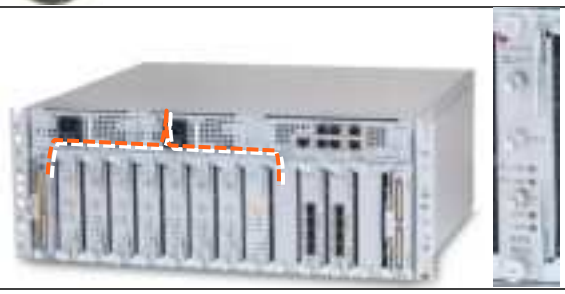
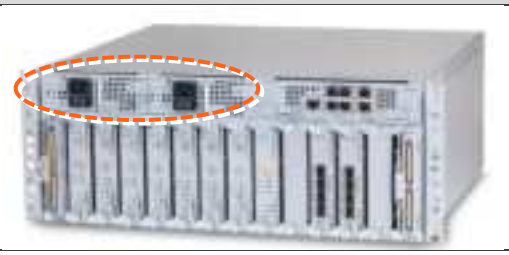
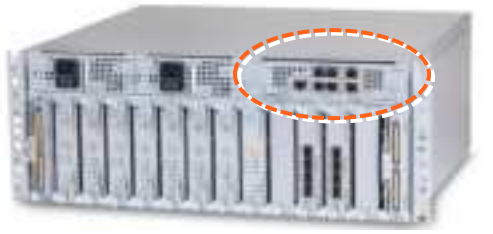
2.6.1 Verify Box Contents

2. Open the package and verify all elements are available according to the following table:

Table 9: HEU Package Items List

Item	Quantity	Image	Part Number
HARDWARE – provided in the box			
Headend Unit Chassis (with blank panels on RIM and one PSM slots) – includes factory installed Fan Module (FAM) in chassis rear	1		
FAM Fan Module (FAM) – single unit hosting 4 fans (factory installed in chassis rear)	1		
RJ45/RJ45 communication cable L=2m-2.15m (P/N 705900003) – HCM management cable	1		
RIM kit: Radio Interface Module (service specific)	1-12 (according to order)		
RIX Module Kit Radio Expander Module – expands the RF sources to the OIU	1 or 2 (according to order)		
Pilot Transport Cable (P/N: PCKC47*) – Single QMA to QMA cable; L = 47 in; used for passing reference clock signal connections between RIX modules. *Additional lengths can be ordered: • PCKC20: L=20 in • PCKC63: L=63 in • PCKC79: L=79 in	1		

Item	Quantity	Image	Part Number
ERFC (Expander Cable) - RF interface cable to HEU; 9 pin SMP to SMP connector Available in five different lengths: • ERFC16: L= 16 in • ERFC24: L= 24 in • ERFC34: L= 34 in • ERFC40: L= 40 in • ERFC59: L= 59 in	1		
DCM kit **Optical cables** Up to 900 meters LC/UPC SM DX **SFP+ Pluggable Transceivers** (hot-pluggable optical transceiver module); Support for option 8 line-rate 10.1 Gbps, single mode			
ETM Kit: ETM Expander Termination Module (for unused Expander slot) unit	1		
PSM Kit (AC or DC modules): • **PSM-AC**: 100-240 VAC Power Supply Module including standard IEC 60320-1 C13 cable • **PSM-DC**: 48 V DC Power Supply Module; 9 A Max.; Includes six pin terminal block connector	1 or 2 kits (according to order)		

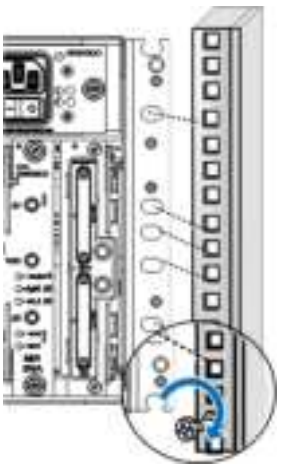
Item	Quantity	Image	Part Number
			
Controller Module Kit (HCM or ACM - according to order) • **dHCM Kit** (Headend Control Module) – installed in Main HEU unit; enables remote/local management of all hosted units • **ACM Kit** (Auxiliary Control Module) – installed in Auxiliary HEU units; provides management connections for the Auxiliary HEU.			

2.6.2 Mount the Chassis in a Rack

Notes:

- *One HEU supports connections to up to four IHUs*
- *IHU chassis requires 4U rack height availability*
- *Rack nuts and screws not provided*

1. Determine the location of the HEU in the rack while considering additional HEU and IHU units and the lengths of the available ERFC cable.
2. Refer to **Error! Reference source not found.** for planning the rack positions.
3. Secure the units' rack ears to the rack frame as follows:
   - Insert two screws half-way into the rack frame.
   - Position the chassis on to the screws using the handles and the top and bottom half slots of the rack ears.
   - Secure the unit in the rack via all applicable bracket holes using the appropriate rack nuts and screws.



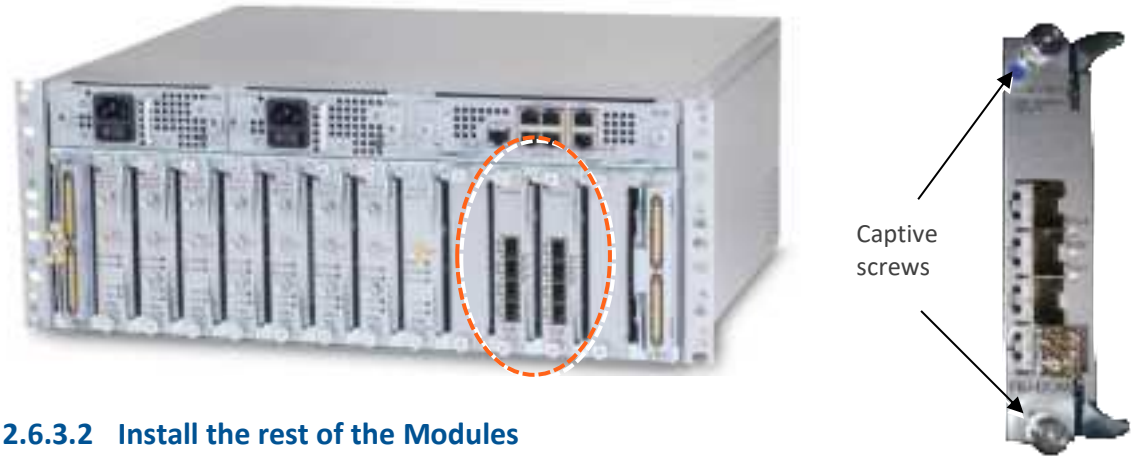
Installing Chassis in Rack

2.6.3 Install the Modules in the Chassis

Note: For modules with ejectors (i.e. RIM, RIX OIM, OIX, DCM and HCM/ACM) – verify that the ejectors are completely open when inserting in dedicated slot and then push in until the module clicks in to the backplane. See Figure 13: Module Captive Screws and Ejectors below, that shows an example of module type captive screws and ejectors.

2.6.3.1 Install the DCM Module

1. Slide the DCM to its slot in the HEU chassis
2. Secure the DCM to the Rack with the 2 captive screws



2.6.3.2 Install the rest of the Modules

Refer to Figure 12: IHU Interfaces and Slots for module locations. Remove blank panel and slide in the relevant module (chassis slots are 100% mistake proof):

- (One) HCM (for Standalone/Master HEU units) / (One) ACM (for Auxiliary HEU unit)
- (One to two) PSM – for single power supply installations, install the PSM in either (PSM) slot
- (One) RIX module
- (One to eight) RIM – no need to terminate unoccupied RIM slot
- (One to two) DCM
- (One) RIX

Referring to the following figure, secure the modules to the backplane by:

- Closing the ejectors (for relevant modules)
- Tightening the captive screws

Figure 13: Module Captive Screws and Ejectors

2.6.4 Connect the Cables

2.6.4.1 Ground

The grounding connection is performed via a two-hole, standard barrel grounding lug located on the HEU rear panel.

- For use with stranded copper wire conductors
- 10-14 AWG
- Holes - 1/4 inch

Grounding Lug (Chassis Rear)

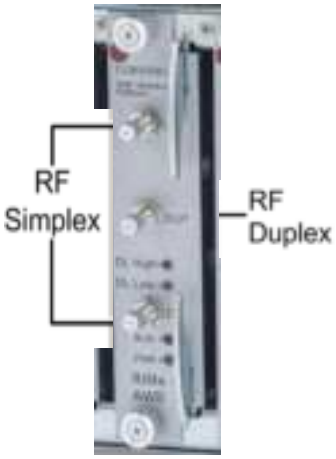
2.6.4.2 Connect RIMS to RF Source(S)

For each RIM - connect the external RF source to the corresponding RIM (service specific) Simplex or Duplex QMA connectors:

a. For each RIM - connect the RF coax cable to the RIM's Simplex or Duplex QMA connectors.

b. Route the connected cables through the Cable Management Tray towards the right or left of the tray (depending on the module location in the chassis).

c. Connect the RF coax cable from the RIM to the corresponding external RF source.



RIMs connections

2.6.4.3 RIX 10 MHz Pilot Clock Connections

Notes:

- *This section is only relevant for configurations with additional IHU or HEU and OIU units.*
- *The REF IN and REF OUT pilot clock ports must be connected in a closed loop.*
- *Both RIX modules of each chassis must be connected.*
- *The jumper cables are routed through the sides of the cable management tray and door.*

Referring to the following Figure, use the QMA/QMA jumper cable (PCKC47 provided with each RIX) to connect the REF OUT and REF IN ports of each of the RIX modules in the HEU chassis. See Figure 10

Note: use SFP+ from the approved list provided by Corning.

1. Remove the rubber stopper from the source port.
2. Push the SFP+ connector into the port, until it clicks (note that there is only one correct direction for plugging-in).
3. Remove the white plug-protectors from the end of the SFP+ cable.
4. Plug the SFP+ cable into the D-MRU port until it clicks.
5. connect the other edge of the cable to the source unit

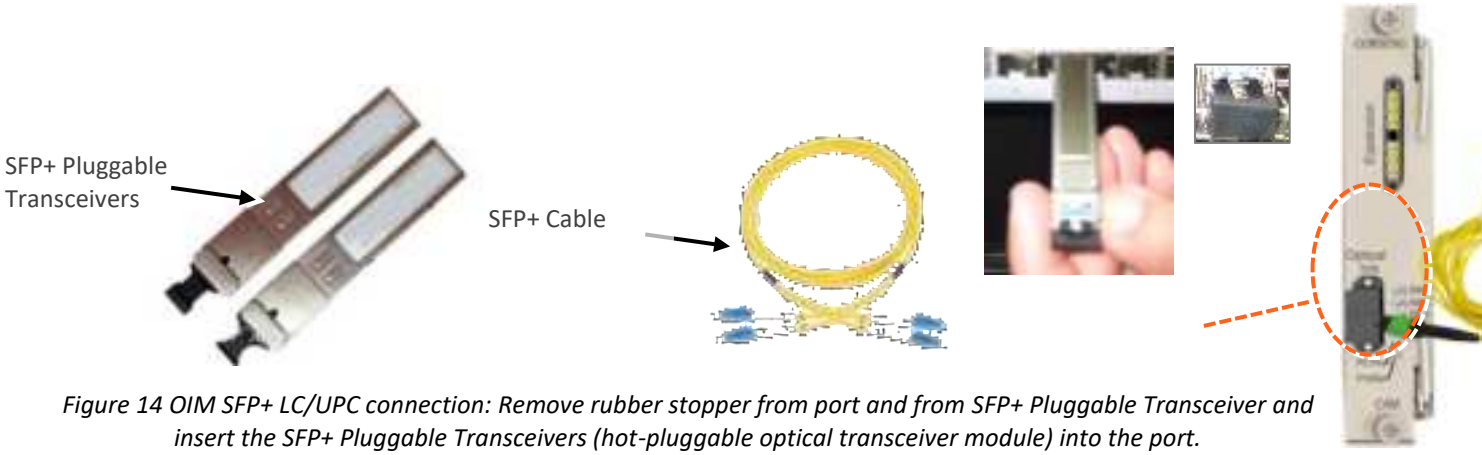


Figure 14 OIM SFP+ LC/UPC connection: Remove rubber stopper from port and from SFP+ Pluggable Transceiver and insert the SFP+ Pluggable Transceivers (hot-pluggable optical transceiver module) into the port.

2.6.4.4 RIX to OIX Connections

Note: Each RIX module supports connections to up to two IHU.

1. Using the appropriate length ERFC cable (according to distance of available OIX port) connect the HEU RIX module 9-Pin connector to the corresponding connector on the IHU OIX module.

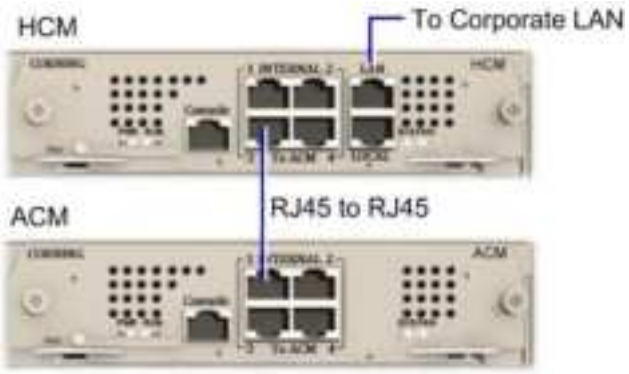
2. Refer to TBD for schematic diagram of coax connections in a maximum HEU-OIU configuration of 4x4 where all HEU units are connected to all IHU units.

2.6.4.5 Management Connections

Notes:

- *One RJ45/RJ45 management cable is provided with each headend unit (i.e. HEU/IHU).*
- *Up to 7 ACMs are connected to a single HCM, where the connection between the units is using RJ45 cables.*

- For HCM modules only - using the provided RJ45/RJ45 communication cable, connect the HCM LAN port to the corporate LAN:



HCM LOCAL Port to ACM Port LOCAL Management Connection

- HCM to ACM Management Connections - using RJ45/RJ45 communication cables perform the headend management connections according to the following:
- Referring to the above Figure - for configurations with one HCM and up to four ACM modules (e.g. one HEU and four HIU units), directly connect as follows

From (any) HCM ….	To (any) ACM…
INTERNAL (TO ACM) Port 1/2/3/4	**INTERNAL (TO HCM**) Port 1/2/3/4

- Referring to the following Figure - for configurations with one HCM and more than four ACM modules (e.g. 4x4 HEU-OIU configurations) where there are only four available HCM INTERNAL ports

2.6.5 Additional stack and DRU connections

➢ **For connections to additional IHU or HEU and DRU units:**

Using the appropriate length ERFC cable (according to distance of available OIX/RIX port) connect remaining IHU RIX and OIX module connectors as follows:

- Connections to additional IHU unit (see Figure 6) :
  - IHU #1 RIX 9-Pin connector to the corresponding IHU #2 OIX module
  - IHU #1 OIX 9-Pin connector to the corresponding IHU #2 RIX module
- Connections to additional HEU and OIU units (see Figure 7):
  - IHU RIX 9-Pin connector to the corresponding connector on the OIX module of the additional OIU.
  - IHU OIX 9-Pin connector to the corresponding connector on the RIX module of the additional HEU.

Note: The RIX and OIX modules of the additional HEU unit must also be connected.

See use cases for details, section 1.4.1

2.6.6 Power ON

- For PSM-AC modules – connect supplied power cable (100-240 VAC) connector to the PSM input connector and to the AC outlet and switch on..
- For PSM-DC modules – refer to Quick Start Guide provided with module for wiring pinout.

Verify that the Power Status LED on each PSM shows green. See Figure 13 for PS<-AC LED.

AC Power Supply Module LEDs

2.6.7 Verify NORNAL Operation

If RF source is operational, verify that the RIM, DCM and HCM/ACM LEDs indicate normal operation

Module	LED	Description
RIM	Protect	N/A
	DL High	Off - DL RF input level in threshold range Steady Red – DL RF input level is 3dB above max expected power
	DL Low	Off - DL RF input level in threshold range Steady Red - DL RF input level is 15dB below max expected power
	RUN	Blinking Green - RIM module SW has initialized and is up and running Off – Power off
	PWR	Steady green - Input power is within required range
HCM/ACM	PWR	Steady Green - Power input detected by HCM/ACM
	RUN	Blinking Green – HCM module SW up and running
	SYS	Steady Green - Overall status of the managed system is ok
	FAN	Steady Green – Normal operation status for all fans

3. Session Access and Main Menu

Once all the system elements are installed, the system administrator can log in to the system GUI and perform initial configurations.

It is recommended to begin working with the Corning® Everon™ 6000 by following these steps:

1. Review the supported access options (section 1.1) and default network settings (section 1.2).
2. Open a local session to the HCM (section 1.3).
3. Configure the network settings to allow future remote access (section 1.6).
4. Follow the instructions to perform the initial configurations using the system GUI (chapter 2).

3.1 Supported Access Options

This section describes the HW and SW required to connect to the HCM.

First connection to the HCM should be done with a laptop or a tablet.

The following browsers are supported:

- Microsoft Internet Explorer 11.0 and above
- Mozilla Firefox 42.0, 43.0, and above
- Google Chrome 45.0, 46.0, and above

After the initial configurations are done, it is recommended to establish remote access to the HCM by using the following:

- LAN Ethernet connection to the HCM with a minimum connectivity and throughput capability of 256 Kbps.

3.2 Default Network Settings

The HCM has three types of RJ45 Ethernet ports: LOCAL port, LAN port and four INTERNAL ports.

- LOCAL Port: 1 Gb Ethernet connection for a local setup session.
  The port can be configured as a DHCP server (connected to a DHCP client computer) – this is the default. Alternatively, a static IP address can be used. The default static address is: 193.168.1.1; Subnet Mask: 255.255.0.0

Note: The LOCAL port is designated for a local connection. However, the port may be used for a remote session as well, for troubleshooting and service purposes. In any case, don't connect a netword device to the port if it's configured as a DHCP server, as the server will disrupt the LAN IP addressing.

- LAN Port: 1 Gb Ethernet connection to the customer's network for remote management. Can be configured to simultaneously support IPv4 as well IPv6 network protocols.
- INTERNAL Ports: Four RJ45, 100 Mb Ethernet ports used for management of connected ACMs.

Note: Any one of these ports can also be used for a local connection if required.

Default settings: IP: 10.0.0.1; Subnet Mask: 255.0.0.0

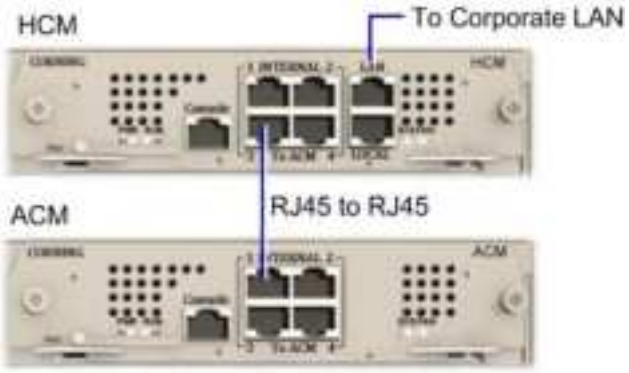
3.3 Opening a Local Session

Below are the instructions for opening a local management session in order to perform basic system configurations via the system GUI.

➢ **To Open the system GUI**

1. Connect a computer (i.e., laptop) to the HCM LOCAL port via an RJ45 Cat 5 Ethernet cable, as shown below:

- For HCM modules only - using the provided RJ45/RJ45 communication cable, connect the HCM LAN port to the corporate LAN:



HCM LOCAL Port to ACM Port LOCAL Management Connection

IMPORTANT: The LOCAL port is set by default as a DHCP server. DO NOT connect the HCM LOCAL port to a network as the DHCP server can disrupt LAN IP addressing.

The local port can also be set to a static IP Address. This requires setting up your computer network parameters in the same subnet as the default IP Address of the local port: 172.16.1.1

The default IP address for HCM v2.2 and lower is 192.168.1.1.

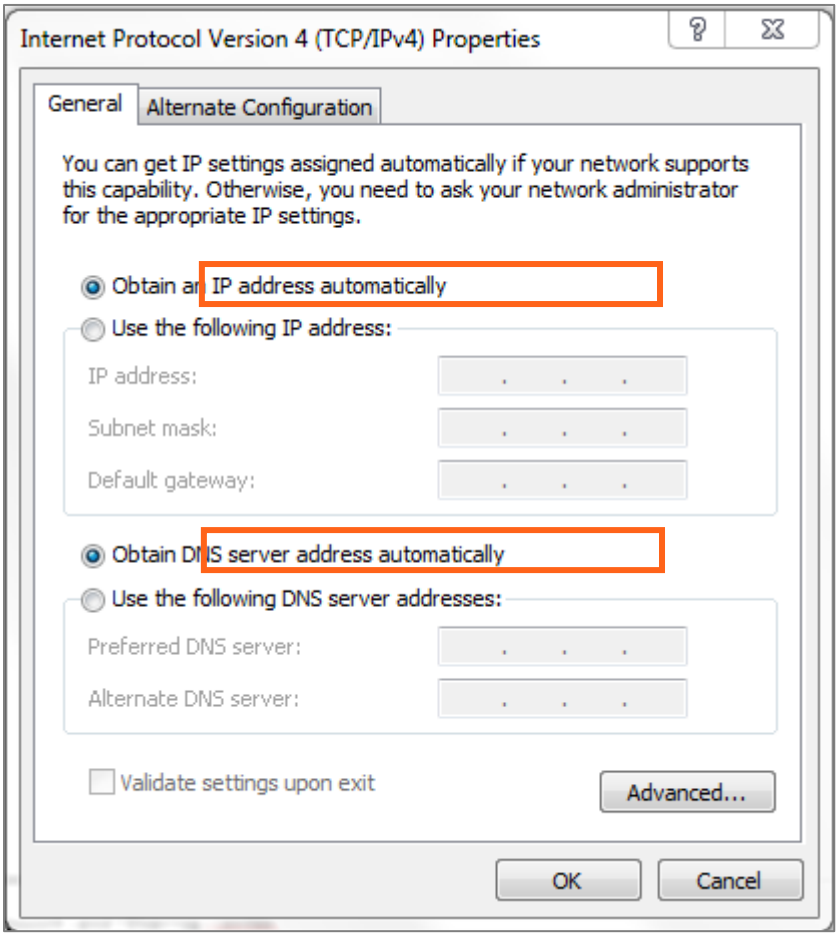
2. On your computer, verify that the Local Area Connection settings for obtaining the IP address and the DNS server address are set to "automatic":

- "Obtain IP Address automatically."
- "Obtain DNS server address automatically".

Follow these steps to find the settings above (the steps may vary slightly depending on the OS version used):

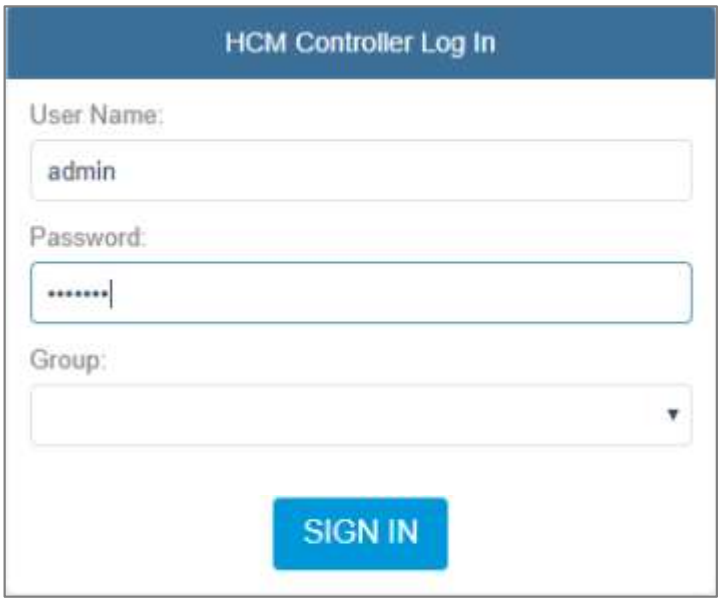
1. Go to the Control Panel.
2. Select Network and Internet.
3. Select Network and Sharing Center.
4. Select Change adapter settings (in the left menu).
5. Right click Local Area Connection and select "Properties".
6. Select Internet Protocol Version 4/6 and click "Properties".

   The window below appears:



3. Open a browser and type-in the following address in the address bar: 193.168.1.1

   The HCM Controller Log In dialog appears:



4. For first-time authentication use the following default values:
   - Username: admin
   - Password: default provided with your system.
   - Group: leave blank.

IMPORTANT! For security reasons it is highly recommended to immediately change the password (via the "Admin" -> "Security" tab) and log in again using the new password.

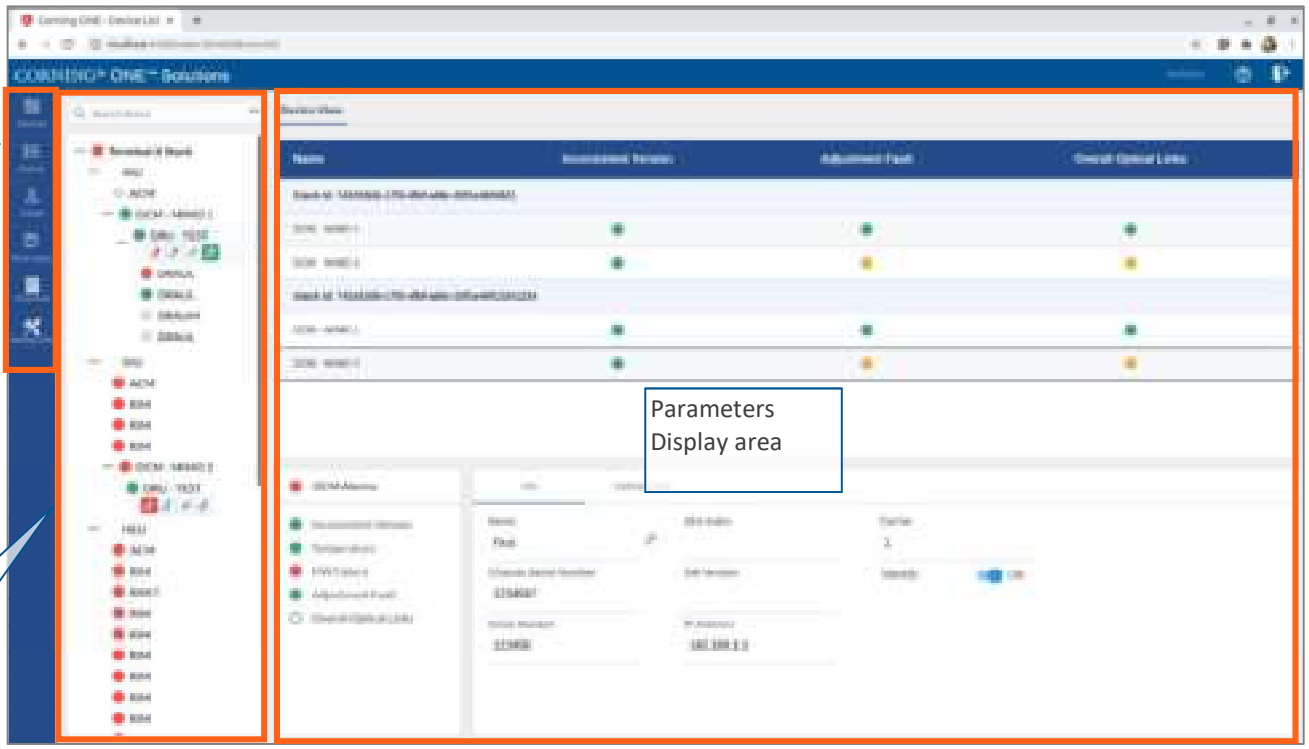
5. Click the "SIGN IN" button. System GUI main screen appears.

SCREEN

3.4 Screen Layout

The main menu (located to the left of the window) lists all the available management options.

Next to the main menu either the system tree or the corresponding sub-options are displayed. The display changes according to the option selected from the main menu.


Main Menu
System tree / sub-options
Parameters Display area

3.5 Main Menu Options

The table below lists the management options provided by the main menu:

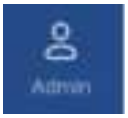
Table 10: Main Menu Options

Icon	Enables user to…
	View the system topology and information about the different system elements.
	View all system events and generate reports.
	Perform initial system configurations. **This option is only visible to the system administrator.**
	Administrative options to perform system configurations, implement updates, define and monitor user's activity.
	View the information of the different stacks of the system.
	Manage the system RF channels.

3.6 Remote Management

This section describes the configurations required for remote session access using Ethernet connection via the LAN port.

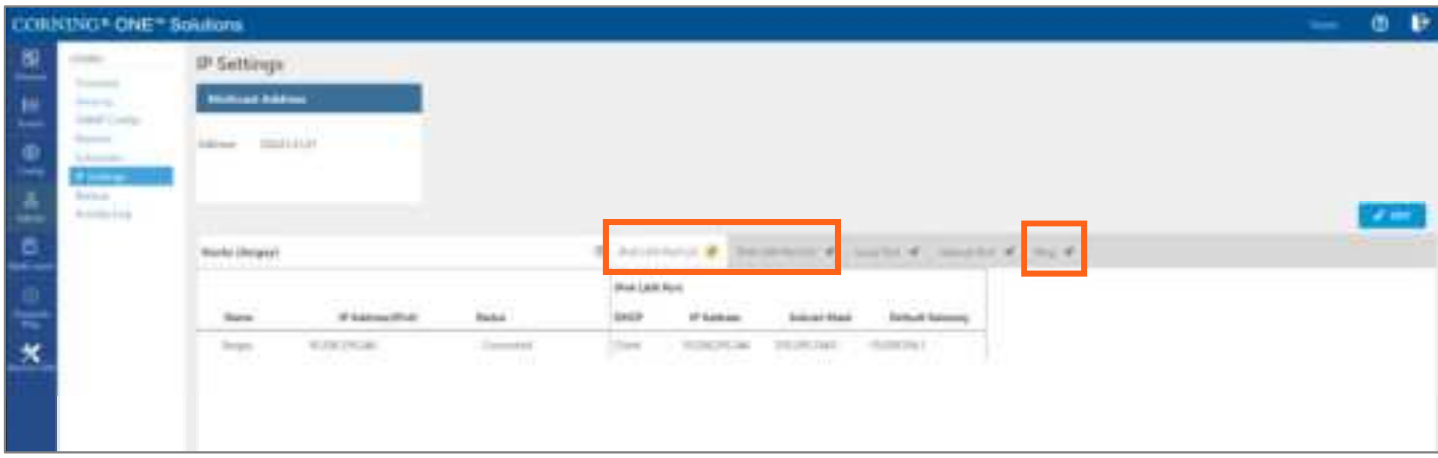
➢ **To configure the HCM LAN port**

1. In the main menu bar, click 

→ 

.
2. Select the "IPv4 LAN Port" or "IPv6 LAN Port" tabs and click the 

button.



3. For Static IP Address — set DHCP as "None," set the IP address, subnet mask and default gateway manually to legal values, which aren't used by other system elements. Make sure the address format matches IPv4 or IPv6, according to the tab being updated.

   For Dynamic IP Address — set DHCP as "Client" and click OK.
4. All HCMs in the MS-group are automatically updated when one stack in the group is updated.
5. Run a browser and enter the LAN port IP Address in the address bar to open a remote management session.

A Ping Tool option is provided to verify access to IP hosts (rather than opening another application).

For more information about the ping tool and the IP Settings tab refer to section 3.1.3.5.

4. Initial Commissioning

This section describes all the initial configurations that must be done by the system administrator.

4.1 Main Menu Config Option

The 

option in the main menu is only visible to the system administrator. This section describes the configurations that only the system administrator can perform.

4.1.1 Site config

When choosing the **Site Config** option from the **Config** submenu, the following screen appears:

An image represents each relevant site. By clicking on the site image, the configuration options for the specific site appear. The configuration options are described below.

2.1.1.1 Module Owner

The **Module Owner** tab shows all system chassis with the RIMs inside each chassis.

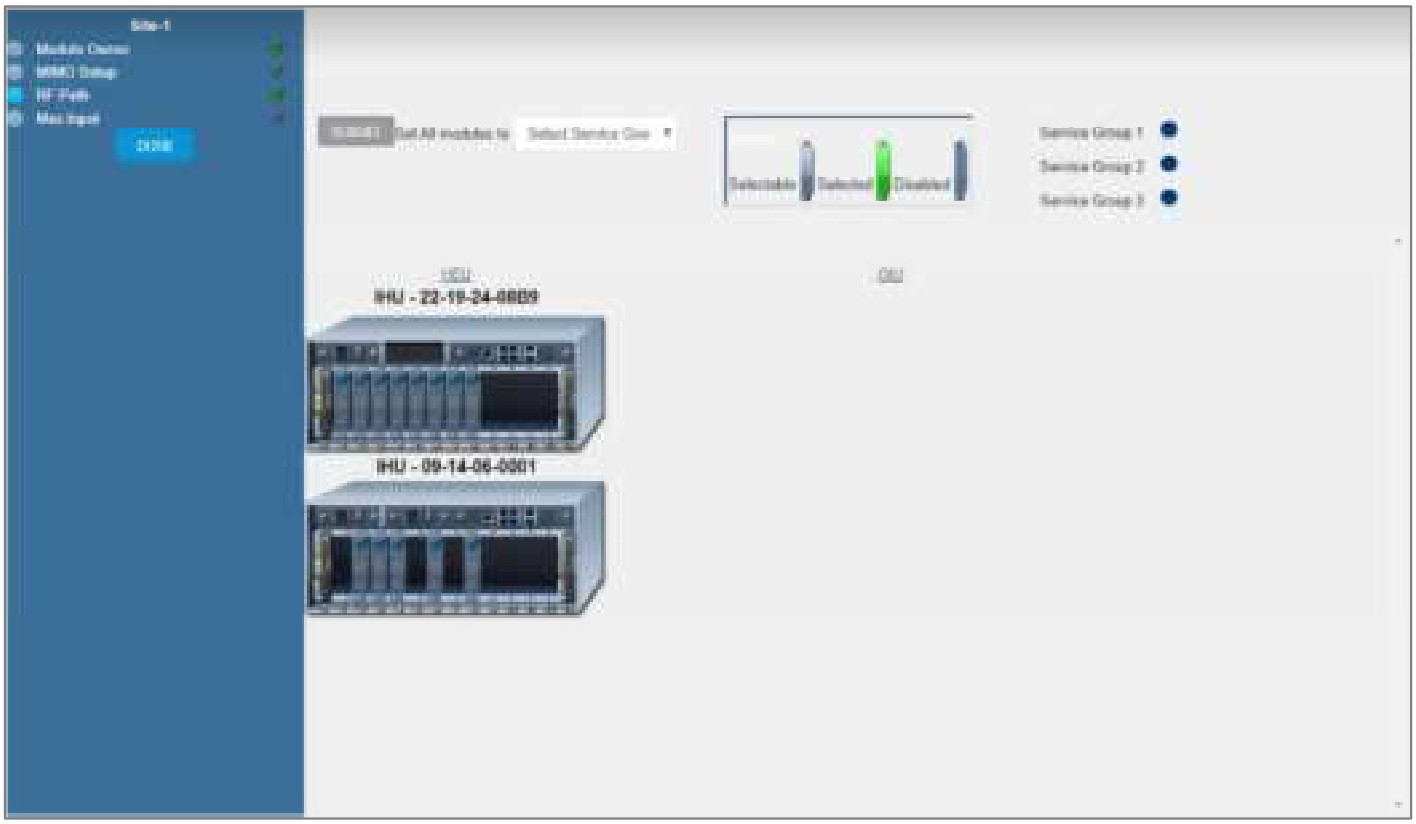
The user can click on a RIM to have the carrier name displayed. This view is read only – changes to RIM carrier assignments can only be done via the Channels tab in the main menu.

2.1.1.2 RF Path

The **RF Path** tab enables the user to easily see which RIMs belong to which service group.

A service group consists of one or more RIMs which are connected to a DCM, and via a DRU to one or more remote units. Up to 2 service groups are supported. This view is read only.

A RIM can be selected to show to which service group it belongs. Alternatively, a service group can be selected to show all the RIMs which belong to it.



2.1.1.3 Max Input

The **Max Input** tab allows the configuration of three parameters for each RIM:

- Max Expected Power
- UL Gain Mode
- UL Gain Value

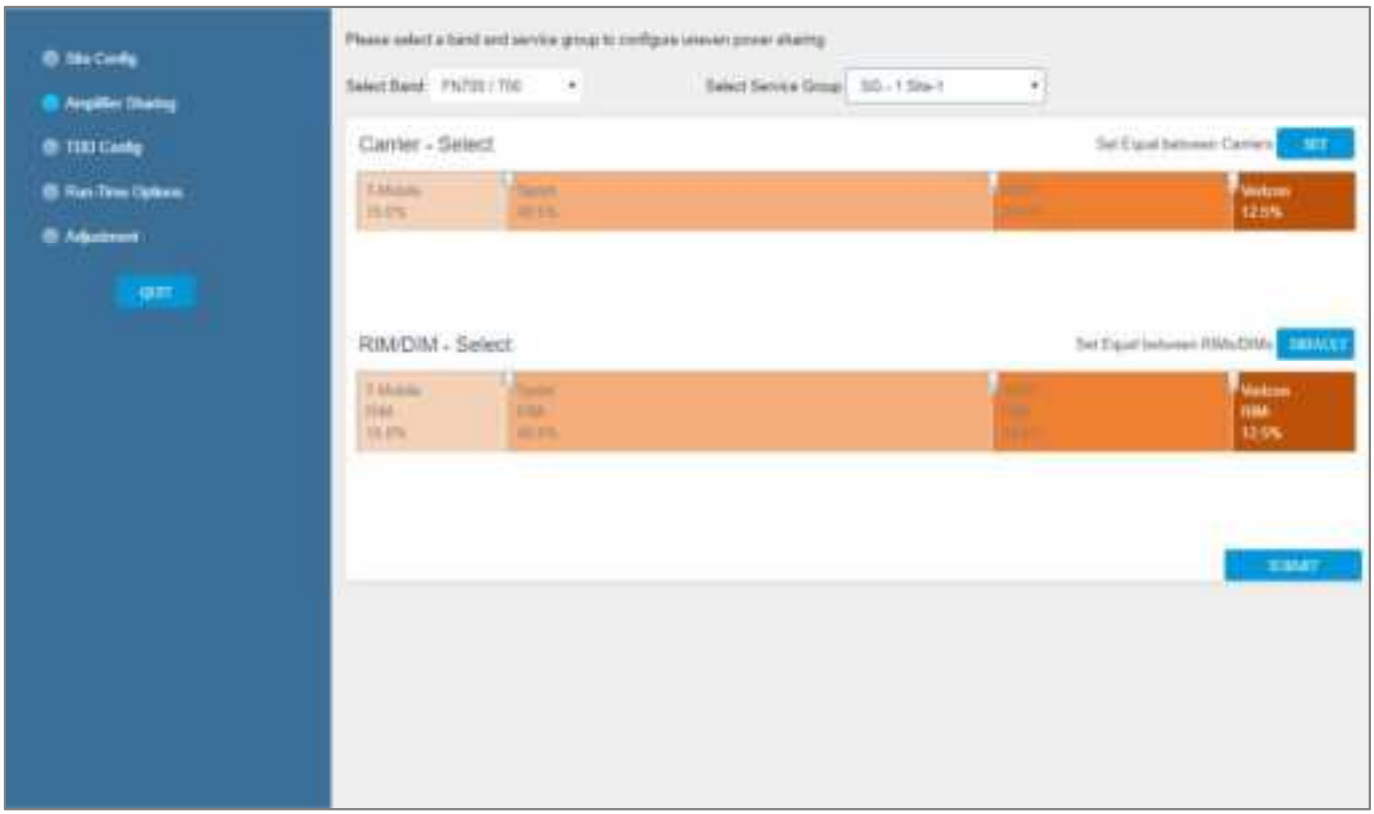
A single RIM can be clicked to be configured. Alternatively, a group of RIMs can be configured by selecting a service group, chassis or a frequency band.


Select All
- Select Group -
- Select Chassis -
- Select Band -
Manual

4.1.2 Amplifier Sharing

The **Amplifier Sharing** tab shows all supported frequency bands and the carriers sharing each band.

The carriers are sharing the power associated with the frequency band.



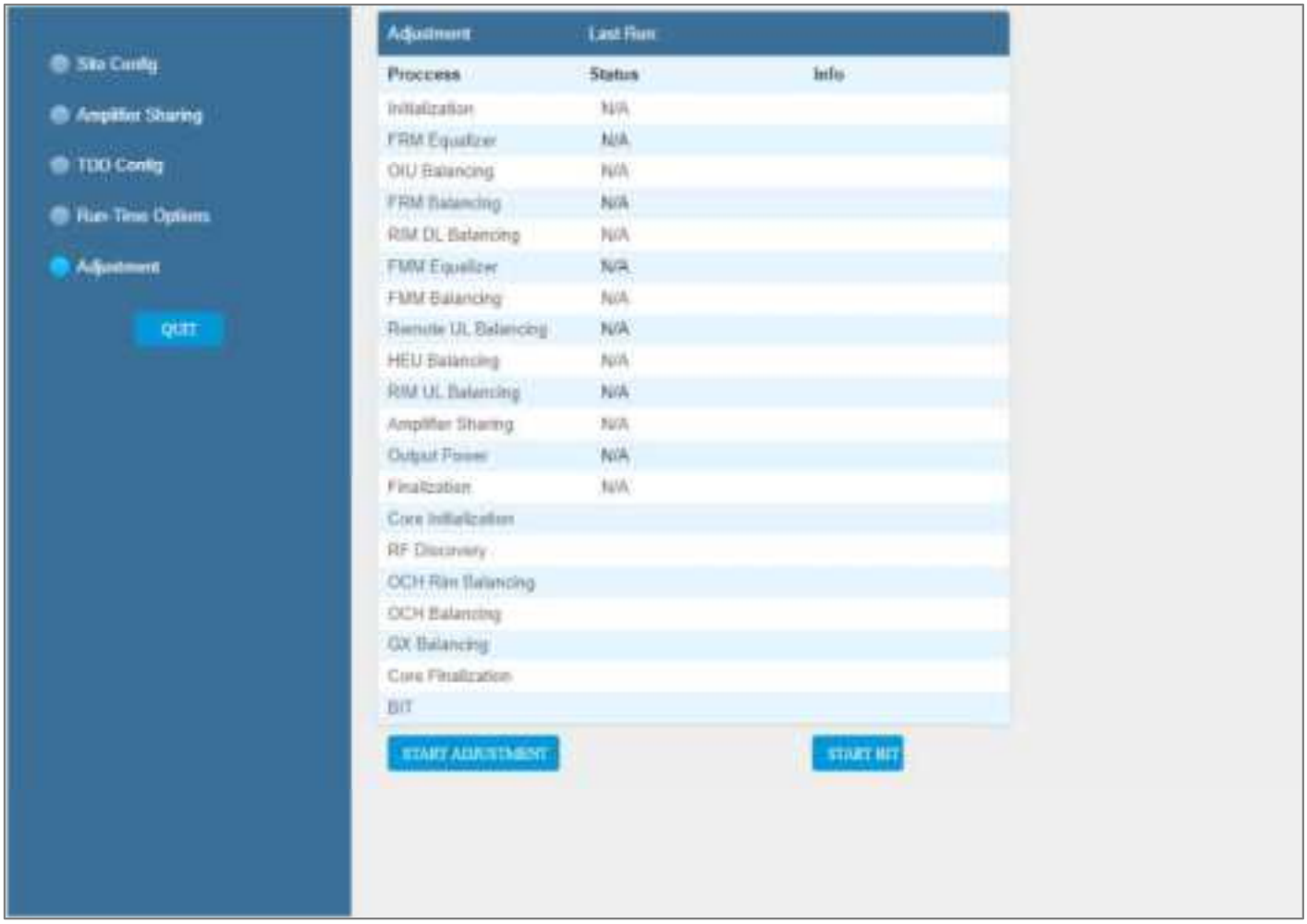
4.1.3 TDD Config

The **TDD Config** tab allows the user to config TDD related parameters per stack.


TDD Configuration
4G Table
Sub Frame
1 2 3 4 5 6 7 8 9 10
D S U D D D S U D D
5G Table
Slot
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
D D D S U U D D D D D D D S U U D D D D
TDD 3.0 Config Form
Common Parameters
Value
Service Group
Range
Network
Allocation Mode
CP Type
Normal
Frame Format
Sub Carrier Spacing (SC)
Service Group 1
Service Group 2
Service Group 3
SUBMIT

4.1.4 Adjustment

The **Adjustment** tab allows the user to start the adjustment process. During adjustment the status and relevant information are updated for each process.



4.2 Create new user groups

Initially the system administrator is the only system user. In order to enable other users to log in to the system the system administrator must create user groups for the different providers/carriers.

When a new group is created the administrator of the new group must log in to add users to the group.

Only the system administrator can create new groups.

For more information about system security refer to section 3.1.3.2.

➢ **To create a new group**

1. Log in as the **system** administrator.
2. In the main menu bar, click 

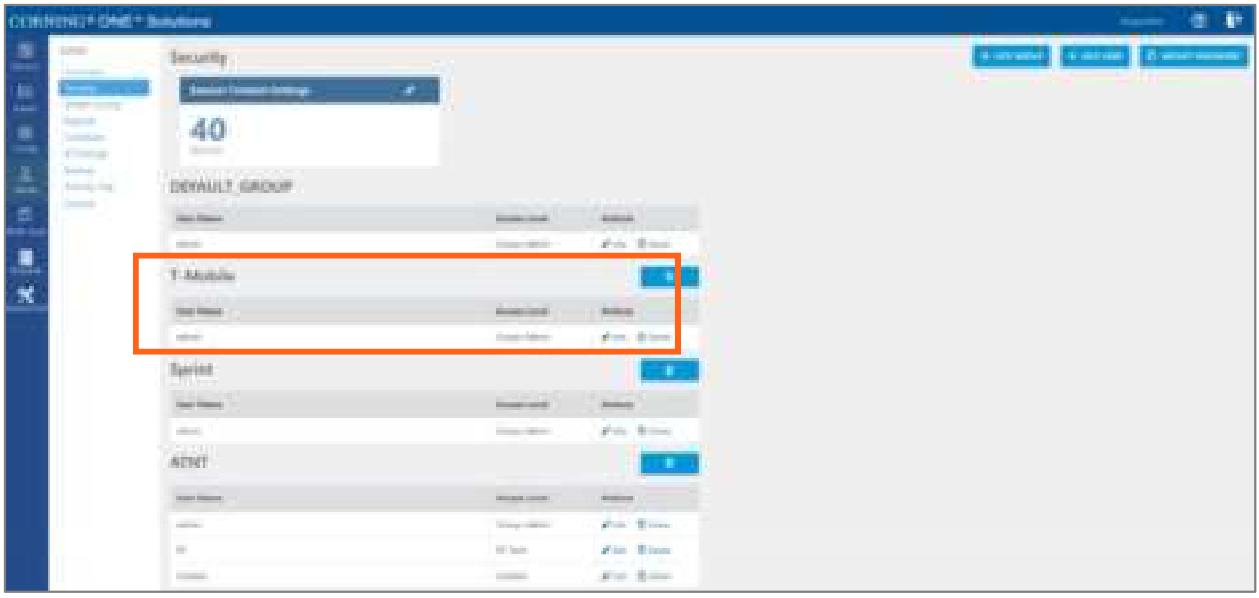
→ 

.
3. Click the 

button → enter the new group name (alphanumeric characters only, no spaces) and click OK. Up to 31 groups can be created.
4. The new group name is added to the list of defined groups and the group administrator is automatically created with the following default authentication:
    - Username: admin
    - Password: admin
    - Group: group name

    Note: Default Passwords should be changed when the relevant users first log in to the system. See password changing flow below. System admin can't change the group admin password.

This is an example of how the new group is listed in the **Security** tab:



5. System Graphical User Interface (GUI)

This section describes the system GUI options.

5.1 Main GUI Options

The main menu options are described below.

5.1.1 Devices Screen – Element Management

The Devices option provides visual information on the system layout, connected units and hierarchy, alarms etc. The system elements hierarchy tree is detected via an auto-discovery process, executed upon system start-up.

The system units' alarms are indicated according to severity, type, masked/unmasked alarms, etc. These coding icons are detailed in the table below.

When choosing **Devices** from the main menu, the following screen appears (the displayed system tree is updated according to system topology):

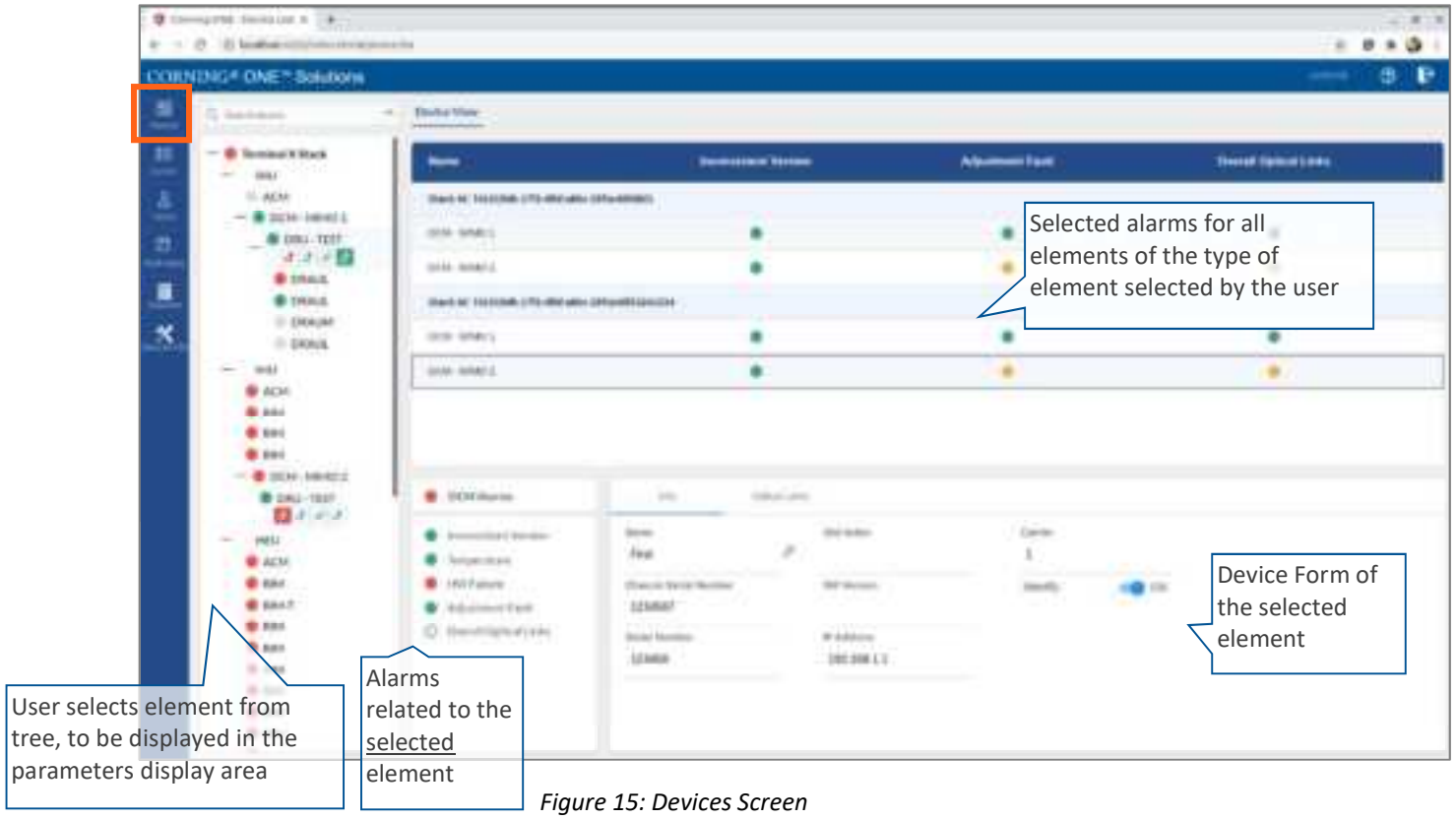


Figure 15: Devices Screen

Note: The same DRU may appear in the system tree multiple times if it is connected to different DCMs.

5.1.1.1 System Tree Alarms

This section includes a description of the alarm icons as well as a list of all alarm types per system element.

For each element, the system displays the most severe status in the system tree. Each device status is indicated by a coloured circle to its left, according to the symbols shown in the following table:

Table 11: Alarm Icons

Icon Unmasked	Masked	Indicates that…
 Red circle		There is a major alarm related to the element
 Green circle		No alarm is related to the element
 Orange circle		There is a minor alarm related to the element
		Unit is disconnected
		Indication on DRU-DCM connection
		
		
		

Any status changes are reported via SNMP to a monitoring system. If an alarm is masked, it isn't reported to the monitoring system. In addition, system events log lists only unmasked alarms which were set or unset. Unmasked alarms are listed separately (see section 1.3.2 Events Screen).

The status of the element in the system tree doesn’t change due to alarm masking.

For example: DCM status icon is red due to HW Failure alarm. If HW Failure alarm is masked, DCM status icon remains red.

Below are lists of all alarms per system element type and their meanings.

Table 3: HCM Alarms Descriptions

Alarm Name	Description
HW Failure	Faulty HCM hardware.
Adjustment Failure	Unsuccessful Adjustment procedure.
Installation Failure	Faulty physical installation between chassis.
SW Release Mismatch	A module (or modules) in the system do not have the defined active release. Several modules may not have corresponding software versions.
Connectivity	Faulty connectivity state in one of the previously discovered system modules (module should appear gray in the network topology).
Overall Status	Overall status of enabled (unmasked) alarms.

Table 4: ACM Alarms Descriptions

Alarm Name	Description
Overall Status	Overall status of enabled (unmasked) alarms.
HW Failure	ACM faulty hardware upon initialization or during operation.
Over Temperature	Ambient temperature inside the ACM is greater than 75°C.
Inconsistent Version/ SW Version	The module does not have the defined active release.
Adjustment Fault	Unsuccessful Adjustment procedure.
Ext1/Ext2 Clock Failed	Failure in master reference clock. Only relevant when ACM is installed in an HEU or IHU chassis as follows: •For ACM installed in an HEU chassis - Ext1/Ext2 Clock Failed are relevant. •For ACM installed in an IHU chassis - only Ext1 Clock Failed alarm is relevant.
Pilot Clock Failed	Relevant for IHU and OIU. Indicates failure in reference in the pilot clock in the OIX Expander.
Fan Failure	Fault in at least one of the fan modules (i.e., fan does not match duty cycle set value). Displays the highest severity alarm.
Power Failure	Power failure in one or both (if two are installed) of the PSMs.
Output Under Voltage	The ACM has detected an input voltage value under 10.8 V DC from one of the PSM modules (severity – minor) or both (severity – major) during three consequent samplings.
Input Under Voltage	The ACM has detected an input voltage value of under 60 V AC from either one PSM module (severity – minor) /both PSMs (severity – major).

Table 5: RIM Alarms Descriptions

Alarm Name	Description
Overall Status	Overall status of enabled (unmasked) alarms.
HW Failure	Hardware failure during startup or during normal operation.
Over Temperature/Temp	Ambient temperature inside the RIM is more than 75°C.
Inconsistent Version/SW Version	The module does not have the defined active release.
Adjustment Fault	Unsuccessful adjustment procedure for the selected module.
Service State	Service has been disabled by the user.
DL Input Power Low	BTS RF power input to the RIM is at least 15 dB lower than the configured max expected power.
DL Power Overload	BTS RF power input to the RIM is at least 3 dB higher than the value measured during the adjustment procedure.
Sync Loss Only applicable for RIM TDD	Green — indicates TDD sync lock between RIM and input signal. Red — TDD sync lock error (unlocked).
Clock Synthesizer Only applicable for RIM TDD	UL/DL Synthesizer and Reference Clock lock/unlock status.
Band Mismatch Only applicable for RIM AWS	RIM bands are overlapping.

Table 6: DRU Alarms Descriptions

Alarm Name	Description
Inconsistent Version	The module does not have the defined active release.
Temperature	Ambient temperature inside the DRU is more than
HW Failure	DRU faulty hardware upon initialization or during operation.
Overall Optical DCM Links	Overall status of enabled (unmasked) alarms in input links.
Overall Optical RU Links	Overall status of enabled (unmasked) alarms in output links.

Table 7: DCM Alarms Descriptions

Alarm Name	Description
Inconsistent Version	The module does not have the defined active release.
Temperature	Ambient temperature inside the DCM is more than
HW Failure	DCM faulty hardware upon initialization or during operation.
Adjustment Fault	Unsuccessful Adjustment procedure.
Overall Optical Links	Overall status of enabled (unmasked) alarms in output optical links.

Table 8: dLRU/dMRU/dHRU Alarms Descriptions

Alarm Name	Description
HW_ALRM	Indicates **un-recoverable** HW failure. Applicable for module or sub-module.
TEMP_ALRM_Minor_X	Over temperature indication. X is sensor number.
TEMP_ALRM_Critical_X	Critical temperature indication. X is sensor number.
SERVICE_OFF_X	X band is OFF. Only applied if there is a channel in that band, but band is OFF.
ANT	Antenna issues.
UL_LIMITER_X	UL limiter active due to high UL signal and antenna. X is band number.
DL_RF_LOW_X	X channel power at CPRI input is low.
CLK	CLK/CPRI un-synchronized.
DISCONNECTED_PORT	dLRU/dMRU/dHRU ports connected to different DRUs.
LOW_TRANSMISSION_ALARM	Digital power and analog power mismatch.
OVERFLOW	Digital signal overflow.
VSWR_X	VSWR alarm on band X.
SELF_PROTECTION	

Alarm Name	Description
TDD_OUT_OF_SYNC	
PA_OVERCURRENT	
CONNECTION_ERROR	

The following table lists alarms which are relevant to the CPRI protocol. These alarms are relevant for the optical links some of the system elements have (see sections 1.3.1.5-7 below).

Table 9: CPRI Alarms Descriptions

Alarm Name	Description
LOS	Loss of signal.
LOF	Loss of frame synchronization.
RAI	Remote alarm indication.
SDI	SAP (service access point) default indication.
Certified SFP	Indicates whether SFP certified.

5.1.1.2 HCM Device Form

The device form of an HCM has a single tab: Info.

The Info tab has general information about the system element:

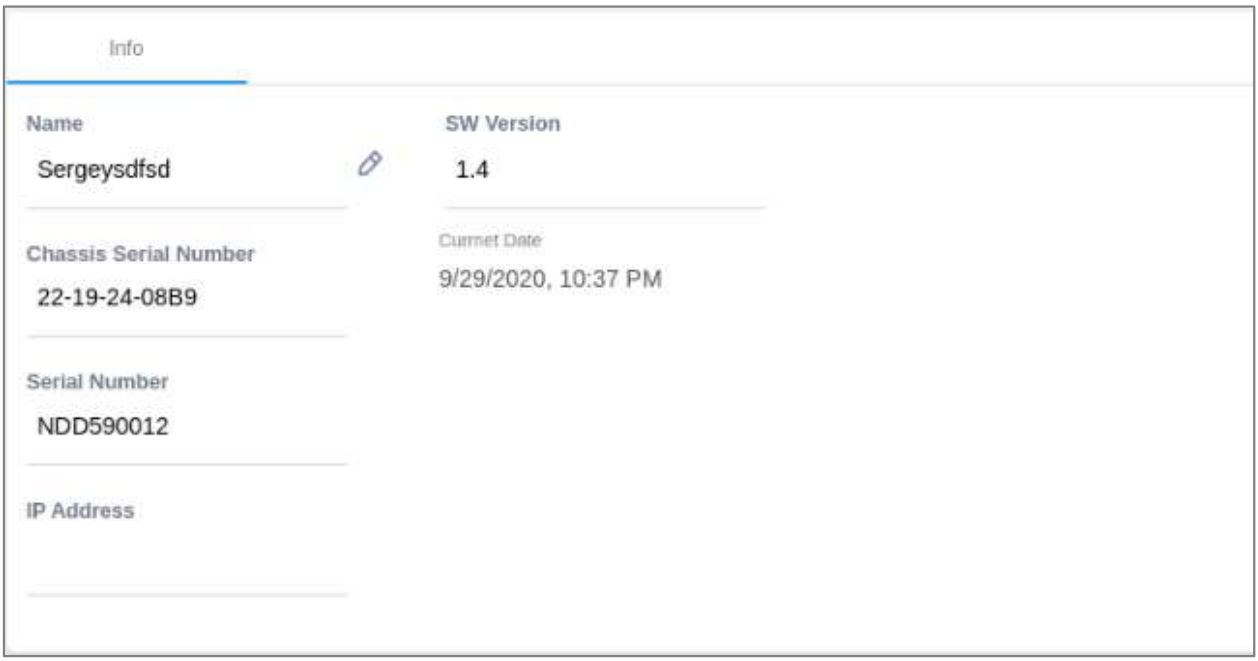


Table 10: HCM Info Device Form Fields

Field	Information
Name	The name of the element as it appears in the system tree.
Chassis Serial Number	The serial number of the chassis the HCM resides in.
Serial Number	The serial number of the HCM.
IP Address	The IP address of the HCM.
SW Version	SW version updated in HCM.
Current Date	Current system date and time.

5.1.1.3 ACM Device Form

The device form of an ACM has two tabs: Info and Power Supply.

The Info tab has general information about the system element:

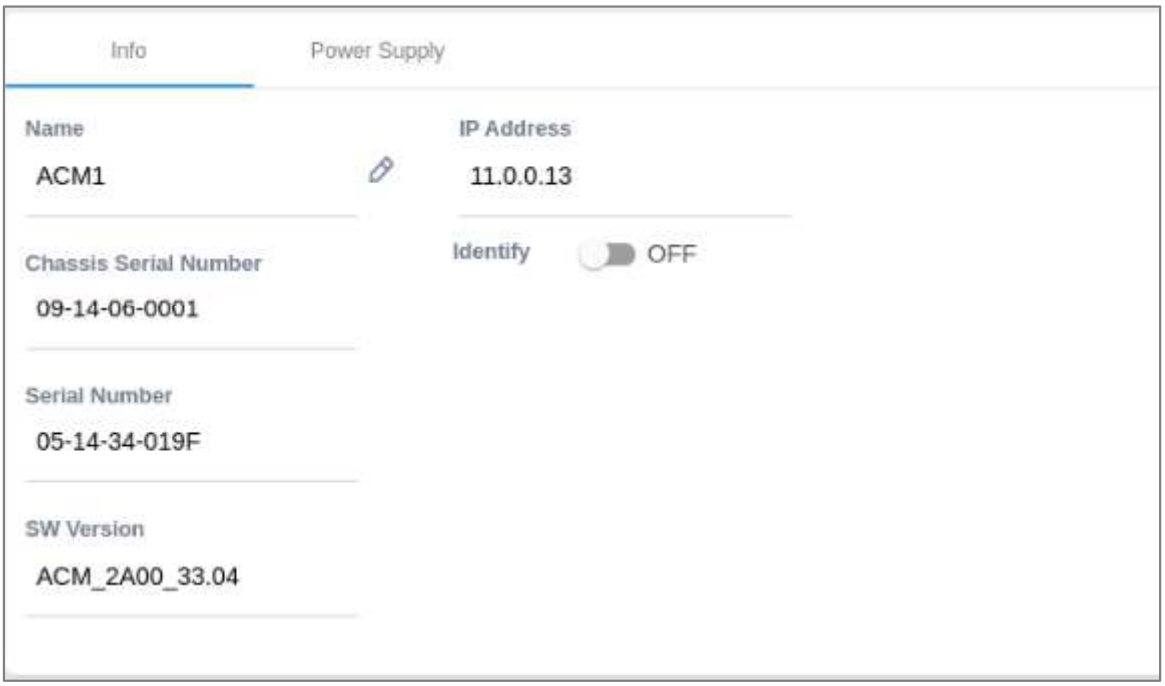
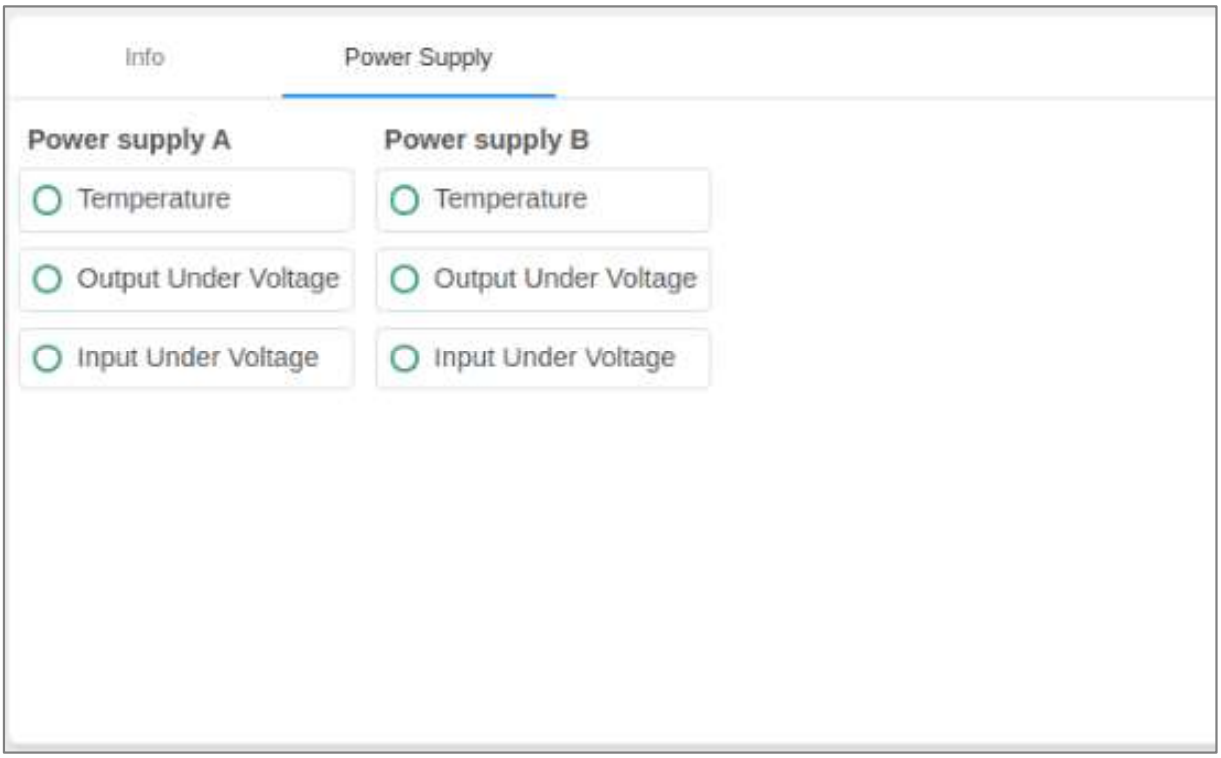


Table 11: ACM Info Device Form Fields

Field	Information
Name	The name of the element as it appears in the system tree.
Chassis Serial Number	The serial number of the chassis the ACM resides in.
Serial Number	The serial number of the ACM.
SW Version	SW version updated in ACM.
IP Address	The IP address of the ACM.
Identify (ON/OFF switch)	When the switch is ON the ACM LEDs are blinking (can be used to identify the specific module among many other modules).

The Power Supply tab shows the relevant alarms status for both power supplies. There are two power supplies for backup and the switch between the power supplies is automatic. Explanation of the alarms can be found in section 1.3.1.1 Table #: ACM Alarms Descriptions. In the example below there are no alarms related to any of the power supplies.



5.1.1.4 RIM Device Form

The device form of a RIM has at least two tabs: Info and RF Parameters. A RIM which supports TDD also has a TDD tab in its Device Form.

The Info tab has general information about the system element:

Table 12: RIM Info Device Form Fields

Field	Information
Name	The name of the element as it appears in the system tree.
Chassis Serial Number	The serial number of the chassis the RIM resides in.
Serial Number	The serial number of the RIM.
Slot Index	The number of the slot in the chassis the RIM resides in.
Band Type	Band number according to LTE frequency bands. Band number is mapped directly to a frequency range.
SW Version	SW version updated in RIM.
IP Address	The IP address of the RIM.
Temperature	Current temperature of the RIM.
Carrier	Identification of the supplier the RIM belongs to (telecommunications company).
Identify (ON/OFF switch)	When the switch is ON the RIM LEDs are blinking (can be used to identify the specific module among many other modules).

The RF Parameters tab has information about the RIM UL and DL signals:

Table 13: RIM RF Parameters Device Form Fields

Field	Information
DL Power Detector[dBm]	Power of base station down link transmission. Range is -10 to +37[dBm].
Automatic Limit Control (ON/OFF switch)	
Service State (ON/OFF switch)	Service State OFF simulates RIM is disconnected. Transmission disabled by user.
Max Exp. Power [dBm]	User defined max power for the base station transmission. An alarm is triggered if the value in DL Power Detector field deviates from this value. For information about the alarms refer to section …
UL Gain Mode	Auto Symmetrical – equalizes the UL Gain Manual (default) – select a value in the range of -19 dB to +15 dB (in 1dB steps). Note that the UL gain range enabled is determined by the max expected power setting. See table
UL Gain [dBm]	

Table 14: Max Expected Power Settings

Max Expected Power Value [dBm]	Max UL Gain Range [dB]
0	-19 to +10
1	-19 to +11
2	-19 to +12
3	-19 to +13
4	-19 to +14
5 to 37	-19 to +15

A RIM which supports TDD (Time Division Duplexing) has an additional tab – TDD:

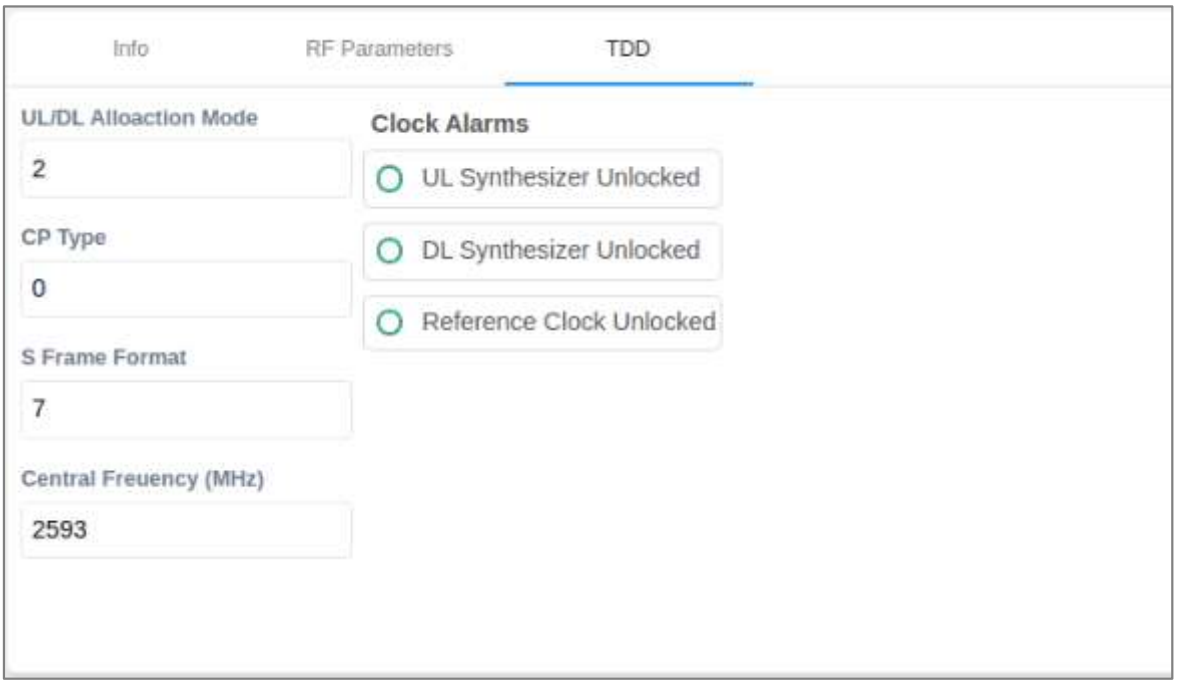


Table 15: RIM TDD device form fields

Field	Information
UL/DL Allocation Mode	0 to 6
CP Type	Cycle Prefix: Normal/Extended
S Frame Format	0 to 8
Central Frequency (MHz)	Low – 2526 Medium – 2593 High – 2660 Custom – 2526 to 2660 (0.1MHz steps)

5.1.1.5 DCM Device Form

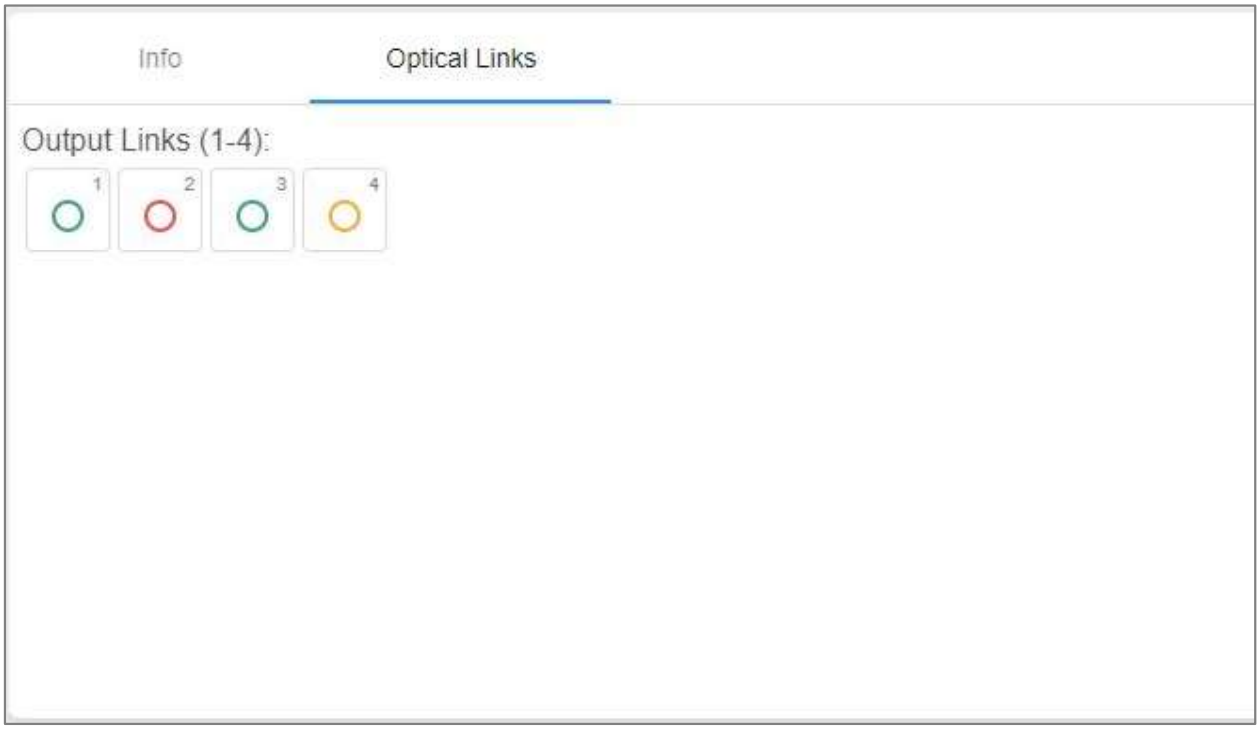
The device form of a DCM element has two tabs: Info and Optical Links.

The Info tab has general information about the system element:

Table 16: DCM Info Device Form Fields

Field	Information
Name	The name of the element as it appears in the system tree.
Chassis Serial Number	The serial number of the chassis the DCM resides in.
Serial Number	The serial number of the DCM.
Slot Index	The number of the slot in the chassis the DCM resides in.
SW Version	SW version updated in DCM.
IP Address	The IP address of the DCM.
Carrier	Identification of the supplier the DCM belongs to (telecommunications company).
Identify (ON/OFF switch)	When the switch is ON the DCM LEDs are blinking (can be used to identify the specific module among many other modules).

The Optical Links tab has information about the optical links of the DCM. Each optical link has the colour of the most severe alarm related to it. In the example below links 1 and 3 have no alarms, link 2 has a major alarm and link 4 has a minor alarm.



5.1.1.6 DRU Device Form

The device form of a DRU element has two tabs: Info and Optical Links.

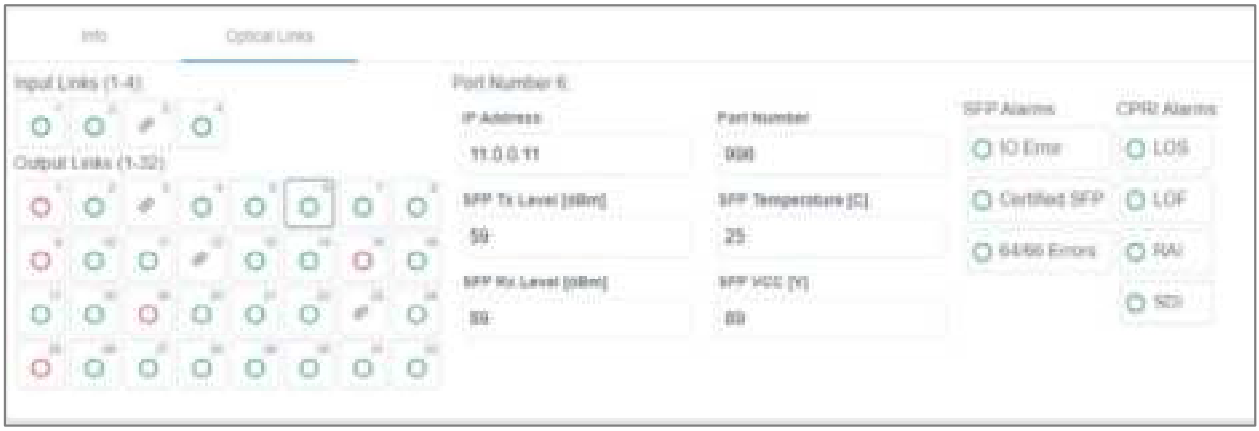
The Info tab has general information about the system element:

Table 17: DRU Info device form fields

Field	Information
Name	The name of the element as it appears in the system tree.
Serial Number	The serial number of the DRU.
SW Version	SW version updated in DRU.
IP Address	The IP address of the DRU.
Identify (ON/OFF switch)	When the switch is ON the DRU LEDs are blinking (can be used to identify the specific module among many other modules).

The Optical Links tab has information about the optical links of the DRU. Each optical link has the colour of the most severe alarm related to it. The DRU can have up to 4 optical input links and 32 optical output links.

The user can click on one of the inputs or outputs to view information about the link. In the example below output link number 6 was clicked and the information about this link is displayed:



5.1.1.7 dLRU/dMRU/dHRU Device Form

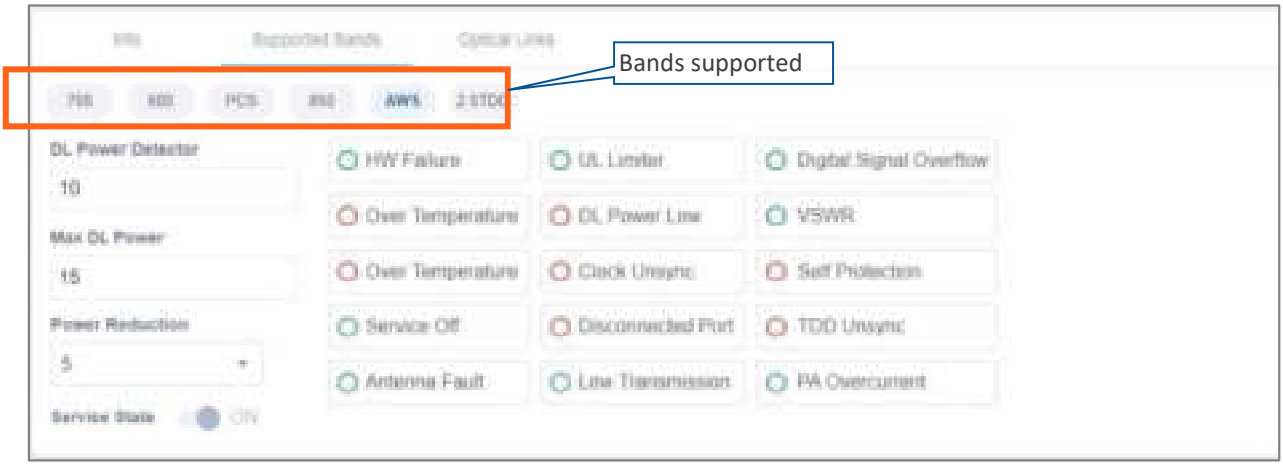
The device form of a dL/M/HRU element has three tabs: Info, Supported Bands and Optical Links.

The Info tab has general information about the system element:

Table 18: dLRU/dMRU/dHRU Info Device Form Fields

Field	Information
Name	The name of the element as it appears in the system tree.
Serial Number	The serial number of the dL/M/HRU.
SW Version	SW version updated in dL/M/HRU.
HE Chassis SN	The serial number of the Head End chassis the dL/M/HRU is connected to.
DRU's Ports	The DRU ports the dL/M/HRU is connected to. Same dL/M/HRU can be connected to several DRU ports.
Temperature	The current temperature of the dL/M/HRU.
Identify (ON/OFF switch)	When the switch is ON the dL/M/HRU LEDs are blinking (can be used to identify the specific module among many other modules).

The Supported Bands tab lists all the bands supported by the dL/M/HRU. clicking on a band will show the band information. In the example below information about the AWS band is displayed:



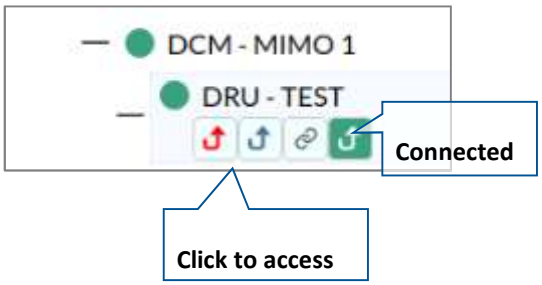
The Optical Links tab has information about the optical links of the dL/M/HRU. Each optical link has the colour of the most severe alarm related to it. When clicking on one of the inputs, information about the link appears. In the example below there are 3 input links because the DRAUL is connected to 3 DRU ports. link number 2 was clicked and the information of this link is displayed:

5.1.1.8 DRU to DCM Connection

➢ **Example: DRU to DCM(s) Connection**

The following figures indicate connectivity between DRU and DCM(s).

For DRU the device status per DCM is shown in the following manner:



The number of arrows is the number of DCMs the DRU is connected to. The user may skip between the DRU's connected DCMs by clicking the arrow of the desired DCM.

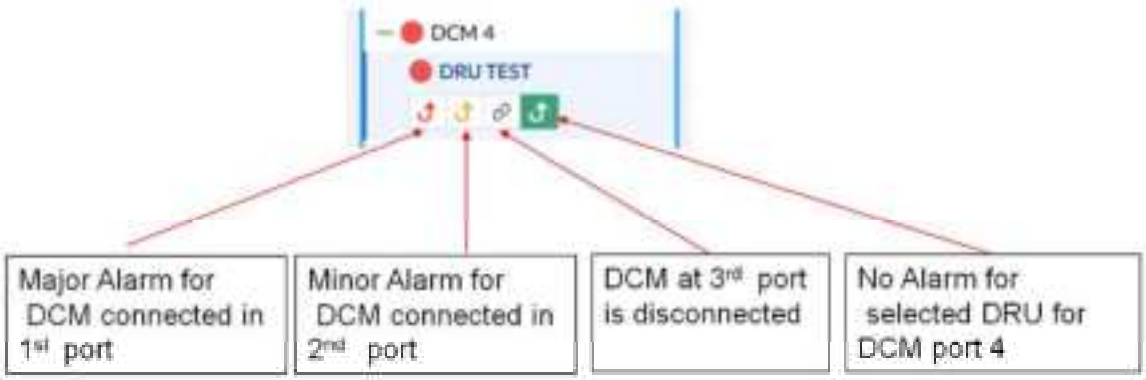


Figure 16: Example – alarms for connected DCMs

5.1.2 Events Screen

The events option provides indications on the different events in the system. This includes: alarms, upgrades, admin-actions, etc. The events may be sorted according to the time they occurred, severity, source, etc. The user may choose to display the alarms history, masked alarms or active alarms.

When choosing Events from the main menu the following screen appears:

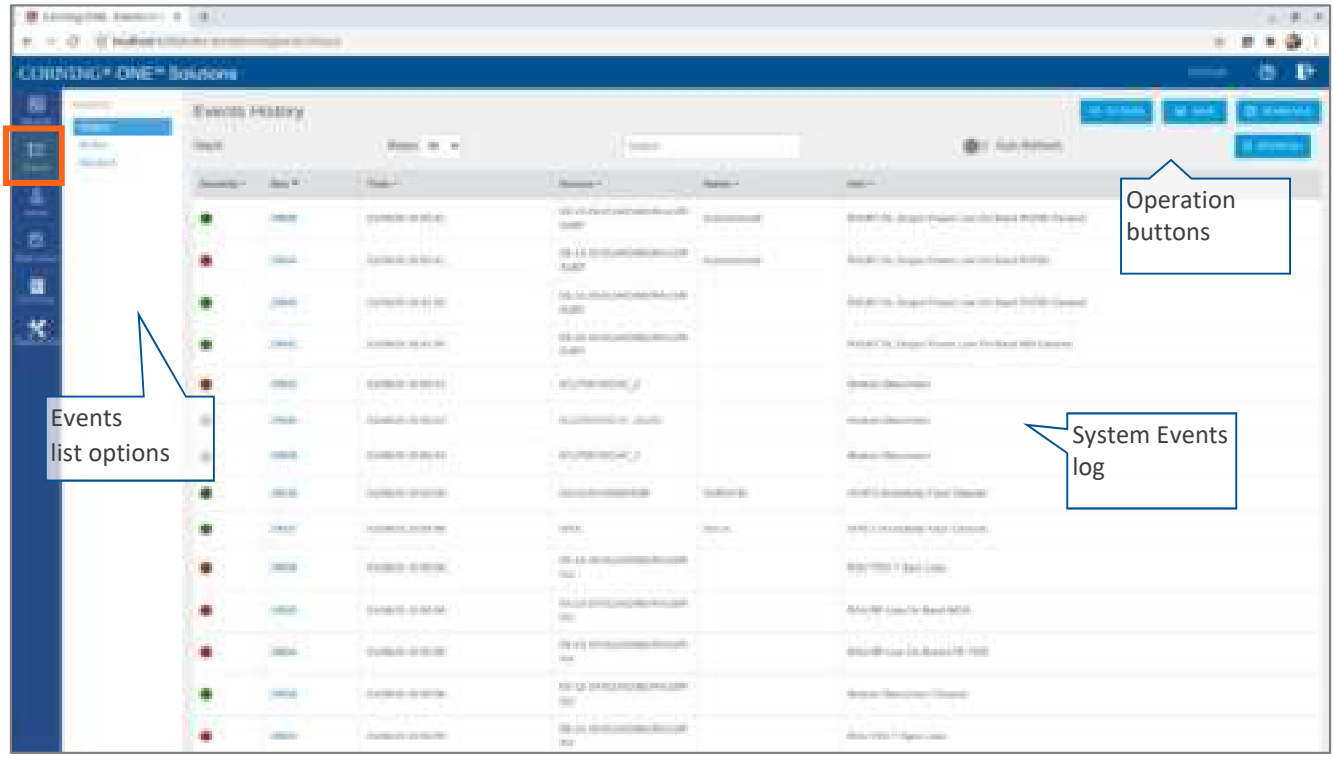


Figure 17 Events Screen

Table 19: Events Screen Sub-Options

Tab	Information
History	View all events in a certain time period.
Active	View events which are currently active.
Masked	View events which are masked by user.

5.1.3 Admin Screen

The admin screen allows the user to define administrators, update credentials, upgrade firmware, generate reports and other admin options as detailed in the table below.

When choosing the **Admin** from the main menu the following screen appears:

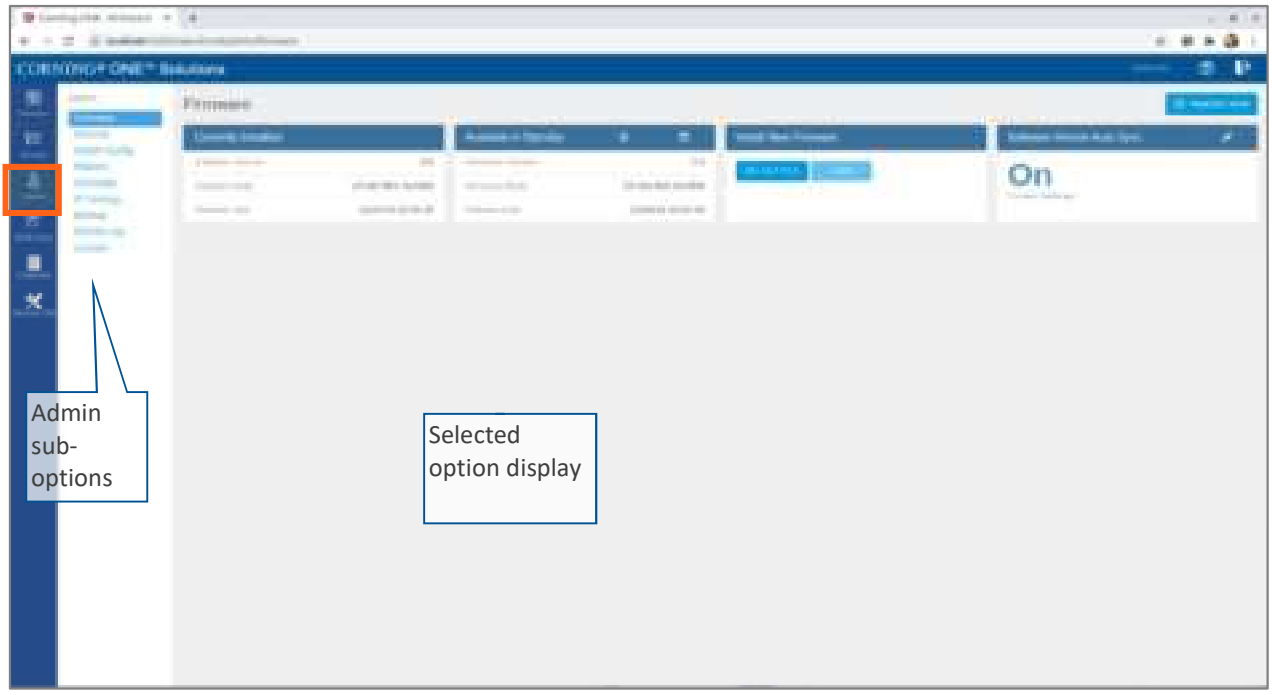


Table 20: Admin Screen Sub Options

Tab	Enables user to…
Firmware	Update HCM FW and enable FW auto synchronization. Lists which FW version is currently installed and what versions are available.
Security	Create and manage multi-user account groups and monitor user activities.
SNMP Config	Use any SNMP manager.
Reports	View the summary of the information of various types of devices in the network along with basic physical and configuration information on each device.
Scheduler	Schedule specified system operations and administrative procedures.
IP Settings	Change IP addresses that were auto assigned by DHCP, ping a manually typed IP address, etc.
Backup	Choose the stacks to be backed-up or re-stored to/from a backup file or SD card(s).
Activity Log	View activities such as configuration changes, according to a range of criteria such as User, Date, Device or Activity type.
License	View a list of available licenses and their expiration time, load new license obtained from Corning.

5.1.3.1 Firmware

The **Firmware** tab allows the user to upgrade the firmware version of the system elements.

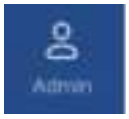
The HCM upgrade procedure consists of downloading the new software version, setting it as the “Active” version, and restarting the HCM. The new software can be activated either immediately or at a more convenient time as defined by the user. The procedures are performed via the **Firmware** submenu.

By default, Auto Sync option is enabled, hence the software of all installed devices at the site is updated to the software version of the HCM. If this automatic update is not desired, the “Auto Sync” option can be set to “OFF.”

The 

button can be used when a reboot is required.

➢ **To upgrade the firmware version**

1. In the main menu bar, click 

→ 

.
2. Download the new image file: In the "Install New Firmware" area (see image below), click the "SELECT FILE" option and then browse for the required *.img file. For the latest build, refer to the Corning Everon™ 6000 software release notes.

   Once the required file is selected, click "LOAD". The download progress is indicated in the progress bar and may take up to 10 minutes to complete. When the download is complete click "OK".

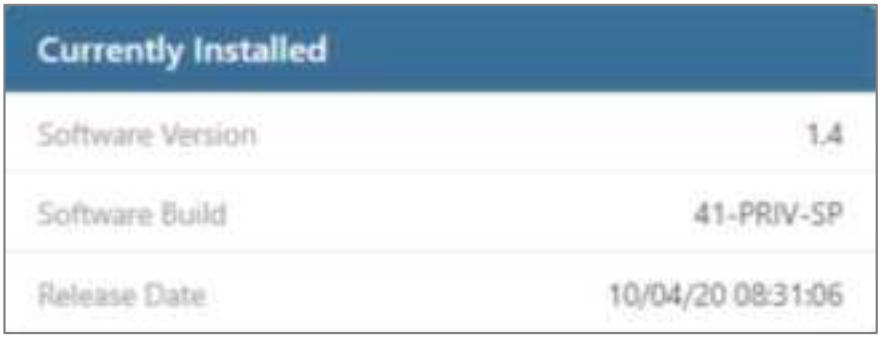
Note: Do not attempt to refresh the browser or perform any operation before download procedure is complete.

3. Activate the new firmware version: After the download is complete, the new firmware version should appear in the "Available in Standby" area:

Activate the new firmware – either immediately by using the  icon or at a scheduled (user defined) time by using the  icon.

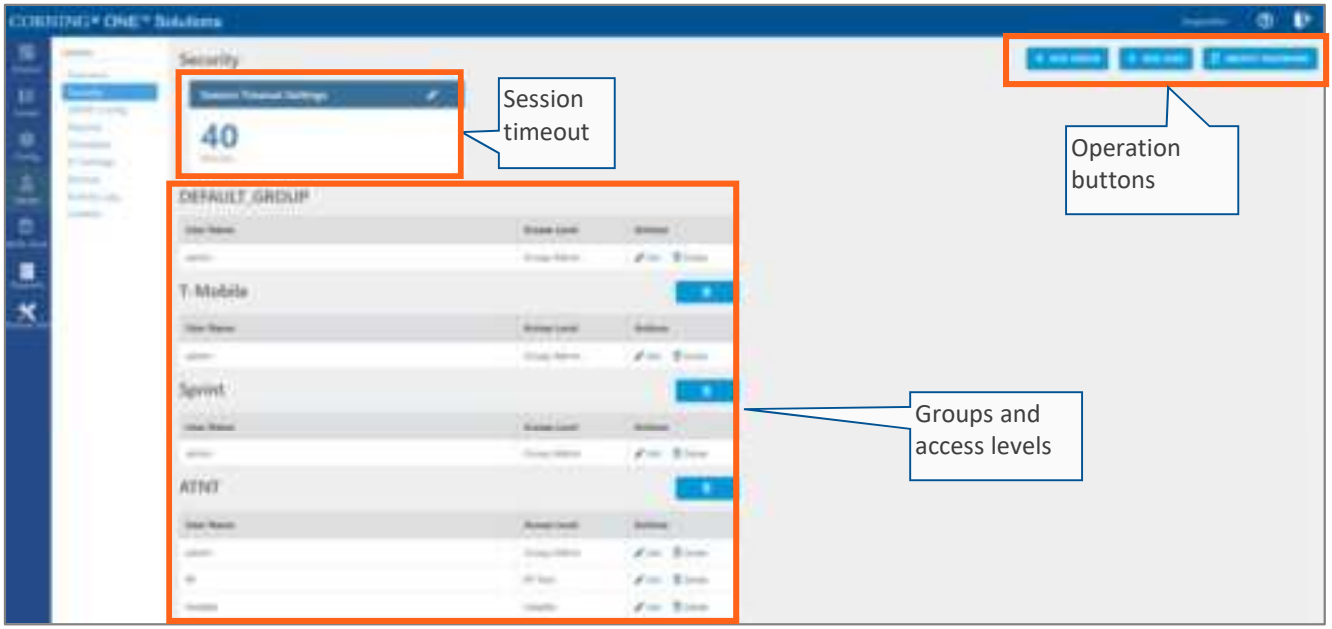
4. After the new firmware is activated, and the controller automatically restarts: Log in to the system.

   The new firmware version should appear in the "Currently Installed" area:



5.1.3.2 Security

Access security is provided by definitions of user groups created by the system administrator. Groups are used to limit access to specific devices so that only devices allocated to a group are accessible by members of that group.



The **Security** tab allows the definition of the groups and the system users. The following three types of users are supported:

- **System administrator:** Single user of the highest level that can create groups with dedicated group administrators. Only the system administrator can create new groups.
- **Group administrator:** Automatically created for each group that is created by the system administrator.
- **Group users:** Defined by the corresponding group administrator. Five hard-coded access levels are available per group:

Table 21: Group Users Access Levels

Level	Description
Operator	R/O access to Devices and Events screens.
Installer	R/O Access to Devices and Events screens. Write access to *free text parameters* to allow the definition of location and identification information.
RF Tech	Access to the Devices, Config, Events and Channels screens: • Write access to all *RF* parameters. • R/O to all other parameters.
IT Tech	Access to the Devices and Admin screens: • Write access to all non-*RF* parameters. • Access to activity logs of all users and groups. • HCM firmware upgrade. • R/O to all other parameters.
Group Admin	The group admin has the capabilities of all the other access levels and the permissions to create and manage the users in the group.

➢ To create a new group

Refer to section 2.2

➢ To add users to a group

1. Log in as the **group** administrator (use relevant group name at log in).
2. In the main menu bar, click 

.
3. Click the 

button. The following form appears:
   - Enter the Name of the user (alphanumeric characters, no spaces).
   - Specify an access level according to table 21: Group Users Access Levels.
   - Set the user Password (at least 8 characters) and type it again in the Confirm (password) field.

   Note: The strength of the password is indicated upon entering it in the field (i.e., very weak/weak/reasonable/strong). Weak passwords will not be accepted.

   When done filling in the information, click OK.

Note: A group can have up to 20 users. Maximum of 31 groups and 500 users per HCM.

4. The new user account is added to the group list. For example:

   ATNT group has three users defined: admin, RF and Installer.

5. Users can be removed from the group list using the Delete icon. User information, including password, can be modified using the Edit icon. The group administrator can change the passwords of the users in the group.

Note: Users with "Group Admin" access level can be added by the group admin. The original group admin can be removed.

➢ **Password modification by the user**

1. In the main menu bar, click Admin → Security.
2. Click the MODIFY PASSWORD button. The following form appears:

Enter the old password and the new password, confirm the new password and then click "SAVE".

The password must consist of at least 8 alphanumeric characters, no spaces. Weak passwords will not be accepted.

Note: The group admin can change the passwords of the users in his group as explained in the flow above: "To add users to a group" step 5.

- **Session Access and Timeout.**

Sessions are accessed or terminated according to the following criteria:

- Up to ten simultaneous sessions for multiple users are supported.
- The login of users is enabled according to priority. When the maximum number of multiple users are logged in and another user attempts to login, the outcome depends on the level of the user attempting the login:
  - For a higher-level user, the lowest-level user with the longest session time is logged out and the appropriate session termination message appears.
  - For the same level or lower level than the lowest logged in level, session access is denied, and the appropriate message appears.
- If no session activity is detected for the configured amount of time, i.e. session timeout, the session is terminated.

- **To configure the session timeout**

1. In the main menu bar, click 

→ 

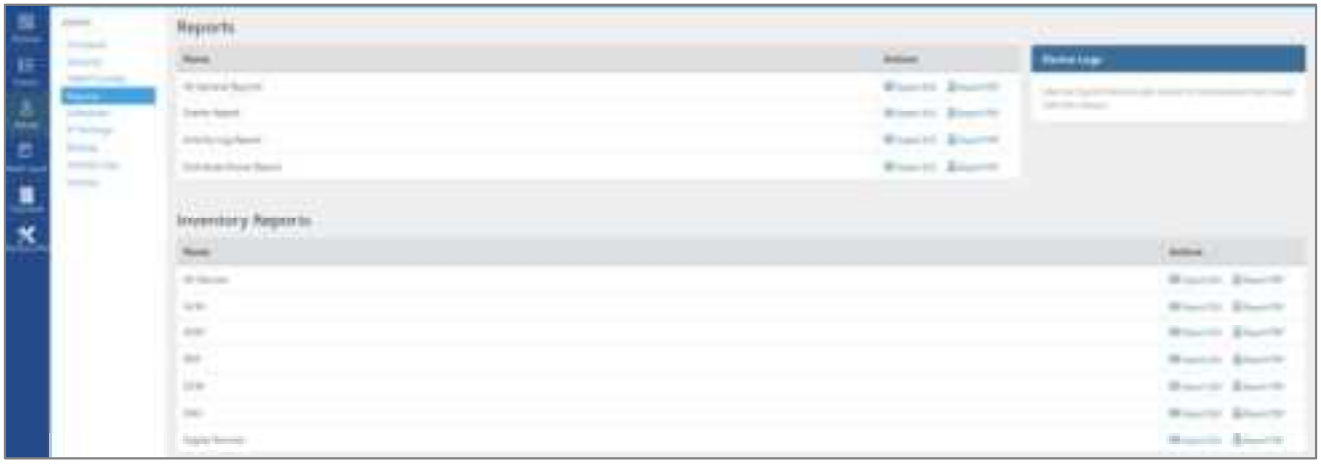
.
2. In the “Session Timeout Settings” area, click the  icon.

3. Enter a timeout value between 1-255 (minutes) or “Never". Then click "OK".

5.1.3.3 SNMP Config

5.1.3.4 Reports

The types of reports which can be generated are listed under "Reports" (these are the general reports) and "Inventory Reports". The reports can be generated either in XLS or in PDF format. In addition, "Device Logs" can be exported for troubleshooting by the system administrator.



- **General Reports**

The General Reports options are explained in the table below:

Table 22: General Reports

Report Type	What does the report include
All General Reports	This report includes the events, activity log and distribute power reports.
Events Report	Three reports are generated: History (all events), active events and masked events.
Activity Log report	Lists the user activity with information such as time stamp, affected module, username, group, etc.
Distribute Power	Lists the RF power distribution, configured and actual output power, for all system remotes and RIMs.

The General reports can be exported individually or simultaneously, using the All General Reports option, in PDF or XLS format. When all General files are exported in PDF format, the files are provided as a single ZIP file that includes individual PDF files; when exported in XLS format, the files are provided in a single XLS file with dedicated tabs.

- **Inventory Reports**

  Inventory reports provide detailed information in the selected format of "All Devices" or a specific system element.

  The information includes location, installed versions, IP Address, and more.

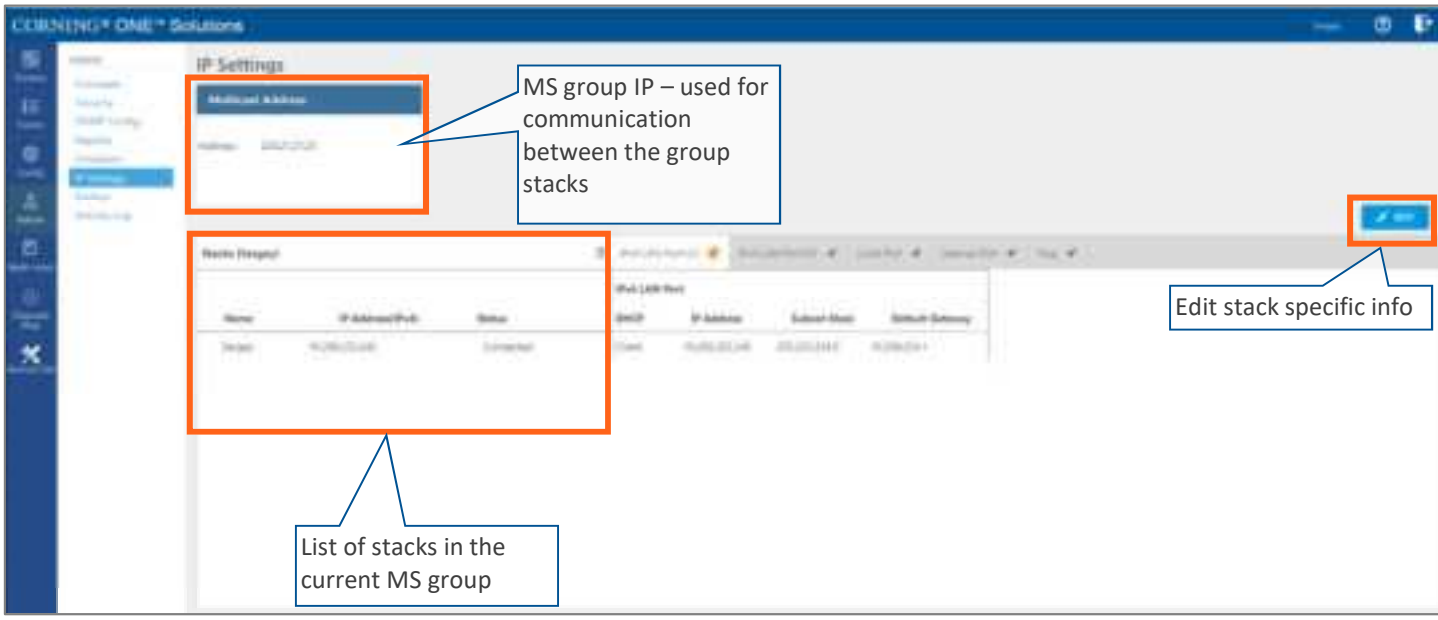
- **Device Logs**

  Device logs are the HCM logs and they are accessible to system admin level users only; used for tech support troubleshooting.

5.1.3.5 IP Settings

The **IP Settings** tab allows the configuration of all stacks in the current MS group. It allows changing IP addresses that were auto assigned by DHCP, pinging a manually typed IP address and more.

For more information about remote access configuration refer to section 1.6.



All HCMs in the MS-group are automatically updated when one stack in the group is updated. The update is done using the Multicast Address which is used for communication between the stacks in the group.

Each HCM has three types of RJ45 Ethernet ports: local port, LAN port and four internal ports.

The local port is usually used for first time local access – refer to section 1.3.

The LAN port is used for remote access – refer to section 1.6.

The internal ports are used for management of the connected ACMs.

Each port DHCP can be set to "Client" for dynamic IP addressing. If DHCP is set to "None" the IP address, subnet mask and default gateway must be set manually.

A Ping Tool option is provided in the IP Settings pane. Use this tool to verify access to IP hosts (rather than opening another application).

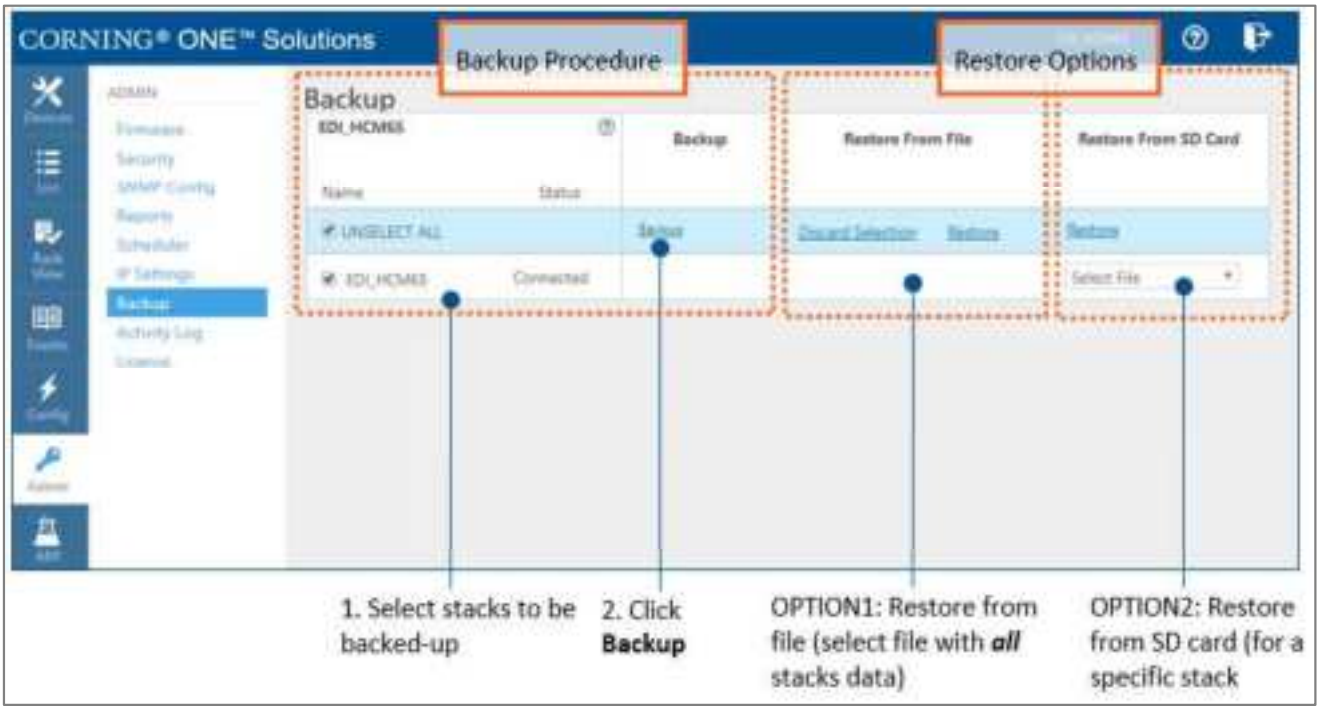
In the "'Ping" work area, enter the IP address and then click the "PING" button. The validity/invalidity result of the IP address appears in the Result line.


Ping
Enter IP Address
1
2
PING
Result
3

5.1.3.6 Backup

The **Backup** tab allows the **system administrator** to backup and restore system configurations. Other users don't have the permissions to perform these procedures.

The system administrator selects the configuration of which stacks to back up to a file and the Micro SD card inserted in the HCM (see section * for SD card slot location). It is recommended to perform backup after each configuration change.



➢ **To backup and restore configurations**

1. In the main menu bar, click 

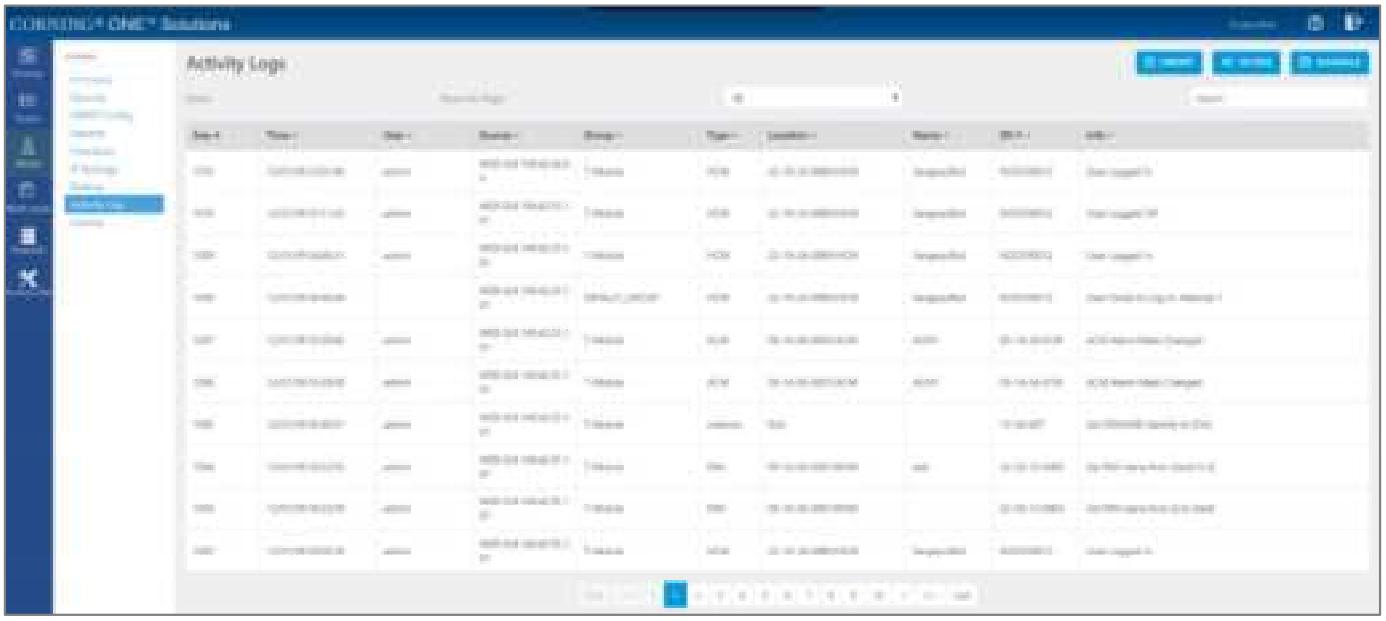
→ Backup.
2. Select the stacks to be backed up by checking their boxes.
3. Click "Backup". A backup file will be created, and the configurations will be saved in the HCM SD card as well.
4. To restore configurations from a file: click the "Select File" button in the **"Restore From File**" area, select a file from the computer and click "Restore".

   To restore configurations from the HCM Micro SD card: select the configuration file from the drop-down list in the **"Restore From SD Card"** area and click "Restore".

5.1.3.7 Activity Log

The **Activity Log** is used to view activities such as configuration changes, according to a range of criteria such as User, Time, Group, etc. The information can be saved in *.csv format (can be opened with MS-Excel).

The full log list of all user activities is displayed:



The activity log display can be changed in the following ways:

- "Rows Per Page" can be changed to list a different number of activities per page. Page navigation is at the bottom of the screen.
- Enter a specific value in “Search” field (serial number, exact time and date, etc.) to display only the activities that match the search criteria.
- Click on a specific header (i.e. Time) to rearrange activities according to the selected criteria in ascending or descending order.
- Use the “FILTERS” button to limit the displayed information according to device type, action type, and date.

5.1.4 Multi-Stack Screen

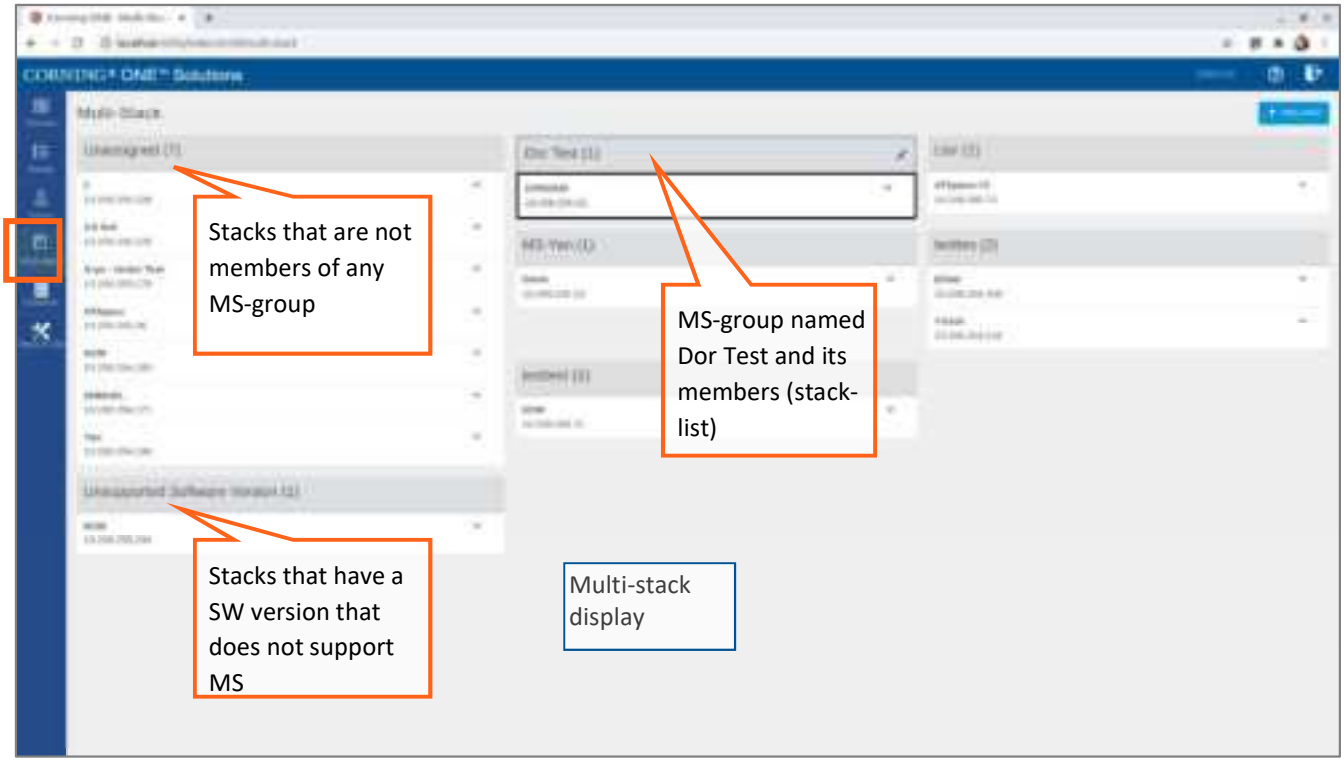
MS management allows centralized network management of sites with multiple stacks deployment, sharing common configuration, where user-defined groups of stacks are automatically and immediately updated with common data.

MS management allows a main admin (i.e. sysadmin) user to access a single stack GUI and create an **MS-group** of up to 100 stacks. The network publishes the list of grouped stacks; then, when an **MS-group** stack member is updated, the updates and common-data attributes are immediately distributed and synchronized (according to the latest time-stamped and indexed data) to each of the stacks that are members of that **MS-group**.

In addition, the system allows access and management of private (per stack) attributes (such as name, stack-tree, etc.).

The system allows up to 5 users to access and manage the **MS-group** GUI simultaneously (one of them can be sys-admin user).

When choosing **Multi-Stack** from the main menu the following screen appears:



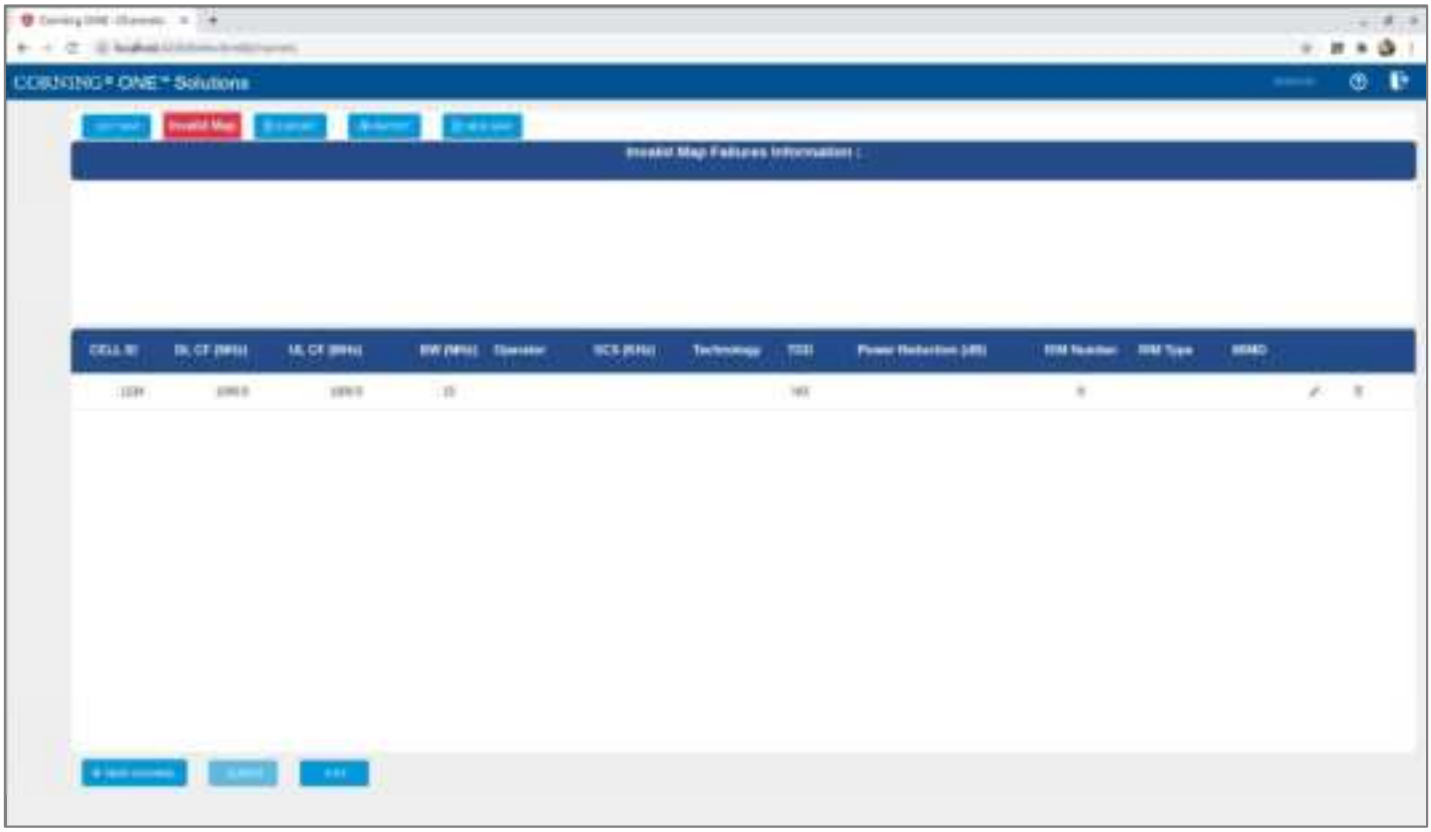
The user can view the information of the different stacks of the system.

5.1.5 Channels Screen

The Channels screen allows the user to create, view and modify the system RF channels.

The configuration is done via a map: each map is a group of channels. The system allows storage of two map configurations: one that is currently being used by the system (named VALID map), and another map configuration that may be edited for future use (named INVALID map), where each map determines the configuration of all the system RF channels.

When choosing **Channels** from the main menu the following screen appears:



When configuring a new system, the user is required to create a new map and then add channels to it. Channels can be added to existing maps as well.

The following table shows the available options for managing the RF channels map:

Table 21: Map Options

Option	Enables user to…
GET MAP	When clicking this button the following option appears:  Switch between saved maps: invalid map or valid map.
EXPORT	Save the map currently loaded in xls format.
IMPORT	Load a map from xls file.
NEW MAP	Create a new map.
+ NEW CHANNEL	Add a new RF channel to the map currently loaded.
SUBMIT	Check validity of the map currently being edited. If the map is successfully validated it will replace the existing valid map. If errors are encountered, the map currently being edited will replace any existing (previously saved) invalid map.
EXIT	Exit back to the main menu. NOTE: before exiting, make sure to save changes to the edited map; otherwise they will be lost.

A map of channels can have one of the following statuses:

Table 22: Map Status

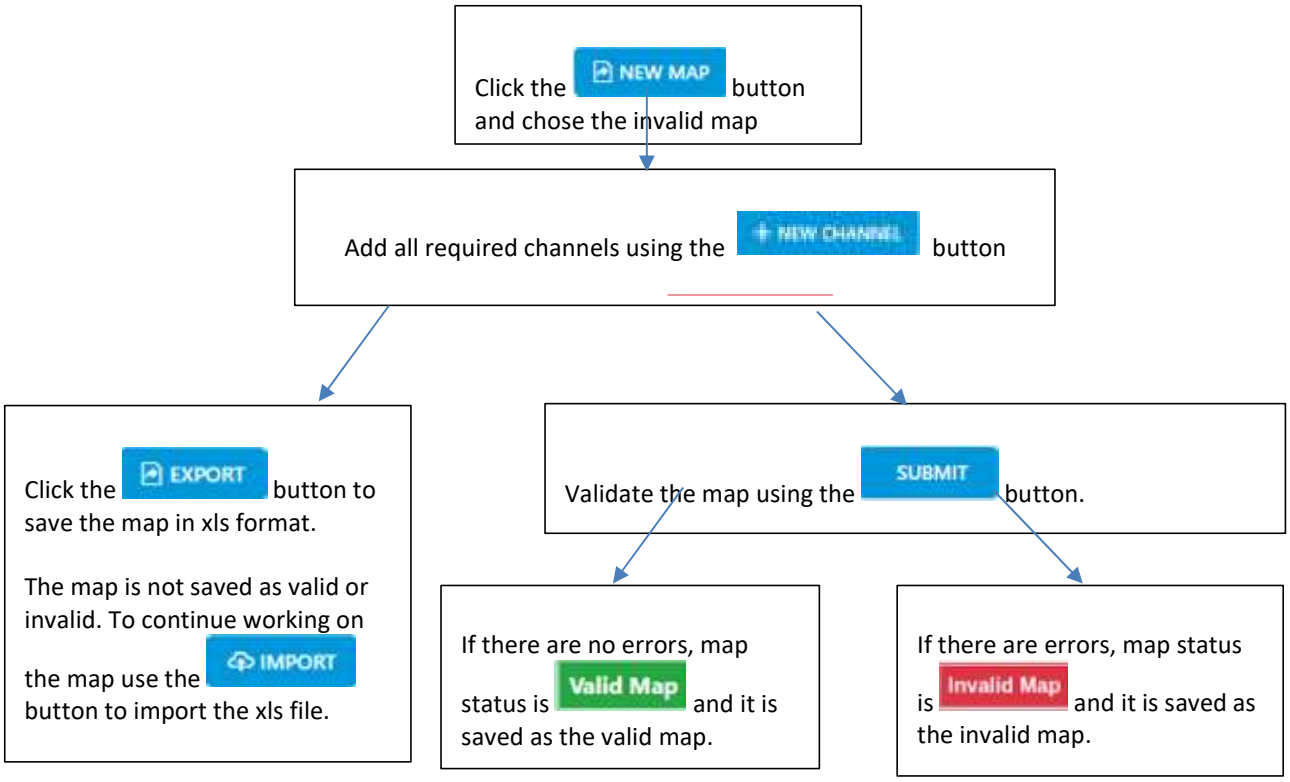
Map status	Enables user to…
Invalid Map	The map was submitted, but errors were found during activation.
Valid Map	The map was submitted, no errors were found during activation.
[illegible]	Map was not submitted yet.

Note: At any given time only 2 maps are saved: one valid map and one invalid map.

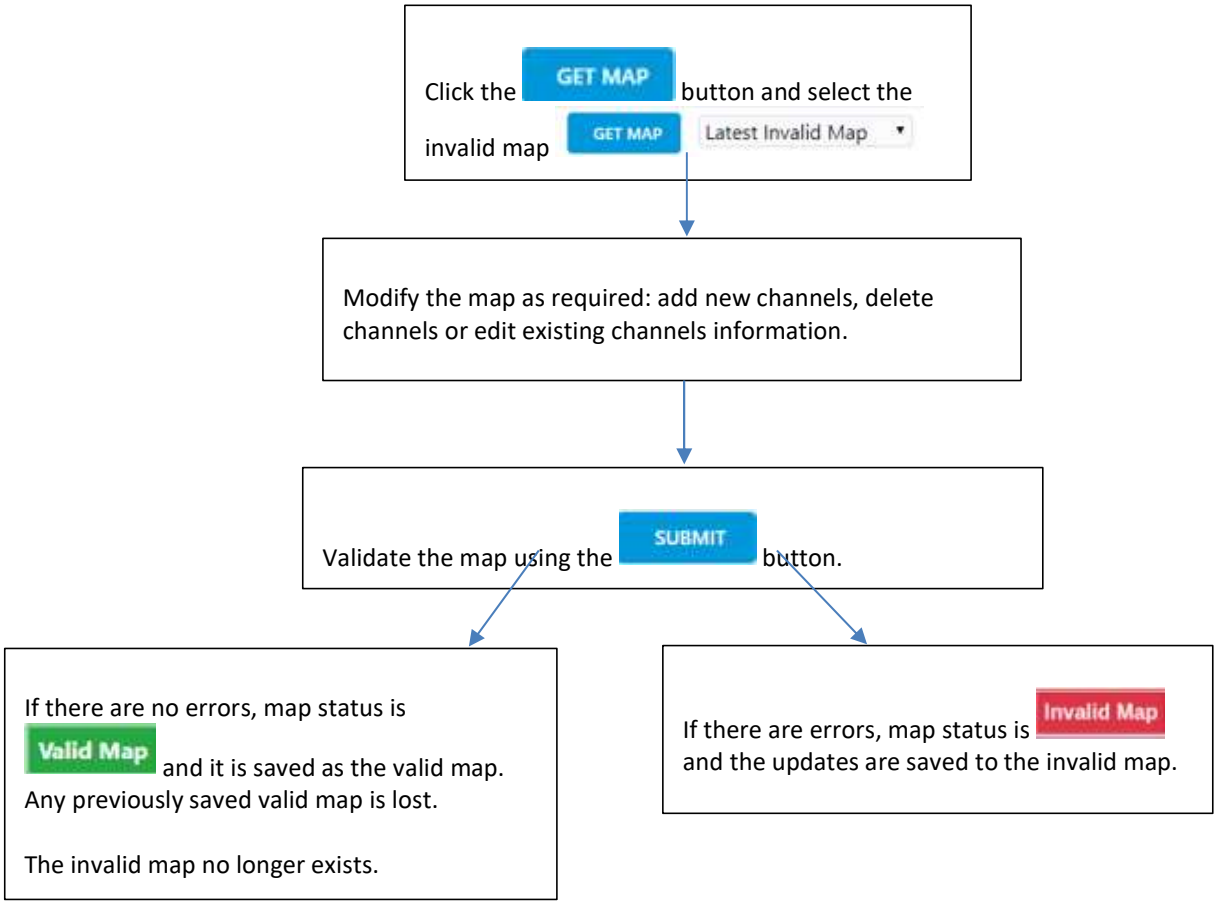
5.1.5.1 Map Management Flows

Below are 2 map management scenarios for example.

1. Create a new map from scratch:



2. Change an invalid map and repeat the validation process:



5.1.5.2 Adding a New Channel

When choosing the **New Channel** option, the following form appears:

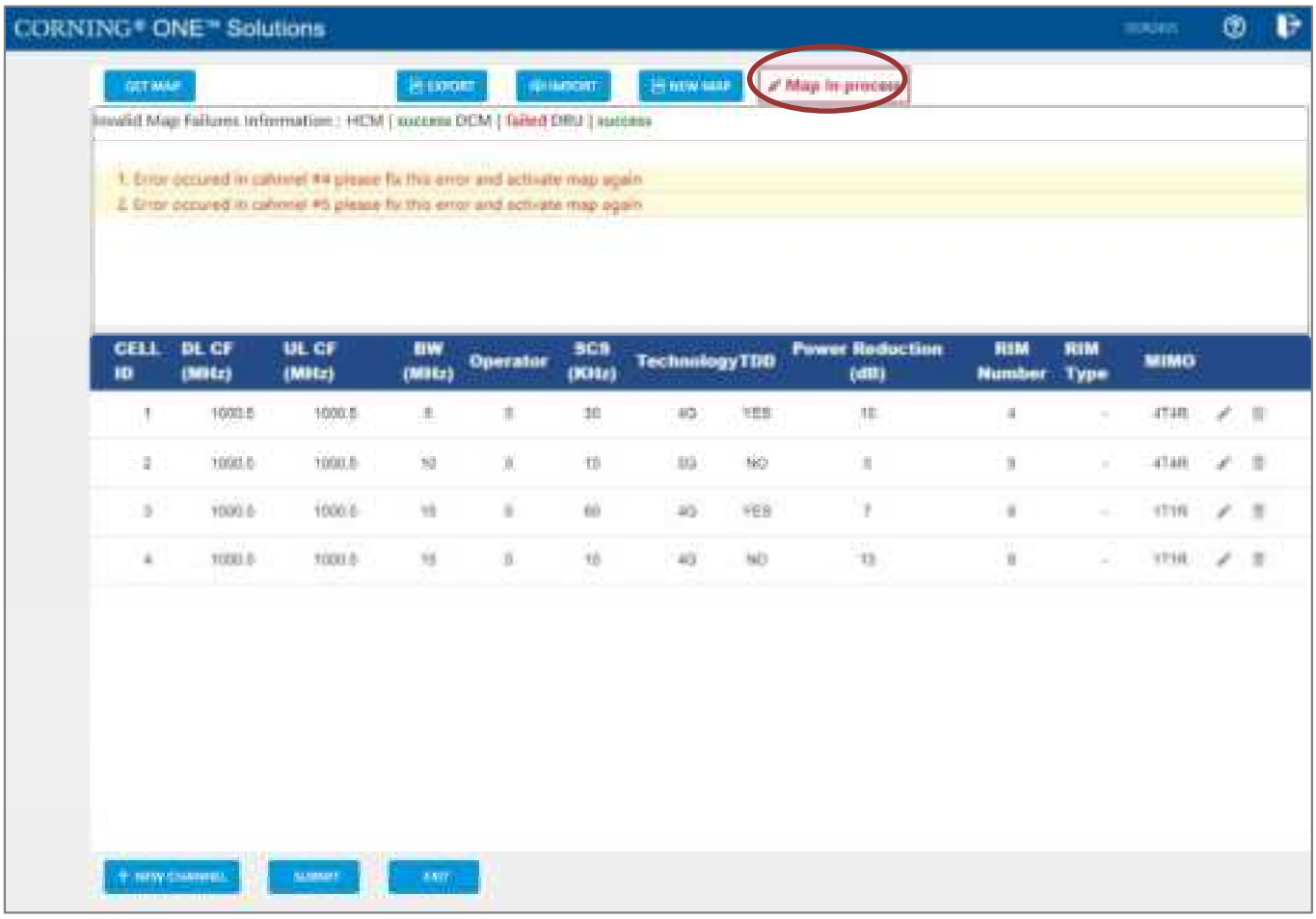
Table 23: Add Channel Form

Field	Information
Cell Id	Channel name entered by the user, may include location and other information regarding the channel.
DL CF	Downlink Center Frequency (MHz).
UL CF	Uplink Center Frequency (MHz).
BW	Bandwidth (MHz).
Operator	Name of operator (name of telecommunication company).
TDD Service	YES/NO; Indicates whether Time Division Duplexing is enabled.
Power Reduction	
RIM Number	Slot number of the connected RIM. Slots 1-8 are IHU slots and slots 9-20 are HEU slots.
Technology	The applicable values are 3G/4G/5G.
SCS	Sub Carrier Spacing (kHz).
MIMO	Number of transmitters and receivers.

Note: Up to 32 channels can be added (16 channels per DCM).

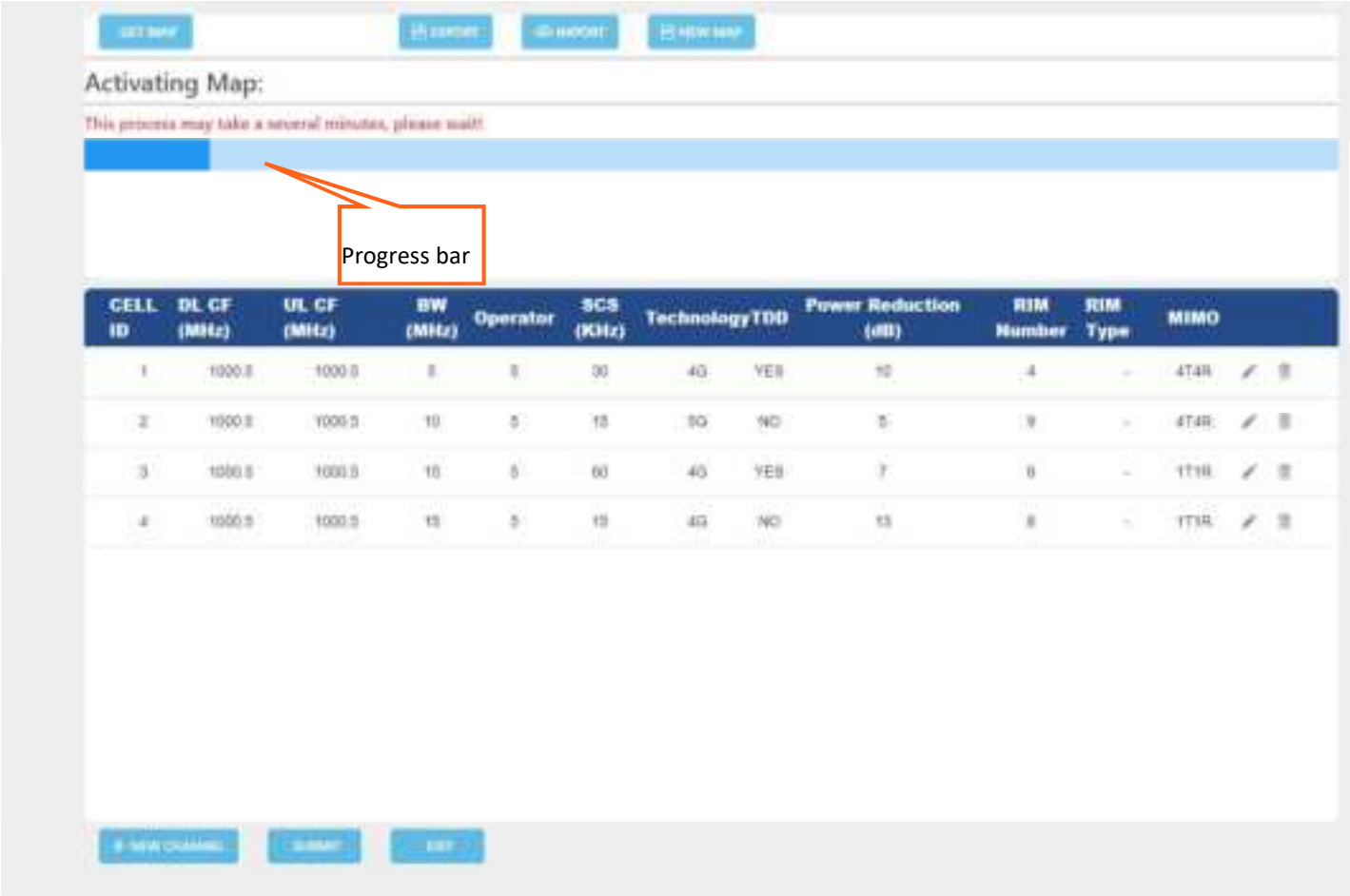
5.1.5.3 Submitting a map

1. When changes are made to any map the status of the map is "map in process" until the changes are submitted:

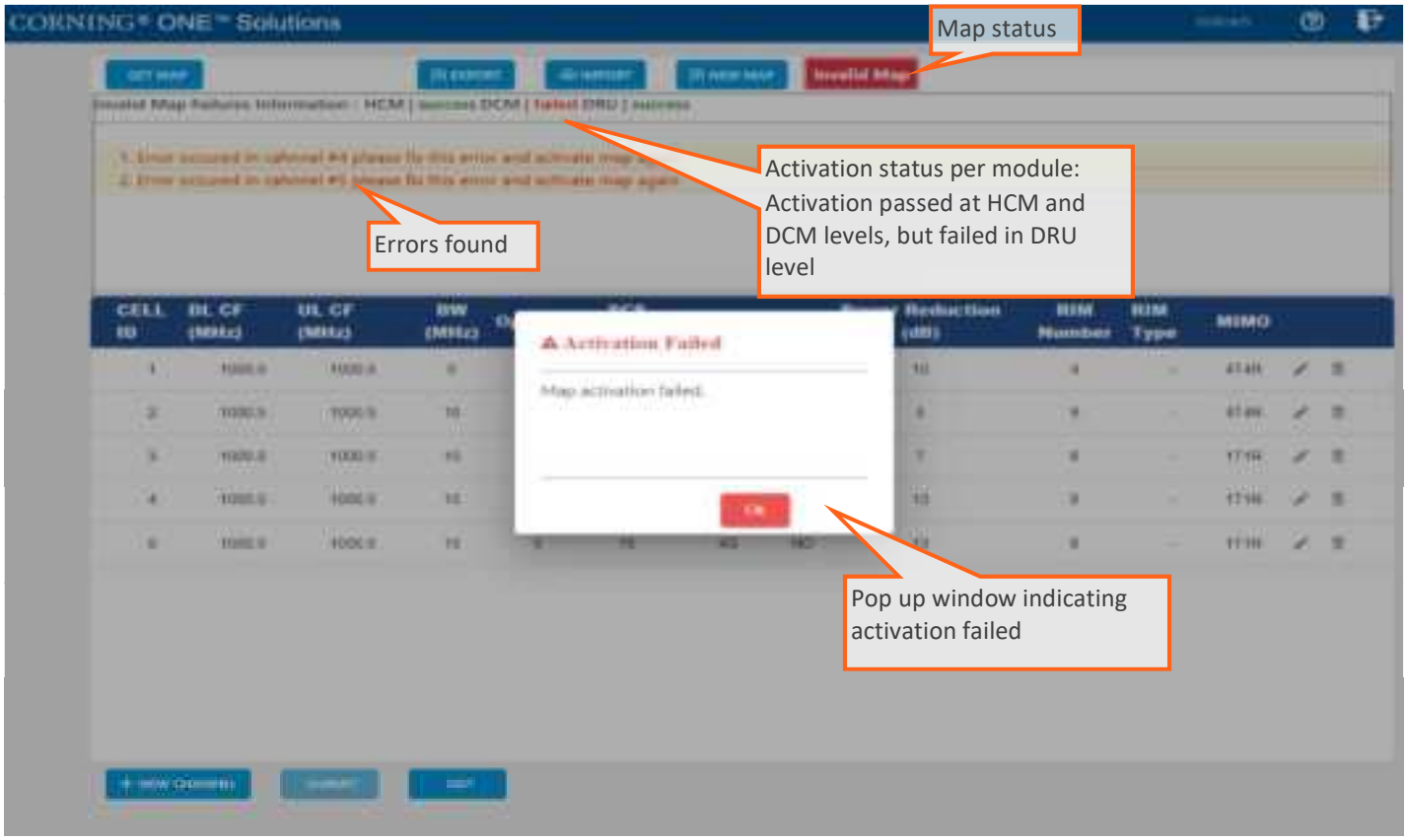


2. When the user is done making changes to the map, he can press the "submit" button. Validation of the map begins, and a progress bar appears:

The system performs a basic check to make sure all parameters have valid values according to system limits, such as: Number of channels per specific BW, channels overlap, etc.


Activating Map:
This process may take a several minutes, please wait!
Progress bar
CELL ID
DL CF (MHz)
UL CF (MHz)
BW (MHz)
Operator
SCS (KHz)
Technology
TDD
Power Reduction (dB)
RIM Number
RIM Type
MIMO

3. A pop up window indicates the activation status. If activation fails, the errors are displayed, as well as the activation status per module. In the following example, the map status is "invalid map" (the map will be saved as the invalid map).



If activation is successful, the status of the map becomes "valid map" (map is saved as the valid map).

If the user makes changes to an invalid map, submits it and activation passes, the map is saved as the valid map and the invalid map is deleted.

6. SNMP Management

The Everon system supports SNMP protocol, which allows standard monitoring via a large variety of 3rd party endpoint monitoring tools, also known as *SNMP manager agents* (e.g., HP OpenView, CA Unicenter, IBM Tivoli, CastelRock SNMPc): The Everon system sends indications on system events and failures to a user-defined monitoring destination-address, by sending *SNMP protocol traps*. Integrating between Everon system and the monitoring agent, is done by loading Everon MIB file (Management Information Base) to the SNMP manager agent. This file includes system driver-like data required for the two systems to communicate, where one of the parameters is a binding table (provided here in section 6.3), that allows interpreting the supported traps sent by Everon.

Everon supports simultaneously two SNMP protocol versions - SNMPv2 and SNMPv3. This allows system monitoring by multiple tools that support different SNMP protocol versions.

- **SNMPv2** is enabled by default and can be disabled by the user. The user can also modify the community string, which is an ID of the SNMP device used for communication with the SNMP manager. The community string is sent with all SNMP requests.
- **SNMPv3** provides a secure SNMP protocol and facilitates remote configuration of the SNMP entities, thus simplifying remote administration. The security aspect is addressed by offering both strong authentication and data encryption for privacy, whereas the administration aspect focuses on notification originators and proxy forwarders. SNMPv3 authentication and security:
  - Verification for each received SNMP message that it has not been modified during transmission through the network.
  - Verification of the user identity for which the received SNMP message was supposedly generated.
  - Detection of received SNMP messages, requesting or containing management information, whose time of generation is not recent.

Note: Everon allows the user to perform system configurations via the SNMP manager.

➢ **To allow SNMP monitoring, the user needs to perform the following steps:**

1. Perform SNMP Setup, see 6.1
2. Optional: Test the configuration using a MIB browser, see 6.2
3. Start monitoring the system

Notes:

** The supported traps are listed in section 6.4*

** The information each trap includes is listed in section 6.2.*

6.1 SNMP Setup

This section details the following steps, required to set SNMP trap monitoring:

1. Through Everon GUI: set the SNMP protocol version parameters (SNMPv2 / SNMPv3), see 6.1.1
2. Through Everon GUI: Set Traps Monitoring Destination Addresses, see 6.1.2
3. Through your 3rd party SNMP monitoring tool: Load the MIB files, see 6.1.3

6.1.1 Set Protocol Version Parameters (SNMPv2 / SNMPv3)

➢ **To set SNMP version:**

1. Choose **Admin** from the main menu → **SNMP Config**. The following screen appears:

2. In the following instructions, refer to the protocol version relevant in your deployment, and perform the set of instructions listed below.

➢ **To Configure the SNMPv2 parameters:**

1. In the main menu bar, click 

→ 

.
2. In the “V2 Configuration” area, click  to change the current configurations.

   The **SNMP Community** dialog appears:

3. Select/unselect the checkbox next to "Enable V2" to enable/disable SNMPv2.
4. If necessary, modify the community name in the **Community** field.
5. Click **OK**.

➢ **To configure SNMPv3 parameters**

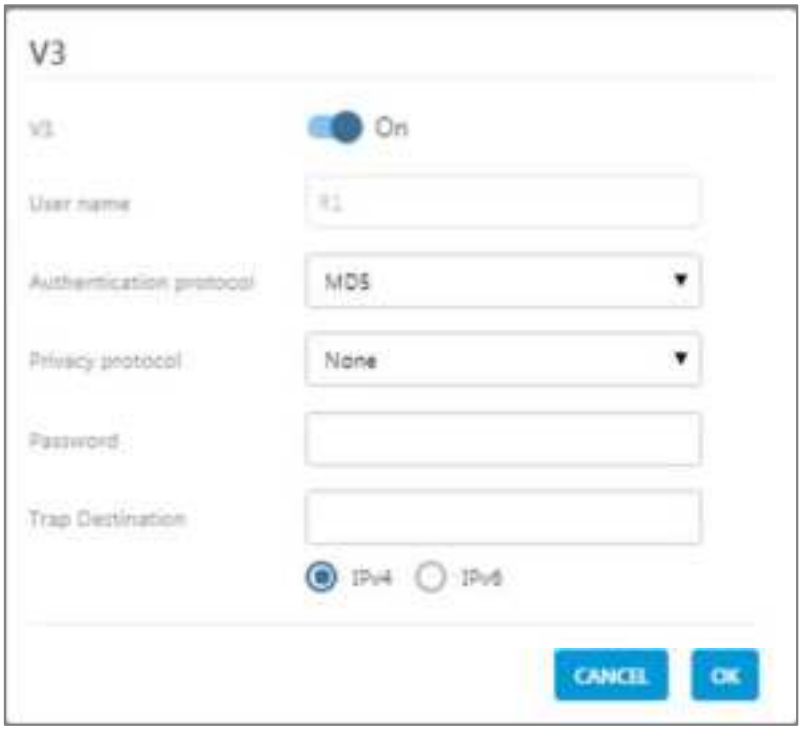
1. In the main menu bar, click 

→ 

.
2. Select the required user from the **User Name** list and click 

. The following dialog appears:

3. Enable "V3" to get the SNMPv3 configuration options:



4. Configure the following SNMPv3 parameters for the user:
   - Authentication protocol – MD5/SHA.
   - Privacy protocol – None/DES/AES-128.
   - Password – one password for both authentication and privacy protocols.
5. Select the internet protocol version (IPv4/IPv6) for the SNMP traps and enter the trap destination address:
   - IPv4 - SNMPv3 trap destination address: IP (x.x.x.x).
   - IPv6 - SNMPv3 trap destination address: IP (0:0:0:0:0:0:0:0).
6. Click **OK**.

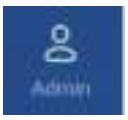
6.1.2 Set Traps Monitoring Destination Addresses

This section explains how to configure the IP addresses to which SNMP traps are sent. Both IPv4 and IPv6 addresses are supported.

In addition, each SNMP trap destination can be configured with an HB trap timer ("keep alive").This option enables a periodical trap indicating that the device is operational. The trap is sent every user-configured time interval: 1-59 minutes.

Note: The defined HB interval must be the same for all devices in the system. This option is disabled by default.

➢ **To define the trap destination IP address**

1. In the main menu bar, click 

→ 

.
2. Click 

in the **Trap Destination List** area.

   The **Trap Destination IP Address** dialog appears:

3. **Select the protocol version of the IP address**: IPv4/IPv6 and enter the trap destination address.
   - IPv4: IP (x.x.x.x).
   - IPv6: IP (0:0:0:0:0:0:0:0).
4. **If needed: select the Custom** radio button, to allow….
5. **If needed: set the Heartbeat (HB):**
   - In the HB box, select Enable from the roll-down menu
   - Determine the time interval (rate) for sending HBs.

   Note: Ensure the HB definition is identical in the whole system.
6. Click OK.
7. DONE: The IP address is added to the list.

6.1.3 SNMP manager Setup: Load the MIB File

This section describes the steps necessary to view the traps sent by the monitored system in the management application.

Note: It is assumed that the HCM IP address and the trap destination addresses have already been configured.

➢ **To view interpreted traps through the 3rd party management application**

1. Start the management application.
2. Load and compile the MIB-II file (a public domain file which can be found on http://www.rfc-editor.org).
3. Load and compile the ma_events.mib file.
4. Load and compile the maHCM.mib file.

Note: In most cases MIB files are loaded and compiled using the "MIB menu" tool items in the main menu of the management application.

5. SNMP monitoring can begin.

6.2 Test the Configuration using a MIB Browser Tool (Recommended)

After SNMP is configured, it is recommended that the user verifies that SNMP information is properly received and sent by the monitored system.

To do so, the user may download a MIB browser (free to download). MIB browsers are accessible and easy to use tools, which can be used to check the configurations and view, configure and parse SNMP traps.

6.3 Trap Variable Bindings

Data within a trap is encoded in a typical key-value pair configuration. These pairs are called “variable bindings” and they contain extra information related to the trap. For example, a trap has the binding "trapDeviceTpe", which may have the value "1". This means the Module that generated the trap is the HCM.

The table below lists all bindings supported.

Table 21: Binding Table

No.	Binding	Description
1.	trapSequenceID	Trap sequence ID to be sent with the trap. This is a trapSequenceID varbind that is attached to the trap message in order to allow the manager to track missing traps.
2.	trapTimeStamp	Time and date the current event occurred; Format H:M:S D/M/Y
3.	trapDeviceType	Additional data sent with the trap; Type of module that generated the trap: hcm = (1) acm = (2) rim = (3) oim = (4) RAU5 = (5) rxu = (6) fmm = (9)

No.	Binding	Description
		frm = (10) site = (11) mru = (12) lau = (21) och = (24) gx = (25) mxu = (26)
4.	trapDeviceSerial	Additional data sent with the trap. This is the serial number of the device that generated the trap (up to remote unit level).
5.	trapChassisSN	Chassis serial number of the module
6.	trapChassisIndex	Additional data sent with the trap. This is the base controller index that generates the trap (chassis index).
7.	trapSlotIndex	Additional data sent with the trap. This is the base controller's port index that generates the trap (the slot inside the chassis).
8.	trapPortIndex	Additional data sent with the trap. This is the connector index of the base controller that connects to the generating device (the optical port of the OIM).
9.	trapRemoteIndex	Additional data sent with the trap. This is the internal index within the generating device (e.g., RxU index).
10.	trapCtrlSerialNum	Serial number of the controller generating the event; Internal parameter.
11.	trapCtrlName	Name of controller
12.	trapModuleName	Name of module
13.	trapSeverity	The alarm severity: (1) Notify (2) Minor (3) Major
14.	trapChannel	Trap channel for remote unit band number for OIM optic port.
15.	trapChannelDescription	Trap channel for remote unit band name for the OIM optical port.

6.4 List of traps

The system supported traps (i.e. alert messages sent by the system to the SNMP manager, indicating system events or failures), are provided in the following table.

Table 21: List of Traps

Trap name	Description	OID
controllerPowerUp	Controller power up indication	1
moduleDisconnected	Module disconnected	4
moduleDetected	Module detected	5
versionMismatchSet	Module Version Mismatch	6
versionMismatchClear	Module Version Mismatch clear	7
moduleAdjustmentFaultSet	Module Adjustment Fault	8
moduleAdjustmentFaultClear	Module Adjustment Fault clear	9
ModuleHwFailureSet	HW Failure	10
moduleHwFailureClear	HW Failure Clear	11
moduleInvalidChannelsMapSet	Module Invalid Channels Map set	12
moduleInvalidChannelsMapClear	Module Invalid Channels Map clear	13
adjustFaultSet	Adjustment Procedure Fault set	20
adjustFaultClear	Adjustment Procedure Fault clear	21
installFaultSet	Installation Fault set	22
installFaultClear	Installation Fault clear	23
releaseMismatchSet	SW Release Mismatch versions set	24
releaseMismatchClear	SW Release Mismatch versions clear	25
connectivitySet	Connectivity set	26
connectivityClear	Connectivity clear	27
hcmHeartbeat	HCM Heartbeat (Keep alive)	28
N/A	HCM HB Placeholder (not in use)	29
N/A	HCM License Placeholder (not in use)	30
N/A	HCM License Placeholder (not in use)	31
hcmInvalidChannelsMapSet	HCM Invalid Channels Map set	32
hcmInvalidChannelsMapClear	HCM Invalid Channels Map clear	33
hcmMissingEquipmentSet	HCM Missing equipment for the Channels Map	34
hcmMissingEquipmentClear	HCM Missing equipment for the Channels Map clear	35
acmPSMAOverTemperatureSet	ACM Power Supply A over Temperature	100
acmPSMAOverTemperatureClear	ACM Power Supply A over Temperature Clear	101
acmOverTemperatureSet	ACM Over Temperature	102
acmOverTemperatureClear	ACM Over Temperature clear	103
acmPSMBOverTemperatureSet	ACM Power Supply B over Temperature	104
acmPSMBOverTemperatureClear	ACM Power Supply B over Temperature Clear	105
acmPSMAOutputUnderVoltageSet	ACM Power Supply A Output Under Voltage	108
acmPSMAOutputUnderVoltageClear	ACM Power Supply A Output Under Voltage Clear	109
acmPSMBOutputUnderVoltageSet	ACM Power Supply B Output Under Voltage	110
acmPSMBOutputUnderVoltageClear	ACM Power Supply B Output Under Voltage Clear	111
acmExt1ClockDownSet	ACM Ext1 Clock down	114
acmExt1ClockDownClear	ACM Ext1 Clock down Clear	115
acmExt2ClockDownSet	ACM Ext2 Clock down	116
acmExt2ClockDownClear	ACM Ext2 Clock down Clear	117
acmPilotClockDownSet	ACM Pilot Clock Down	118

Trap name	Description	OID
acmPilotClockDownClear	ACM Pilot Clock Down Clear	119
acmPSMAInputUnderVoltageSet	ACM Power Supply A Input Under Voltage	120
acmPSMAInputUnderVoltageClear	ACM Power Supply A Input Under Voltage Clear	121
acmPSMBInputUnderVoltageSet	ACM Power Supply B Input Under Voltage	122
acmPSMBInputUnderVoltageClear	ACM Power Supply B Input Under Voltage Clear	123
acmPowerFailureSet	ACM Power Failure	126
acmPowerFailureClear	ACM Power Failure Clear	127
acmFamFailureSet	ACM Fam Failure	128
acmFamFailureClear	ACM Fam Failure Clear	129
rimDLRFLowPowerSet	RIM DL RF Low Power	200
rimDLRFLowPowerClear	RIM DL RF Low Power Clear	201
rimDLOverPowerSet	RIM DL Over Power	202
rimDLOverPowerClear	RIM DL Over Power Clear	203
rimServiceOffSet	RIM Service Off	204
rimServiceOffClear	RIM Service Off Clear	205
rimOverTemperatureSet	RIM Over Temperature	208
rimOverTemperatureClear	RIM Over Temperature Clear	209
rimTddSyncLossSet	RIM TDD Sync Loss	212
rimTddSyncLossClear	RIM TDD Sync Loss Clear	213
rimAwsMixConnectionSet	RIM AWS3 Band mismatch	214
rimAwsMixConnectionClear	RIM AWS3 Band mismatch Clear	215
Place Holder	Place Holder	216
Place Holder	Place Holder	217
rimUlSynthesizerUnlockedSet	RIM UL Synthesizer Unlocked	250
rimUlSynthesizerUnlockedClear	RIM UL Synthesizer Unlocked Clear	251
rimDlSynthesizerUnlockedSet	RIM DL Synthesizer Unlocked	252
rimDlSynthesizerUnlockedClear	RIM DL Synthesizer Unlocked Clear	253
rimReferenceClockUnlockedSet	RIM Reference Clock Unlocked	254
rimReferenceClockUnlockedClear	RIM Reference Clock Unlocked Clear	255
siteAdjustFaultSet	Site Adjustment Fault	700
siteAdjustFaultClear	Site Adjustment Fault clear	701
siteReleaseMismatchSet	There are Modules with Version Mismatch in the site	702
siteReleaseMismatchClear	All Modules Versions OK in the Site	703
siteConnectivitySet	There are Disconnected Modules in the site	704
siteConnectivityClear	All Modules are connected in the site	705
druOverTemperatureSet	DRU over temperature	2100
druOverTemperatureClear	DRU over temperature Clear	2101
druSfpPortSet	DRU SFP port X (X from 1 to 36) status	2102
druSfpPortClear	DRU SFP port X (X from 1 to 36) status clear	2103
druCpriLinkSet	DRU CPRI link X (X from 1 to 36) status	2104
druCpriLinkClear	DRU CPRI link X (X from 1 to 36) status clear	2105
dcmOverTempratureSet	DCM over temperature	2200
dcmOverTempratureClear	DCM over temperature clear	2201
dcmSfpPortSet	DCM SFP port X (X=1,2,3,4) status	2202
dcmSfpPortClear	DCM SFP port X (X=1,2,3,4) status clear	2203
dcmCpriLinkSet	DCM CPRI link X (X=1,2,3,4) status	2204
dcmCpriLinkClear	DCM CPRI link X (X=1,2,3,4) status clear	2205
ruSfpPortSet	Remote SFP port X (X=1,2,3,4) status	2300
ruSfpPortClear	Remote SFP port X (X=1,2,3,4) status clear	2301

Trap name	Description	OID
ruCpriLinkSet	Remote CPRI link X (port# of remote side) status (Examples for remotes CPRI links numbers: DLRU Med bands 1,2,3 DLRU Low bands 1 DMRU 1,2 DHRU 1,2,3,4)	2302
ruCpriLinkClear	Remote CPRI link X status clear	2303
ruOverTempratureSet	Remote Unit Over temperature - sensor X	2304
ruOverTempratureClear	Remote Unit Over temperature clear	2305
ruServiceOffSet	Remote Unit service off - band X (600/700L/700H/FN/800/850/PCS/AWS/WCS /TDD 2.5)	2306
ruServiceOffClear	Remote Unit service off clear	2307
ruUlLimiterSet	Remote Unit UL Limiter - band X	2310
ruUlLimiterClear	Remote Unit UL Limiter clear	2311
ruDlRfLowSet	Remote Unit DL RF Low	2312
ruDlRfLowClear	Remote Unit DL RF Low clear	2313
ruConnectionErrorSet	Remote Unit connection error	2316
ruConnectionErrorClear	Remote Unit connection error clear	2317
ruOverflowSet	Remote Unit Overflow - per channel X	2320
ruOverflowClear	Remote Unit Overflow clear	2321
ruVswrSet	Remote Unit VSWR Alarm in band X	2322
ruVswrClear	Remote Unit VSWR Alarm clear	2323
ruPaSelfProtectionSet	Remote Unit PA Self Protection Alarm - band X	2324
ruPaSelfProtectionClear	Remote Unit PA Self Protection Alarm clear	2325
ruTddOutOfSyncSet	Remote Unit TDD out of sync - band X	2326
ruTddOutOfSyncClear	Remote Unit TDD out of sync clear	2327

7. APPENDIX A: Ordering Information and Specifications

- **Specifications |**

  - **RF Parameters**

Frequency Range Name	Uplink	Downlink
600-band 71	663-698 MHz	617-652 MHz
700L (Lower Band)- band 12	698-716 MHz	728-746 MHz
700U (Upper Band)-band 13	776-787 MHz	746-757 MHz
FirstNet (700)-band 14	788-798 MHz	758-768 MHz
800/850 -band 26	817-849 MHz	862-894 MHz
1900 (PCS)-band 25	1850-1915 MHz	1930-1995 MHz
EAWS-band 66	1710-1780 MHz	2110-2200 MHz
WCS -band 30	2305-2315 MHz	2350-2360 MHz
2500 -band 41	2496-2690 MHz (TDD)	

  - **Standards and Certifications**

Attribute	Description
EMC	CE, EMC FCC 47 CFR Part 15 sub part B
Safety	62368
Radio	Fire Safety UL 2043 (applicable for LRU only)

*Technical spec subject to change without notice

- **Radio Interface Frames (IHU/HEU)**
- **IHU Chassis**

Radio Interface Frame Modules	
RIMe – up to 8 modules per chassis	Single band module (see bands table) Interfaces: UL, DL and duplexed interface ports, QMA RF connectors Weight: 1.9 lbs (0.9 kg)
DCM – up to 2 modules per chassis	Interfaces: CPRI: 4x SFP+ (optical connectors) Weight: 2.9 lbs (1.3 kg)
RIX- one module per chassis	Interfaces: Two 9-pin coaxial interface connectors (RF and Clock) Two QMA ports for reference clock connections between Radio Interface Frames (IHU, HEU) Weight: 1.54 lbs (0.7 kg)
OIX - one module per chassis	Interfaces: Two 9-pin coaxial interface connectors (RF and Clock) Weight: 1.54 lbs (0.7 kg)
PSM – up to 2 modules per chassis	Power Consumption 200 Watt (Full Chassis) AC PSM: power input 120-220 VAC; tri-pin DC PSM: power input 48 VDC; 9A Max.; 6-pin terminal block connector On/Off power switch Weight: 1.9 lbs (0.9 kg)
dHCM – one module per system using IHU and 7 HEU chassis	Interfaces: Four RJ45 100 Mb Ethernet ports - internal interfaces to auxiliary control modules One RJ45 1 Gigabit Ethernet LAN port – for remote management One RJ45 1 Gigabit Ethernet Local port – for local configuration and management One RJ45 console port – for service personnel use only (e.g., debugging, etc.) SD card slot – support for micro SD card up to 32 GB, used for saving and importing system configuration files Status LEDs: indicating power, module operation (RUN), system status and fan operation of chassis Weight: 2.2 lbs (1 kg)
ACM -one module per chassis	Interfaces: Four RJ45 100 Mb Ethernet ports - internal interfaces to dHCM One RJ45 console port – for service personnel only Status LEDs: indicating power, module operation (RUN), system status and fan operation of chassis To dHCM RJ-45 internal port Weight: 2.2 lbs (1 kg)

Mechanical	
Dimension (H x W x D)	7” x 17.3” x 18.95” (177.8 x 440 x 481.7 mm)
Mounting	19”/4U
Weight	58 Lbs (26.4Kg) for full chassis configuration

Environmental	
Operating temperature	0 to +50° C (32 to 122° F)

*Technical spec subject to change without notice

- **HEU Chassis**

Radio Interface Frame Modules	
RIMe – up to 12 modules per chassis	Single band module (see bands table) Interfaces: UL, DL and duplexed interface ports, QMA RF connectors Weight: 1.9 lbs (0.9 kg)
RIX- one module per chassis	Interfaces: Two 9-pin coaxial interface connectors (RF and Clock) Two QMA ports for reference clock connections between Radio Interface Frames (IHU, HEU) Weight: 1.54 lbs (0.7 kg)
PSM – up to 2 modules per chassis	Power Consumption 200 Watt (Full Chassis) AC PSM: power input 120-220 VAC; tri-pin DC PSM: power input 48 VDC; 9A Max.; 6-pin terminal block connector On/Off power switch Weight: 1.9 lbs (0.9 kg)
ACM -one module per chassis	Interfaces: Four RJ45 100 Mb Ethernet ports - internal interfaces to dHCM One RJ45 console port – for service personnel only Status LEDs: indicating power, module operation (RUN), system status and fan operation of chassis To dHCM RJ-45 internal port Weight: 2.2 lbs (1 kg)

Mechanical	
Dimension (H x W x D)	7” x 17.3” x 18.95” (177.8 x 440 x 481.7 mm)
Mounting	19”/4U
Weight	64.5 Lbs (29.3) for full chassis configuration

Environmental	
Operating temperature	0 to +50° C (32 to 122° F)

*Technical spec subject to change without notice

- **DRU - Digital Routing Unit**

Interfaces & Mechanical	
CPRI ports	32 x SFP+ (10.1 Gbps, CPRI line bit rate option 8) to Remote Units
CPRI ports	4 x SFP+ (10.1 Gbps, CPRI line bit rate option 8) to DCM
Ethernet Ports	2x RJ45 - LAN, Local
External synchronization	2*QMA -10MHz In/Out
Mounting:	19” rack, 1U
Dimension (W x H x D)	Size: 19” x 1.75” x 16.5” (482.6 x 44.5x 419 mm)
Weight	19.8 Lbs (9Kg)
Powering	
Powering	48V DC / or AC 220/110V
Power Consumption	180 Watt
Environmental	
Operating temperature	0 to +50° C (32 to 122° F)

*Technical spec subject to change without notice

- **Low Band dRAU LRU-Low power Remote**
- **Unit End to End System Performance**
- **Headend to Digital Low power Remote Unit**

RF Specifications						
Frequency Range Name			**600**	**700L & 700U & FirstNet**		**800/850**
Frequency Range	Uplink	MHz	663-698	698-716	776-787,788- 798	817-849
	Downlink		617-652	728-746	746-757, 758-768	862-894
Max. Operating Bandwidth-Non-contiguous		MHz	Full Band			
Instantaneous Bandwidth		MHz	35	18	21	32
Downlink Output Power (LRU)		dBm	20	20		20
Attenuation Adjustable Range (1dB step)		dB	0-20			
Pass Band Ripple (p-p)		dB	≤ 4	≤ 4	≤ 4	≤ 4
Channel Bandwidth		MHz	5/10/15/20			
Uplink Noise Figure (typical)		dB	12			
Uplink IIP3 (typical)		dBm	-14			
VSWR			≤ 1.8			
EVM (256 QAM) (TM3.1A @ Rated power)		%	< 3.5			
Spurious Emission			3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7)			
Electrical Specifications						
Power Consumption		Watt	70			
DC voltage		DC	37-56			
Interfaces and Mechanical						
CPRI Port			1, SFP+ 10.1Gbps			
Antenna Ports			2, 4.3-10 female			
Dimension (W x H x D)		Inch (mm)	9.84 x 10.63 x 2.75 (250 x 270 x70)			
Weight		Lbs (Kg)	13 (6)			
Mounting and installation			Wall, ceiling and pole mount options			
Cooling			Convection			
Environmental						
Operational Temperature		°F (°C)	-40° to 131° (-40° to 55°)			
Outdoor installation (Ingress Protection)			IP 66			

*Technical spec subject to change without notice

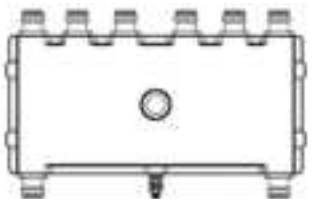
- **Medium Band LRU- Low power Remote Unit**
- **End to End System Performance**
- **Headend to Digital Low power Remote Unit**

RF						
Frequency Range Name			**1900**	**EAWS**	**WCS**	**2500**
Frequency Range	Uplink	MHz	1850-1915	1710-1780	2305-2315	2496-2690
	Downlink		1930-1995	2110-2180	2350-2360	2496-2690
Max. Operating Bandwidth-Non-contiguous		MHz	Full Band			
Instantaneous Bandwidth		MHz	65	70	10	60 + 60
Downlink Output Power (LRU)		dBm	20	20	18	20
ATT Adjustable Range (1dB step)		dB	0-20			
Pass Band Ripple (p-p)		dB	≤ 4	≤ 4	≤ 4	≤ 4
Channel Bandwidth		MHz	5/10/15/20			5/10/15/20 for 4G 40 or 60 for 5G
Uplink Noise Figure (typical)		dB	12			
Uplink IIP3 (typical)		dBm	-14			
VSWR			≤ 1.8			
EVM (256 QAM)		%	< 3.5			
Spurious Emission			3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7); 3GPP TR 36.846 V12.0.0			
Electrical Specifications						
Power Consumption		Watt	80			
DC voltage		DC	37-56			
Interfaces and Mechanical						
CPRI Port			3, SFP+ 10.1Gbps			
Antenna Ports			2 ,4.3-10 female			
Dimension (W x H x D)		Inch (mm)	9.84 x 10.63 x 2.75 (250 x 270 x 70)			
Weight		Lbs (Kg)	13 (6)			
Mounting and installation			Wall, ceiling and pole mount options			
Cooling			Convection			
Environmental						
Operational Temperature		°F (°C)	-40° to 131° (-40° to 55°)			
Outdoor installation (Ingress Protection)			IP 66			

*Technical spec subject to change without notice

LRU 2:2 MIMO Antenna Combiner

The LRU combiner is used to combine the 2 LRU's:
Low Band dRAU LRU and Medium Band LRU.
The combiner has a total of 6 input ports and 2 output ports.
There are two independent three-frequency combiners inside.
The input frequencies are:
617-894MHz (connected to LRU Low Band dRAU)
1695-2690 MHz (connected to LRU Medium Band)
3450-4000MHz (for future connection to CBRS C-Band LRU)



		Port1/Port4	Port2/Port5	Port3/Port6
Port Name		Low Band dRAU 1/2	Mid Band 1/2	C-Band 1/2
Frequency Range	MHz	617-894	1695-2690	3450-4000
Bandwidth	MHz	277	995	550
Insertion Loss	dB	≤ 1		
Pass band Ripple	dB	≤ 0.5		
Out of Band Isolation	dB	≥50@1695-2690 ≥50@3450-4000	≥50@617-894 ≥40@3450-4000	≥50@617-894 ≥50@1695-2690
PIM	dBc	-155 (@ 2x1W)		
Return Loss	dB	≥18		
Isolation	dB	≥40		
Impedance	Ω	50		
Interfaces and Mechanical				
Port Type		4.3-10 Female		
Dimension	Inch(mm)	10.6 x 4.92 x 1.38 (270 x 125 x 35)		
Maximum Power		1W (Average)		
Environmental				
Operating temperature	°F (°C)	-40 to +185 (-40 to +85)		
Ingress Protection		IP66		

*Technical spec subject to change without notice

- **MRU - Medium Power Remote Unit**
- **System performance**
- **Head End to Medium power Remote Unit**

RF										
Frequency Range Name			**600**	**700L & 700U & FirstNet**		**800 /850**	**1900**	**EAWS**	**WCS**	**2500**
Frequency Range	Uplink	MHz	663-698	698-716	777-798	817-849	1850-1915	1710-1780	2305-2315	2496-2690
	Downlink		617-652	728-746	746-768	862-894	1930-1995	2110-2180	2350-2360	
Max. Operating Bandwidth-Non-contiguous	MHz		Full Band							
Instantaneous Bandwidth	MHz		35	18	21	32	65	70	10	60+ 60
Downlink Output Power	dBm		33	33		33	37	37	37	37
Attenuator Adjustable Range (1dB step)	dB		0-20							
Pass Band Ripple (p-p)	dB		≤ 4							
Channel Bandwidth	MHz		5/10/15/20							5/10/15/20 for 4G 40 or 60 for 5G
Uplink Noise Figure (typical)	dB		12							
Uplink IIP3 (typical)	dB		-12							
VSWR			≤ 1.8							
EVM (256 QAM) (TM3.1A@ Rated power)	%		< 3.5							
Spurious Emission			3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7)							
CBRS ready frequencies	MHz		3350-3980. Combined with all other services							
Coupling port	dB		35							
Electrical Specifications										
Power Consumption (Typical)	Watt		With DC power supply: 515 With AC power supply: 550							
DC voltage	DC		48							

Interfaces and Mechanical		
CPRI Port		2, SFP+ 10.1Gbps
Antenna Ports		1, 4.3-10 female
CBRS port		1, N-Type female
Coupling port		1 ,QMA connector that will enable measurement of the DL/UL signals while the system is working
Dimension (W x H x D)	Inch (mm)	17.45 x 10.5 x 15.75 (443.2 x 266.7 x 400)
Mounting and installation		19”,6U -Wall mount and Rack mount options
Weight	Lbs (Kg)	83.77(38) -Fully populated with 6 RF modules
Cooling		Active
Environmental		
Operational Temperature	°F (°C)	-40° to 131° (-40° to 55°)
Indoor installation		For outdoor applications external enclosure is required

*Technical spec subject to change without notice

- **HRU -High-Power Remote Unit**
- **System performance (Head End to High power Remote Unit)**

RF										
Frequency Range Name			**600**	**700L & 700U & FirstNet**		**800 /850**	**1900**	**EAWS**	**WCS**	**2500**
Frequency Range	Uplink	MHz	663-698	698-716	777-798	817-849	1850-1915	1710-1780	2305-2315	2496-2690
	Downlink		617-652	728-746	746-768	862-894	1930-1995	2110-2180	2350-2360	
Max. Operating Bandwidth-Non-contiguous	MHz		Full Band							
Instantaneous Bandwidth	MHz		35	18	21	32	65	70	10	100
Downlink Output Power	dBm		43	43		43	43	43	43	43
Attenuator Adjustable Range (1dB step)	dB		0-20							
Pass Band Ripple (p-p)	dB		≤ 4							
Channel Bandwidth	MHz		5/10/15/20							5/10/15/20 for 4G 40 or 60 for 5G
Uplink Noise Figure (typical)	dB		6							
Uplink IIP3 (typical)	dB		-20							
VSWR			≤ 1.8							
EVM (256 QAM) (TM3.1A@ Rated power)	%		< 3.5							
Spurious Emission			3GPP TS 36.106/25.106; 3GPP TS 38.104 V15.5.0 (sections 6; 7)							
Electrical Specifications										
Power Consumption (Typical)	Watt		OEU (Optical Expansion Unit) –connected to RFU's					50		
			RFU (RF Unit) – MIMO 2:2 for the bands 600,700,800/850,1700.1900,2300,2500TDD					220		
AC voltage	AC		100-240							

Interfaces and Mechanical			
CPRI Port		4, SFP+ 10.1Gbps	
Antenna Ports		1 ,4.3-10 female	
Dimension (W x H x D)	Inch (mm)	OEU	14.6 x 3.2 x 13.8 (370 x 80 x 355)
		RFU except 700	19.7 x 3.2 x 13.8 (500 x80 x355)
		RFU 700	19.7 x4.8 x 13.8 (500 x121 x355)
Mounting and installation		Wall mount	
Weight	Lbs (Kg)	OEU	26.4 (12)
		RFU except 700	39.6 (18)
		RFU 700	44 (20)
Cooling		Convection	
Environmental			
Operational Temperature	°F (°C)	-40° to 131° (-40° to 55°)	
Outdoor installation (Ingress Protection)		IP 65	

*Technical spec subject to change without notice

Low Bands Combiner specifications

The Low Band dRAU combiner is designed to combine the following services :600MHz,700MHz, 800/850MHz and high frequencies from the Medium Band combiner

Frequency Name		**600**	**700**	**800/850**	**High Freq**
Port Name		Port 1	Port 2	Port 3	Port 4
Frequency Range	MHz	617-716	728-798	817-894	1695-2690
Insertion Loss	dB	≤0.3			
Port Isolation	dB	≥50			
Return Loss	dB	≤20			
Pass band ripple	dB	≤0.2			
PIM	dBc	≤155@2×43dBm			
Power Capacity	Watt	250 per port			
Interface					
Connector		4.3-10 Mini DIN-Female			

*Technical spec subject to change without notice

Medium Bands Combiner specifications

The medium band combiner is designed to combine the following services: 1900, EAWS, WCS and 2.5GHz.
If a single module is required a single input (2500) is used.
If 2 * 2.5GHz RF modules are used (to support 4G and 5G services) 2 inputs are required (2500 IN1 and 2500 IN2) .

Frequency Name		**1900**	**EAWS**	**WCS**	**2500**	**2500 IN1**	**2500 IN 2**	**2500 OUT**
Port Name		Port 1	Port 2	Port 3	Port 4	Port 5	Port 6	Port7
Frequency Range	MHz	1850-2020	1695-1780 2110-2200	2305-2360	2496-2690			
Insertion Loss	dB	≤ 0.3				≤3.3		
Port Isolation	dB	≥50				≥20, 2500 IN1 to 2500 IN2 ≥50 to Other ports		
Return Loss	dB	≤20						
Pass band ripple	dB	≤ 0.2						
PIM	dBc	≤155@2×43dBm						
Power Capacity	Watt	250 per port						
Interface								
Connector		4.3-10 Mini DIN-Female						

*Technical spec subject to change without notice

8. Ordering information |

- **Headend Unit Assemblies and RF Modules**

Part Number	Description
HEU:	Head End Unit Assembly (without RIMe); provided with ERFC, one PSM and one RIX (supports up to 12 RIMe's)
HEU-1-00-1-A-A	Hosts one RIX module; one ETM. one PSM-AC and one ACM
HEU-1-00-1-D-A	Hosts one RIX module; one ETM. one PSM-DC and one ACM
HEU-1-00-2-A-A	Hosts one RIX module; one ETM , 2 PSM-AC and one ACM
HEU-1-00-2-D-A	Hosts one RIX module; one ETM, 2 PSM-DC and one ACM

Part Number	Description
RIMe-25T	2500 MHz TDD
RIMe-W23	WCS 2300 MHz
RIMe-L70	LTE 700 MHz
RIMe-E80	CELL/ESMR 800 MHz
RIMe-A17	AWS 1700 MHz
RIMe-P19	PCS 1900 MHz
RIMe-FN70	FirstNet® 700 MHz
RIMe-L60	TMO 600 MHz

Note: IHUs support both RIMe and OIMs (ordering information detailed in HEU and OIU ordering information).

Part Number	Description
IHU:	Integrated Headend Unit Assembly (without RIMe and DCM's); provided with ERFC cable, one RIX and one OIX. Supports up to eight RIMe and two DCM's
IHU-2-11-1-A-dH	Hosts one RIX; one OIX; one ERFC cable; one PSM-AC module and one dHCM module
IHU-2-11-2-A-dH	Hosts one RIX; one OIX; one ERFC cable; two PSM-AC modules and one dHCM module
IHU-2-11-1-A-A	Hosts one RIX; one OIX; one ERFC cable; one PSM-AC module and one ACM module
IHU-2-11-2-A-A	Hosts one RIX; one OIX; one ERFC cable; two PSM-AC module and one ACM module
IHU-2-11-1-D-dH	Hosts one RIX; one OIX; one ERFC cable; one PSM-DC module and one dHCM module
IHU-2-11-2-D-dH	Hosts one RIX; one OIX; one ERFC cable; two PSM-DC modules and one dHCM module
IHU-2-11-1-D-A	Hosts one RIX; one OIX; one ERFC cable; one PSM-DC module and one ACM module
IHU-2-11-2-D-A	Hosts one RIX; one OIX; one ERFC cable; two PSM-DC module and one ACM module

Part Number	Description
dHCM	Digital Headed Control Module; Includes two RJ45 cables (2 m)
ACM	Auxiliary Control Module; Includes two RJ45 cables (2 m)
DCM -4-S	Digital Conversion Module 4 CPRI ports, SISO (SFP+ not included)

Part Number	Description
PSM-AC	AC Power Supply – installed in HEU, OIUc, and IHU chassis; includes U.S. plug power cords
PSM-DC	DC Power Supply - installed in HEU, OIUc, and IHU chassis; includes 48 V DC six-pin terminal block connector

- **DRU Part Numbers**

Part Number	Description
DRU-1A-32C-4C-AD	Digital Routing Unit, 32 CPRI Ports of Distribution, 4 CPRI ports for uplink, AC and DC Power(SFP+, not included)

- **LRU Part Numbers**

Part Number	Description
Stand Alone Modules	

dLRU-G2-678	LRU module, supporting low bands in MIMO configuration: 600, 700 and 800/850
dLRU-17192325	LRU module, supporting mid bands in MIMO configuration: PCS, AWS, WCS and TDD 2500 MHz
dLRU-COMB	LRU combiner for low, mid band including CBRS/C-Band, including jumper cables, termination loads and combiner plate
dLRU-CABLE	Jumper cable between the LRU and the combiner
dLRU-TL	Termination load for LRU combiner
Assemblies	
dLRU-67817192325	LRU set including: LRU Low Band dRAU, LRU mid band, mounting brackets, combiner plate, jumper cables, termination load, combiner
Wall Mount bracket	
BR-dLRU	LRU bracket for wall or celling mount installation

- **MRU Part Numbers**

Part Number	Description
Stand Alone Modules	
dMRU-ASM-DC	MRU Chassis Assembly with: dOPTM ,FAM, Mid-Plane, Cavity Filter, DC power supply
dMRU-ASM-AC	MRU Chassis Assembly with: dOPTM ,FAM, Mid-Plane, Cavity Filter, AC power supply
dMRU-CHS-ASM	MRU Chassis Assembly with: dOPTM ,FAM, Mid-Plane, Cavity Filter
dMRU-dOPTM	MRU Digital Optical Module
dMRU-PSM-AC	MRU Power Supply Module AC feeding
dMRU-PSM-DC	MRU Power Supply Module DC feeding
dMRU-DPAM-67	MRU- Digital Power Amplifier Module supporting 600,700 Lower,700 Upper and Firstnet
dMRU-DPAM-8	MRU- Digital Power Amplifier Module supporting 800/850
dMRU-DPAM-17	MRU- Digital Power Amplifier Module supporting AWS 1700MHz
dMRU-DPAM-19	MRU- Digital Power Amplifier Module supporting PCS 1900MHz
dMRU-DPAM-23	MRU- Digital Power Amplifier Module supporting WCS 2300MHz
dMRU-DPAM-25-TDD	MRU- Digital Power Amplifier Module supporting TDD 2500MHz
Assemblies	
dMRU-671719-AC	MRU-AC Assembly w/ DPAM: 600/700,AWS, PCS
dMRU-671719-DC	MRU-DC Assembly w/ DPAM: 600/700,AWS, PCS
dMRU-671923-AC	MRU-AC Assembly w/ DPAM: 600/700,AWS, PCS, WCS
dMRU-671923-DC	MRU-DC Assembly w/ DPAM: 600/700,AWS, PCS, WCS
dMRU-6781719-AC	MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS , AWS
dMRU-6781719-DC	MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS , AWS
dMRU-678171923-AC	MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS, AWS , WCS
dMRU-678171923-DC	MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS, AWS , WCS
dMRU-67817192325-AC	MRU-AC Assembly w/ DPAM: 600/700,800/850, AWS, PCS, WCS , TDD 2500
dMRU-67817192325-DC	MRU-DC Assembly w/ DPAM: 600/700,800/850, AWS, PCS, WCS , TDD 2500
dMRU-67819-AC	MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS
dMRU-67819-DC	MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS
dMRU-6781923-AC	MRU-AC Assembly w/ DPAM: 600/700,800/850, PCS, WCS
dMRU-6781923-DC	MRU-DC Assembly w/ DPAM: 600/700,800/850, PCS, WCS
Wall Mount Bracket	
BR-dMRU-W	MRU Wall Mounting Bracket
General Information	

MRU-DC/AC includes: OPTM, FAM, Mid-Plane and Cavity Filter Shipping Box will include:
AC power Cord-3m (in case of AC), BR-DMRU-R
Wall mount BR is not included, should be ordered separately.

HRU Part Numbers

Part Number	Description
Stand Alone Modules	
dHRU-dHPOM	HRU Digital High Power Optical Module
dHRU-dHPAM-6	HRU Digital High Power Amplifier Module supporting 600
dHRU-dHPAM-7	HRU Digital High Power Amplifier Module supporting 700
dHRU-dHPAM-85	HRU Digital High Power Amplifier Module supporting 800/850
dHRU-dHPAM-19	HRU Digital High Power Amplifier Module supporting PCS
dHRU-dHPAM-17	HRU Digital High Power Amplifier Module supporting AWS
dHRU-dHPAM-23	HRU Digital High Power Amplifier Module supporting WCS
dHRU-dHPAM-25	HRU Digital High Power Amplifier Module supporting TDD 2500, 100MHz contiguous BW
dHRU-COMB-L	HRU combiner module supporting low bands 600,700,800/850 including cables
dHRU-COMB-M	HRU combiner module supporting low bands AWS,PCS,WCS and TDD 2500 including cables
dHRU-TL	HRU termination load
BR-dHRU-L	HRU bracket to support Low Band dRAU modules
BR-dHRU-M	HRU bracket to support mid band modules
dHRU-CABLE	HRU 4.3-10 RF Jumper Cable
dHRU-INT-SFP	HRU Internal SFPs (from dHRU-dHPOM to modules) and Fiber
Assemblies	
dHRU-6781719232525-AC	HRU assembly supporting low and mid bands in a MIMO configuration: 600, 700, 800/850, PCS, AWS, WCS, TDD 2500
dHRU-678-AC	HRU assembly supporting low bands in a MIMO configuration: 600, 700, 800/850
dHRU-781719-AC	HRU assembly supporting low and mid bands in a MIMO configuration: 700, 800/850, PCS, AWS
dHRU-1719232525-AC	HRU assembly supporting mid bands in a MIMO configuration: PCS, AWS, WCS, TDD 2500

- **SFP+ Part Numbers**

Part Number	Description
SFP-10G-10K-BiDi-1270	SFP+ 10.1Gb/s ,10Km, Bi Directional TX 1270nm, for DCM and DRU output connected to Remote Units
SFP-10G-10K-BiDi-1330	SFP+ 10.1Gb/s ,10Km, Bi Directional TX 1330nm, for Remote Units and DRU input connected to DCM
SFP-10G-10K	SFP+ 10.1Gb/s ,10Km, dual fiber
SFP-10G-1.4K	SFP+ 10.1Gb/s ,1.4Km, dual fiber