3.9 Locking and Unlocking a Device

3.9.1Purpose

This procedure describes how to lock and unlock a device.

3.9.2Procedure

The following are described in this section:

3.9.2.1 Locking a Device

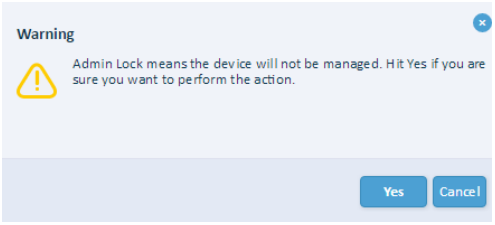
➢ **To lock a device:**

1 Select a device in the *Devices* window.

2 Click the **Admin Actions** icon and select **Lock**.

Figure 82: Locking a Device

NOTE!	Alternatively, you can select a device in the *Device Details* window. The following will show up :



3 Click the Yes button in order to apply locking .

After locking the device, the device is in the Admin Locked state. At this point, the device is no longer synchronized with BreezeVIEW and any changes made to the device on BreezeVIEW are not synchronized to the device.

Any changes made via are not synchronized with BreezeVIEW.

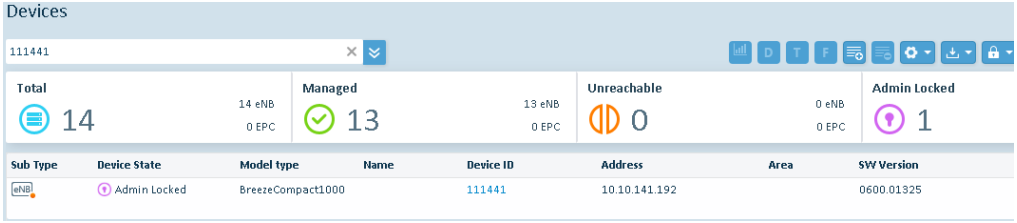


Figure 83: Locked Device

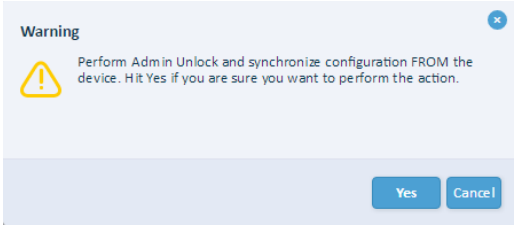
3.9.2.2 Unlocking and Synchronizing a Device

➢ **To unlock and synchronize a device:**

1 Select a locked device in the *Devices* window.

2 Click the **Admin Actions** icon and select **Unlock & Sync From Device**.

Figure 84: Unlock & Sync From Device

NOTE!		Alternatively, you can select a device in the *Device Details* window. As a result the following screen will show up :  **Figure 84: Unlock & Sync From Device reset warning message on BREEZEVIEW**

3 Click the Yes button in order to apply the unlocking.

4 After unlocking the device, the device is in the **Managed** state. The device's parameters are shown in the GUI.

3.10 Rebooting BreezeCOMPACT from BreezeVIEW

3.10.1 Purpose

This procedure describes how to perform a BreezeCOMPACT Manual Reset operation from BreezeVIEW. Use this procedure to implement configuration changes or to resolve issues, when necessary.

3.10.2 Procedure

➢ **To perform a manual reset:**

1 In the *Device Details* window or the *Devices* window, click the Device action button and then select **Reboot**.

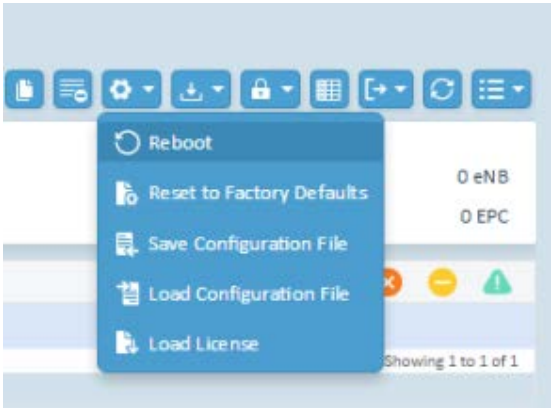
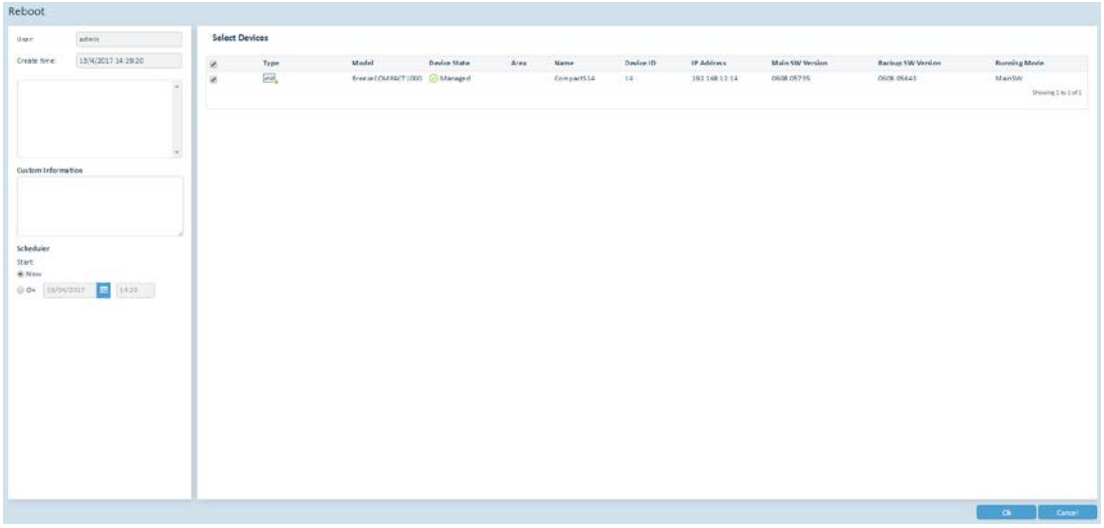


Figure 85: Reboot

Press OK on the following window



The following window displays:

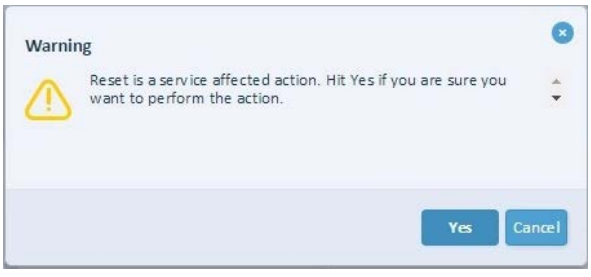


Figure 86: Warning – Reset

2 Click **Yes**.

The device begins the reset process and its **Management Status** changes to **Unreachable**, as shown below:

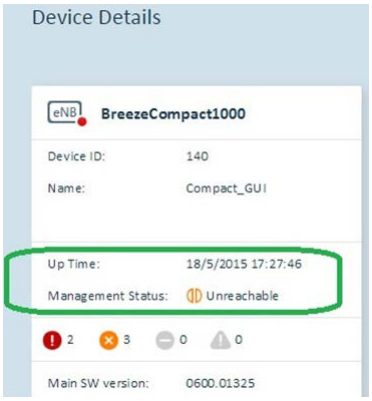


Figure 87: Device Details – Unreachable Management Status

After the device resets, its **Management Status** changes to **Managed** and its **Up Time** is updated.

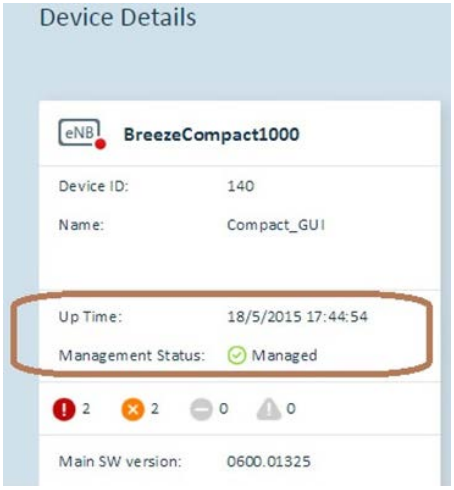


Figure 88: Device Details – Managed Management Status

The reset event is listed in the *System Events* window, as shown below:

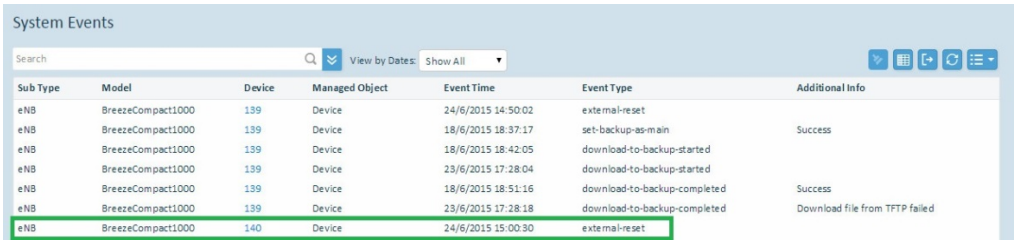


Figure 89: System Events Window – Reset

3.11 Spectrum Analyzer

3.11.1 Spectrum Analyzer Collection

The Spectrum Analysis Collection feature enables you to determine the noise characteristics per eNB frequency range and channel.

Collection performed online and not affecting eNB services. Measurements are collected at five-minute intervals.

The data is collected within a range of eNB frequencies and on all active Rx ports (up to 4 ports), the spectrum analyzer is aligned with the system configured TDD split, and the listening period is in the uplink period.

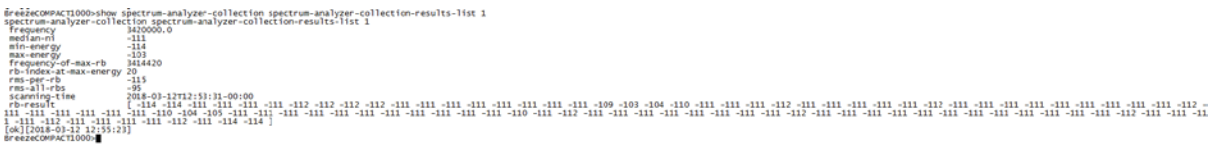
3.11.1.1 Spectrum Analyzer Collection scanning results

To display results for all active ports:

BreezeCOMPACT1000>show spectrum-analyzer-collection spectrum-analyzer-collection-results-list

To display results for specific port:

BreezeCOMPACT1000>show spectrum-analyzer-collection spectrum-analyzer-collection-results-list 1



BreezeCOMPACT1000>show spectrum-analyzer-collection spectrum-analyzer-collection-results-list

Possible completions:

1 - The Scanned Antenna Port Number

2 - The Scanned Antenna Port Number

3 - The Scanned Antenna Port Number

4 - The Scanned Antenna Port Number

Possible match completions:

frequency - Frequency(MHz)

frequency-of-max-rb - Frequency of RB at Max NI (kHz)

max-energy - Max NI per dBm/RB

median-ni - Median NI per dBm/RB

min-energy - Min NI per dBm/RB

rb-index-at-max-energy - RB Index at Max NI

rb-result - The Scanned Antenna Port Number

rms-all-rbs - RMS BW per dBm

rms-per-rb - RMS NI per dBm/RB

scanning-time - ScanningTime

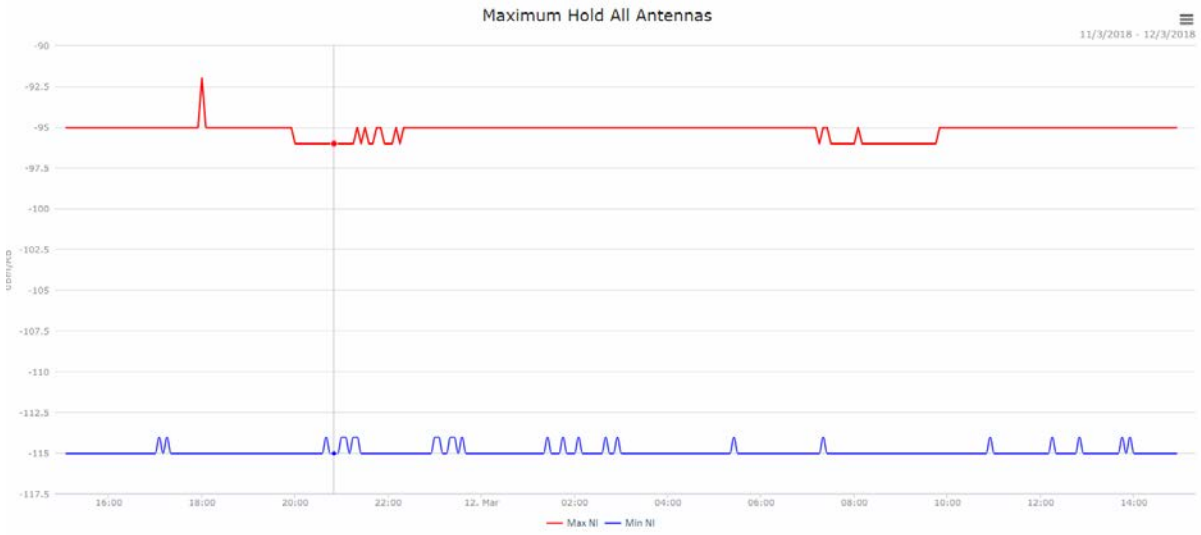


Figure 90: BREEZEVIEW -ENB Spectrum Analyzer Collection All Antennas

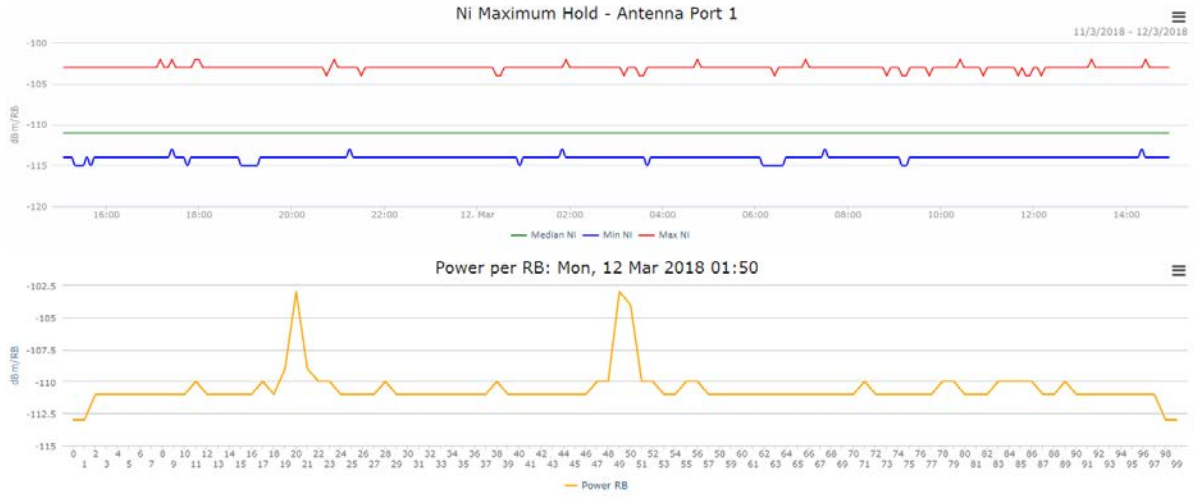


Figure 91: BREEZEVIEW -ENB Spectrum Analyzer Collection 1 Antenna

3.11.2 Spectrum Analyzer Range Frequency Scanning

The Spectrum Analysis feature enables you to determine the noise characteristics per channel per frequency range. When the Spectrum Analyzer feature is activated, the unit enters a passive scanning mode for a period of time during which information is gathered. The scanned channels are the channels comprising a selected subset.

Upon activating the spectrum analysis, the unit automatically shuts down the RF transmit ports and keep eNB receive ports for capturing the data. During the information-gathering period, the UEs will not be serviced by the eNB. At the end of the period, the user should configure the system for normal operation.

The data is collected within a range of frequencies and on all active Rx ports (up to 4 ports), the spectrum analyzer is aligned with the system configured TDD split, and the listening period is in the uplink period.

3.11.2.1 Spectrum Analyzer State

Perform the command “show spectrum-analyzer state”

BreezeCompact> show spectrum-analyzer state

spectrum-analyzer state spectrum-analyzer-state Disable

spectrum-analyzer state spectrum-analyzer-state-cell2 Disable

spectrum-analyzer state scanning-state Disable

spectrum-analyzer state scanning-state-cell2 Disable

Disable (normal operation), Enable (spectrum analyzer mode)

state scanning-state options:

Disable (spectrum analyzer is not in active scanning), Enable (spectrum analyzer is in active scanning)

3.11.2.2 Spectrum analyzer configuration

The default spectrum analyzers settings can be used, the frequency scanning range will be defined as the whole band supported by the BreezeCompact hardware, however in order to minimize the scanning time it is recommend to perform scanning on the desired spectrum.

Use “show” command to display the Spectrum Analyzer scanning parameters. For example:

BreezeCompact% show spectrum-analyzer scanning

start-frequency 3400000;

stop-frequency 3700000;

frequency-step 1000;

interval 1000;

repetitions 0;

Configurable parameters:

- start-frequency – Scanning start frequency (in kHz) stop-frequency – Scanning stop frequency (in kHz)
- frequency-step – Scanning step/resolution frequency (in kHz), minimum step of 0kHz step, default 1000kHz
- interval – defines the time to between each frequency steps, higher interval time will enable more measurements but increase the overall scanning duration, minimum internal 10msec, default 1 second.
- repetitions – in cases where operator would like to perform several scans for a period of time, it can define the repetition number. For example repetition value 1, the spectrum analyzer will scan the frequency range two rounds. In default case (0), only one round of spectrum scan will be reported.

Use "set" command for configuration of the above parameters:

BreezeCompact% set spectrum-analyzer scanning <Parameter> <Value> Perform commit command:

BreezeCompact% commit

Use command "show spectrum-analyzer scanning" to verify definitions

BreezeCompact% show spectrum-analyzer scanning

start-frequency 3480000;

stop-frequency 3530000;

frequency-step 1000;

interval 200;

repetitions 0;

Quit from the configuration level to CLI level BreezeCompact% quit

3.11.2.3 Enable / Disable spectrum analyzer

➢ **To enable spectrum analyzer:**

- BreezeCompact> request spectrum-analyzer-actions enable-spectrum-analyzer

This action will enable the spectrum analyzer, the Tx ports will stop transmit. Are You sure? [no,yes] yes

Spectrum analyzer will become enabled after several seconds. To verify state:

BreezeCompact> show spectrum-analyzer state spectrum-analyzer state (Enable/Disable)

3.11.2.4 Start scanning

BreezeCompact> request spectrum-analyzer-actions start-scanning This action will start the scanning operation. Are You sure? [no,yes] yes [ok][2016-05-03 10:41:18]

BreezeCompact> show spectrum-analyzer state scanning-state

spectrum-analyzer state scanning-state Enable

3.11.2.5 Wait for scanning finished

The spectrum analyzer state will be Enabled as long as the scanning is performed, scanning-state will be changed to Disable once scanning is finished. In order to monitor the state:

BreezeCompact> show spectrum-analyzer state scanning-state

spectrum-analyzer state scanning-state Disable

3.11.2.6 See the scanning results

To display results for all active ports:

BreezeCompact> show spectrum-analyzer scanning-results-list

- **To display results for specific port number:**
  - BreezeCompact> show spectrum-analyzer spectrum-scanning-results-list antenna-port <Port Number>
- **To show the full table (without need for pressing enter):**
  - BreezeCompact> show spectrum-analyzer spectrum-scanning-results-list | nomore

Example for results operating Spectrum analyzer with interference on central frequency of 3655000kHz and 10MHz Bandwidth:

BreezeCompact> show spectrum-analyzer spectrum-scanning-results-list antenna-port 2

ANTENNA PORT	FREQUENCY	MEDIAN NI	MIN ENERGY	MAX ENERGY	FREQUENCY OF MAX RB	RB INDEX AT MAX ENERGY	RMS PER RB	RMS ALL RBS	SCANNING TIME	KEY RB RESULT	RB RESULT
2	3490000.0	-115	-116	-100	3489820	12	-111	-98	2017-04-27T10:13:54-00:00	1	0
										2	0
										3	-116
										4	-116
										5	-116
										6	-116
										7	-115
										8	-114
										9	-114
										10	-113
										11	-110
										12	-100
										13	-106
										14	-113
										15	-111
										16	-111
										17	-113
										18	-115
										19	-116
										20	-116
										21	-116
										22	-116
										23	0
										24	0
										25	0
										26	0
										27	0
										28	0
										29	0
										30	0
										31	0
										32	0
										33	0
										34	0
										35	0
										36	0
										37	0
										38	0
										39	0
										40	0
										41	0
										42	0
										43	0

Each frequency scanned (one row) is comprised of multiple Resource Blocks (RBs) within the bandwidth used. In most cases Median/Min/Max NI measurement will give good indication for interference.

Explanation about the table fields:

Table 3-2: SA results table

Measurement	Description	Units
ANTENNA PORT	BreezeCOMPACT port number	1,2,3,4
FREQUENCY	RF Central frequency	kHz
MEDIAN NI	Median NI	dBm
MIN ENERGY	Minimum NI	dBm
MAX ENERGY	Maximum NI	dBm
FREQUENCY OF MAX RB	Frequency of Maximum NI	kHz
RB INDEX AT MAX ENERGY	Telrad internal use	1 ... 96
RMS PER RB	RMS normalize for 1RB	dBm
RMS ALL RBS	RMS of the BW	dBm
SCANNING Time	Time of the latest result of the measurements at specific RF frequency	
KEY RB RESULTS	Numbers in order according to the number of the RBs (Recourse Blocks)	1 100
RB RESULT	Energy per RB	dBm

Figure 92: BREEZEVIEW -ENB Spectrum Analyzer Range Frequency Scanning page

3.11.2.7 Disable spectrum analyzer

BreezeCompact> request spectrum-analyzer-actions disable-spectrum-analyzer

This action will disable the spectrum analyzer the system will be back to normal mode. Are You sure? [no,yes] yes

See that spectrum analyzer is disabled:

BreezeCompact> show spectrum-analyzer state spectrum-analyzer state

spectrum-analyzer-state spectrum-analyzer state Disable

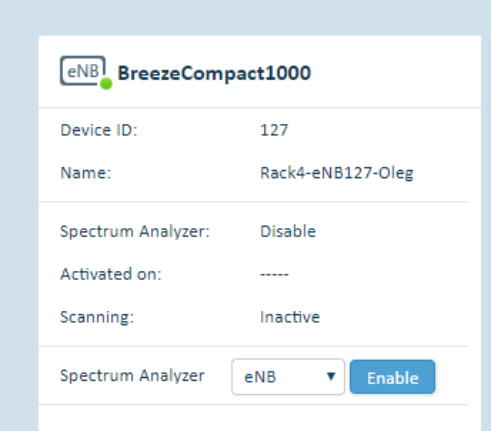
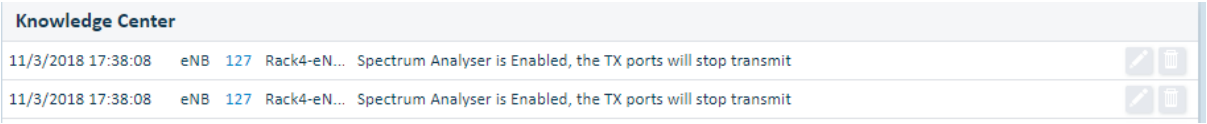


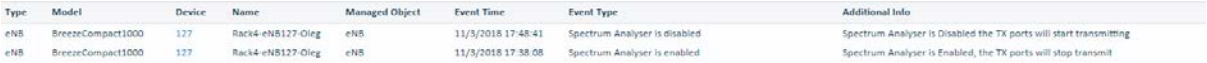
Figure 93: BREEZEVIEW – Spectrum Analyzer Disable

3.11.2.7.1 Spectrum analyzer events in BreezeVIEW

When spectrum analyzer is enabled, TX power shutdown event is raised in Home page Knoweledge Center.



System event is raised for spectrum analyzer disable or enabled.



3.12 Performance Monitoring

3.12.1 Purpose

This procedure describes how to access and to use the Device Performance View in order to collect and view Key Performance Indicators (KPIs).

3.12.2 Procedure

For performance monitoring, measurements are collected at five-minute intervals.

The following are described in this section:

3.12.2.1 Accessing KPIs

➢ To access KPIs:

- To access KPIs, click the **Performance** button. The location of this button varies, depending on the window from which you make your selection, as follows:

70 From the *Device Details* window: Click the **Performance** button.

Figure 94: Accessing the KPI – Device Details Window

71 From the *Devices* window: Highlight a device and click the **Performance** button.

Figure 95: Accessing the KPI – Devices Window

Clicking the **Performance** button opens the Device Performance View. The opening window of the Device Performance View displays performance data for the eNodeB in a graph.

Each KPI graph displayed in the view's main window uses a fixed time span of 24 hours back from the current time.

Figure 96: eNodeB Device Performance View

The top bar in the Device Performance View displays numeric values for basic KPIs, as shown below:

Figure 97: Basic KPIs

To exit the Device Performance View and return to the Single Device Configuration View, click the wrench  button at the top right of the main display area.

3.12.2.2 Using the Device Performance Graphical Display

To access a specific KPI graph in the Device Performance View, click the dropdown menu to the right of the **Dashboard** button and then select the required KPI in the list.

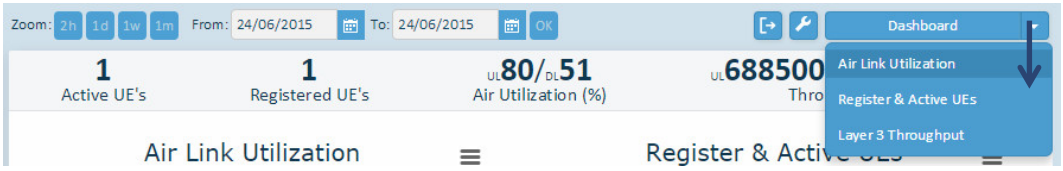


Figure 98: Device Performance View Toolbar

The following KPI graphs are available:

- **Air Link Utilization,** page 113
- **Registered and Active UEs,** page 113
- **Layer 3 Throughput,** page 114

Each KPI graph contains the following elements:

- The KPI name as the graph header
- The displayed units and unit values on the Y axis
- The time indication on the X axis
- A legend located below the graph

Figure 99: Legend

Clicking an item in the legend removes that KPI from the graph. Clicking that item again returns it to the graph.

In all KPI graphs, you can position the cursor over a point on the line in the graph and then click the left mouse button to see the value of the parameters for that specific point in time.

3.12.2.2.1 Air Link Utilization Graph

Figure 99 shows the Air Link Utilization KPI graph.

Figure 100: Air Link Utilization Graph

3.12.2.2.2 Registered and Active UEs Graph

Figure 100 shows the Registered and Active UEs KPI graph.

Figure 101: Registered and Active UEs Graph

3.12.2.2.3 Layer 3 Throughput Graph

Figure 100 shows the Layer 3 Throughput graph.

Figure 102: Layer 3 Throughput Graph

3.12.2.2.4 Changing the Time Zoom

You can zoom in and zoom out on the X axis timeframe, as needed.

➢ To zoom in on the X axis:

- Position the cursor on the point in the graph in which you are interested. Click the left mouse button and then drag the mouse without releasing the button to the left or right, to zoom in or out, respectively. Then, release the mouse button.

Figure 103: Changing the Time Zoom – Before Releasing the Mouse Button

Figure 104: Graph View Zoom – After Releasing the Mouse Button

You can click the **Reset Zoom** button to return to the general graph view.

3.12.2.3 Exporting KPIs to Excel

KPIs can be exported to an Excel file, as needed.

➢ **To export KPIs to Excel:**

1 Click the **Export** button in the view toolbar to open the following window:

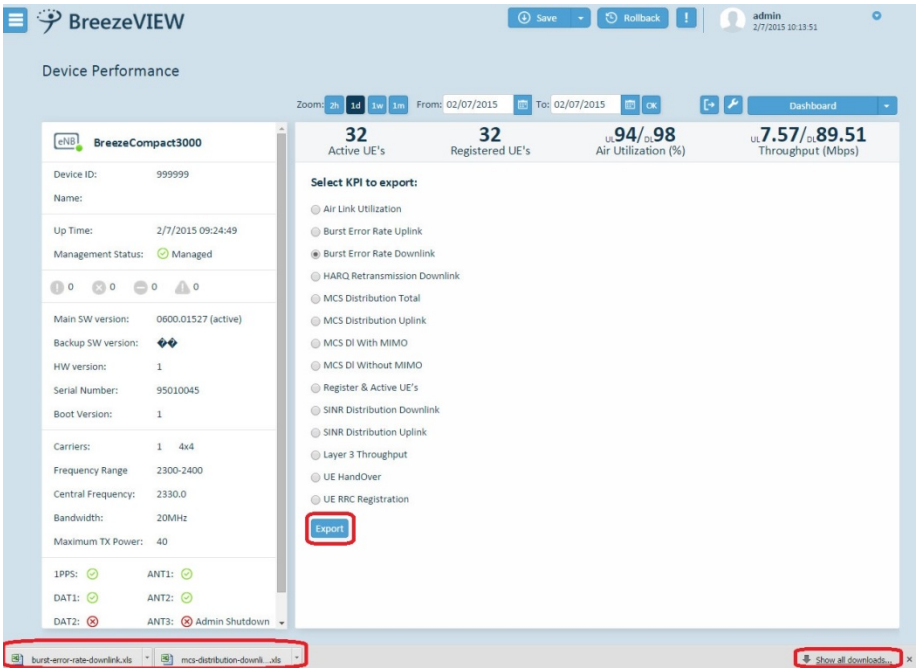


Figure105: Export Window

2 Select the radio buttons for the KPIs you want to export.

3 Specify the time frame, as described in Section 3.12.2.4, Selecting the Performance Display Time.

4 Click **Export**.

3.12.2.4 Selecting the Performance Display Time

You can specify the time span for the view using the following buttons in the view toolbar:

Figure 106: Time Span Selection

- 2h: Displays two hours back from the current time
- 1d: Displays one day from back from the current time
- 1w: Displays one week back from the current time
- 1m: Displays one month back from the current time

When specifying the time frame for the graph, use the **From/To** dates to specify the dates for the graph, in whole days.

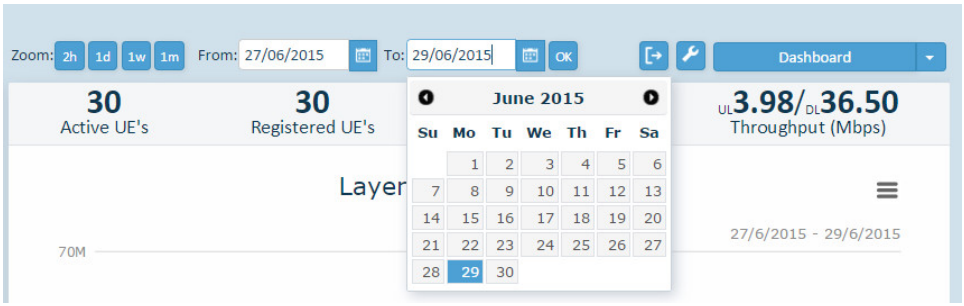


Figure 107: From/To Dates

3.12.2.5 Printing and Saving Charts

The **Chart** button, which is located at the top right of each graph, enables you to perform the following operations:

Figure 108: Chart Button

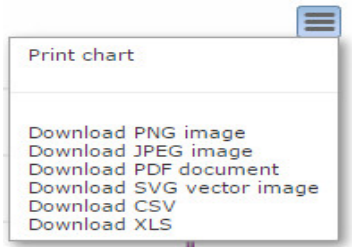


Figure 109: Chart Context Menu

- Download the graph as a PNG image
- Download the graph as a JPEG image
- Download the graph as a PDF document
- Download the graph as an SVG vector image
- Download the graph to a CSV file
- Download the graph to an XLS file

3.12.3 Performance KPIs Description

The performance KPIs are displayed and exported in BreezeVIEW. The KPIs are collected within the sampling period (every five minutes) and stored in the BreezeVIEW database.

Table 3-3: Performance KPIs

#	KPI Report	Unit	Description	Calculation	Guidelines
1	Air Link Utilization	Percent (%)	Air link utilization enables the actual consumption of the air resource during the sampling period to be analyzed. The calculation is based on the actual consumption of the air frame resource blocks (RBs) as a percentage of the number of RBs available for data transport. The utilization is presented separately for the DL and the UL.	100 * (Used RBs) / (Potential RBs per channel BW)	This important KPIs to track the system load over time especially in peak hours.
2	Registered and Active UEs	Count	This report presents the following information: ■ **Number of Registered UEs:** All UEs that are registered to the eNodeB (RRC connected) ■ **Number of Active UEs:** UEs that are currently using and occupying sector resources (meaning those that have DL and/or UL data packets)	Count Active and Idle UEs	This report presents a snapshot of the number of registered and active UEs within the sampling period. It can be used for over-subscription validation.
3	Layer 3 Throughput	Bps	Average eNodeB traffic over the collection period for both DL and UL (IP layer, excluding LTE MAC overheads)	Number of bits / (sampling period)	
4	Packet Error Rate (PER) Downlink	Percent (%)	Each transport block carrying one or more packets has a retransmission (HARQ) mechanism, After the maximum number of retransmissions is exceeded, the packet is considered as an errored packet.	Number of DL packet errors / total number of bursts within the sampling period	Can be used to explore (TCP) throughput degradation issues (if the PER ratio is high).

#	KPI Report	Unit	Description	Calculation	Guidelines
5	Packet Error Rate (PER) Uplink	Percent (%)	Each transport block carrying one or more packets has a retransmission (HARQ) mechanism, After the maximum number of retransmissions is exceeded, the packet is considered as an errored packet.	Number of UL packet errors / total number of bursts within the sampling period	Can be used to explore (TCP) throughput degradation issues (if the PER ratio is high).
6	MCS Distribution Downlink – With MIMO	bps	This report presents the actual transferred bits per DL MCS for MIMO within the sampling period.	Bits / second per DL MCS (Modulation)	BreezeCOMPACT Rate Adaptation selects the MCS (modulation) to be used in the DL and UL. The throughput is maximized according to various considerations, such as the channel condition of the UEs. The report may help to understand issues related to low-modulation CPEs, in order to improve deployment spectral efficiency.
7	MCS Distribution Downlink – Without MIMO	bps	This report presents the actual transferred bits per DL MCS without MIMO within the sampling period.	Bits / second per DL MCS (Modulation)	The report may help to understand issues related to low-modulation CPEs, in order to improve deployment spectral efficiency.
8	MCS Distribution Downlink – Total	bps	This report presents the actual transferred bits per DL MCS within the sampling period.	Bits / second per DL MCS (Modulation)	The report may help to understand issues related to low-modulation CPEs, in order to improve deployment spectral efficiency.
9	MCS Distribution Uplink	bps	This report presents the actual transferred bits per UL MCS within the sampling period.	Bits / second per DL MCS (Modulation)	The report may help to understand issues related to low-modulation CPEs, in order to improve deployment spectral efficiency.

#	KPI Report	Unit	Description	Calculation	Guidelines
10	SINR Distribution Downlink	Ratio	Downlink Signal-to-Interference-plus-Noise ratio (SINR) distribution is based on a Channel Quality Indication (CQI) report by the UE to the eNodeB. UE measurements are made on the DL. The higher the CQI value (from 0 to 15) reported by the UE, the higher the modulation scheme (from QPSK to 64QAM) and the higher the coding rate used by the eNodeB to achieve better efficiency.	Ratio of CQI index consumption within the sampling period	
11	SINR Distribution Uplink	Ratio	UL SINR is measured by the eNodeB, based on the UL. The report presents the ratio of SINR distribution on the UL, from -10dB to 40dB, in 1dB steps.	Ratio of UL SINR per dB	
12	HARQ Retransmis-sion Downlink	Ratio	A Hybrid Automatic Repeat Request (HARQ) is used for error corrections on the PHY level, enabling short retransmission periods and improved performance. Depending on the QCI configuration of the HARQ retransmission, after a number of HARQ retransmissions, the burst is considered as an error to the upper layers. The DL HARQ retransmission is reported from *Zero* retransmissions to *Above Four* retransmissions.	Ratio per number of retransmis-sions	
13	UE RRC Registration Procedure	Count	A UE registration procedure is done every time the UE attempts to connect to the system. This report measures the number of successful and failed registrations.	Count of total (successful and failed) registration attempts	The report may enable the operator to identify network-level issues with failed registrations, which should be very low.
14	UE Handover	Count	A UE handover is the process of the UE moving from one eNodeB to another. This report counts the UE handovers within the sampling period.	Count UE Handover successful and failed attempts	The report may enable the operator to identify network-level handover activity, in order to assist with network optimization.

Chapter 4: Events and Alarms

In This Chapter:

4.1 Alarm Introduction

The system supports the following event and alarm notification categories. The numbers in parentheses indicate the alarm type:

- **alarmNotification (1):** An Alarm Notification is a persistent indication of a fault. An alarm is said to be:

Set (or raised) when a fault is first detected and is administratively enabled.

Cleared when a fault is first noticed to have ceased or is administratively disabled.

- **systemEventNotification (2):** A System Event Notification indicates an event that is of interest to the operator of the management system, but is not indicating any failure of the system or part of it. As such, system events only carry information. They are not assigned with a severity, and are not cleared by any mechanism.
- **configurationChangeNotification (3):** A Configuration Change Notification indicates an event related to a configuration change. In general, configuration change notifications are issued by the device as a result of any configuration change performed on any managed object. This can be done by either the element management system or by any other management entity (for example, the CLI). The configuration change notification data also includes the nature of the change (Create/Delete/Modify). In some cases, more than one notification type may be issued due to a single event. For example, creating a new managed object that is not yet installed generates a configuration change notification and an alarm notification.

4.2 Alarm Severities

The Event Severity Value (eventSeverityValue) indicates how the managed object (MO) has been affected by the alarming event. It represents the severity of the alarm, as perceived by the MO.

The Object Severity Value (objectSeverityValue) indicates the overall perceived severity level of the MO at the moment the alarm message was issued.

The severity levels defined in the system are in accordance with ITU-T Rec X.733, and are as follows. The numbers in parentheses indicate the severity level:

- **Cleared (1):** The Cleared severity level indicates the clearing of one or more previously reported alarms. This alarm clears all alarms for this MO that have the same alarm type, probable cause and specific problems (if given).
- **Indeterminate (2):** The Indeterminate severity level indicates that the severity level cannot be determined.
- **Critical (3):** The Critical severity level indicates that a service-affecting condition has occurred and an immediate corrective action is required. Such a severity may be reported, for example, when an MO becomes totally out of service and its capability must be restored.
- **Major (4):** The Major severity level indicates that a service-affecting condition has developed and an urgent corrective action is required. Such a severity may be reported, for example, when there is a severe degradation in the capability of the MO and its full capability must be restored.
- **Minor (5):** The Minor severity level indicates the existence of a non-service-affecting fault condition and that corrective action should be taken in order to prevent a more serious (for example, service affecting) fault. Such a severity may be reported, for example, when the detected alarm condition is not currently degrading the capacity of the MO.
- **Warning (6):** The Warning severity level indicates the detection of a potential or impending service-affecting fault, before any significant effects have been felt. Action should be taken to further diagnose (if necessary) and correct the problem in order to prevent it from becoming a more serious service-affecting fault.

4.3 Handling Alarms and Events Using the CLI

Each system event record includes the event time, severity, event name and event short description.

➢ To view alarms and events:

- Run the following command:

show notification stream alarms.

➢ To monitor alarms/events:

- Run the following command:

show notification stream alarms last <positiveInteger>

➢ To view alarms/events that occurred during a certain time period:

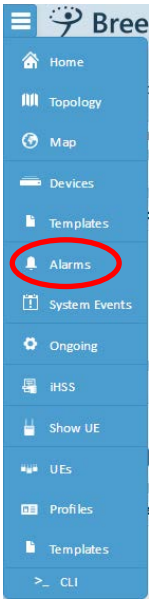
- Run the following command:

show notification stream alarms from <date> to <date>

4.4 Handling Alarms and Events Using BreezeVIEW

➢ **To handle alarms and events using BreezeVIEW:**

1 To view alarms:



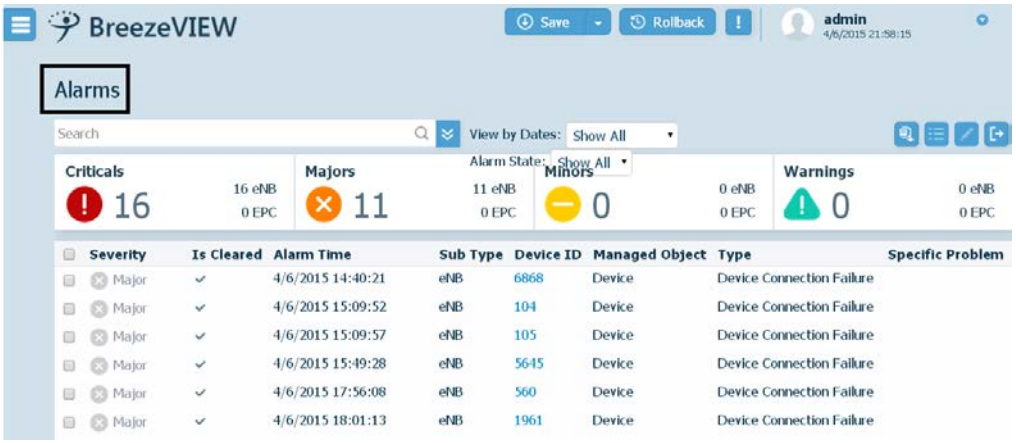
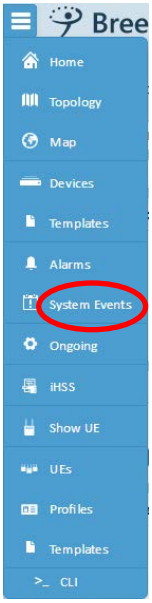


Figure 110: BreezeVIEW – Alarms

2 To view events:



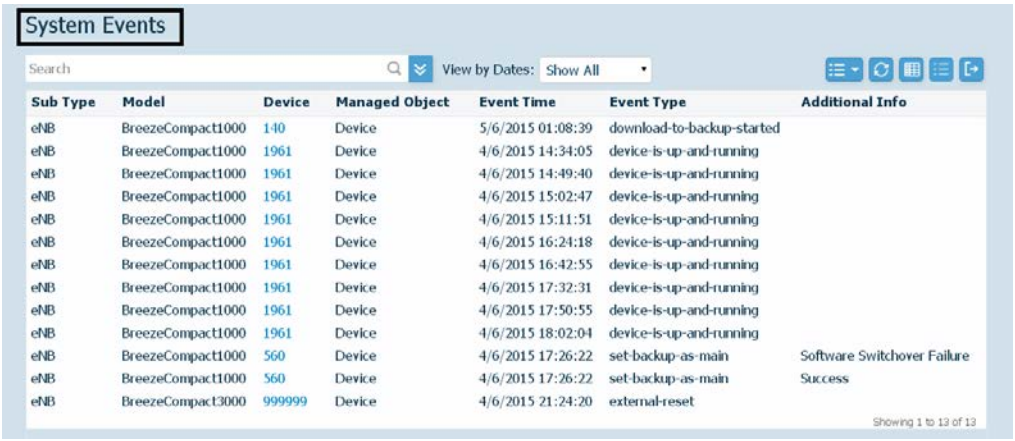


Figure 111: BreezeVIEW – System Events

4.5 BreezeCOMPACT – System Events

Table 4-1 describes the system events supported in the current release.

Table 4-1: BreezeCOMPACT System Events

No.	Event Name	Description	Guideline
1	External Reset performed	the user commit a device reset	
2	Internal reset performed	the device committed a reset	
3	SW upgrade - Load SW file to backup started	SW upgrade process is started	
4	SW upgrade - Load SW file to backup completed	SW upgrade process is completed	
5	Make backup file as primary performed	Set backup SW as main performed	

No.	Event Name	Description	Guideline
6	Device is Up and Running	The device is Up and available	The event is raised when the device is up and running after being initialized. This event must be the first one issued after initialization completes.
7	Upload Device Configuration File started	Upload Device Configuration File is started	
8	Upload Device Configuration File completed	Upload Device Configuration File is completed	
10	Download Device Configuration File started	Download Device Configuration File is started	
11	Download Device Configuration File completed	Download Device Configuration File is completed	
12	Upload Device Logs Files started	Upload Device Logs Files is started	
13	Upload Device Logs Files completed	Upload Device Logs Files is completed	
14	Spectrum Analyzer Enabled	The spectrum analyzer is enabled, the Tx ports will stop transmit	The system events triggers together with Critical alarms TX shut-down
15	Spectrum Analyzer Disabled	The spectrum analyzer is disabled the Tx ports will start transmitting	

4.6 BreezeCOMPACT – Alarms

Table 4-2 describes the alarms supported in the current release.

Table 4-2: BreezeCOMPACT Alarms

Alarm Name	Severity	Alarm Description	Problem Cause/Guideline
Device High Temperature	Critical	The device temperature is too high.	
SW Upgrade, Run from Backup Failure	Minor	A failure occurred while booting up using the backup image residing in the device flash.	
SW Upgrade, Set as Main Failure	Minor	A failure occurred while trying to set the backup image as the main image.	
Device Connection Lost	Minor	BreezeVIEW lost connection with the device.	The event is detected and initiated by BreezeVIEW upon detecting a link failure with a unit.
Data Port is down	Critical	Connectivity with Data port has been lost.	should be raised only on connection change, from connected to lost connection

Alarm Name	Severity	Alarm Description	Problem Cause/Guideline
RH Hardware Failure	Critical	The RH detected an internal hardware problem. The alarm is issued on a specific hardware port.	For radio hardware failures, the system raises an alarm specifying the cause and automatically restarts. If the issue appears again, contact Telrad support for further assistance. You will need to provide the complete alarm information. For alarms related to the environment, do the following: Temperature: Ensure that the unit is working in accordance with the product's permitted temperature. VSWR: Ensure proper installation, cabling, and connections. In addition, ensure that there are no obstacles or obstructions affecting the antenna.
GPS Communication Failure	Major	Communication failure with the GPS receiver.	Recheck the GPS cable connectivity. Ensure that the CAT5 cable is properly installed.
GPS Lock Not Achieved	Major	Failed to *lock*. No traffic is provided when *not locked*.	
External 1 PPS Input Failure	Major	The device lost its 1PPS signal input.	When BreezeCOMPACT gets GPS synchronization from another BreezeCOMPACT unit (for example, GPS chaining), the signal may be lost. Verify proper cable installation and make sure that the master unit is working properly with GPS.
TX Clock Holdover Timer Expired	Critical	Clock holdover for Tx shut-down timer expired. The unit stopped transmitting.	The unit alerts first for a *Clock Holdover Entered* event after timer expiration (several hours), and then stops transmitting. Ensure that GPS is properly installed.
Clock Holdover Timer Expired	Major	Clock Holdover Timer Expired, Failure of the internal source	

Alarm Name	Severity	Alarm Description	Problem Cause/Guideline
Clock Holdover Entered	Major	The unit entered Clock Holdover mode because it is not receiving the 1PPS signal.	PS may have difficulties of receiving satellites. Try to improve the GPS installation and make sure that it is properly installed with a clear sky and no obstacles. Note: The system is fully functional for several hours when entering Holdover mode. After GPS reception is improved, the system clears the alarm.
Synthesizer Error	Critical	Synthesizer internal hardware problem was detected. The unit stopped transmitting.	Contact Telrad support for further assistance.
Tx Power Shut Down	Critical	Tx power shut down.	A Tx power shutdown may result due to multiple reasons, such as a Radio Head failure or a user-initiated shutdown. In case Spectrum Analyzer is enabled, Tx shutdown will be performed automatically. Contact Telrad support for further assistance.
Authenticator Communication Timer Expired	Major	Authenticator communication timer expired.	
Excess Number of MSs (UEs)	Minor	The number of UEs in an active operation state served by the cell exceeded the threshold.	
High UL Median Noise	Minor	The UL median noise level represents the median value of the noise floor histogram. If the measured UL median noise level exceeds the value calculated as the target noise, a noise alarm is generated.	Interference may result in high UL noise. Proper analysis of the deployment is needed, in case this alarm is triggered inconsistently.
DCS Channel Busy	Major	Measured noise level is exceeded the threshold (DCS), the channel declared as 'busy'	For BreezeCOMPACT deployed in the US/Canada in 3.65GHz unlicensed band, DCS is required. This alarm indicate channel busy which requires the operator to move to different frequency. Clear alarm condition: when the NI is 3 dB below the "Channel Busy NI Level" Threshold value, the channel declared as cleared

Alarm Name	Severity	Alarm Description	Problem Cause/Guideline
SCTP link failure	Critical	Alarm raised when SCTP communication link fails and cleared when SCTP connection is restored	

Chapter 5: Licensing Mechanism

In This Chapter:

5.1 Licensing introduction

As of Release 6.8 all Telrad LTE equipment, including BreezeCOMPACT, must be loaded with license file (Certificate) in order to be operational.
Per each shipped or already deployed specific hardware unit (Unique Serial Number) a dedicated license will be required which will enable all the purchased features.
The license Certificate files will be supplied by Telrad
An HW without loaded certificate will not be operational but will remain manageable (locally and remotely) for configuration and license certificate loading via the following means:

- BreezeVIEW – From the BreezeVIEW to all the network elements in a single operation
- CLI – Directly to a single HW

The license certificate includes the following data:

- Certificate expiration date
- Licensed features that have been purchased

5.2 Licensing Prerequisites

Before upgrading BreezeCompact to Release 6.9 the following prerequisites should be verified:

* Timing - Each BreezeCOMPACT must include a working GPS module and configured with a reachable and valid NTP server IP
* TFTP server – every HW should be configured with BreezeVIEW IP as TFTP IP address (or if working without BreezeVIEW – the correct TFTP IP address in which the license certificates are placed)
* License Certificates – Customer needs to receive from Telrad license certificates for the devices that are being upgraded.

5.3 BreezeVIEW License related Functionality

License nearing expiration alerts – escalating alerts seen in BreezeVIEW Alarms view as expiration date approaches

5.3.1 License Distribution to HW

Transfer the license certificates to the BreezeVIEW machine and place them in the following directory - /opt/lte/Data/license

In BreezeVIEW R6.9 open devices view and highlight the R6.9 device/s still not uploaded with license

Press 'Device Action' button on top right of the devices list and choose 'Load License' (bottom) option

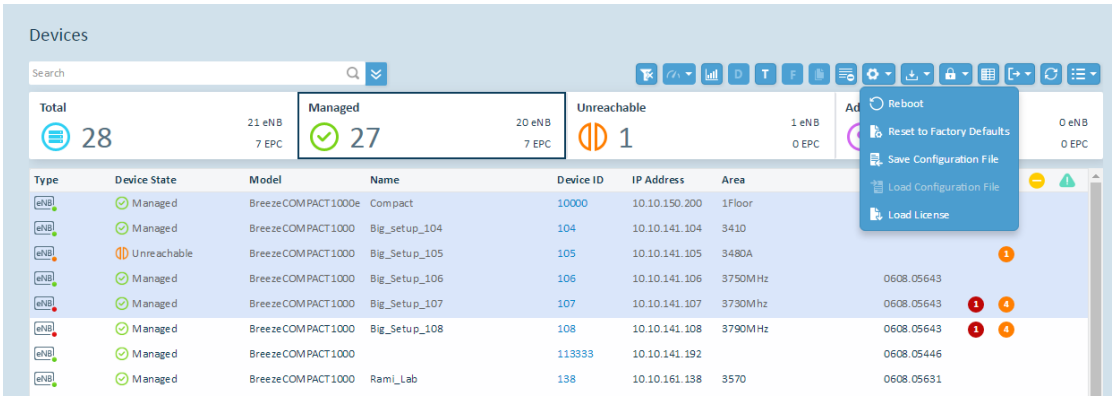


Figure 112: Devices view with highlighted devices to be licensed

In the opened 'Load License File' form verify the correct devices are present and click 'ok'

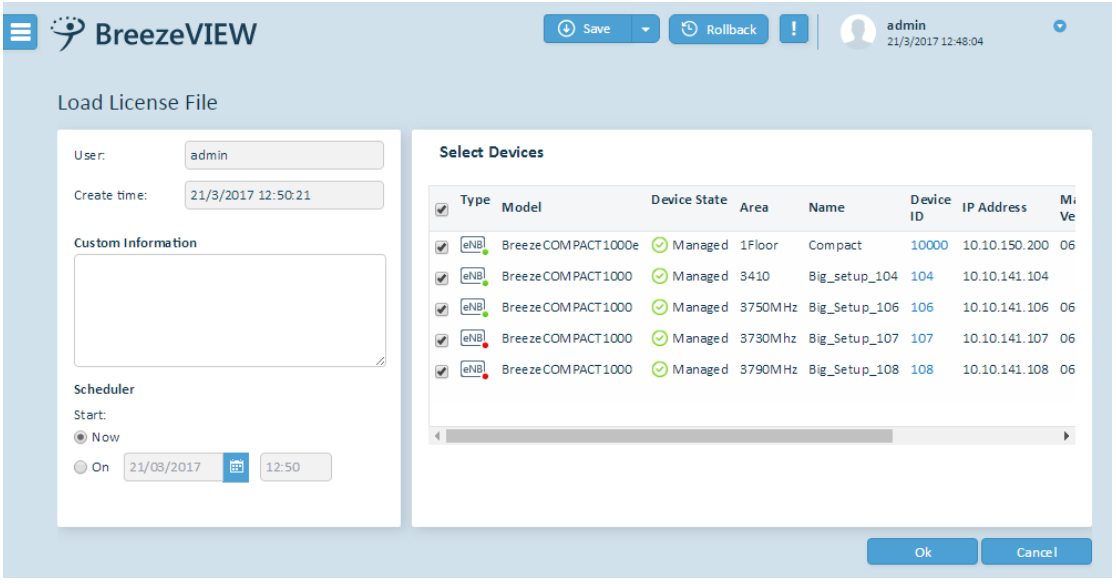


Figure 113: Load License File form

Reply 'yes' to the opened warning notification

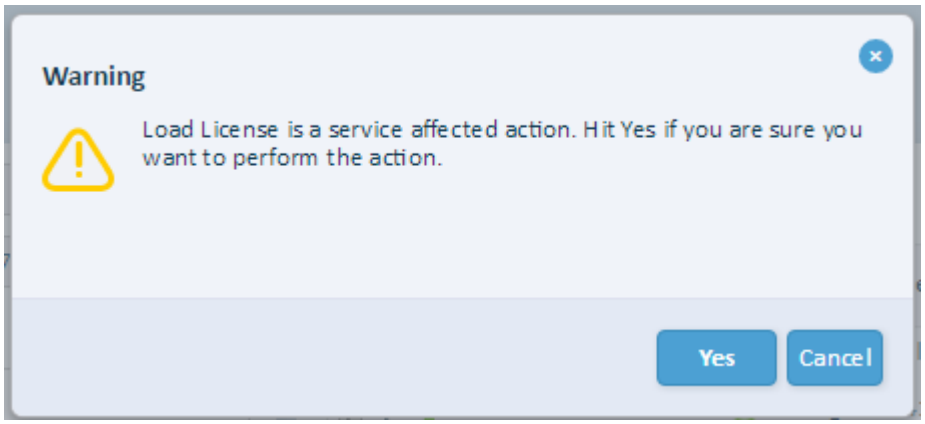


Figure 114: License loading warning frame

The 'Ongoing' view will open, verify operations for all chosen devices have completed successfully (unlike what is seen in the enclosed screenshot)

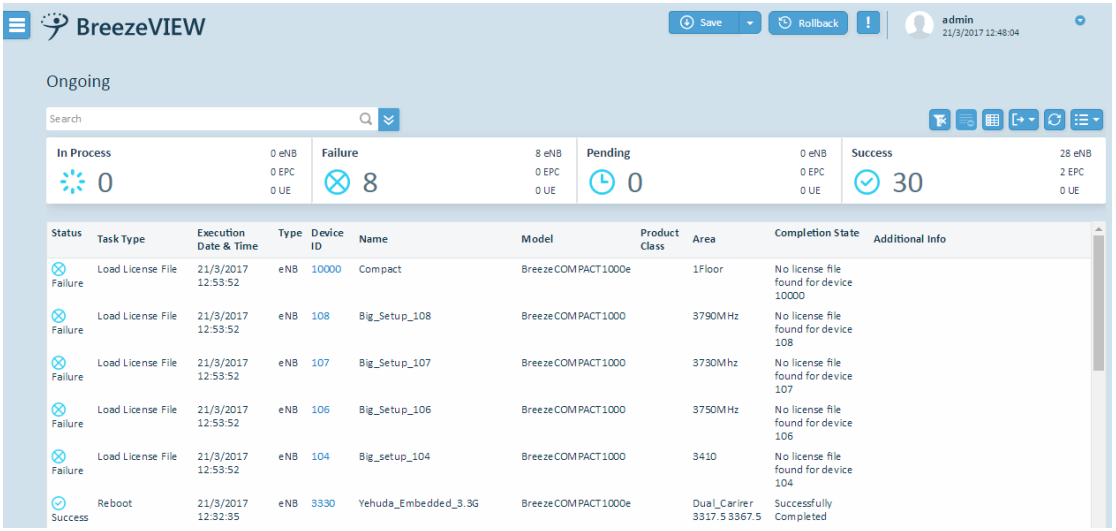


Figure 115: Ongoing task view (in this example - with failed license loading operations)

5.3.2 License Status View per Single HW

To check/verify General license status of an LTE device enter the configuration screen of this device and expand the left read-only pane by pressing the triangle on the left pane right upper corner

NOTE: this view does not detail the license content per device

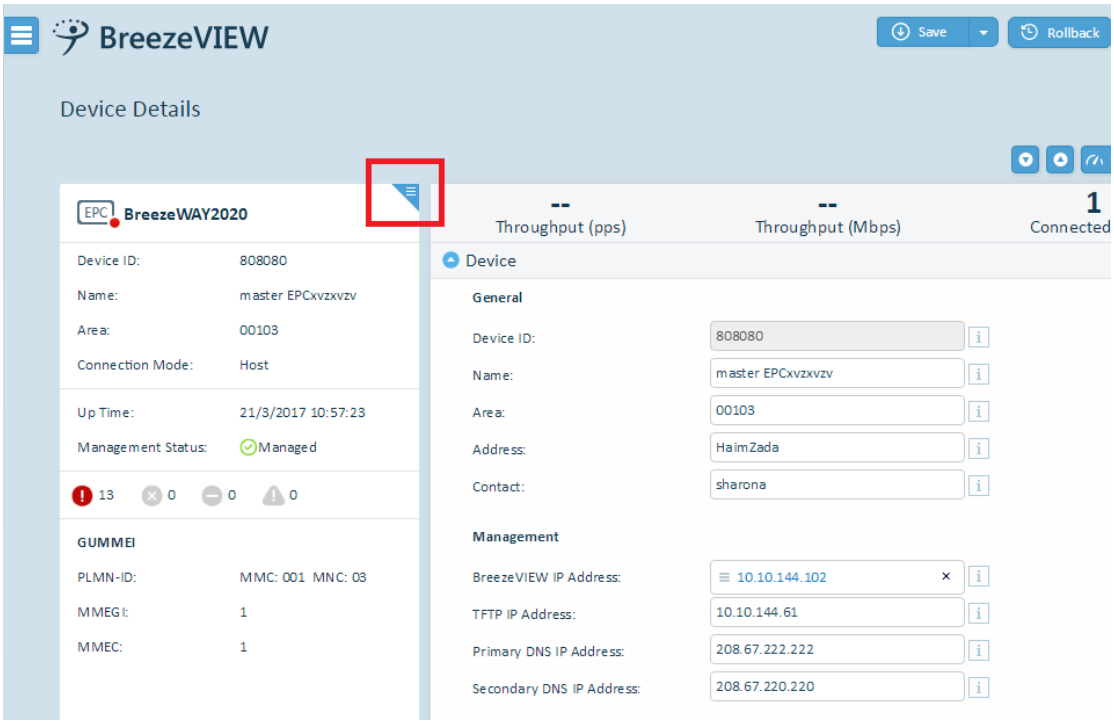


Figure 116: closed left pane without license info

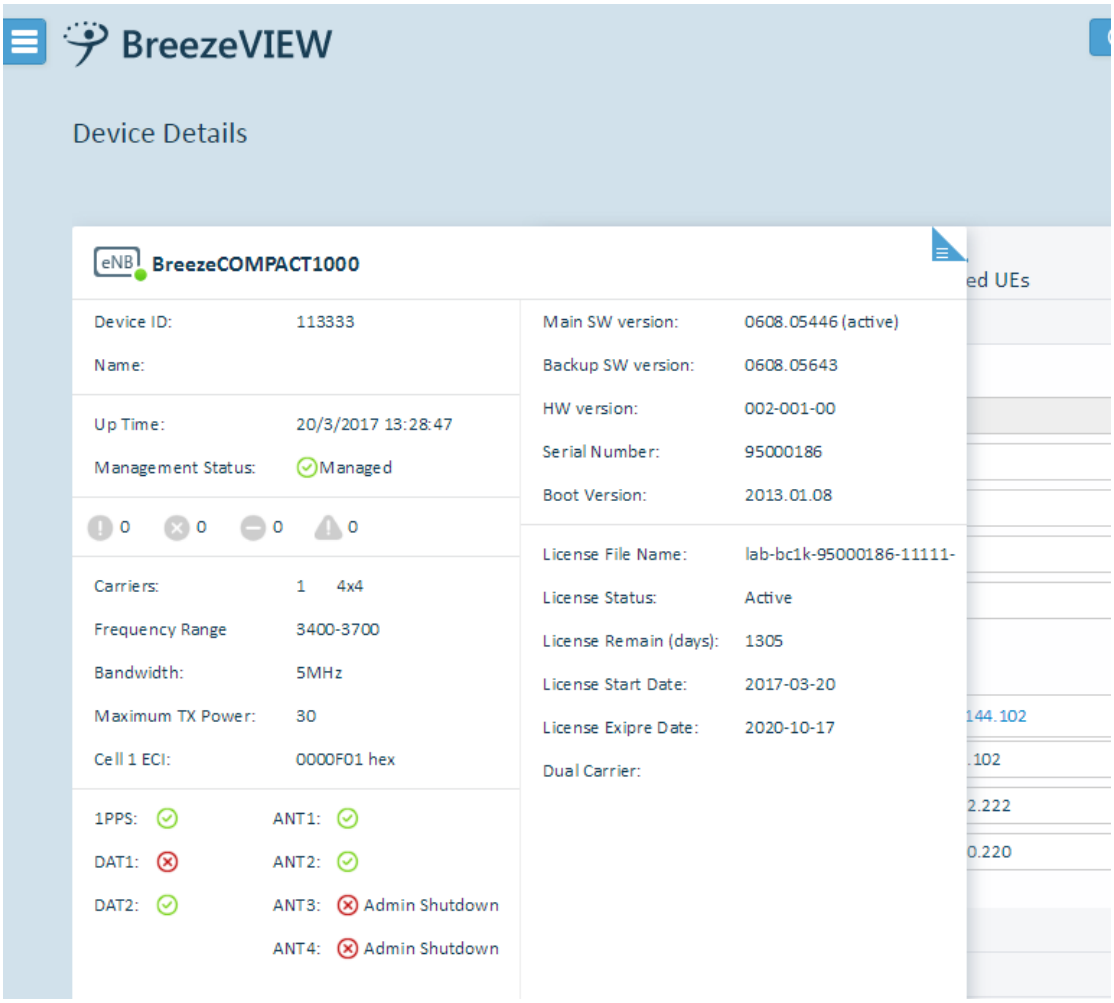


Figure 117: expanded left pane with license info

5.3.3 License inventory Display per network

To view/export the detailed license status of all devices in the network use the 'Device Licensing' option in the 'Network View' area

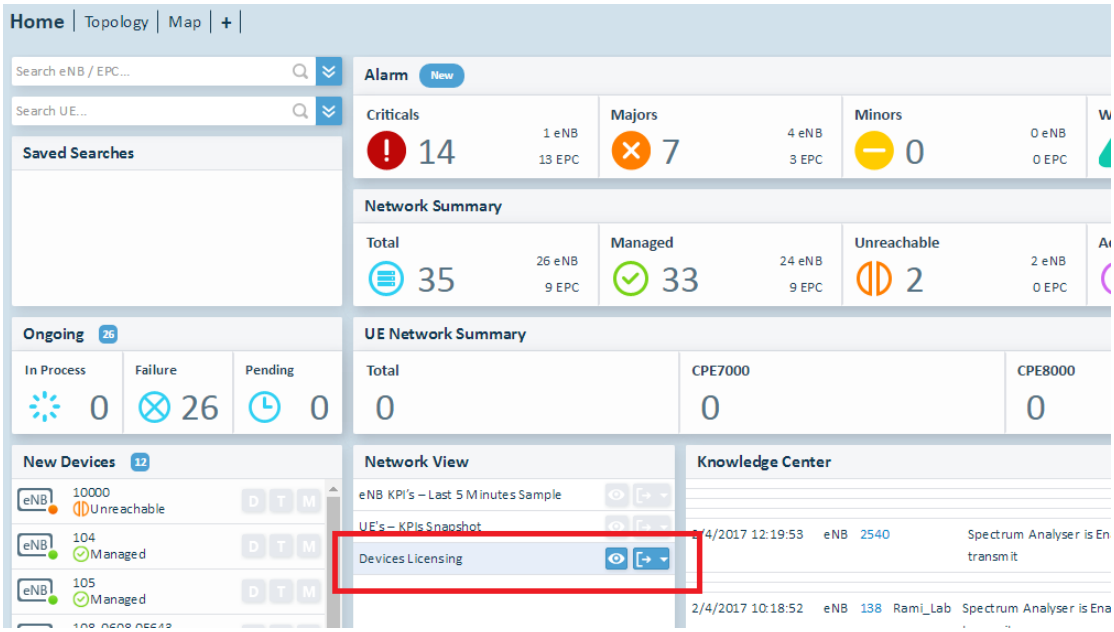


Figure 118: Device licensing controls

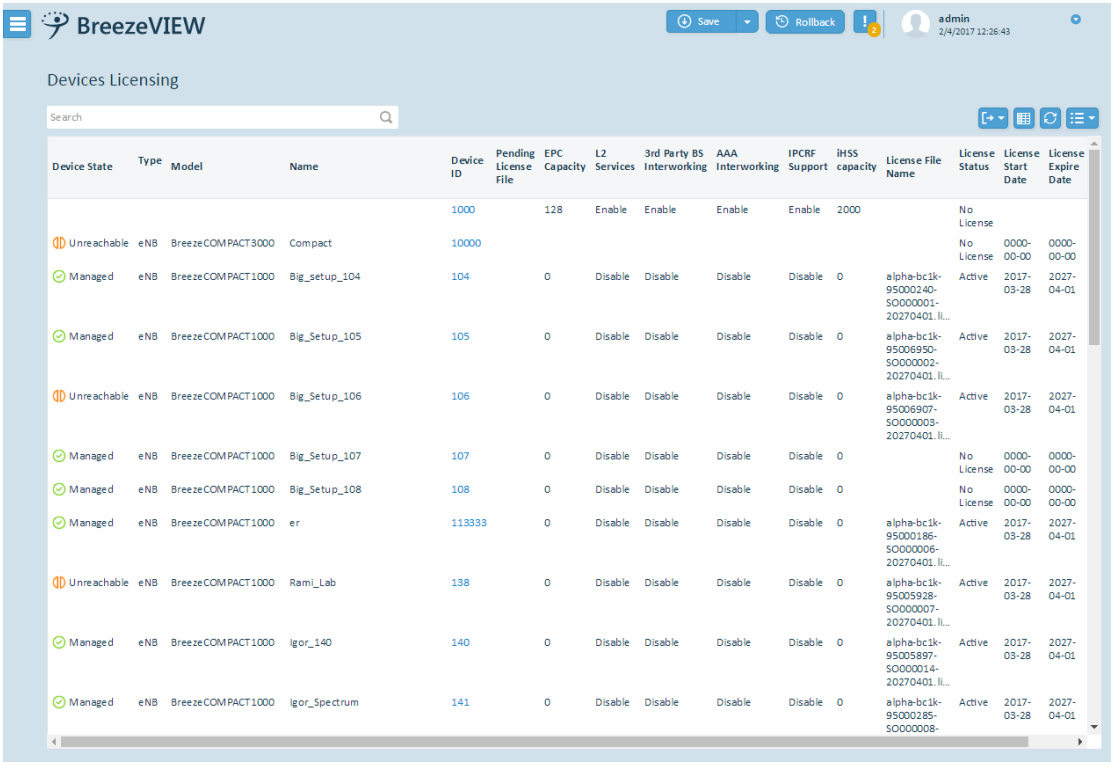


Figure 119: Device Licensing view

5.3.4 License Related Alarms

In BreezeVIEW open Alarms view, enter 'license' as search word.

The display will include devices with expired license or license nearing expiration (needs renewing).

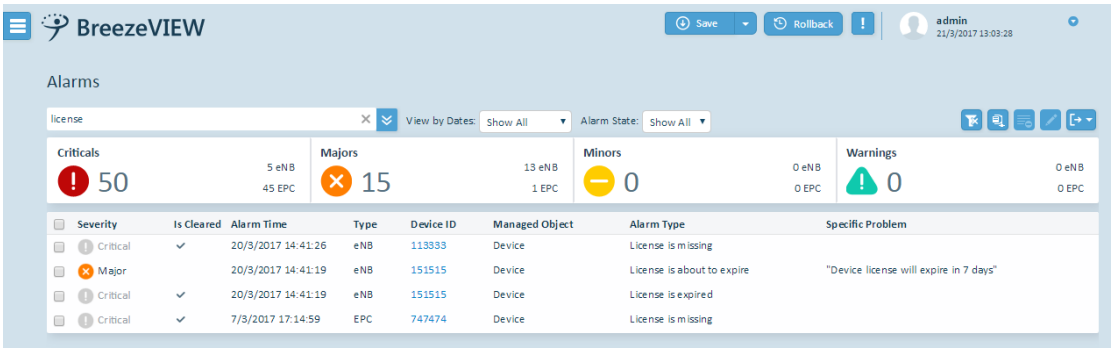


Figure 120: Alarms view with 'license' as search criterion

5.4 CLI License Operations

This item will detail the way to perform license related actions for single device from devices' CLI as secondary option in case BreezeVIEW is not available.

Reminder – BreezeVIEW is prime and should be preferred for license functionality.

5.4.1 TFTP server verification/configuration

Make available a TFTP server, create a directory named 'license' in its home directory and in this directory place the license certificates.
In all the upgraded devices about to be licensed verify TFTP server IP is pointed at the TFTP server machine in the following way:
Log into the device using SSH as root user
type 'cli' and then 'enter' to switch to CLI interface
type 'conf' and then 'enter' to switch to configuration mode
type ' show device management tftp-ip-address' to view current IP configured
if needed configure new IP by running command 'set device management tftp-ip-address <ip>'

5.4.2 Showing license status of an LTE device

Log into the device using SSH as root user
Type 'cli' to switch to CLI interface

The command to run is 'show license'

Command reply for a device with no license loaded

```
BreezeCompact> show license
license general operational-license-file ""
license general pending-license-file ""
license general status   NoLicense
license features start-date 0000-00-00
license features expiry-date 0000-00-00
license features topology single-carrier-2x2 Enable
license features topology single-carrier-2x4 Enable
license features topology single-carrier-4x4 Enable
license features topology split-mode-2x2-f1 Enable
license features topology split-mode-2x2-f1f2 Enable
license features topology dual-carrier Enable
[ok][2017-03-29 12:02:11]
BreezeCompact>
```

Command reply for a licensed device:

```
BreezeCompact> show license
license general operational-license-file telrad-bc1k-95006907-SO000001-20190909.lic
license general pending-license-file ""
license general status   Active
license features start-date 2017-03-21
license features expiry-date 2019-09-09
license features topology single-carrier-2x2 Enable
license features topology single-carrier-2x4 Disable
license features topology single-carrier-4x4 Disable
license features topology split-mode-2x2-f1 Disable
license features topology split-mode-2x2-f1f2 Disable
license features topology dual-carrier Disable
[ok][2017-03-26 08:26:51]
BreezeCompact>
```

5.4.3 Loading LTE license via CLI

The operation is comprised of two stages – downloading the license certificate to the device and activating it

The machine from which the license certificate is to be downloaded needs to have a tftp server installed and working on it

Downloading the license file

Log into the device using SSH as root user

Type 'cli' to switch to CLI interface

Type the following command (in the following example the license certificate name is new_customer-bc1k-321654-testso-20201017.lic

Option 1 – specifying TFTP server IP to download from

```
BreezeCompact> request license-file download-license-file source-ip-address 1.1.1.1 source-path-file-name license/new_customer-bc1k-321654-testso-20201017.lic
This action will download a license file from external tFTP server into device. Are You sure? [no,yes] yes
Status Success
[ok][2017-03-26 09:50:59]
BreezeCompact>
```

Option 2 – without specifying TFTP server IP (in this case the device will download from the IP configured in it as TFTP server)

```
BreezeCompact> request license-file download-license-file source-path-file-name license/new_customer-bc1k-321654-testso-20201017.lic
This action will download a license file from external tFTP server into device. Are You sure? [no,yes] yes
Status Success
[ok][2017-03-26 09:54:02]
BreezeCompact>
```

NOTE – each of these options assumes the license certificate is placed directory 'license' which itself is placed in the home directory of the tftp server. If it is placed in a different place, the path from the tftp server home directory to the license certificate location should be added to the license certificate name.

Verifying successful license certificate download - run the following command

```
BreezeWay2020> show notification stream alarms last 1
```

to view the outcome of the license download operation

Activating downloaded license file

```
BreezeCompact> request license-file activate-license-file
This action activates device license. Are You sure? [no,yes] yes
Status MissingPathFileName
Reason License file not exist
[ok][2017-03-26 08:35:13]
BreezeCompact>
```

To verify license active and valid run the following command –

```
show license
```


Telrad
We're on your wavelength.