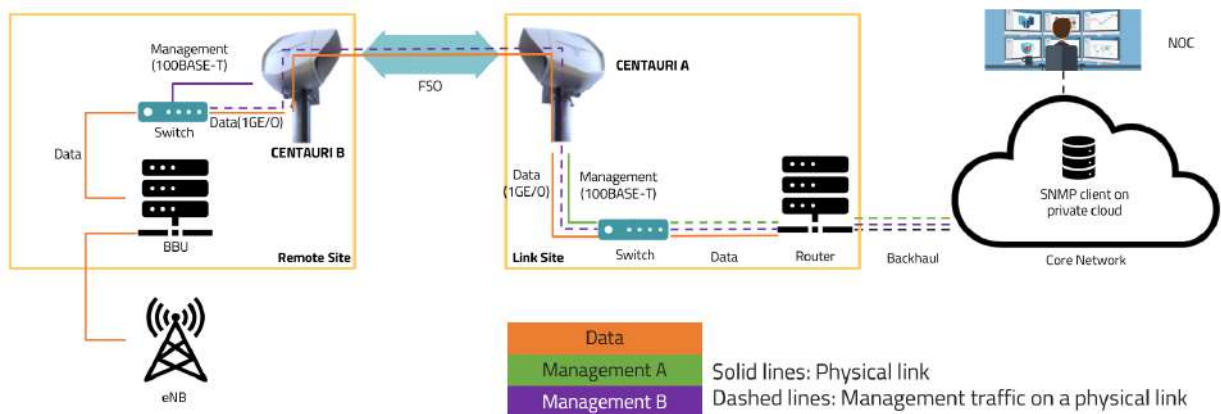
### 4.1. SNMP (out-of-band)

- 4.1.1. The management port will be connected to the core network directly, so that the SNMP client on the private cloud can query CENTAURI devices over the internal network.



### 4.2. SNMP (in-band)

- 4.2.1. Both the management and data ports will be connected to a switch, which is connected directly to the Core network. The SNMP client on the private cloud can query the CENTAURI over the internal network.





## 5. Setup SNMP for 3rd Party Monitoring Tools

- 5.1. CENTAURI's SNMP monitoring capability is robust and provides a rich set of metrics, alarms and traps which can be set up for use in many standard network monitoring applications like PRTG, LogicMonitor, LibreNMS, Zabbix, Nagios, and others.
- 5.2. For a list of all SNMP alarms and traps supported, please visit our support portal page here - [SNMP Alarms and Traps Info](#)
- 5.3. Latest MIB file available here - [MIB file](#) (to be used with devices on V5.x.x SW)
- 5.4. To query the SNMP agent running in each CENTAURI device, you may use either a numerical OID or the MIB OID. For example:

```
snmpget -On -t 10 -v 1 -c tct <hostname|IP> TCT-SNMP-MIB::tctSnmpRxPwr
```

```
snmpget -On -t 10 -v 1 -c tct <hostname|IP> .1.3.6.1.4.1.54505.1.1
```

- 5.5. To obtain the numbering OID from the MIB OID:

**Note:** You must install and configure the TCT-SNMP-MIB.txt file within your SNMPD MIBs directory. To do this add the TCT-SNMP-MIB.txt file with the following contents to .snmp/mlbs (or to the directory where you store your MIBs).

```
snmptranslate -On TCT-SNMP-MIB::tctSnmpRxPwr
```

- 5.6. A sample of the contents of a TCT-SNMP-MIB.txt file are shown next.



```
TCT-SNMP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    OBJECT-TYPE, Integer32,
    MODULE-IDENTITY, enterprises FROM SNMPv2-SMI;

tctSnm MODULE-IDENTITY
    LAST-UPDATED "201912120000Z"
    ORGANIZATION "transcelestial.org"
    CONTACT-INFO
        "
        postal: 28A Temple Street,
                058573, Singapore
        email: dev@transcelestial.com
        "
    DESCRIPTION
        "MIB objects for Centauri SNMP queries"

    REVISION      "201912120000Z"
    DESCRIPTION
        "First draft"
    ::= { enterprises 54505 }

--
-- Measurements
--
tctSnmMeasurements OBJECT IDENTIFIER ::= { tctSnm 1 }

tctSnmRxpwr OBJECT-TYPE
    SYNTAX      OCTET STRING
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Get device receive power in dBm"

    ::= { tctSnmMeasurements 1 }

tctSnmLinkStatus OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Get laser link status:
        - 0: link is down
        - 1: link is up
        "

    ::= { tctSnmMeasurements 2 }

tctSnmTxPwr OBJECT-TYPE
    SYNTAX      OCTET STRING
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Get device transmit power in dBm"

    ::= { tctSnmMeasurements 3 }

END
```



- 5.7. Note that the query command used to poll for telemetry is different for each version of SNMP.

5.7.1. **SNMP v1**

```
snmpget - On - t 10 -v 1 -c tct <hostname|IP> .1.3.5.1.4.1.54505
```

5.7.2. **SNMP v2**

```
snmpget - On - t 10 -v 2c -c tct <hostname|IP> .1.3.6.1.4.1.54505.1.1
```

5.7.3. **SNMP v3 \***

```
snmpget - On - t 10 -v 3 -l authPriv -u **** -a sha -A **** -x aes -X  
**** <hostname|IP> .1.3.6.1.4.1.54505.1.1
```

\* You will need to obtain a username, password and passphrase from Transcelestial when setting up the SNMP client

## 6. Transcelestial cloud-based monitoring features

- 6.1. The Transcelestial cloud-based monitoring dashboard provides access to time-series graphs with selectable time scales and refresh intervals for the following metrics:

- 6.1.1. Transmitted (Tx) power
- 6.1.2. Received (Rx) power
- 6.1.3. Received (Rx) power threshold for LOS
- 6.1.4. Device uptime

- 6.2. The Transcelestial cloud-based monitoring dashboard also allows users to see alarms and to choose to receive email alerts for the following alerts:

- 6.2.1. Received (Rx) power WARNING (close to LOS threshold)
- 6.2.2. Received (Rx) power ALARM (LOS)
- 6.2.3. Device down (Power loss/no data from device)

## 7. Using Transcelestial cloud-based monitoring (Grafana)

- 7.1. Transcelestial will provide you with a link and login instructions separately.
- 7.2. Upon logging in, you will see a snapshot of the current state of CENTAURI devices for your deployment.



7.3. Hover over the graphs to see the exact data points for each measurement at a specific point in time.





7.4. Click and drag to select a specific period to zoom in on.



7.5. After selecting the timeframe to view, the zoomed-in view will be displayed





- 7.6. Use the date/time picker fields in the upper right part of the dashboard to manually select a time period and adjust the view of the dashboard.



- 7.7. Refresh the dashboard to see the most up-to-date telemetry from the devices. Choose to set an “auto-refresh” interval.







- 7.8. To filter the dashboard to see data from specific devices, CTRL + click on the device names below the graph and select which devices to include.

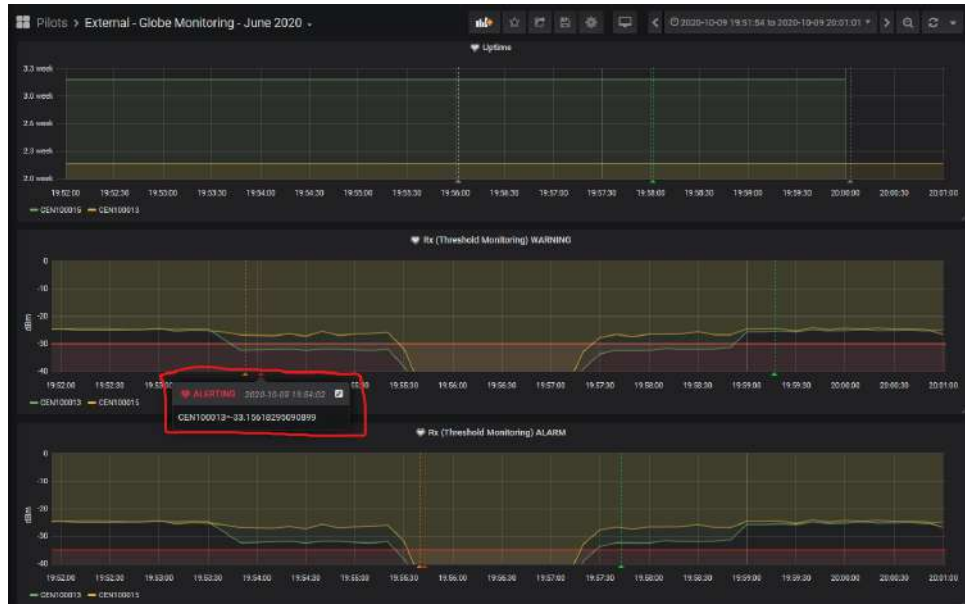


- 7.9. Warnings and alarms (alerts) will appear in the cloud-based dashboard. Choose to have alerts delivered by email, as well.
- 7.10. The monitoring system will trigger alerts for the following events



### 7.10.1. **WARNING:** Rx power close to LOS threshold for >10s

#### Monitoring Dashboard View



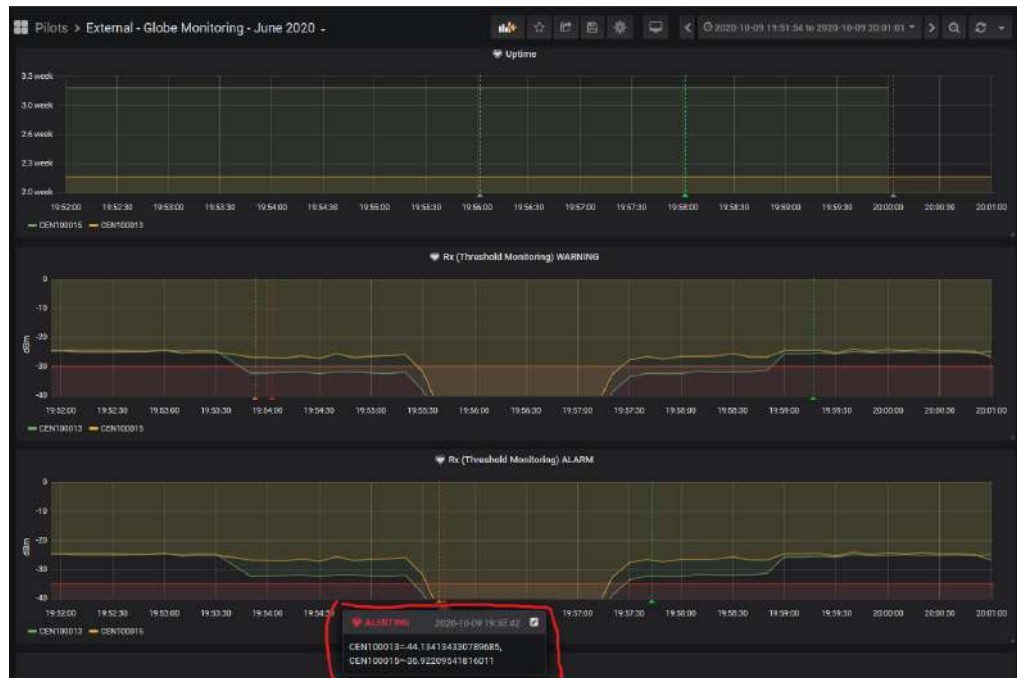
#### E-MAIL View





### 7.10.2. **ALARM:** Rx power too low for >10s, LOS

#### Monitoring Dashboard View



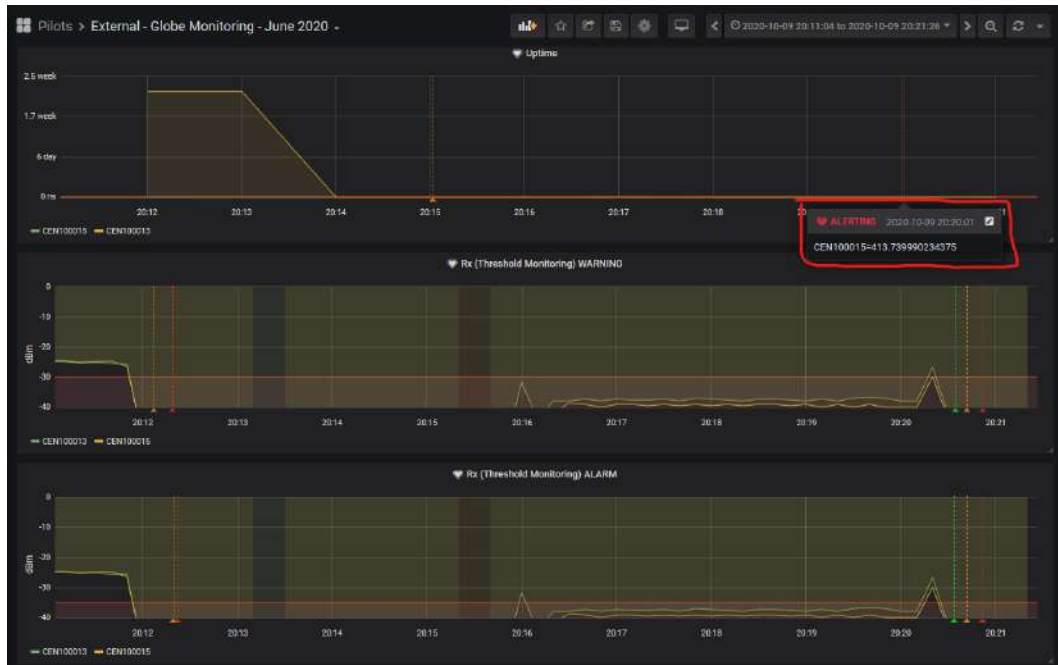
#### E-MAIL View





### 7.10.3. ALARM: Device Power Off, Link Down

#### Monitoring Dashboard View



#### E-MAIL View





## Troubleshooting

There are issues which may occur during deployment. Some of the more common challenges are listed below across several different areas.

You may always access the [CENTAURI Knowledge Base](#) for additional information and the most up-to-date information, or [to submit a support request](#), if needed.

### Power

| Problem  | Troubleshooting actions   |
|--|---|
| No power to device from PoE or AC PoE connection | <ul style="list-style-type: none"><li>• Check AC source for incoming power</li><li>• Ensure that PoE source supports 802.3at/bt</li><li>• If using a PoE injector, is it a model/version tested and recommended by Transcelestial?</li><li>• Are any of the LED's on the device flashing or lit, at all?</li><li>• Is the length of the Cat6A cable connecting PoE to the device &lt; 100m in length?</li><li>• Test Cat6A cable integrity<ul style="list-style-type: none"><li>○ Can a PC that is connected to the same network Ping the CENTAURI device?<br/>Note: The default IP address for CENTAURI is 10.11.12.13/24 subnet 255.255.255.0.</li><li>○ Use a cable tester to ensure cable is properly crimped;</li><li>○ Connect a PC to the Cat6A cable (instead of CENTAURI), and Ping test to another device on the same network.</li><li>○ If Ping tests fail, or they pass with dropped packets, replace the cable.</li></ul></li><li>• If the Cat6A cable pass tests but there is still no power delivered to CENTAURI<ul style="list-style-type: none"><li>○ Verify that PoE is being sent from the switch; and/or</li><li>○ Replace the PoE injector;</li></ul></li><li>• If all the above do not resolve the issue, try connecting CENTAURI to a DC power source</li></ul> |
| No power to device from DC 48V connection        | <ul style="list-style-type: none"><li>• Check the DC source for incoming power</li><li>• Check that the wires connected to the DC terminal plug are securely fastened and that the plug is correctly seated in the DC connector jack.</li><li>• Ensure that the DC cable used is an appropriate gauge. Transcelestial recommends 16AWG for the DC power connection.</li><li>• Use a multimeter to test that the voltage reaching the terminal connector at CENTAURI is more than 40V. If the voltage arriving at CENTAURI is less than 40V, replace the cable with a larger gauge cable.</li><li>• If the above steps do not resolve the issue, we recommend trying to power the device using AC PoE.</li></ul>   |



## Fibre

| Problem  | Troubleshooting actions  |
|--|--|
| Fibre port on switch/device has no LED indication  | <ul style="list-style-type: none"> <li>The data link requires use of Duplex single mode fiber with LC connectors.</li> <li>The maximum length of the fiber cable must be within the limits allowed by the SFP/SFP+ adapter. <ul style="list-style-type: none"> <li>Check the SFP/SFP+ used (single mode and distance)</li> <li>SFP/SFP+ used on both switch and device are the same make?</li> </ul> </li> <li>IS the fiber cable tx/rx terminated correctly at both ends?</li> <li>TX-&gt;RX and RX-&gt;TX</li> <li>Check the Grafana dashboard for SFP-related power indication. This should show the TX-RX of the external SFP port</li> <li>If the TX/RX power is &lt;-10dbm then proceed to check the Rx power on the switch end of the fiber.</li> <li>If there is power coming from the switch, then the cable is fine. Proceed to change SFP/SFP+.</li> <li>If the above steps fail to resolve the issue, try changing to an alternate fiber port on the switch, if possible.</li> </ul> |
| Traffic has high drops noticed at the switch, but the laser link appear to be fine based upon monitoring data (via NMS or Grafana) | <ul style="list-style-type: none"> <li>Check for any sharp bends on the fiber cable route between CENTAURI and the switch. Ensure fiber cable is routed with no sharp bends</li> <li>Check fiber cable health by using a power meter to check RX power on the switch end of the cable</li> <li>If fibre cable appears to be working properly, change the SFP/SFP+.</li> </ul>  |

## Alignment

| Problem  | Troubleshooting action  |
|--|---|
| Unable to reach the DMD App when my laptop is connected to management port | <ul style="list-style-type: none"> <li>The default IP address for the DMD App is <a href="https://10.11.12.13">https://10.11.12.13</a></li> <li>If the "Get IP Address Via DHCP" option is selected then the IP address for the device may have been assigned by whatever router the device is connected to.</li> <li>You can reset the device to factory defaults (including default static IP) by following the <a href="#">instructions here</a>.</li> </ul> |
| Unable to log into DMD App using my user id and password                   | <ul style="list-style-type: none"> <li>Try using the default user id and password for the DMD App. It may be that the device was reset to factory defaults before your login attempt</li> <li>If you changed the local user password and cannot remember it, you may want to consider <a href="#">performing a factory reset</a>.</li> </ul>  |



## “Link down” events

| Threshold Type                             | CENTAURI 1G | CENTAURI 10G |
|--|-------------|--------------|
| Warning Threshold<br>(Near Loss of Signal) | -30 dBm     | -22 dBm      |
| Alarm Threshold<br>(Loss of Signal)        | -35 dBm     | -25 dBm      |

| Problem  | Troubleshooting actions  |
|--|--|
| Grafana/NMS shows link is down, RX power is below -35 dbm for 1G, or -25 dbm for 10G   | <ul style="list-style-type: none"> <li>• Monitor and observe for a few minutes to see if the link recovers</li> <li>• If the link is down for more than 10 minutes and there is no rain event on site, check to see if monitoring data is still being received by Grafana or your NMS. <ul style="list-style-type: none"> <li>◦ If there is monitoring telemetry despite the link being down, then power is still on at the site.</li> </ul> </li> <li>• If the link fails to recover during or after a heavy rain event, you may need to go on site to check if there are any Line of Sight (LOS) obstructions, any material blocking the CENTAURI laser aperture/window, or if a significant impact or vibration event, or pole sway has caused significant misalignment of the device.</li> <li>• If the link is still down despite all on site conditions returning to normal, perform a reboot/power cycle on CENTAURI.</li> </ul>  |
| Monitoring shows link down but there is no rain event or other known disruption event. Devices have been rebooted/power cycled and link remains down | <ul style="list-style-type: none"> <li>• Perform a local ping test to the device from a PC (Ping to whatever IP has been set via static IP or DHCP)</li> <li>• If no ping available, check power (refer to <a href="#">power troubleshooting</a>)</li> <li>• If the ping and power troubleshooting steps fail to help resolve the issue, then the device needs to be sent for RMA. <a href="#">Submit a Return Materials Authorisation (RMA) request</a>.</li> <li>• If spare devices are available, swap out the affected device to restore service as soon as possible.</li> <li>• If ping is available, you may need to check the alignment of the device at one or both ends of the link, using the CENTAURI app. See <a href="#">Alignment</a> and <a href="#">Using the CENTAURI App</a>.</li> <li>• If both devices appear to be aligned and paired, but the link remains down, <a href="#">contact Transcelestial support and request escalation of your issue</a>.</li> <li>• You will need to ensure that “Allow Remote Access” is enabled under “<a href="#">Device Settings</a>” for each device, and that the devices are connected to the internet to allow remote troubleshooting.</li> </ul> |





## SNMP Monitoring

| Problem   | Troubleshooting Actions  |
|---|--|
| Unable to import devices to NMS using SNMP            | <ul style="list-style-type: none"><li>• Please use the .txt MIB file provided by Transcelestial and configure the OIDs accordingly</li><li>• SNMP MIBs are available for Rx power, Tx power, and LOS (link status)</li></ul> |
| Unable to write changes to device properties via SNMP | <ul style="list-style-type: none"><li>• Expected behaviour</li><li>• Write access for SNMP will be enabled only when devices not managed by Transcelestial</li></ul>   |

## Grafana Monitoring

Transcelestial may provide free access to Grafana dashboards for the purpose of monitoring for your CENTAURI links. Grafana is a cloud-hosted data streaming service, configured and managed by Transcelestial.

For proper configuration and management of CENTAURI, both devices in a link must have an internet connection which is available via the management port.

| Problem  | Troubleshooting Actions   |
|--|---|
| Only one device RX power, link status and TX power is reported | <ul style="list-style-type: none"><li>• Check that all devices in the link have internet connectivity</li><li>• Check the router and power cycle the specific port (if possible) or the router to which the "lost" device is connected</li><li>• Check the health of the Cat6 cable from CENTAURI to the switch or router. Try a Ping test to confirm access to the device.</li></ul> |
| Login/Password not working                                     | <ul style="list-style-type: none"><li>• <a href="#">Contact Transcelestial support</a></li></ul>  |
| No throughput data metrics available                           | <ul style="list-style-type: none"><li>• Expected behaviour for a Layer 1 device</li><li>• Telemetry will only provide metrics consistent with those used to monitor Layer 1, SFP/SFP+: Rx power, Tx power, and link status</li></ul>  |



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## Document Revision History

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| 1 March 2021     | 1.1   | Dinesh Kummaran          |
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| 13 July 2021     | 1.3   | Dinesh Kummaran          |
| 30 November 2021 | 2.0   | Chip Wilcox              |
| 14 December 2021 | 2.0b  | Chip Wilcox              |
| 9 February 2022  | 2.1   | Chip Wilcox              |
| 9 June 2022      | 2.2<br>- New DMD App  | Chip Wilcox              |
| February 2023    | 3.0<br>- Updated compliance information<br>- Laser Safety information updates<br>- Multiple changes to features   | Chip Wilcox              |
| March 2023       | 2023.03.1+2<br>- Minor updates to laser safety and installation precautions   | Anna Bell<br>Chip Wilcox |
| March 2023       | 2023.03.3<br>- Change all headers to sentence case<br>- Update figure numbers<br>- Laser safety changes consistent with intended version changes<br>- Emphasise key warnings which prevent successful deployments and cause support escalations (i.e. preventable user errors)<br>- Consolidate SNMP info in one section<br>- Move SNMP info to "first" and Grafana to "second" | Chip Wilcox              |
| September 2023   | 2023.09<br>- Change minimum distance supported for alignment from 200m to 50m<br>- Removed images that show link deployment distances from 200m - 3km<br>- Added support portal link to latest SNMP alarms and traps info<br>- Added support portal link to latest MIB file   | Dinesh Kummaran          |