

TRBOnet Watch

User Guide

Version 3.0

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1 Introduction

1.1 About This Guide

This document is intended for the radio network control room personnel in charge of the radio system monitoring and maintenance. It introduces the user interface and functionality of the TRBOnet Watch Server and TRBOnet Watch Console applications.

1.2 About TRBOnet

TRBOnet is a suite of professional applications for the MOTOTRBO digital two-way radio networks. TRBOnet manages voice, text and data communication paths to network endpoints and provides a unified graphical dispatcher workbench interface for all the messaging and workforce orchestration tasks.

1.3 Contacts

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EMEA	+44 203 608 0598	info@trbonet.com — general and commercial inquiries
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2 Overview

2.1 About TRBOnet Watch

TRBOnet Watch is an advanced software packet sniffer designed for logging and analyzing data streams in your MOTOTRBO radio networks. This solution also gives you an integrated view into the health of your network. The application monitors infrastructure resource usage and allows a user to detect topology problems and verify that all components of the system are configured correctly.

The software provides views of system performance from every perspective. Built-in tools and monitors greatly reduce time required for data analysis and eliminate the necessity for on-site visits. This cutting-edge technology enables a simple setup procedure and does not require NAI Data licenses.

Real-time monitor shows activity on each slot of your system. TRBOnet Watch is capable of determining what kind of data is transmitted on available channels. You can easily verify that radios send registration statuses and GPS data to the system. This software can recognize voice calls, telemetry and option board data, as well as text messages and system packets. The log contains detailed information about each entry including sender and recipient identifiers, slots, talk groups and signal strength for calls.

Topology monitor gives you an insight into MOTOTRBO networks connected to TRBOnet Watch. It helps you pinpoint configuration problems and check if there have been any alarms from the repeaters. This is especially useful for large multi-site systems. It also allows you to check if new repeaters have been successfully added to your network. The Topology screen allows you to verify that all components of the system have unique identifiers and there are no conflicting identifiers. The Diagnostic tab provides the full information about IP connections in the system and the uptime for each repeater. This tab offers enhanced features such as remote channel change or disabling repeaters.

The **Reports** and **Analytics** tabs are designed to visualize megabytes and gigabytes of information obtained from the radio network. Advanced filters help you get a clear understanding of system performance by system name, slot, frequency, unit ID or talk group. This information can be used to bill customers using your radio infrastructure. The Channel Usage and Frequency Usage reports are of interest to those who want to ensure their systems have sufficient capacity for efficient communications. The All Channels Busy report shows how often the radio channels have not been available for radio users within a user defined time interval.

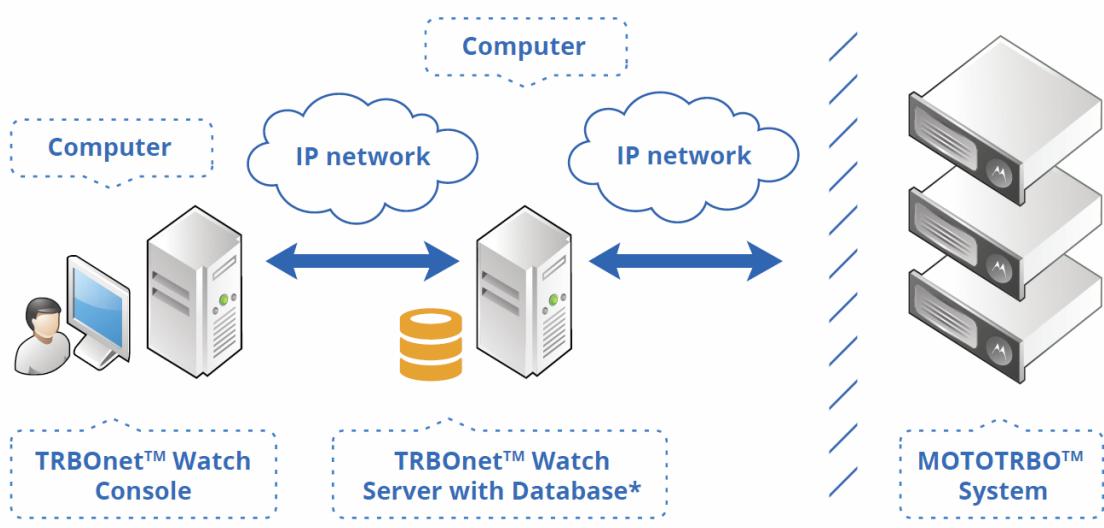
2.2 Features

TRBOnet Watch features include:

- Support for all MOTOTRBO platforms
- Multiple systems monitoring
- Topology problem detection
- Real-time traffic capture
- Network usage by system, site, slot, channel, talk group, radio user
- Hardware alarms
- Signal strength
- RSSI level map
- SNMP integration
- No NAI Data licenses required

2.3 Architecture

TRBOnet Watch is a client-server solution that does not require additional hardware and can be added to a MOTOTRBO radio system of any size and architecture.



*Microsoft SQL Server Express (free edition)

Figure 1: TRBOnet Watch architecture

The server part of the application is installed on any networked computer that meets the hardware and software requirements. The TRBOnet Watch Server implements the MOTOTRBO protocols, manages IP connection to repeaters, and stores data.

The client software can run on any remote computer and receives all the information about the system from anywhere over an IP connection.

2.4 Hardware and Software Requirements

Table 1: TRBOnet Watch 3.0 hardware and software requirements

TRBOnet Watch Server			
Channels	Less than 50	Less than 250	250+
CPU	Intel Core i3/i5	Intel Core i7	Contact technical support
Memory	4 GB	8 GB	
HDD	300 MB for installation files		
Sound Card	No		
Supported OS	Windows 7, Windows 8, Windows 10, Windows Server 2008, Windows Server 2012		
Software	.NET Framework 4.6.1, MS SQL Server Express 2008 Edition or higher		
TRBOnet Watch Console			
CPU	Intel Core i3		
Memory	4 GB		
HDD	70 MB for installation files		
Sound Card	Yes		
Display	1280x1024 minimal resolution, 1600x900 recommended resolution		
Additional Devices	Speakers		
Supported OS	Windows 7, Windows 8, Windows 10		
Software	.NET Framework 4.6.1		

2.5 Compatibility with MOTOTRBO Firmware Versions

TRBOnet Watch can monitor all kinds of traffic on MOTOTRBO systems IP Site Connect, Capacity Plus, Linked Capacity Plus, Connect Plus, Extended Range Direct Mode, and Capacity Max. The following table describes the compatibility between TRBOnet Watch product versions and MOTOTRBO firmware versions for each supported system type.

Table 2: MOTOTRBO firmware versions compatible with TRBOnet Watch

TRBOnet Watch version	IPSC	Capacity Plus	LCP	Connect Plus	ERDM	Capacity Max
2.3.5	02.40.12				Not supported	
2.5	02.06.00.07				02.07.00.03	
3.0	02.08.00.07				02.08.00.07	

2.6 Licensing

When you purchase TRBOnet Watch, you obtain a commercial (non-expiring) license that specifies functional modules and types of radio networks available for users. The core conditions include one repeater connection, one server, and one client console. All repeaters that need to be monitored must be included in the license. If the actual number of repeaters exceeds the license limits, extra connections are ignored.

The list of optional features includes:

- Additional repeater connections
- Additional consoles
- RSSI monitoring

2.7 System Monitoring Levels

TRBOnet Watch can monitor a MOTOTRBO system on one of the following levels:

- Level 1: Link Establishment: Watch monitors all IP connections in the system.
- Level 2: Diagnostics: Watch monitors all IP connections in the system and RDAC connections of all repeaters in the system.
- Level 3: Call Monitoring: Watch monitors all IP and RDAC connections in the system and air traffic in the system channels. Traffic is not parsed.
- Level 4: Call Parsing: Watch monitors all IP and RDAC connections in the system and air traffic in the system channels. Traffic is parsed, all types of traffic are recognized.

The scope of functionality available in TRBOnet Watch Console depends on the system type and on the monitoring level specified for each system in the TRBOnet Watch Server configuration tool. Some features require a special license.

The following table summarizes the functionality available in TRBOnet Watch Console for each system type and at each level of system monitoring.

Table 3: TRBOnet Watch Console functionality available on each level of system monitoring

TRBOnet Watch feature	IP Site Connect	ERDM	Capacity Plus	LCP	Connect Plus (XRC)	Connect Plus (XRT)	Capacity Max
Level 1: Link establishment							
Diagnostics	IP connection status						
Topology	IP connections only						
Reports	Event Viewer only. Other reports display no information.						
Level 2: Diagnostics							
Diagnostics	Full support. Connect Plus (XRC) sends diagnostics from repeaters on the site.						These systems do not support Level 2
Topology	Full support						
Reports	Event Viewer only. Other reports display no information.						

TRBOnet Watch feature	IP Site Connect	ERDM	Capacity Plus	LCP	Connect Plus (XRC)	Connect Plus (XRT)	Capacity Max				
Level 3: Call monitoring											
Diagnostics	Full support										
Topology	Full support										
Real-time traffic monitoring	Slots, channels	Slot	Channels	Channels	Channels	Channels	Channels				
Recognized traffic:	<p>* These call types appear as bars of different color in real-time traffic monitors. If the cell is blank, the respective call type is not recognized.</p> <ul style="list-style-type: none"> ▪ Location ▪ System ▪ Voice ▪ Data 										
Call parsing	Not supported										
Reports:	<p>* These reports display no information if the respective cell is blank. Other reports display full information.</p>										
RSSI Levels: GPS	Yes	Yes	Yes								
RSSI Levels: Map	Yes	Yes	Yes								
GPS Data											
Text Messages											
Charts	All	All	All	All	All	All	All				
Level 4: Call Parsing											
Diagnostics	Full support			These systems do not support Level 4							
Topology	Full support										
Reports	All	All	All								
Charts	All	All	All								
Real-time traffic monitoring	Slots, channels	Slot	Channels								
Recognized traffic:	<p>* These call types appear as bars of different color in real-time traffic monitors</p> <ul style="list-style-type: none"> ▪ Registration ▪ Telemetry ▪ Text ▪ Location 										
▪ Registration	Yes	Yes	Yes								
▪ Telemetry	Yes	Yes	Yes								
▪ Text	Yes	Yes	Yes								
▪ Location	Yes	Yes	Yes								

TRBOnet Watch feature	IP Site Connect	ERDM	Capacity Plus	LCP	Connect Plus (XRC)	Connect Plus (XRT)	Capacity Max
▪ System	Yes	Yes	Yes				
▪ Voice	Yes	Yes	Yes				
▪ User	Yes	Yes	Yes				
▪ Data	Yes	Yes	Yes				
▪ Option Board	Yes	Yes	Yes				
Call parsing	Yes	Yes	Yes				
Listening to voice transmitted on the channel (Mute button)	Yes	Yes	Yes				

2.8 Glossary

Table 4: Acronyms

Term	Description
ARS	Automatic Registration Service
BSI	Base Station Identification
CPU	Central Processing Unit
CWID	Continuous Wave Identification
ERDM	Extended Range Direct Mode
GPIO	General Programmable Input Output
GPS	Global Positioning System
HDD	Hard Disk Drive
IP	Internet Protocol
IPSC	IP Site Connect
LCP	Linked Capacity Plus
MIB	Management Information Base
NAI	Network Advertising Initiative
NMS	Network Management Station
NSCP	Neocom Software Control Protocol
OID	Object Identifier
OS	Operating system
OTA	Over the Air
RCM	Repeater Call Monitoring
RDAC	Repeater Diagnostics and Control
RoIP	Radio-over-IP
RSSI	Received Signal Strength Indicator
SMS	Short Message Service
SNMP	Simple Network Management Protocol
TCP	Transmission Internet Protocol
TOT	Time-Out Timer
UDP	User Datagram Protocol
URL	Uniform Resource Locator
XCMP	Extended Command and Management Protocol
XNL	XCMP Network Layer

3 Installation and Upgrade

This section describes how to install, repair, uninstall, and upgrade your TRBOnet Watch software to the higher version.

3.1 Installing TRBOnet Watch

Before you start installing TRBOnet Watch, make sure that your computer meets the minimum hardware and software requirements. For more information, refer to section [2.4, Hardware and Software Requirements](#) (page 4).

To install TRBOnet Watch:

1. Double-click the *TRBOnet.Watch_<version>.exe* file to run the TRBOnet Watch setup wizard. Click **Next**.
2. Accept the terms in the license agreement. Click **Next**.
3. Select the installation type:
 - **TRBOnet Watch 3.0 Console and Server:** Choose to install both the server and client software on one computer.
 - **TRBOnet Watch 3.0 Console:** Choose to install the client software on the computer, for instance, on the dispatcher's desktop.
4. Click **Next**.
5. Click **Install**, then click **Finish** to exit the setup wizard.

After the installation is finished, you need to specify several configuration settings as described in section [4, TRBOnet Watch Server](#) (page 11).

3.2 Repairing TRBOnet Watch

To repair the TRBOnet Watch installation:

1. Double-click the *TRBOnet.Watch_<version>.exe* file to run the TRBOnet Watch setup wizard. Click **Next**.
2. Select the **Repair** option.
3. Click **Repair**, then click **Finish** to exit the setup wizard.
4. Run the TRBOnet Watch Server as a Windows service as described in section [4.3, Creating a Windows Service](#) (page 12).

Except for the Windows service, the repaired installation keeps all configuration settings unchanged.

3.3 Uninstalling TRBOnet Watch

To uninstall TRBOnet Watch from your computer:

1. Double-click the *TRBOnet.Watch_<version>.exe* file to run the TRBOnet Watch setup wizard. Click **Next**.
2. Select the **Remove** option.
3. Click **Remove**. TRBOnet Watch is removed from your desktop.

Note: Log files, configuration files, and folders are not removed from the disk automatically. Uninstalling TRBOnet Watch does not affect the TRBOnet Watch database.

3.4 Upgrading TRBOnet Watch

To upgrade TRBOnet Watch:

1. Uninstall the current version of TRBOnet Watch as described in section [3.3, Uninstalling TRBOnet Watch](#) (page 9).

2. Install the TRBOnet Watch as described in section [3.1, Installing TRBOnet Watch](#) (page 9).

3. Launch the TRBOnet Watch Server.

The configuration settings of the uninstalled server are preserved in the configuration file and are displayed in the **TRBOnet Watch Server** window after the upgrade.

4. Run TRBOnet Watch Server as a Windows service as described in section [4.3, Creating a Windows Service](#) (page 12).

5. Click **Database** in the **Configuration** pane. Then click **Upgrade Database** in the right pane.

4 TRBOnet Watch Server

This section describes how to configure your TRBOnet Watch for radio network monitoring and diagnostics.

4.1 Launching TRBOnet Watch Server

To launch the TRBOnet Watch Server, double-click the **Watch 3.0 Server** icon on the desktop, or click **All Programs** and then **Neocom Software** and **Watch 3.0 Server** on the **Start** menu.

When the TRBOnet Watch Server is launched for the first time, the main configuration window appears.

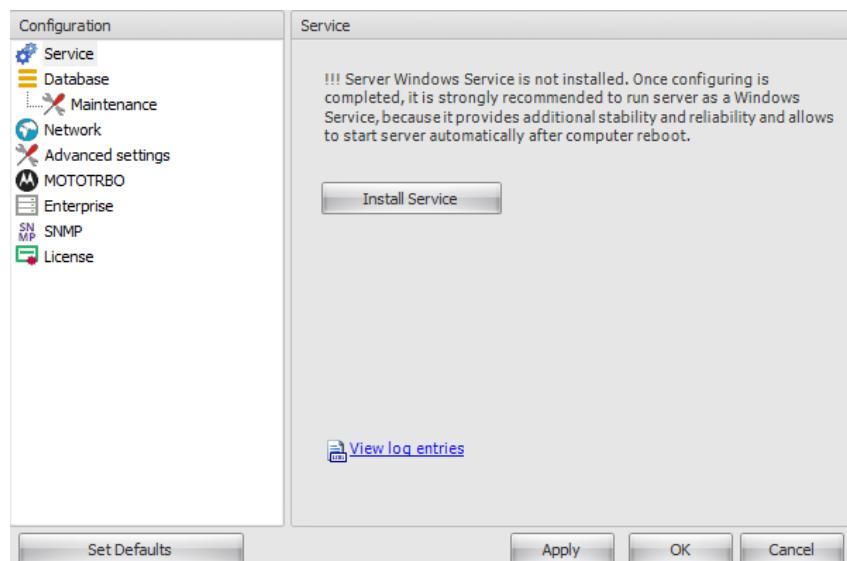


Figure 2: TRBOnet Watch Server

4.2 Managing the Software License

TRBOnet Watch contains a free trial license that allows you to evaluate the product with some functional limitations such as no support for remote agent connections and the limited number of master repeaters.

To use the product after the evaluation period, order a license from a reseller or Neocom software directly. Include the information about your current license in your request. To do it, open the **License** tab, click **Copy to Clipboard**, and insert the copied details to the request.

To apply a new license:

1. Copy the new license file to a local folder. If this folder contains other license files, delete them.
2. In the **TRBOnet Watch Server** window, select **License** in the **Configuration** pane.
3. Click **License Manager**. The **License Manager** dialog box appears.
4. Click **Next**. Click the search button next to the **License file** field and point the license file.

5. Click **Next**, then click **Finish**.

4.3 Creating a Windows Service

Running TRBOnet Watch as a Windows service is a mandatory configuration step.

To run the TRBOnet Watch Server as a Windows service:

1. In the **Configuration** pane, select **Service**.
2. Click **Install Service** in the **Service** pane. The Windows service is created and stopped.
3. Click the **Start** link.

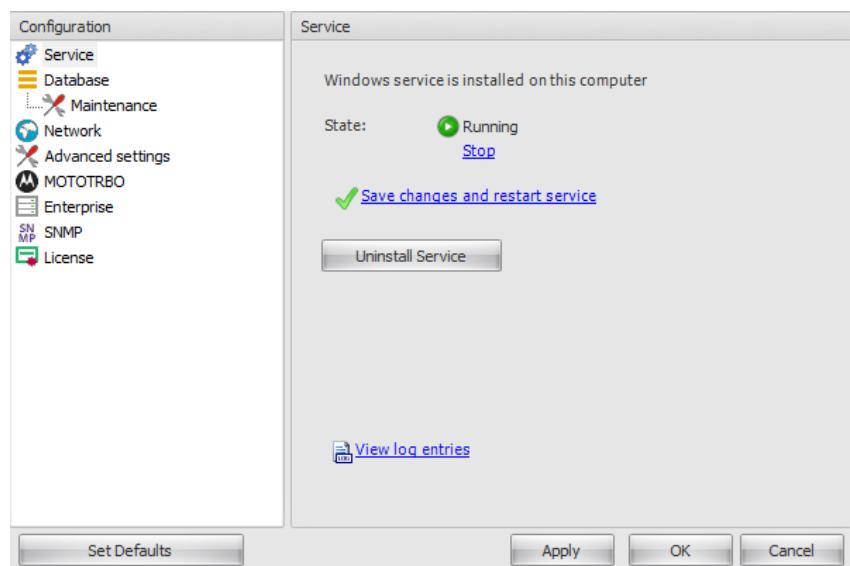


Figure 3: Managing the Windows service

The following buttons and commands are available in the **Service** pane:

- **Start / Stop:** Click to start or stop the Windows service.
- **Save changes and restart service:** Click to save the recent configuration changes to the local CONFIG file and to restart the service with the updated settings.
- **Uninstall Service:** Click to remove the service. After that, the TRBOnet Watch Server can be launched as a desktop application.
- **View log entries:** Click to open the TRBOnet Watch Server system log in the **View log entries** dialog box. The log may be requested by the technical support, should the customer report any TRBOnet Watch issue.

4.4 Configuring the IP Network Settings

Configure communication between the TRBOnet Watch Server and the TRBOnet Watch Consoles over IP.

To specify the IP network settings:

- In the **TRBOnet Watch Server** window, select **Network** in the **Configuration** pane.

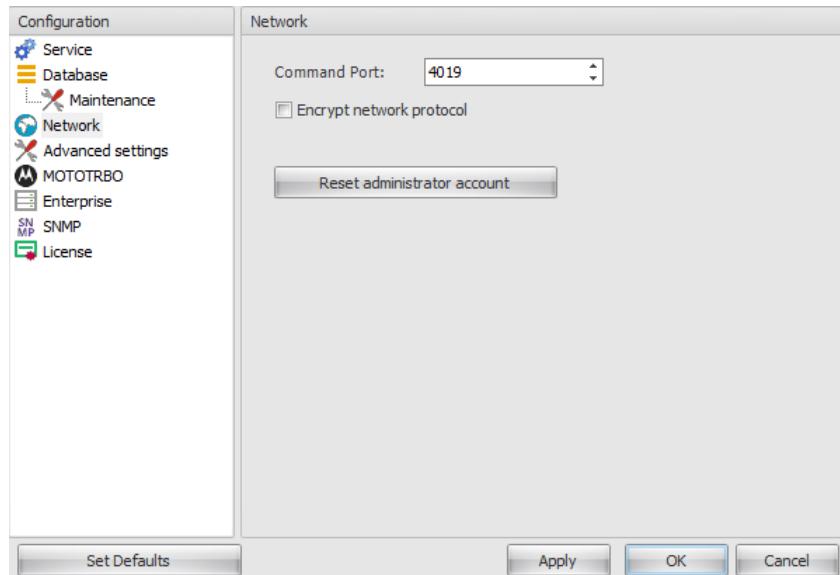


Figure 4: Configuring the Network settings

- In the **Network** pane, specify the following settings:
 - Command Port**
Specify the IP port for communication with TRBOnet Watch Console (default value: 4019).
 - Encrypt network protocol**
Select this option for TRBOnet Watch Server to transfer encrypted data to TRBOnet Watch Console.
 - Reset administrator account**
Click this button to reset the administrator's login and password to their default values.

4.5 Creating a TRBOnet Watch Database

Creating a TRBOnet Watch database is a mandatory configuration step.

Note: Before you create a database, make sure that you have an SQL Server application installed on your server or on a networked storage device. For the list of SQL Server editions compatible with the current version of TRBOnet Watch, refer to section [2.4, Hardware and Software Requirements](#) (page 4).

To create a TRBOnet Watch database:

- In the **TRBOnet Watch Server** window, select **Database** in the left pane.
- Specify the following database connection properties:

Table 5: TRBOnet Watch Database connection properties

Property	Description
SQL Server	The SQL Server. Select an instance from the list of the database management systems found on your network.
Database	The preferred database name. Follow the naming rules specific to the selected SQL Server edition.

Property	Description
Authorization	<p>The authorization method. Select the preferred option:</p> <ul style="list-style-type: none"> ▪ Windows Authorization: TRBOnet Watch will use your Windows credentials to access the database. ▪ SQL Server Authorization: TRBOnet Watch will use an MS SQL Server user account to access the database. <p>To use Windows authorization, the Local System account must be granted MS SQL Server administrator privileges. For details, refer to section 4.5.1, Configuring the Local System Account (page 14).</p>
User Name	The MS SQL Server user name. Required for SQL Server Authorization.
Password	The MS SQL Server user password. Required for SQL Server Authorization.

3. Click **Create Database**. The database with the specified name is created.
4. Click **Test Connection**.
5. Configure maintenance of the TRBOnet Watch database. For details, refer to section [4.5.2, Configuring Database Maintenance](#) (page 15).

4.5.1 Configuring the Local System Account

If you configure TRBOnet Watch database connection to use Windows authentication, make sure that the list of MS SQL Server administrators includes the Local System account. Otherwise, you will get the following error message at any attempt to connect to the database:

Cannot open the database requested by the login. The login failed. Login failed for user 'NT AUTHORITY\SYSTEM'.

The Local System account can be granted the required privileges during or after the MS SQL Server installation.

To grant administrator rights to Local System when installing MS SQL Server:

1. Run MS SQL Server setup. Click **Database Engine Configuration** and then the **Server Configuration** tab.
2. Under **Specify SQL Server administrators**, click **Add**.
3. In the **Select Users or Groups** window, click **Advanced**.
4. Click the **Find** button and select the LOCAL SERVICE account. Click **OK** to add the user and close the window. The NT AUTHORITY\LOCAL SERVICE(LOCAL SERVICE) user appears in the list of SQL Server administrators.
5. Click **Next** and follow the prompts to finish setup.

To grant administrator rights to Local System after MS SQL Server installation:

1. Launch MS SQL Server Management Studio.
2. In the **Connect to Server** dialog box, expand the **Server name** menu and point the SQL Server instance on which the TRBOnet Watch database is created. Click **Connect**.



Figure 5: Connecting to the SQL Server instance

3. In the **Object Explorer** pane, expand the SQL Server instance to which you have just connected.
4. Go to the **Security** node and select **Logins**.
5. Under the **Logins** node, right-click **NT AUTHORITY\SYSTEM** and click **Properties**.
6. In the **Login Properties** window, click **Server Roles** in the left pane. Select the **sysadmin** checkbox in the right pane.
7. Click **OK** to add sysadmin privileges to the selected user.

4.5.2 Configuring Database Maintenance

To prevent data loss and reduce the size of the TRBOnet Watch database, create database backups and clean old data regularly. You can do it occasionally, or you can schedule regular database maintenance.

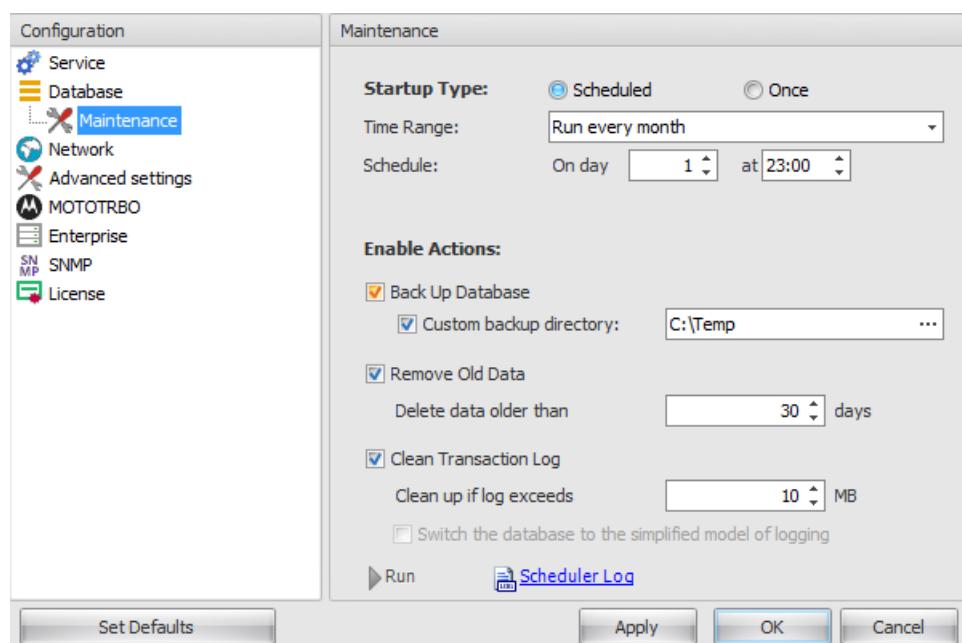


Figure 6: Configuring TRBOnet Watch database maintenance

To configure database maintenance:

1. Launch TRBOnet Watch Server and select **Maintenance** under the **Database** section in the **Configuration** pane.
2. In the **Enabled Actions** section of the right pane, enable the required options:

Table 6: TRBOnet Watch – database maintenance options

Action	Description
Back Up Database	Select to back up the database to the default local folder. To save backup to a particular folder, select Custom backup directory , click the Search button in the edit box, and select the preferred folder.
Remove Old Data	Select to remove old data from the database. Configure the options: <ul style="list-style-type: none"> ▪ Delete data older than: For scheduled maintenance, specify the number of days to keep the data. ▪ Delete data created before: For occasional maintenance, specify the date before which all data should be cleared.
Clean Transaction Log	Select to clear the transaction log. Configure the options: <ul style="list-style-type: none"> ▪ Clean up if log exceeds: Specify the maximum allowed log size (in Mb). If the threshold is exceeded, the transaction log is cleared. ▪ Switch the database to the simplified model of logging: If your database uses the full transaction logging model, select this option to switch to the simplified model in order to reduce the volume of logged transactions. If the database uses the simplified logging model, this option is unavailable.

The database maintenance options are executed in the order they appear in the **Maintenance** pane. If backup is enabled, the data is backed up and then removed.

To schedule database maintenance:

1. In the right pane, click the **Scheduled** option.
2. On the **Time Range** menu, select to run database maintenance every hour, day, week, or month.
3. Specify the day and/or time for maintenance to be started.
4. Select the actions to be executed.
5. Click **Apply** to save the changes.

To run database maintenance immediately:

1. In the right pane, click the **Once** option.
2. Select the actions to be executed.
3. Click **Run** to start maintenance. The progress of the selected operations is displayed in the **Maintenance In Progress** window.

When maintenance is complete, the **Results** area displays the maintenance log record.

To view all records in the database maintenance log, click **Scheduler Log** and click the **Scheduler** tab in the **View log entries** window.

4.6 Changing the Language

To change the language of the TRBOnet Watch Server:

1. In the **TRBOnet Watch Server** window, select **Advanced settings** in the left pane.
2. On the drop-down menu, select one of the supported interface languages.
3. Click **Apply** or **OK**.

The selected language will apply after you reopen the **TRBOnet Watch Server** window.

4.7 Setting the Logging Level

The TRBOnet Watch Server logs specific information that can help the technical support team of the software vendor to investigate a customer reported issue. The level of detail in the system log depends on the Logging level settings.

To select the preferred logging level:

- In the **TRBOnet Watch Server** window, select **Advanced settings** in the left pane.
- On the **Logging level** drop-down menu, select the preferred level of detail in the system log: **Debug**, **Information**, **Warning** (default), or **Error**. Use the **Warning** option unless you are requested by the technical support of the product vendor to select a different level.

The **Debug** level of detail is recorded to the TRBOnet Watch database, which increases the database volume rapidly.

4.8 Enabling Extended Diagnostics

You can set up TRBOnet Watch to show the extended diagnostic information about repeaters in all monitored systems. This information is displayed in additional fields on the **Diagnostics** tab (Live Monitor).

To display extended diagnostics for repeaters:

- In the **TRBOnet Watch Server** window, select **Advanced settings** in the left pane.
- Select the **Enable extended diagnostics** checkbox.
- Click **Apply** or **OK**.

4.9 Registering Radio Systems

Register the radio systems whose channels you need to monitor in the TRBOnet Watch Console.

4.9.1 Registering MOTOTRBO IPSC, Capacity Plus, LCP, and ERDM

To monitor traffic in an IP Site Connect, Capacity Plus, Linked Capacity Plus, or Extended Range Direct Mode system, register the master repeater in the **TRBOnet Watch Server** window.

To register a master repeater:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the **Configuration** pane.
2. In the **MOTOTRBO** pane, click **Add** and then **Add Repeater** on the drop-down menu.
3. Enter the properties for peer-to-peer communication between TRBOnet Watch and the repeater:

Table 7: MOTOTRBO system settings

Property	Description
System Name	The name of the system that uses the master repeater. The system name will be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
TRBOnet Peer ID	The peer ID of the TRBOnet Watch Server in the system. Range: 1 to 16777215. Range for LCP and Capacity Plus: 1-65535. Default: 200. The selected value must be unique (not used) within the radio network.
TRBOnet Local Port	The IP port of the TRBOnet Watch Server used for connection with a radio network. Use a unique port for each master repeater in the system.
SNMP ID	Any value within the valid range used to generate the repeater's physical index. Valid range: 1 to 127. Move the mouse cursor over the SNMP ID field to see the generated index stored in the physical entity table (object entPhysicalTable) of the SNMP Agent. To learn more about SNMP communication with TRBOnet Watch, refer to Appendix B: SNMP Support (page 110).
Master Peer section	
Master IP Address	The static IP address of the master repeater. Default: 192.168.0.100.
Master UDP Port	The UDP port of the master repeater. Range: 1024 to 65535. Default: 50000.
Authentication Key	The private key value of the master repeater as specified in the repeater's configuration. Valid characters: 0-9 and A-F. Max length: 40 characters. Leave this field blank if the repeater authentication is disabled.
System Type	Select the topology of your radio network. Options: Capacity Plus, IP Site Connect, Linked Capacity Plus, Extended Range Direct Mode.
Connection	Select the level of monitoring in the system. Choosing a low level helps reduce traffic and the database volume. Options: <ul style="list-style-type: none"> ▪ Level 1: Link Establishment: Select to monitor the IP connections in the system. ▪ Level 2: Diagnostics: Select to monitor the IP and RDAC connections in the system.

Property	Description
	<ul style="list-style-type: none"> ▪ Level 3: Call Monitoring: Select to monitor the IP and RDAC connections in the system and non-parsed traffic in the channels. ▪ Level 4: Call Parsing: Select to leverage the full-featured monitoring in the system. <p>Find the details in section 2.7, System Monitoring Levels (page 5).</p>

4. Click **Test** to check the IP connection to the master repeater. The result appears in a popup window. If successful, the firmware version and serial number are displayed. Click **Close** to close the popup window.
5. Specify the Privacy settings of the master repeater as described in section [4.9.1.1, Configuring Privacy Settings](#) (page 19).
6. Specify the filtering rules for traffic monitoring and data storage as described in section [4.9.1.2, Configuring Data Storage](#) (page 20).
7. Add system peers as described in section [4.9.1.3, Adding Peers](#) (page 23).

4.9.1.1 Configuring Privacy Settings

The Privacy settings configured on a MOTOTRBO repeater need to be entered in TRBOnet Watch.

To configure Privacy settings:

- In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the left pane, then click the system, and then **Privacy**.
- In the **Privacy** (right) pane, specify the following properties:

Table 8: Privacy settings of the MOTOTRBO repeater

Property	Description
Privacy Type	The type of privacy as specified in the repeater configuration. Options: <ul style="list-style-type: none"> ▪ None: Privacy is disabled. ▪ Basic: Basic Privacy (utilizes a Motorola proprietary non-cryptographic algorithm to transform protected voice and data). ▪ Enhanced: Enhanced Privacy (utilizes a cryptographic algorithm to transform protected voice and data).
Basic Privacy Key ID	Applies to Basic Privacy only. The privacy key specified in the repeater configuration. Valid range: 1 to 255.
Enhanced Algorithm	Applies to Enhanced Privacy only. The encryption algorithm specified in the repeater configuration. Options: ARC4, DES, AES 128, AES 256.
Enhanced Privacy Keys	The Enhanced Privacy keys specified in the repeater configuration. Applies to Enhanced Privacy only. Click Add and add up to 16 Enhanced Privacy keys. Each key appears in the table with the following properties: <ul style="list-style-type: none"> ▪ ID: A unique index key within the range of 1 to 255. ▪ Name: A unique 16-character alias of the encryption key ID. ▪ Value: The encryption value that maps the key ID. Range: 1 to FFFFFFFF.

4.9.1.2 Configuring Data Storage

By default, the TRBOnet Watch Console stores traffic from all monitored radio channels in the database.

In order to save storage space, you can set up filtering rules. Using the filter, you can select data that will be added to the database. The filtering rules allow you to define:

- Groups and subscribers whose activity needs to be monitored.
- Groups and subscribers whose activity should be added to the database.
- Whether the All Calls log should be displayed in the console.
- Whether repeater control messages should be stored in the database.

To configure monitoring and data storage in a system:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the **Configuration** pane, then click the system name and the **Data Storage** section.
2. In the right pane, select the required tab and adjust the settings as follows:

Table 9: Call filtering and data storage settings of the MOTOTRBO repeater

Tab name	Instructions
Group Calls/ Private Calls	On each tab, do any of the following: <ul style="list-style-type: none"> ▪ Select No filter to disable filtering. TRBOnet Watch will monitor and store all calls of the given type (group or private) in the system. ▪ Select Filter to enable filtering. Then add filtering rules for the selected type of calls as described in section Creating Rules (page 20).
All Call	Configure monitoring and data storage of All Calls. <ul style="list-style-type: none"> ▪ Show in Console: Select to display All Calls in the console. ▪ Store Voice: Select to store All Calls in the database. If you disable Show in Console , storing voice is not available.
Advanced	Configure storage of repeater call monitoring (RCM) messages. <ul style="list-style-type: none"> ▪ Store Repeater Call Monitoring messages: Select to store the RCM messages in the database. Enable this option to show RCM data for the given system in Live Monitor and in charts and reports.

Creating Rules

Open the **TRBOnet Watch Server** window and click **MOTOTRBO**, the system name, and **Data Storage** for this system in the **Configuration** pane. To add filtering rules for group calls or private calls, click the **Group Calls** or **Private Calls** tab, respectively.

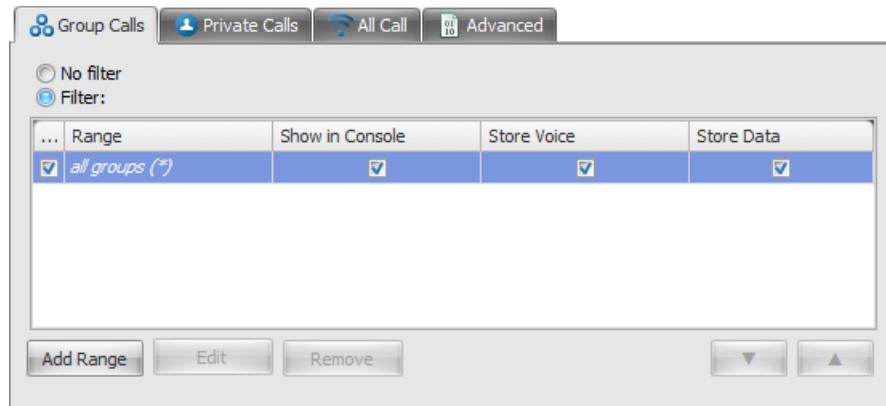


Figure 7: Filtering rules for group calls

Filtering is enabled if the **Filter** option is selected. By default, the selected tab shows the default rule. The title of this rule indicates the range of group numbers (*all groups*) or subscriber numbers (*all subscribers*) covered by this rule.

If necessary, create custom rules for smaller ranges or for individual numbers and set options for each number or range.

To create a new rule:

1. Click **Add Range**. On the **Group Calls** tab, click **Specified Group** or **Group Range** to filter calls made in a particular talk group or a in group range, respectively. On the **Private Calls** tab, click **Specified Subscriber** or **Subscriber Range** to filter calls initiated by a particular subscriber or a subscriber range.
2. In the popup dialog box, specify the group number or the subscriber number, or the first and last number in the range. Click **OK**.

Table 10: Number ranges allowed in MOTOTRBO system types

System	Group range	Subscriber number range
IP Site Connect, Extended Range Direct Mode	1-16,776,415	1-16,777,215
Capacity Plus, LCP	1-254	1-65,535

3. Enable or disable options in the rule. These options apply to a call if the calling number matches the number or range specified in the rule:
 - **Show in Console**: If enabled (selected), the call is displayed in the console.
 - **Store Voice**: If enabled, the voice call is stored as an AMBE+2 file in the database.
 - **Store Data**: If enabled, the data call is stored in the database.

The storage options are available only when the **Show in Console** option is enabled. Allowing voice call storage on a wide range of subscriber numbers will have impact on the database size.

4. Set the priority of the rule by using the arrow keys. The top entry in the list has the higher priority.

At runtime, when a group call or a private call is initiated in the system, the filtering rules for this call type are checked one after another in the order they follow on the respective tab. If the calling number matches a rule, this rule is applied and the rules with the lower priority are not checked. If the calling number matches no rule in the list, the default rule is applied. The default rule always takes the last position in the list and cannot be moved.

Note: If some rules have overlapping ranges, set their priority as described in section [Ordering Rules with Overlapping Ranges](#) (page 22).

To edit the rules, do the following:

- Click **Edit** to modify the rule.
- Click **Remove** to delete the rule.
- Clear the checkbox to disable the rule. The disabled rules are ignored at runtime.

The default rule (*all groups* or *all subscribers*) cannot be removed or disabled.

Ordering Rules with Overlapping Ranges

The order of rules on the tab is important if the rule ranges overlap. For instance, you need to monitor group calls in the IP Site Connect system as follows:

- In the range of 5,000,000 to 10,000,000 you need to store data
- In the range of 8,000,000 to 11,000,000 you need to store voice
- For the remaining numbers, you do not monitor calls

You need to create the following rules:

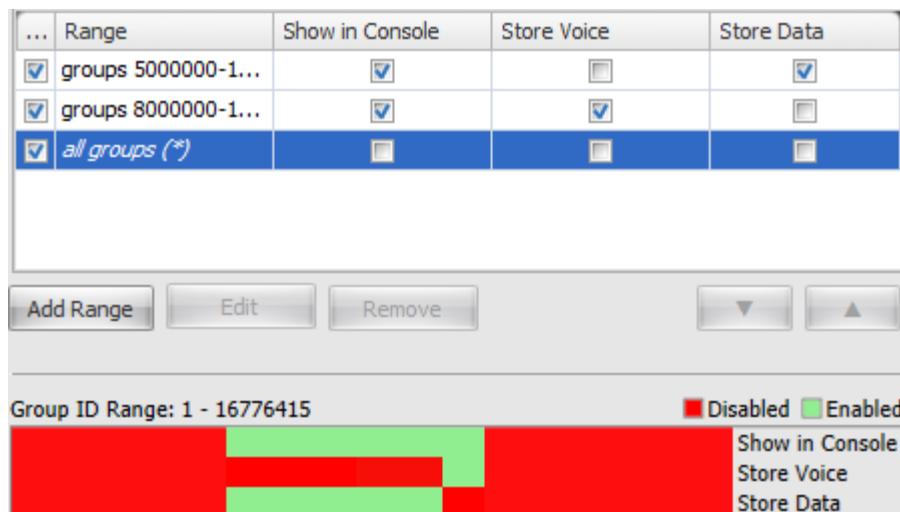


Figure 8: Ordering rules with overlapping ranges

In this example, ranges 5,000,000 - 10,000,000 and 8,000,000 - 11,000,000 overlap. Calls in the range of 8,000,000 - 10,000,000 will be handled as specified in the rule that works first. If you stay with the above rule order, data will be stored in this range. If you move the rule "groups 8000000-11000000" to the top position, voice will be stored.

The color band below the rules visualizes the expected effect of the rule options. Options appear in the color band as three horizontal colored stripes: **Show in**

Console, Store Voice, and Store Data. The length of each stripe stretches from group 1 (left) to the maximum possible number in the system. In case of private calls, the horizontal axis shows subscriber numbers from 1 (left) to the maximum possible number. Rules break the horizontal axis into ranges. Within each range, the color stripes are green or red, depending on the status of the respective rule option – enabled or disabled. If you move the mouse cursor over the colored stripe, the tip shows the range of numbers where the option applies.

4.9.1.3 Adding Peers

Indicate all system peers that you may need to include in reports and charts. Peers added on this tab can be selected as filter settings in the Reports and Analytics tools. Find the details in section [5.3.3.2, Adjusting Filter Settings](#) (page 69).

To add system peers:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the **Configuration** pane, then click the system name and then **Peers**.
2. Use any of these options:
 - Click **Load Peers** in the right pane to automatically find all system peers, including all connected software peers.
 - Click **Add** to add a new peer to the list.
3. If necessary, use the **Add** and **Remove** buttons to edit the list of peers.

4.9.2 Registering MOTOTRBO Connect Plus

A Connect Plus system uses an XRT-9000/9100 controller between TRBOnet Watch and the radio system. The XRT controller connects to one or more XRC controllers, each placed in front of a group of repeaters. A group of repeaters forms a site where an XRC controller works as a master peer.

To monitor a Connect Plus system in TRBOnet Watch, register its XRT controller as described in section [4.9.2.1, Adding an XRT](#) (page 23).

To monitor particular sites in a Connect Plus system, register the required XRC controllers as described in section [4.9.2.2, Adding a Site](#) (page 25). Also, register all sites and peers to get the information about your Connect Plus system in reports and charts.

4.9.2.1 Adding an XRT

To monitor a Connect Plus system, TRBOnet Watch should connect the XRT unit of that system under unique user credentials registered in the XRT configuration. If two different software peers connect to an XRT under the same user account, the XRT monitoring fails.

Warning: Do not monitor a Connect Plus system using two different software applications (TRBOnet Watch or other) at the same time. This may cause a malfunction of the entire radio system.

To add a user account in the XRT configuration:

1. Launch the TRBOnet Connect Plus XRT Configuration Tool software.

2. On the **Settings** menu, click **XRT User Configuration**. The left pane of the application window displays the existing user accounts.
3. To add a new account, click **New** in the right pane and specify the user name and password and other settings. To be able to monitor voice and data calls in the system, select the **Billing Enabled** option.
4. Click **Save**. Your user account appears in the left pane.

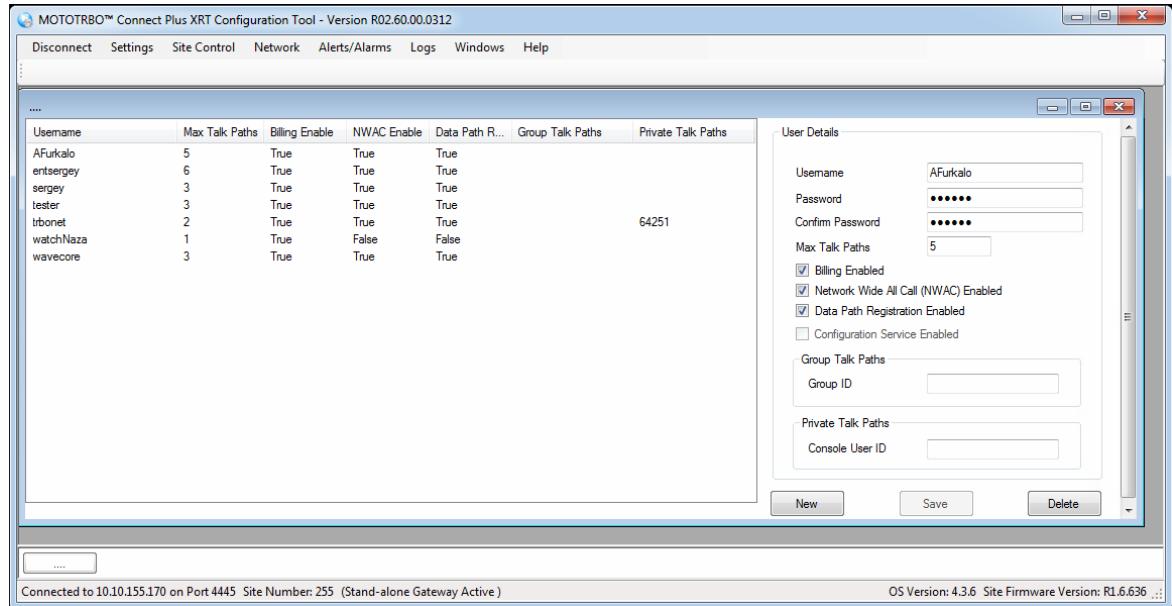


Figure 9: XRT user accounts

To add a Connect Plus system for monitoring, register the XRT of that system in TRBOnet Watch.

To register a MOTOTRBO XRT controller:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the left pane.
2. In the **MOTOTRBO** pane, click **Add** and then **Add XRT-9xxx Controller** on the drop-down menu.
3. In the **Controller** (right) pane, specify the following properties:

Table 11: XRT controller connection settings

Property	Description
System Name	The name of the Connect Plus system to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
Controller IP Address	The IP address of the XRT controller.
Controller TCP Port	The TCP port of the XRT controller. Default: 10001. Note: Click Test to check the specified IP connection.
User Name	The unique user name registered in the XRT configuration.
Password	The XRT user password registered in the XRT configuration.
Record Mode	The preferred monitoring mode. Options:

Property	Description
	<ul style="list-style-type: none"> ▪ Airtime billing from all sites: TRBOnet Watch monitors all system traffic through the XRT connection. Sites and repeaters report their connection statuses to the XRT. <p>Note: In this mode, TRBOnet Watch considers a site disconnected when all of its repeaters are disconnected. When any repeater is connected again, XRT does not inform TRBOnet Watch about the updated connection status of the repeater and of the site. Because of this limitation the Live Monitor tool may display XRC and repeater connection statuses and diagnostics incorrectly.</p> <ul style="list-style-type: none"> ▪ Airtime billing only from added sites: TRBOnet Watch monitors through the XRT connection air traffic of the system sites that are registered in the TRBOnet Watch Server configuration tool. Traffic from other sites is ignored. In this mode, RDAC becomes available for system sites - the Live Monitor tool displays the actual connection statuses and diagnostics for the registered XRC and repeaters. If you choose this mode, register the required sites as described in section 4.9.2.2, Adding a Site (page 25).

4.9.2.2 Adding a Site

For TRBOnet Watch to monitor only particular sites in a Connect Plus system, register the XRC controllers of these sites.

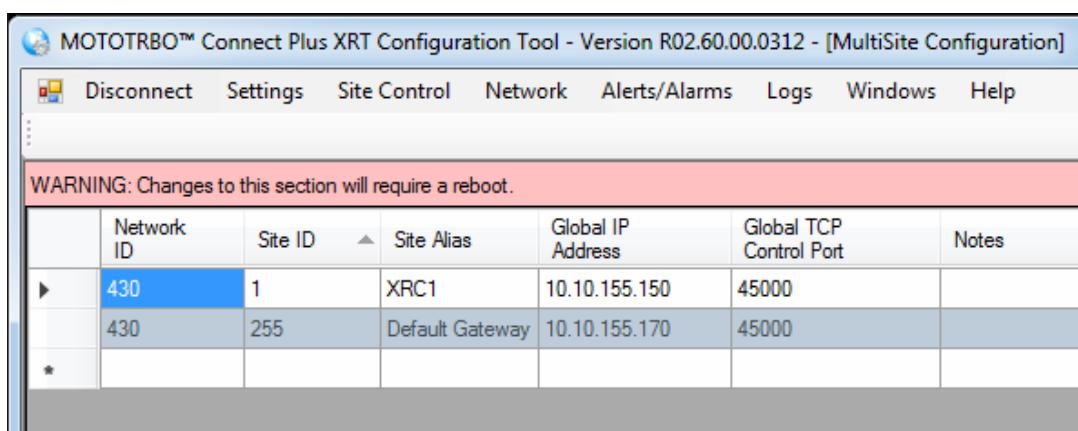


Figure 10: Connect Plus multi-site configuration tool

To learn about all sites created in the Connect Plus system, launch MOTOTRBO Connect Plus XRT Configuration Tool and connect to the required XRT. Click **MultiSite** on the **Settings** menu.

To register a MOTOTRBO XRC controller:

1. In the **Configuration** pane, right-click the name of the Connect Plus system (the XRT controller) under **MOTOTRBO**.
2. Click **Add XRC-9xxx Controller** on the context menu.
3. In the **XRC Controller** pane, specify the following properties:

Table 12: XRC controller connection settings

Property	Description
Name	The name of the site to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
Site ID	The site ID as specified in the XRT configuration (Figure 10).
SNMP ID	Any value within the valid range used to generate the physical index of the repeater. Valid range: 1 to 127. Default: 1 Note: To learn more about SNMP communication with TRBOnet Watch, refer to Appendix B: SNMP Support (page 110).
Monitoring level	The monitoring level of the site. Options: <ul style="list-style-type: none"> ▪ Level 1: Link Establishment: TRBOnet Watch monitors IP connections on the site. ▪ Level 2: Diagnostics: TRBOnet Watch monitors IP and RDAC connections on the site. ▪ Level 3: Call Monitoring: TRBOnet Watch monitors IP and RDAC connections on the site and traffic in the channels. The recognized types of traffic are voice, data, system, and location. Traffic is not parsed.
XRC IP Address	The IP address of the XRC controller as specified in the XTR configuration (Figure 10).
TRBOnet Peer ID	The peer ID of the TRBOnet Watch Server in the system. Range: 1 to 16777215. Default: 100. The value must be unique on the radio network.
XRC RDAC Port	The RDAC UDP Listen Port of the XRC controller (Figure 11, page 27). Default: 38000
TRBOnet Local Port	The IP port on the TRBOnet Watch Server host for connection with a radio network. Default: 50000. Use a unique port for each XRC controller in the system.

4. Click **Test** to check the specified IP connection.
5. In the left pane, click **Peers** under the XRC controller. In the **Peers** pane, add peers belonging to the site. Click **Load Peers** to find all peers on the site automatically. Or, add peers manually using the **Add** button.

Note: If you need to build reports and charts that include information about channels, add all repeaters of each site as peers. Non-registered peers are not available in the filter on tabs **Reports** and **Analytics** and cannot be included in reports and charts.

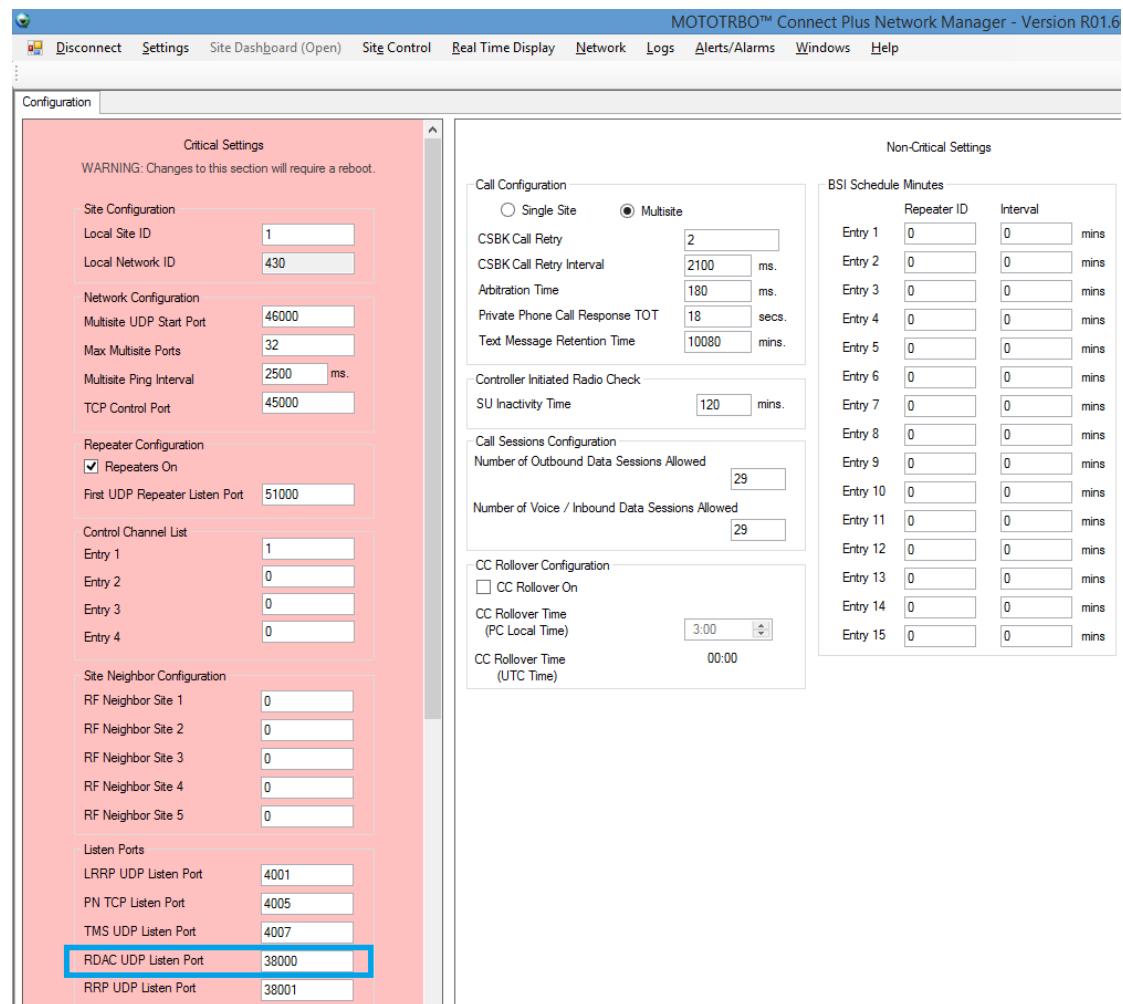


Figure 11: RDAC UDP Listen Port of the XRC controller

4.9.3 Registering MOTOTRBO Capacity Max

To monitor a Capacity Max system, you need to register the system and all RF sites in TRBOnet Watch. Registering other system components such as Trunk Controllers, Data Gateways, and VRC Gateways is optional.

To register a Capacity Max system, you need to open the system configuration in Motorola's Radio Management (RM) software.

To open the Capacity Max configuration:

1. Launch the Radio Management software. Click **Radios**.

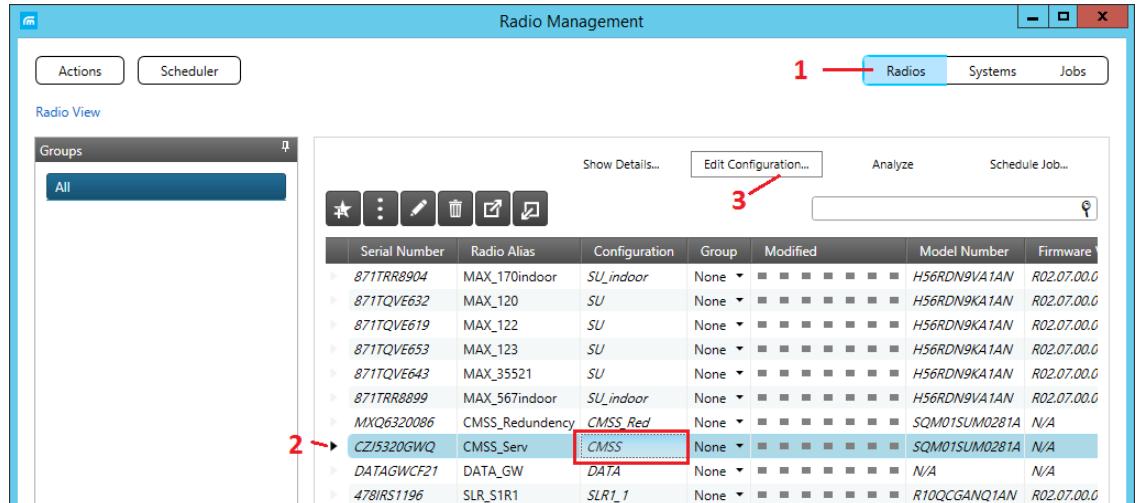


Figure 12: Opening the Capacity Max system configuration

2. In the list, click the arrow in front of the entry with the CMSS configuration.
3. Click the **Edit Configuration** button.

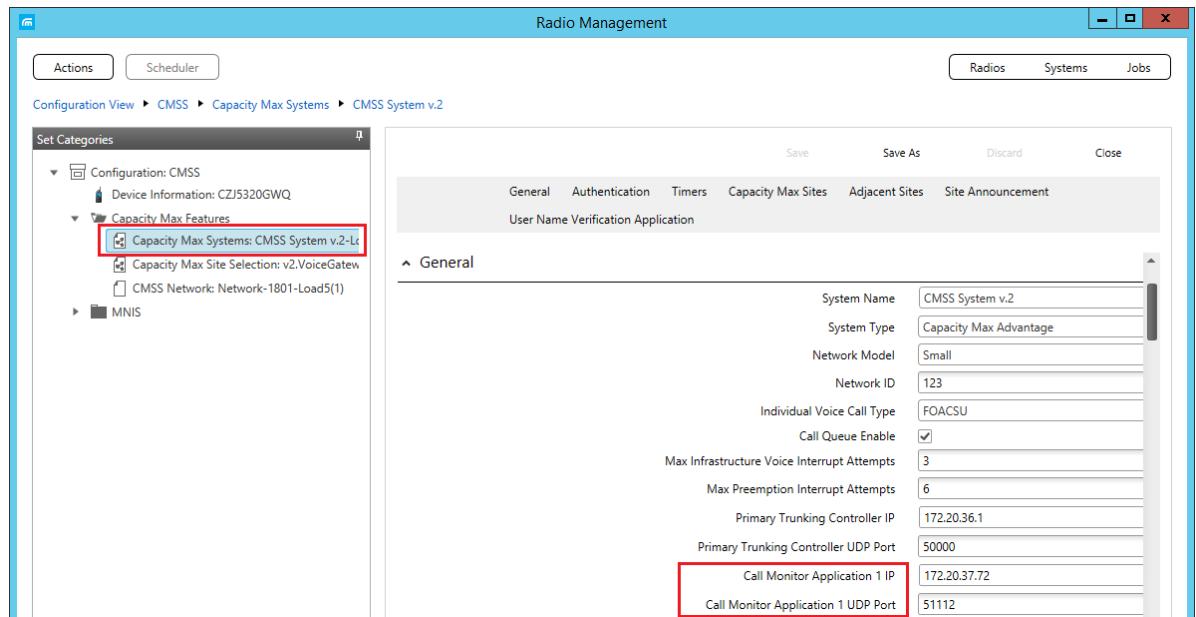


Figure 13: Opening the general settings of the Capacity Max system

4. In the left pane, expand **Capacity Max Features** and click **Capacity Max Systems**.

For your TRBOnet Watch to receive traffic from the Capacity Max system, the **Call Monitor Application 1 IP** setting must specify the IP address of the TRBOnet Watch Server.

To register a Capacity Max system in TRBOnet Watch:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the left pane.
2. In the **MOTOTRBO** pane, click **Add** and click **Add Capacity Max** on the drop-down menu. In the right pane, specify the following connection properties:

Table 13: Capacity Max IP connection settings

Property	Description
System Name	The name of the Capacity Max system to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
Listening IP address	The IP address of the TRBOnet Watch Server. This setting must match the Call Monitor Application 1 IP setting in the Radio Management tool.
Listening UDP Port	The UDP port of the TRBOnet Watch Server host for listening to the Capacity Max system. This setting must match the Call Monitor Application 1 UDP Port setting in the Radio Management tool.

3. Add all RF sites as described in section [4.9.3.1, Adding an RF Site](#) (page 29).
 4. If required, register the Trunking Controller, Data Gateway, and VRC Gateway components.

4.9.3.1 Adding an RF Site

To register all RF sites in your Capacity Max system, open the system configuration on any repeater registered in that system.

To open the Capacity Max configuration on a repeater:

1. Launch the Radio Management software. Click **Radios** (Figure 14, step 1).
 2. In the right panel, click the arrow in front of an entry with the repeater configuration (Figure 14, step 2). Make sure that the whole line is selected.
 3. Click the **Edit Configuration** button (Figure 14, step 3).

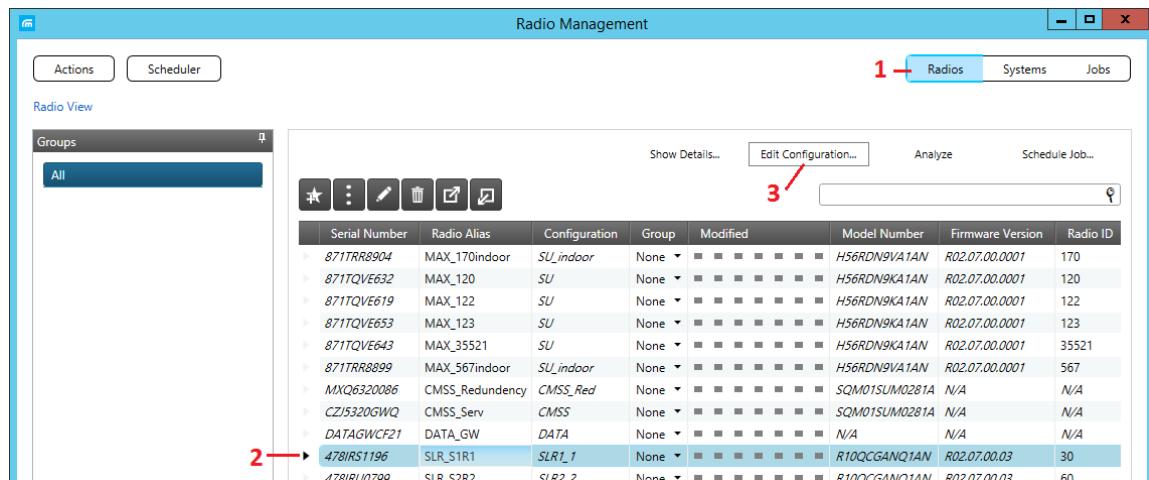


Figure 14: Opening the Capacity Max configuration on a repeater

4. In the left pane, expand **Capacity Max Features** and click **Capacity Max Systems** (Figure 15, step 1).
 5. In the right pane, click **Capacity Max Sites** (Figure 15, step 2).

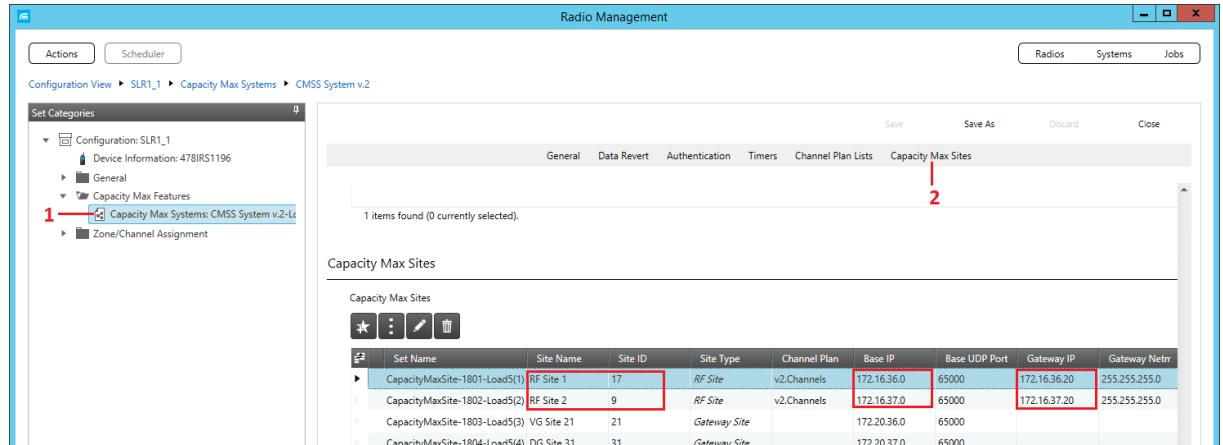


Figure 15: Opening the system sites

Register all RF sites that are displayed in the **Capacity Max Sites** list.

To register an RF Site in TRBOnet Watch:

1. In the **TRBOnet Watch Server** window, right-click your Capacity Max system in the left pane.
2. Click **Add RF Site** on the context menu.
3. In the right pane, specify the following connection properties:

Table 14: RF site connection settings

Property	Description
Name	A user-friendly name of the RF site to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
Site ID	The site ID. This setting must match the Site ID value in the Radio Management tool (Figure 15).
Base IP	The base IP address of the RF site. This setting must match the Base IP value in the Radio Management tool (Figure 15).
Router IP	The IP address for the site router. This setting must match the Gateway IP value in the Radio Management tool (Figure 15).

4. In the left pane, click **Peers** under your RF site.
5. In the right pane, use the **Add** button to add one by one all repeaters belonging to the RF site. To edit the properties of the peer, click the respective field and type the required value.

4.9.3.2 Adding a Trunking Controller

To register a Trunking Controller:

1. Open the Capacity Max system configuration as described in section [4.9.3, Registering MOTOTRBO Capacity Max](#) (page 27).

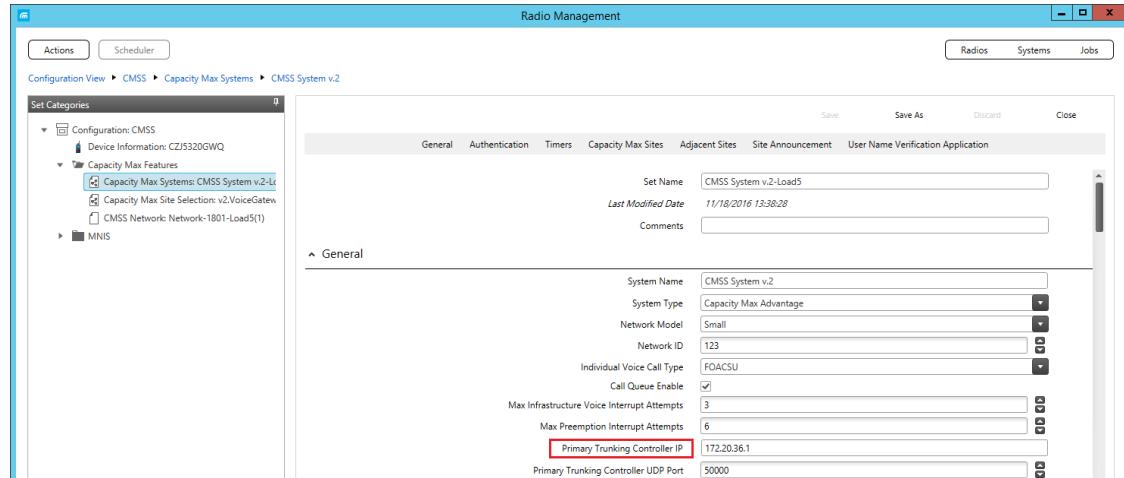


Figure 16: The IP address of the Trunking Controller

2. In the left pane of the **TRBOnet Watch Server** window, right-click the name of your Capacity Max system. Click **Add Trunking Controller** on the context menu.
3. In the right pane, specify the following properties:

Table 15: Trunking Controller connection settings

Property	Description
Name	The name of the Trunking Controller to be displayed in the TRBOnet Watch Console.
IP	The IP address of the Trunking Controller as specified in the Capacity Max system configuration (Figure 16).

4.9.3.3 Adding a VRC Gateway

To register a VRC Gateway:

1. Open the Capacity Max system configuration as described in section [4.9.3, Registering MOTOTRBO Capacity Max](#) (page 27).
2. In the left panel, click **CMSS Network** under **Capacity Max Features** (Figure 17).

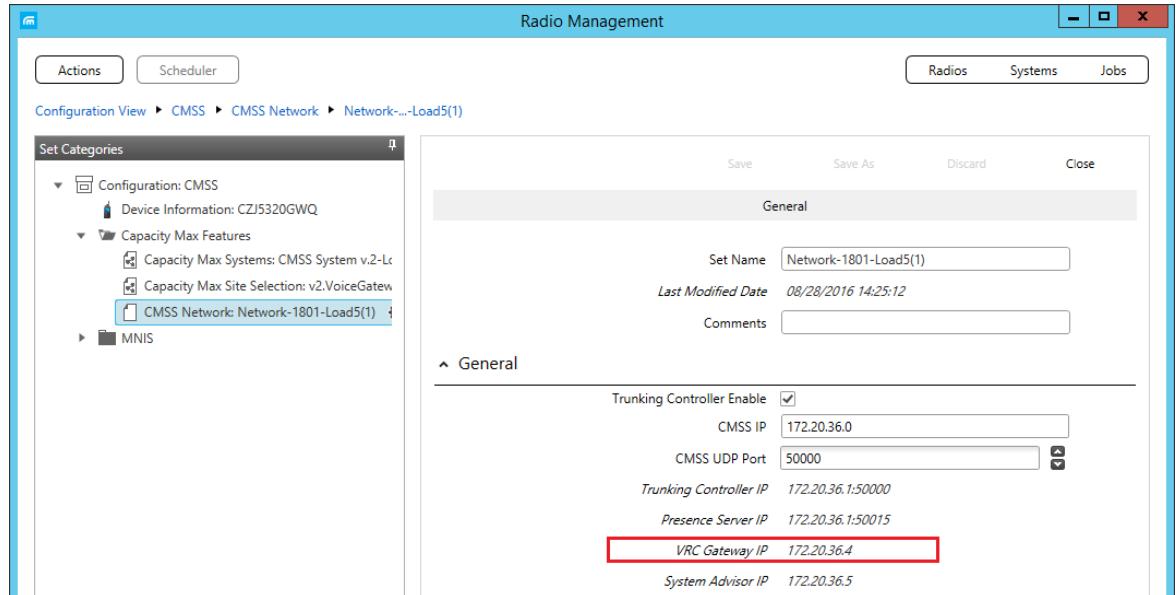


Figure 17: The IP address of the VRC Controller

3. In the left panel of the **TRBOnet Watch Server** window, right-click the name of your Capacity Max system.
4. Click **Add VRC Gateway** on the context menu.
5. In the right panel, specify the VRC Gateway connection properties.

Table 16: VRC Gateway connection properties

Property	Description
Name	A user-friendly name of the VRC Gateway to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
Site ID	The site ID on which the VRC Gateway is deployed. Enter the site ID specified in the Capacity Max system configuration. Note: Open the Capacity Max configuration on any system repeater as described in section 4.9.3.1, Adding an RF Site (page 29).
IP	The IP address of the VRC Controller as specified in the Capacity Max system configuration (Figure 17).

4.9.3.4 Adding a Data Gateway

To register a Data Gateway:

1. In the left pane of the **TRBOnet Watch Server** window, right-click the name of your Capacity Max system.
2. Click **Add Data Gateway** on the context menu.
3. In the right pane, specify the Data Gateway connection properties.

Table 17: Data Gateway connection properties

Property	Description
Name	A user-friendly name of the Data Gateway to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.

Property	Description
Site ID	The site ID on which the Data Gateway is deployed. Enter the site ID specified in the Capacity Max system configuration. Note: Open the Capacity Max configuration on any system repeater as described in section 4.9.3.1, Adding an RF Site (page 29).
IP	The IP address of the host on which the MNIS Data Gateway is installed.

4.9.4 Registering Radio-over-IP Gateways

TRBOnet Watch can monitor traffic of a hardware RoIP gateway that connects a MOTOTRBO two-way radio to the system IP network. To monitor a RoIP gateway, register the respective hardware unit - TRBOnet Swift Agent A001/A002 or Friendly FS-1000. Monitoring of TRBOnet Swift A200 hardware gateways is not supported.

4.9.4.1 Registering a TRBOnet Swift Agent

To register a TRBOnet Swift Agent:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the left pane.
2. In the right pane, click **Add** and then **Add TRBOnet Swift Agent** on the drop-down menu.
3. In the right pane, specify the following properties:

Table 18: TRBOnet Swift Agent settings

Property	Description
System Name	The name of the RoIP gateway. Valid characters: spaces, alphanumeric and special characters.
IP Address	The IP address of the TRBOnet Swift Agent. The expanded list shows all TRBOnet Swift Agent units available on the network. Default: 192.168.0.100.
Port	The IP port of the TRBOnet Swift Agent. Default: 8002.
Ignore voice data	Select to ignore voice traffic from the TRBOnet Swift Agent. If this option is enabled, the TRBOnet Watch Console does not receive voice calls from this RoIP gateway.
VoIP port	The local port of the TRBOnet Swift Agent for voice-over-IP communication. Default: 4000.
Input Pins	Select this option to get telemetry from GPIO pins on the TRBOnet Swift Agent.
PIN <0-4>	Select the physical GPIO pins from which you need to get telemetry. Depending on its modification and operational mode, TRBOnet Swift Agent uses either the CTRL1 (DB26) connector or the CTRL2 (DB9) connector. Logical pins displayed in TRBOnet Watch map the physical CTRL1/CTRL2 connector pins as follows: <ul style="list-style-type: none"> ▪ PIN 0: Pin 22 (CTRL1) ▪ PIN 1: Pin 5 (CTRL1) ▪ PIN 2: Pin 20 (CTRL1) or pin 2 (CTRL2) ▪ PIN 3: Pin 4 (CTRL1) or pin 3 (CTRL2)

Property	Description
	<ul style="list-style-type: none"> ▪ PIN 4: Pin 3 (CTRL1) or pin 8 (CTRL2) <p>Note: To learn more about the TRBOnet Swift Agent connector pin-outs, refer to the <i>TRBOnet Swift Agent A001/A002 User Manual</i>.</p>
Pin name	The pin name to be displayed in the TRBOnet Watch Console. Editable. Default: PIN0 to PIN4.
Pin value	<p>The active level of the input pin. Values: Low level, High level. Select Low level for all pins by default.</p> <p>Note: The active level on pins 4 (CTRL1) and 22 (CTRL1) can be configured. Contact your administrator to verify the actual active levels for these pins.</p>

- Click **Test** to check the IP connection to the TRBOnet Swift Agent.

4.9.4.2 Registering a Friendly FS-1000

To register a Friendly FS-1000:

- In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the left pane.
- In the **MOTOTRBO** pane, click **Add** and point **Add Friendly FS-1000** on the drop-down menu.
- In the **Friendly FS-1000** pane, specify the following properties:

Table 19: Friendly FS-1000 settings

Property	Description
Name	The name of the RoIP gateway to be displayed in the TRBOnet Watch Console. Valid characters: spaces, alphanumeric and special characters.
IP Address	The IP address of the Friendly FS-1000. Expand the list to see all Friendly FS-1000 units available on the network. Default: 192.168.0.100
Port	The network port of the Friendly FS-1000 for communication with the TRBOnet Watch Server. Default: 8002

- Click **Test** to check the connection with the Friendly FS-1000.

4.10 Managing Registered Systems

The **TRBOnet Watch Server** window displays all registered systems in the **Configuration** pane, under the **MOTOTRBO** section.

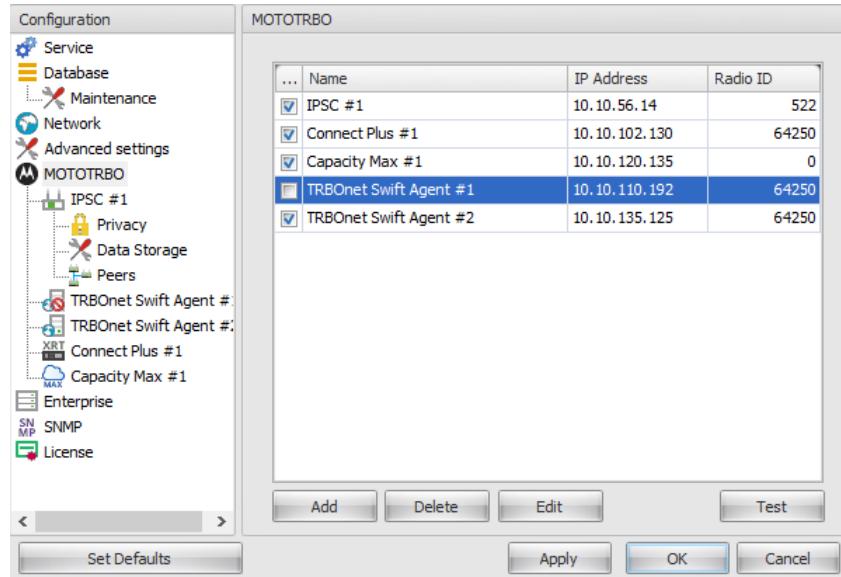


Figure 18: Viewing registered systems in the MOTOTRBO pane

If you click **MOTOTRBO** in the **Configuration** pane, the right pane will display all registered systems of the selected vendor. The system fields include the following information:

- **Name:** The name that you give to the system when registering it.
- **IP Address:** The IP address of the system.
- **Radio ID:** Depending on the system type, the peer ID of the TRBOnet Watch Console or the subscriber ID behind the registered controller.

To exclude a system from monitoring, clear the checkbox in front of the system name (Figure 18), or right-click the system in the **Configuration** pane and click **Disable** on the context menu.

Note: The license limits the number of systems that TRBOnet Watch can monitor simultaneously. To learn how many systems you can enable, check the number of repeaters specified in your license. If you enable more systems and exceed the limit, TRBOnet Watch will monitor the allowed number of systems only, counting them from top to bottom in the **Configuration** pane. The remaining enabled systems are ignored.

To view and edit the configuration settings of any system, double-click it in the list, or select the list item and click **Edit**, or select the system under **MOTOTRBO** in the **Configuration** pane.

Using the Context Menu

You can manage the list of systems using the context menu. Right-click any system in the **Configuration** pane to access the menu.

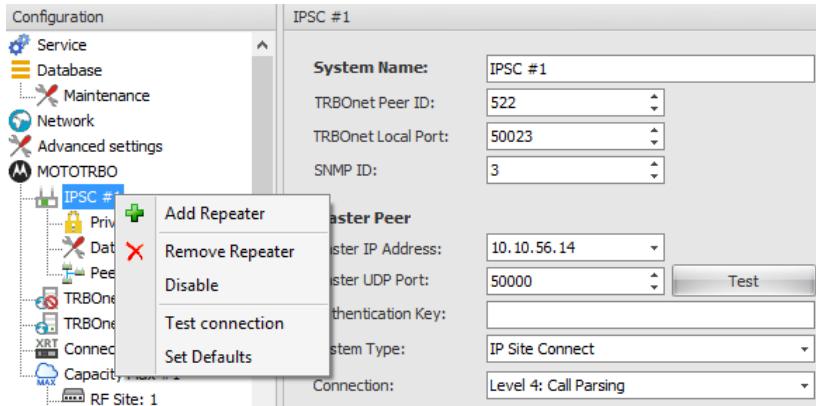


Figure 19: Using the context menu in the Configuration pane

Use the context menu commands as follows:

- **Add:** Click to add a new system of the same type or a system component in the **Configuration** pane.
- **Remove:** Click to remove the selected system or the system component from the **Configuration** pane.
- **Enable/Disable:** Click to enable or disable monitoring of the selected system.
- **Test connection:** Click to test the IP connection between the system and the TRBOnet Watch Server.
- **Set Defaults:** Click to set some settings of the selected system to their default values.

4.11 Registering TRBOnet Enterprise

If you are going to monitor Linked Capacity Plus or Capacity MAX radio systems that are using the NAI protocol to transfer data (Location, ARS, TMS), you'll have to connect to the appropriate TRBOnet Enterprise.

Note: Before connecting to TRBOnet Enterprise, make sure that the required radio systems are properly registered in. Also note that the TRBOnet Enterprise must be version 5.2 or later.

- In the **Configuration** pane, right-click **Enterprise**.
Or, in the **Enterprise** pane, click **Add**.
- In the drop-down menu, click **Add Enterprise**.

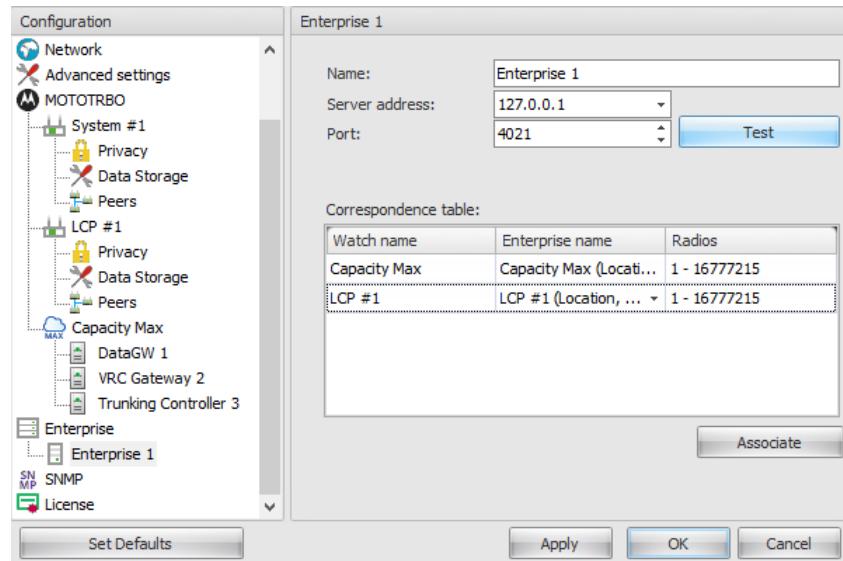


Figure 20: Adding TRBOnet Enterprise

- In the 'Enterprise' pane, specify the following parameters:
 - Name**
Enter a name for the TRBOnet Enterprise you are connecting to.
 - Server address**
Enter the IP address of the PC with TRBOnet Enterprise Server installed and running.
 - Port**
Enter the port number to be used by TRBOnet Watch to connect to TRBOnet Enterprise.
 - Test**
Click this button to see information about the connected TRBOnet Enterprise and available Location services.

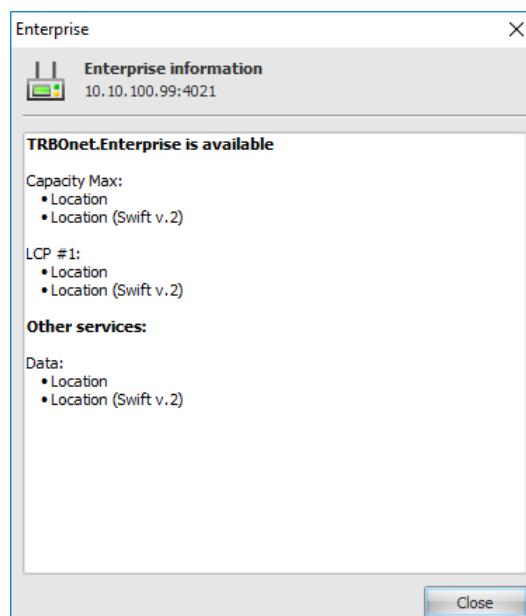


Figure 21: Testing TRBOnet Enterprise

In the **Correspondence table**, you see the following information:

- **Watch name**
The name of the radio system in TRBOnet Watch.
- **Enterprise name**
The name of the radio system in TRBOnet Enterprise. Click the arrow on the right, and from the drop-down list select the name of the appropriate radio system in TRBOnet Enterprise.
- **Radios**
The range of Radio IDs available in the radio system.

Click the **Associate** button to automatically match the radio systems in TRBOnet Watch and TRBOnet Enterprise.

4.12 Configuring SNMP Communication

The TRBOnet Watch Server includes the SNMP Agent module that sends notifications and allows for polling tables with information about system topology, current alarm status, and alarm history. For more information, refer to [Appendix B: SNMP Support](#) (section [B.2 MIB Objects](#), page 110).

You can optionally configure the TRBOnet Watch Server to send notifications to a remote NMS using the SNMPv2 or SNMPv3 protocol. The SNMP Agent module supports all security levels for SNMPv3: no authentication and no privacy, authentication no privacy, and authentication and privacy.

To configure a remote NMS for communication with the TRBOnet Watch SNMP Agent, you need to load the MIB files to a remote NMS and configure it. The MIB files are located at the following URL:

http://s3.trbonet.com/download/watch/snmp_tools/NeocomMIBs.zip

Note: To learn more about configuring an NMS, refer to [Appendix B: SNMP Support](#) (page 110).

Next, you need to configure the SNMP Agent for sending notifications to the NMS as further described in this topic.

To configure the SNMP Agent for communication with an NMS:

1. In the **TRBOnet Watch Server** window, click **SNMP** in the **Configuration** pane. The **SNMP** pane loads the default SNMP communication settings.
2. Update the following settings where necessary:

Table 20: SNMP configuration settings

Setting	Description
System Parameters section:	
sysDescr	Specify the information describing your solution working with TRBOnet Watch. Default: The full name and version of TRBOnet Watch.
sysObjectID	TRBOnet Watch OID. Read-only.

Setting	Description
	Value: 1.3.6.1.4.1.40730.1.1.
sysContact	Specify the contact information of the person or organization responsible for solving SNMP Agent issues.
sysName	The full name of the SNMP Agent.
sysLocation	The descriptive physical location of the SNMP Agent. Default: "Default location".
Engine ID	<p>The identifier of the SMNP Agent. Specify the value that contains 10 to 64 hex characters, or stay with the default value. Default: 80000AD0431AF108.</p> <p>Note: If SNMPv3 is enabled, the Engine ID value must match the appropriate setting in NMS.</p>
SNMP Agent section:	
Enable the SNMP Agent and configure the NMS connection.	
Enabled	Select to run the SNMP Agent.
SNMPv3 Only	<p>Select to force the use of the SNMPv3 protocol for encrypted communication between the remote NMS and TRBOnet Watch. The SNMP Agent will ignore all unauthorized requests, including notification requests.</p> <p>Note: If you select this option, fill out the fields in the SNMPv3 User section and the Engine ID field.</p>
Notification section:	
Configure the SNMP Agent to notify the recipient about unauthorized connection attempts.	
SNMP	Select to enable the SNMP Agent to send notifications.
Authentication	<p>Select to enable the SNMP Agent to send notifications in case of unsuccessful authentication on the agent.</p> <p>Note: This option requires the SNMPv3 Only option selected.</p>
To	<p>The IPv4 address to which the SNMP Agent sends notifications. The UDP port is 162.</p> <p>Note: Click Test to send a test notification to the recipient.</p>
Version	<p>The SNMP protocol version for sending notifications. Values: SNMPv2, SNMPv3.</p> <p>Note: If you select SNMPv3, fill out the fields in the SNMPv3 User section.</p>
SNMPv3 User section:	
If SNMPv3 is enabled, specify the SNMP Agent user credentials.	
User	Specify the user of the SNMP Agent with the required security level (noAuthNoPriv, authNoPriv, or authPriv).

Setting	Description
Auth Password	Specify the authentication password if required by the user's security level.
Privacy Password	Specify the privacy password if required by the user's security level.
Auth Protocol	If the authentication password is used, specify the authentication protocol. Values: None, MD5, Sha.
Privacy Protocol	If the privacy password is used, specify the privacy protocol. Values: None, DES, TripleDES, AES128, AES192, AES256.

5 TRBOnet Watch Console

This section describes how to configure, manage, and use the TRBOnet Watch Console for monitoring and diagnostics of different system types. This section also includes instructions for building analytics and reports.

5.1 Configuration

This section describes how to set up the TRBOnet Watch Console.

5.1.1 Connecting to TRBOnet Watch Server

When you launch the TRBOnet Watch Console for the first time, the dialog box appears.

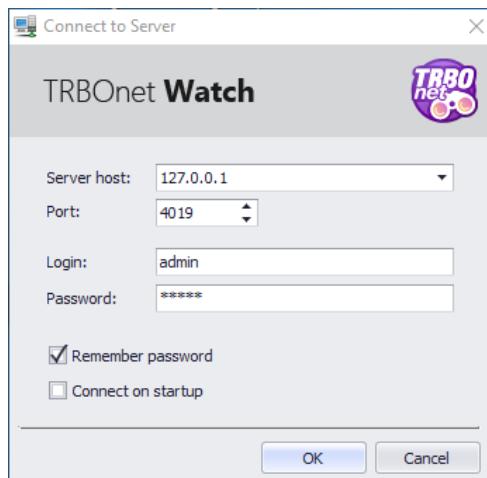


Figure 22: The Connect to Server dialog box

- In the Connect to Server dialog box, specify the following settings:
 - **Server host**
The IP address of the TRBOnet Watch Server. Select this address from the drop-down list or type it manually.
 - **Port**
Enter the local port of the TRBOnet Watch Server PC to accept connections from the TRBOnet Watch Console.

Note: This is the **Command Port** parameter of TRBOnet Watch Server configured in section [4.4. Configuring the IP Network Settings](#) (page 12).
 - **Login**
Enter the Login registered in the TRBOnet Watch Console Users list.
 - **Password**
Enter the User Password.

Note: The default Administrator credentials are **admin** for the login and **admin** for the password.
 - **Connect on startup**
Select this option to launch the Watch Console without typing Login and

Password every time. Use this option if you regularly connect to the same TRBOnet Watch Server and your workstation is in a secure location.

- Click **OK**.

To reconnect to a different TRBOnet Watch Server:

- On the **File** menu, click **Connect to Server**.

5.1.2 Changing the Language

You can set up the TRBOnet Watch Console to display all labels and messages in one of the supported languages.

To select a different language for the console:

- On the **Tools** menu, click **Language**.
- Click the preferred language on the drop-down menu.
- Click **OK**.

The changes will take effect when you close and launch the console again.

5.1.3 Configuring Playback Settings

The audio settings for playback can be viewed and modified.

To specify the playback preferences:

- On the **Tools** menu, click **Audio Settings**.
- In the **Playback Settings** dialog box, specify the following settings:
 - **Device**: Select the playback device available on your desktop.
 - **Network interface**: Select the network to which your TRBOnet Watch Server is connected.
- Click **OK**.

5.1.4 Setting the Audio Output File Name Format

By default, all monitored voice calls are stored in the TRBOnet Watch database. The name format of the stored files is a preconfigured format string. To view and edit this string, click **Audio file name format** on the **Tools** menu.

The **Audio Output File Name Format** dialog box displays the current format string, for example:

'%SENDER%' %CALLTYPE% '%RECIPIENT%' (%TIME%)

The format string can include the following variables:

- **CALLTYPE**: The call type (Private Call, Group Call, All Calls).
- **SENDER**: The radio ID of the sender.
- **RECIPIENT**: The radio ID of the recipient.
- **TIME**: The time when the call started. Format: mm-ss-ms

Each variable is embraced in the % (percent sign) delimiters that do not appear in the resulting file name. The format string can include spaces and special characters that improve the structure of the file name. For example, the resulting file name for the above format string may look as follows:

'126' Group Call '1' (13-50-30).<extension>

If you need to modify the format string, note the following:

- When removing a variable from the format string, select and delete the entire %<VARIABLE>% substring.
- If you clear the format string and save an empty string, the audio file is not created.
- The number of added characters appears in the upper right corner of the dialog box.

5.2 Live Monitor

Live Monitor serves for real-time monitoring and diagnostics of MOTOTRBO systems and Radio-over-IP gateways. To use Live Monitor, launch the TRBOnet Watch Console and click **Live Monitor** in the left pane.

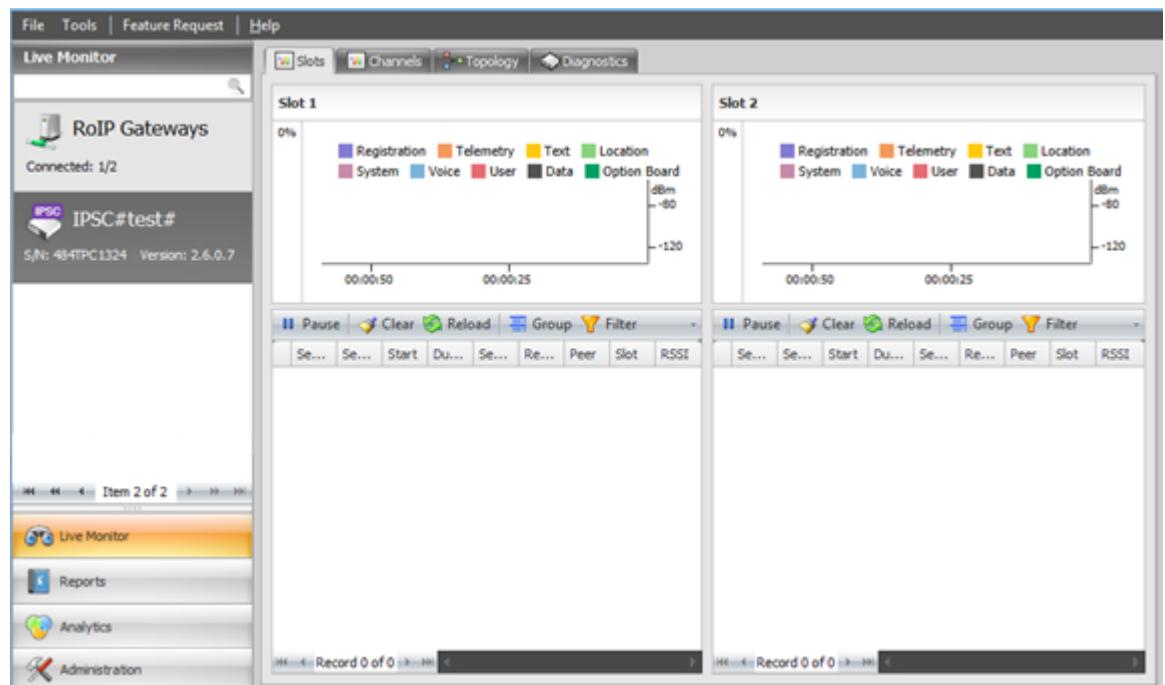


Figure 23: Live Monitor

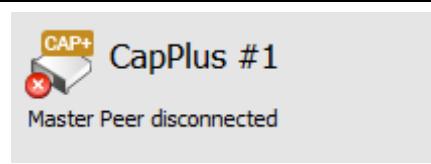
The left pane displays all monitored radio systems as tabs. Each tab represents a particular MOTOTRBO system or a system site. All RoIP gateways appear in the left pane as a single tab.



Figure 24: RoIP gateways

RoIP gateways (all available)

Connected: 1/2: Two gateways are selected for monitoring and one of them is connected to the IP network.



Capacity Plus system

The system name is displayed next to the icon.

Displayed below is the serial number and firmware version of the master repeater.

Figure 25: A Capacity Plus system



Master Peer disconnected

Figure 26: An LCP system



S/N: 484TPC1324 Version: 2.6.0.7

Figure 27: An IP Site Connect system



Master Peer disconnected

Figure 28: An Extended Range Direct Mode system



Version: 0.0.0.0

Connected: 3/3

Figure 29: A Connect Plus system



Version: 0.0.0.0

Connected: 1/1

System: XRT Controller #1

Figure 30: A site in a Connect Plus system



Connected: 3/3

Figure 31: A Capacity Max system



Connected: 3/3

System: Capacity Max #1

Figure 32: An RF site in a Capacity Max system

Linked Capacity Plus system

The system name is displayed next to the icon.

Displayed below is the serial number and firmware version of the master repeater.

IP Site Connect system

The system name is displayed next to the icon.

Displayed below is the serial number and firmware version of the master repeater.

Extended Range Direct Mode system

The system name is displayed next to the icon.

Displayed below is the serial number and firmware version of the master repeater.

Connect Plus system

The system name is displayed next to the icon.

Version: Always 0.0.0.0.

Connected: 3/3: Three connected sites of three available in the system.

Connect Plus site

The site name is displayed next to the icon.

Version: Always 0.0.0.0.

Connected: 1/1: One connected repeater of one available on the site.

System: System name.

Capacity Max system

The system name is displayed next to the icon.

Connected: 3/3: Three connected RF sites of three available in the system.

RF site (Capacity Max)

The RF site name is displayed next to the icon.

Connected: 3/3: Three connected repeaters of three available on the RF site.

System: System name.

Click a system or a site in the left pane. The right pane displays the real-time traffic monitors and views available for this system type.

To find a system quickly, start typing the system name in the **Search** box. The filtered pane displays all systems and sites that include the specified string pattern.

Also, you can open a system in a separate window. In the left pane, right-click the system tab and click **Open in New Window** on the context menu.

5.2.1 Monitoring MOTOTRBO Systems

This section describes how to use Live Monitor for monitoring and diagnostics of a MOTOTRBO system or a system site.

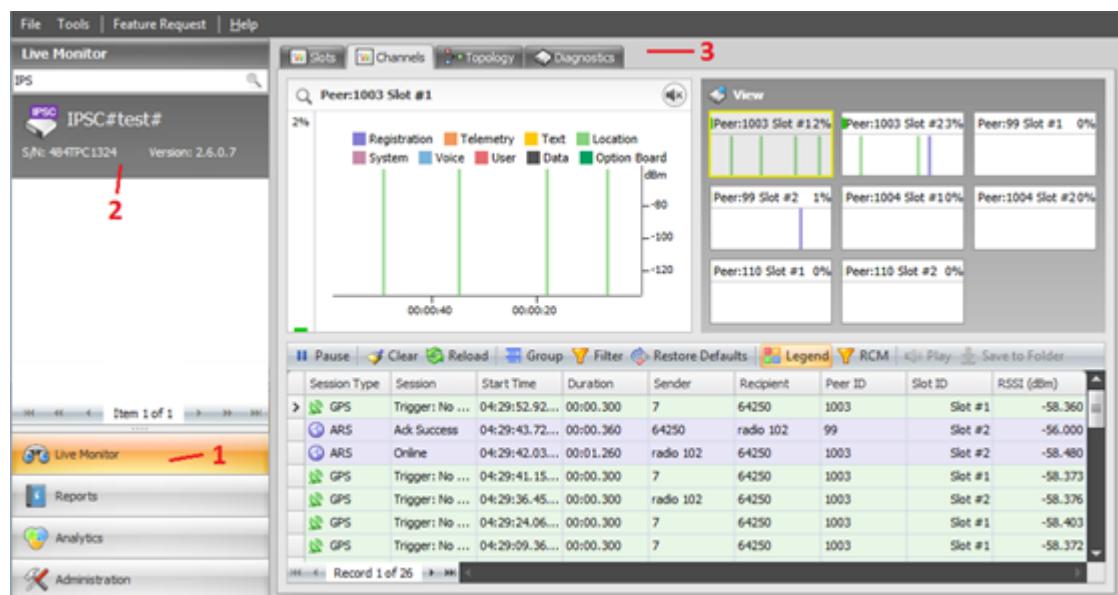


Figure 33: Monitoring MOTOTRBO systems

To monitor activity in a MOTOTRBO system:

- In the left pane of the TRBOnet Watch Console, click **Live Monitor** and then click the tab with the system name.
- In the right pane, click the respective tab:
 - **Slots** (IP Site Connect systems only): Open this tab to monitor traffic in the slots of an IP Site Connect system. For details, refer to section [5.2.1.1, Viewing IPSC System Slots](#) (page 46).
 - **Channels** (all systems, except ERDM): Open this tab to monitor traffic in all system channels in real time. For details, refer to section [5.2.1.2, Viewing System Channels](#) (page 47).
 - **Topology**: Open this tab to see all peers in all systems or in the system selected in the left pane. For details, refer to section [5.2.3, Viewing System Topology](#) (page 57).
 - **Diagnostics**: Open this tab to inspect the configuration settings and connection and alarm statuses of all system peers. Also, use this tab to manage repeaters remotely. For details, refer to sections [5.2.1.3, Viewing Diagnostics](#) (page 49) and [5.2.1.4, Controlling Repeaters Remotely](#) (page 52).

5.2.1.1 Viewing IPSC System Slots

The **Slots** tab is available for MOTOTRBO IP Site Connect systems only. Use this tab to monitor traffic in two time slots in the system.

The **Slot 1** and **Slot 2** panes include each a real-time traffic monitor and a list of calls transmitted in the given time slot. You can drag the bars between the panes to adjust their width and height.

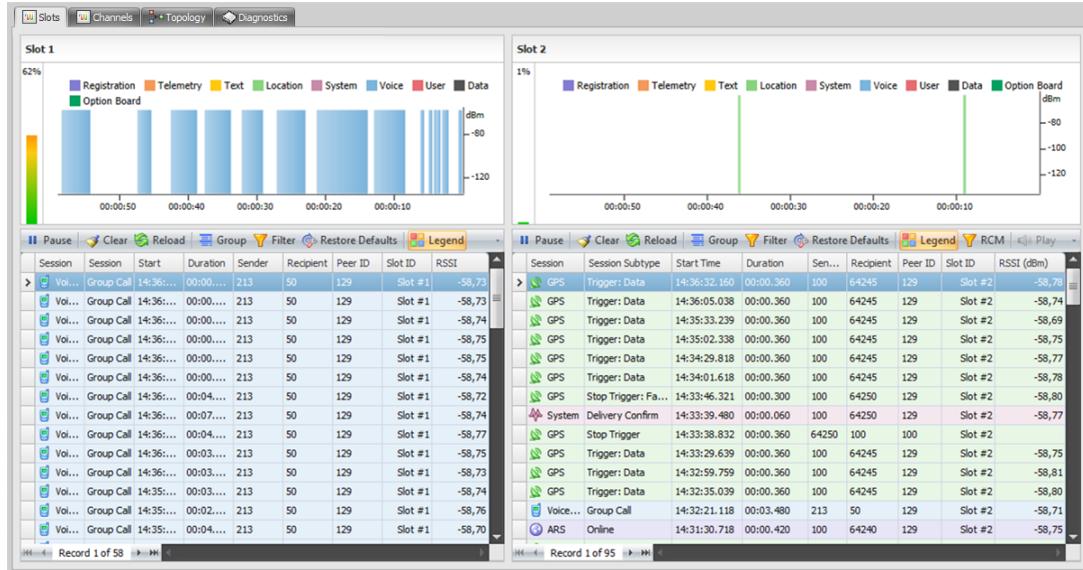


Figure 34: Slots tab

The real-time traffic monitor displays activity in the slot in real time. The received calls are displayed as vertical colored bars moving across the monitor.

- The height of the bar indicates the RSSI level (in dBm) of the received signal relative to the Y-axis.
- The width of the bar corresponds to the duration of the signal (in milliseconds) relative to the X-axis.
- The color of the bar indicates the type of the transmitted data. The legend above the bars shows the meaning of each color: Registration (ARS), Telemetry, Text, Location (GPS), System, Voice, User (user-defined data format), Data (all non-voice calls in LCP systems), Option Board.

Note: In IP Site Connect systems, all call types that cannot be recognized appear as System. In LCP systems, only voice calls can be recognized. If the call is not Voice, it is considered to be Data.

The time during which the colored bar is displayed in the monitor varies between 10 and 300 seconds. To adjust the display time, scroll the mouse wheel in the selected monitor.

The color-graded bar and the percentage value in each monitor serve to indicate the workload of the slot.

The list below the monitor shows all traffic in the slot in real-time. It contains the detailed information about each transmission, including its type (**Session Type** field) and subtype (**Session Subtype** field), the time and duration of the transmission, the

radio IDs of the call sender and recipient, the peer and slot that transmitted the call, and the signal strength measured by the repeater.

The list toolbar includes the following buttons:

Table 21: Slots tab - toolbar buttons

Button	Description
Pause/Run	Hold or continue real-time monitoring of the received traffic. If you click Pause , the monitor and the list will stop updating the content.
Clear	Click the Clear button to purge the list.
Reload	Click the Reload button to undo the Clear command.
Group	Toggle the Group button to enter the grouping mode. To group the list entries by any column, drag the column header to the grouping area above the list header.
Filter	Toggle the Filter button to enter the filtering mode. To filter the list, do any of the following: <ul style="list-style-type: none"> ▪ Click the filter icon on the column header and select the value from the drop-down list. ▪ Enter the value in the filter area right above the column header. All entries not including the specified value in the column will be hidden.
Restore Defaults	Click the Restore Defaults button to undo grouping and filtering.
Legend	Toggle the Legend button to show/hide the legend in the monitor pane.
RCM	Toggle the RCM button to hide/display RCM messages in the list among other entries. For the description of RCM messages, refer to Appendix C: RCM Messages (page 116).
Play	Click this button to play back the selected call in the voice player. Note: This button is grayed out for non-voice calls. It becomes available if you select a voice call in the list.
Save to Folder	Click the Save to Folder button to save the selected voice call to the specified folder as the WAV file. The format of the file name is configured as described in section 5.1.4, Setting the Audio Output File Name Format (page 42). Note: This button is grayed out for non-voice calls. It becomes available if you select a voice call in the list.

When you close the TRBOnet Watch Console, the list of calls is cleared. If you launch the console again, the list starts collecting data for the current work session. To display the data collected during the earlier work sessions, use reports as described in section [5.3, Reports and Analytics](#) (page 62).

5.2.1.2 Viewing System Channels

The **Channels** tab allows you to monitor traffic in all channels of a MOTOTRBO system.

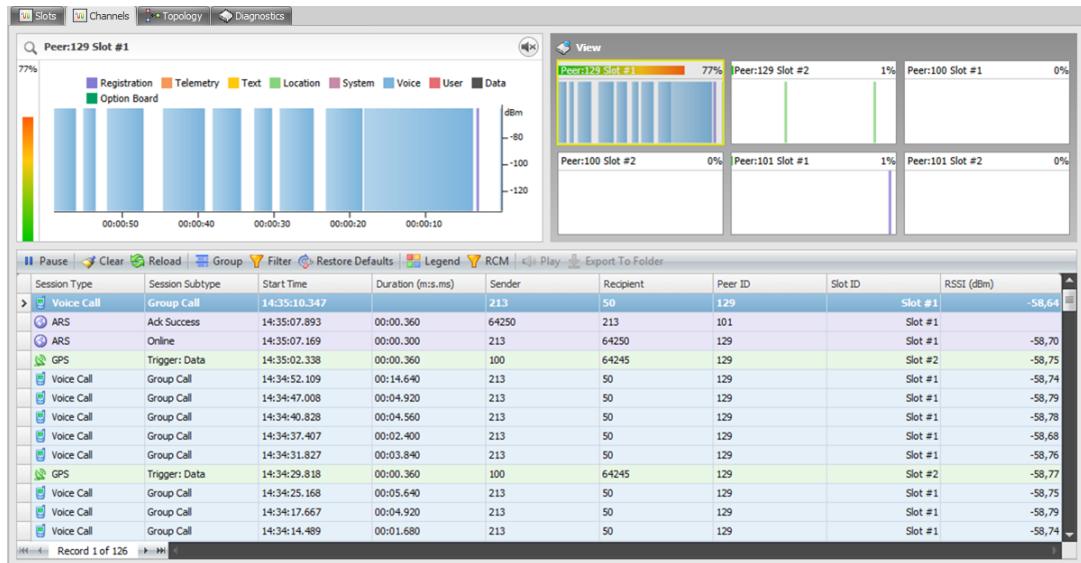


Figure 35: Channels tab

The **View** pane displays all system peers that can transmit calls, including software peers such as TRBOnet Enterprise, TRBOnet Watch, and MOTOTRBO RDAC.

For each peer in the system, the **View** pane displays a pair of small real-time traffic monitors – **Slot #1** and **Slot #2**.

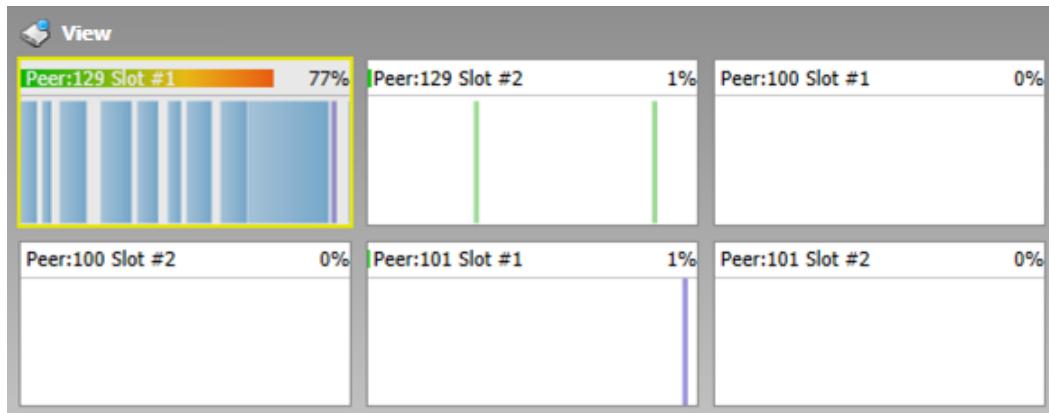


Figure 36: The view of all system peers

If a peer is disconnected, its monitors have pink shading and display the "Feed Offline" message.

Click a small monitor in the **View** pane. The traffic in the selected slot of the peer now appears in the big monitor. The behavior and features of this monitor are described in section [5.2.1.1, Viewing IPSC System Slots](#) (page 46).

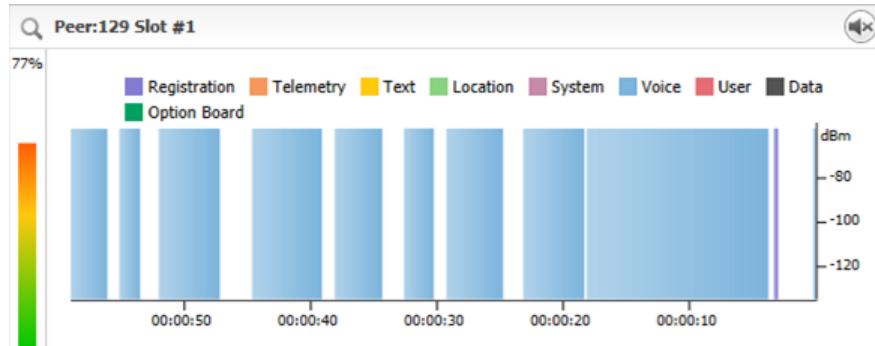


Figure 37: The real-time monitor displays traffic in the slot selected in the View pane

Additionally, the real-time monitor includes the **Mute** toggle button. The mute mode is selected by default. If you click this button to unmute voice transmission on the channel, you can hear a conversation.

Note: Toggling the **Mute** button has no effect if your system is monitored on Level 3 or lower. Learn about the levels of system monitoring in section [2.7, System Monitoring Levels](#) (page 5).

The list shows all calls transmitted in all system slots available in the **View** pane. The list content is collected during one work session in the TRBOnet Watch Console. The fields the toolbar are described in detail in section [5.2.1.1, Viewing IPSC System Slots](#) (page 46).

5.2.1.3 Viewing Diagnostics

The **Diagnostics** tab aggregates the diagnostic information about all MOTOTRBO systems registered in your TRBOnet Watch. This tab helps you pinpoint the configuration problems and check if there have been any alarms from repeaters.

Additionally, use the **Diagnostics** tab to manage a certain repeater remotely. To learn more about this option, refer to section [5.2.1.1, Viewing IPSC System Slots](#) (page 46).

To diagnose a MOTOTRBO system:

- In the left pane of the TRBOnet Watch Console, click **Live Monitor**, then click a MOTOTRBO system.
- In the right pane, click the **Diagnostics** tab.

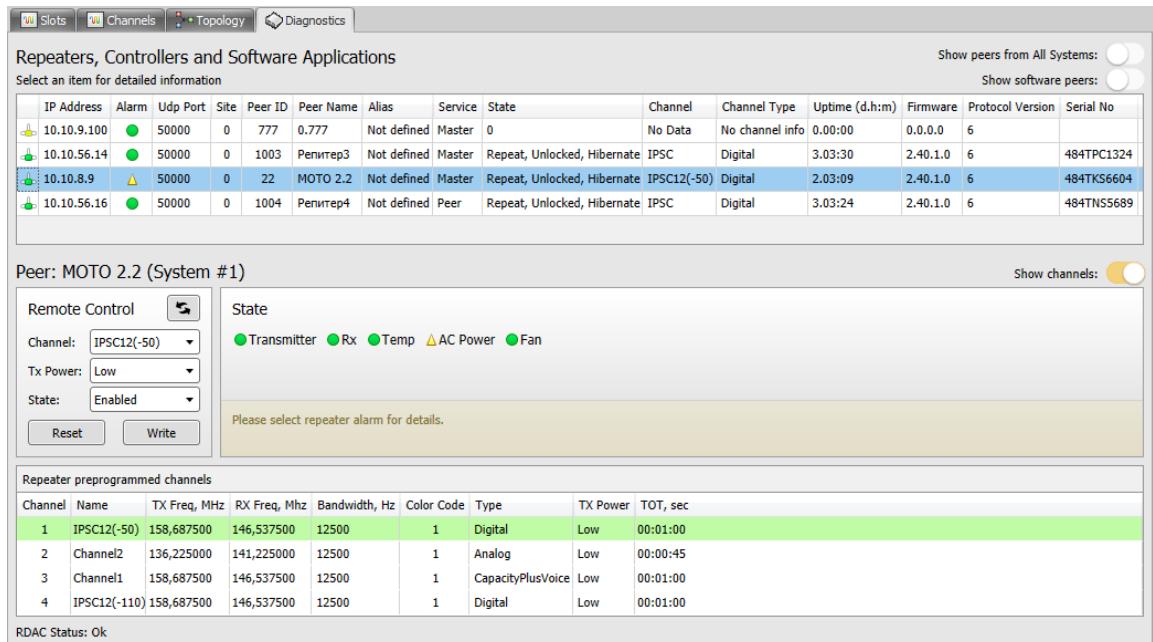


Figure 38: The Diagnostics tab

The **Repeaters, Controllers and Software Applications** list displays the diagnostic information about repeaters and peers in all registered MOTOTRBO systems. Switch the **Show software peers** button to show or hide all software peers in the list.

Table 22: Repeaters, Controllers and Software Applications list - settings

Setting	Description
Icon	<p>The connection status of the peer.</p> <ul style="list-style-type: none">  (green icon): Normal IP connection and RDAC support for repeaters.  (yellow icon): Normal IP connection and no RDAC support for repeaters. Software peers, XRC controllers, and RF sites always display this icon.  (blue circle icon): No IP connection. <p>Note: Point at the icon with the mouse cursor to see the tooltip with the description of the state.</p>
IP Address	<p>The IP address of the peer.</p>
Alarm	<p>The alarm status of the repeater. The severity is indicated by the icon as follows:</p> <ul style="list-style-type: none"> The "green circle" icon indicates normal operational condition (no alarm). The "information" icon (blue circle with the "i" character) indicates an information alarm. The "attention" icon (yellow triangle) indicates a minor alarm. The "red box" icon indicates a major alarm. <p>If a repeater generates several alarms of different severity (major, minor, information), the highest of these severity levels is indicated by the icon. The State panel displays all alarms generated by the repeater.</p> <p>Note: Alarm icons make sense for repeaters only. Other peers always display the "green circle" icon ("no alarm").</p>

Setting	Description
Udp Port	The UDP port of the peer.
Site	The site ID of the peer. Applies to Linked Capacity Plus systems, XRC controllers (Connect Plus), and RF sites (Capacity Max). Otherwise, displays 0.
Peer ID	The peer ID.
Peer Name	The peer name of the repeater as specified in the repeater's configuration.
Alias	The peer alias (if defined). To learn more about adding aliases, refer to section 5.4.2, Managing Aliases (page 79).
Service	The type of peer according to the Peer-to-Peer Protocol definition. Values: Master, Peer
State	The operational state of the repeater. The normal state is "Repeat, Unlocked, Hibernate". Not applicable to software peers (displays 0).
Channel	The channel name of the repeater specified in MOTOTRBO CPS. Not applicable to software peers (displays "No Data").
Channel Type	The channel type. Values: Digital, Capacity Plus Voice, Capacity Plus Data, Linked Capacity Plus Voice, Linked Capacity Plus Data. Not applicable to software peers (displays "No channel info").
RSSI Slot 1 (dBm)	The signal strength on Slot 1 of the repeater.
RSSI Slot 2 (dBm)	The signal strength on Slot 2 of the repeater.
AC Voltage (V)	The AC voltage of the repeater (when not powered from the battery). Supported by New Generation repeaters only.
Output Power (dBm)	The output power. Supported by New Generation repeaters only.
VSWR	Voltage Standing Wave Ratio of the repeater. Display format: X:1. Supported by New Generation repeaters only.
Uptime (d.h:m)	The total time the repeater is up and running.
Firmware	The firmware version of the repeater. Not applicable to software peers (displays "0.0.0.0").
Protocol Version	The version of the radio communication protocol.
Serial No	The serial number of the hardware.

Note: Fields **RSSI Slot 1**, **RSSI Slot 2**, **AC Voltage**, **Output Power**, and **VSWR** display data if TRBOnet Watch is configured to get extended diagnostics from repeaters. Otherwise, these fields are not populated. For details, refer to section [4.8, Enabling Extended Diagnostics](#) (page 17).

When you click a particular peer in the **Repeaters, Controllers and Software Applications** list, other panels on the **Diagnostics** tab are updated to show the following information:

- The peer identification in the format "Peer: <peer ID or repeater programmed name| peer alias> (<system name>)".
- **Remote Control** panel: Displays the repeater settings that you can modify remotely. Disabled for software peers. For details, refer to section [5.2.1.4, Controlling Repeaters Remotely](#) (page 52).
- **State** panel: Displays alarms of the repeater selected in the **Repeaters, Controllers and Software Applications** list. The icons indicate the alarm statuses as described in Table 22 (page 50). Point at a particular alarm with the mouse cursor to get more information.

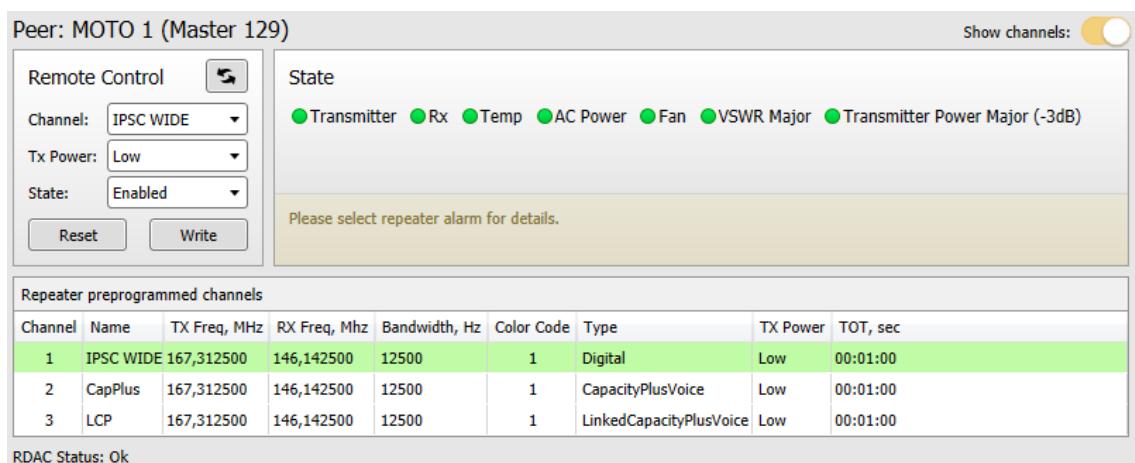


Figure 39: The State panel displays the AC Power alarm with the minor severity level

- **Repeater preprogrammed channels** list: Displays the repeater channels and their properties. Disabled for software peers. For details, refer to section [5.2.1.4, Controlling Repeaters Remotely](#) (page 52).

5.2.1.4 Controlling Repeaters Remotely

Live Monitor allows you to manage a repeater remotely. In the left pane of the TRBOnet Watch Console, click **Live Monitor** and then click a MOTOTRBO system. In the right pane, click the **Diagnostics** tab.



The Remote Control panel shows the following settings for Channel 1 IPSC WIDE:

Channel:	IPSC WIDE
Tx Power:	Low
State:	Enabled

Buttons: Reset, Write

State panel:

- Transmitter
- Rx
- Temp
- AC Power (yellow triangle)
- Fan
- VSWR Major
- Transmitter Power Major (-3dB)

Please select repeater alarm for details.

Repeater preprogrammed channels table:

Channel	Name	TX Freq, MHz	RX Freq, Mhz	Bandwidth, Hz	Color Code	Type	TX Power	TOT, sec
1	IPSC WIDE 167,312500	146,142500	12500		1	Digital	Low	00:01:00
2	CapPlus	167,312500	146,142500	12500		CapacityPlusVoice	Low	00:01:00
3	LCP	167,312500	146,142500	12500		LinkedCapacityPlusVoice	Low	00:01:00

RDAC Status: Ok

Figure 40: Remote Control

The **Remote Control** panel displays the current settings of the repeater that you can modify remotely:

- **Channel:** The selected channel.
- **TX Power:** The transmission power configured for the selected channel.
- **State:** The operational status of the repeater.

The **Repeater preprogrammed channels** list shows the list of channels available for use with this repeater. The channel currently in use has green shading.

Note: You can hide and show the **Repeater preprogrammed channels** list using the **Show channels** button.

The information in the list is read-only. The settings of the programmed channel are as follows:

- **Channel:** The ordinal number of the channel programmed in the repeater configuration.
- **Name:** The channel name programmed in the repeater configuration.
- **TX Freq, MHz:** The TX frequency of the channel.
- **RX Freq, MHz:** The RX frequency of the channel.
- **Bandwidth, Hz:** The bandwidth of the channel.
- **Color Code:** The color code of the channel.
- **Type:** The type of the channel programmed in the repeater configuration.
Allowed values: Digital, Capacity Plus Voice, Capacity Plus Data, Linked Capacity Plus Voice, Linked Capacity Plus Data.
- **TX Power:** The transmission power programmed in the repeater configuration.
- **TOT, sec:** The timeout during which the radio can continuously transmit before transmission terminates automatically.

You can perform the following remote operations with a repeater:

Table 23: Remote operations with repeaters

To do this:	Perform these steps:
Configure a repeater to use a different channel	<p>1. Select the repeater in the Repeaters, Controllers and Software Applications list.</p> <p>2. In the Remote Control panel, expand the Channel drop-down menu and click a different channel.</p> <p>3. Click the Write button. The repeater configuration update may take more than a minute.</p> <p>4. If the channel type has changed after the update, launch the TRBOnet Watch Server and specify the System Type setting accordingly, as described in section 4.9.1, Registering MOTOTRBO IPSC, Capacity Plus, LCP, and ERDM (page 17).</p> <p>Note: The channel type is displayed in the Type field of the Repeater preprogrammed channels list.</p>
Configure the transmission power of the repeater	<p>High transmission power is required to get a stronger signal and extend transmission distances. Low transmission power is preferred for communication in close proximity; it also serves to prevent transmissions into other geographical groups.</p> <p>To configure the transmission power of the repeater:</p> <p>1. Select the repeater in the Repeaters, Controllers and Software Applications list.</p>

To do this:	Perform these steps:
	<p>2. In the Remote Control panel, expand the Tx Power drop-down menu and click the preferred option: High or Low.</p> <p>3. Click the Write button.</p>
Enable/ disable the repeater	<p>When enabled, the repeater transmits, receives and repeats operations. When disabled, the repeater cannot transmit, receive or repeat. In the disabled mode, the repeater responds to GPIO controls such as channel steering and to alarms and diagnostics.</p> <p>To enable or disable the repeater:</p> <ol style="list-style-type: none"> Select the repeater in the Repeaters, Controllers and Software Applications list. In the Remote Control panel, expand the State drop-down menu and click a different option: Enabled or Disabled. Click the Write button.
Reboot the repeater remotely	<ol style="list-style-type: none"> Select the repeater in the Repeaters, Controllers and Software Applications list. Click the Reset button in the Remote Control panel.
Reload the configuration settings	<ol style="list-style-type: none"> Select the repeater in the Repeaters, Controllers and Software Applications list. Click  in the Remote Control panel. <p>The latest configuration settings of the repeater are loaded to the Remote Control panel and to the Repeater Preprogrammed Channels list.</p>

The status bar displays the result of the requested operation. If the repeater is busy, the operation failure is reported. In this case, repeat the operation later.

5.2.2 Monitoring Radio-over-IP Gateways

To monitor a radio-over-IP gateway in the TRBOnet Watch Console, click **Live Monitor** and then **RoIP Gateways** in the left pane. The right pane displays the following tabs:

- **Channels:** Open this tab to monitor traffic in all RoIP gateways in real time. For details, refer to section [5.2.2.1, Viewing Channels](#) (page 55).
- **Diagnostics:** Open this tab to inspect the operational conditions and connection and alarm statuses of all RoIP gateways in real time. For details, refer to section [5.2.2.2, Viewing Diagnostics](#) (page 55).
- **Topology:** Open this tab to see the location of all RoIP gateways (physical units) in the IP network. Refer to section [5.2.3, Viewing System Topology](#) (page 57).
- **Physical GPIO Pins:** Open this tab to monitor the statuses of GPIO pins on all RoIP gateways (applies to TRBOnet Swift Agents only). For details, refer to section [5.2.2.3, Viewing Physical GPIO Pins](#) (page 57).

5.2.2.1 Viewing Channels

The **Channels** tab displays traffic in all RoIP gateways in real time.

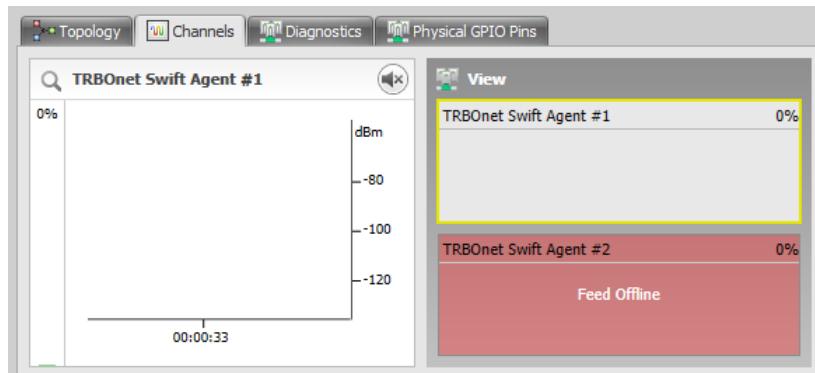


Figure 41: Monitoring traffic of a RoIP gateway

The **View** pane displays small traffic monitors, one per a RoIP gateway. The name of the respective RoIP gateway appears on top of each traffic monitor. If no radio is connected to the RoIP gateway, the respective traffic monitor has pink shading and displays the "Feed Offline" message.

Click a small monitor in the **View** pane. The traffic of the selected RoIP gateway now appears in the big monitor. The features of the big monitor are described in section [5.2.1.1, Viewing IPSC System Slots \(page 46\)](#).

5.2.2.2 Viewing Diagnostics

The **Diagnostics** tab provides the information about IP connections, connected radios, and operational statuses of all RoIP gateways.

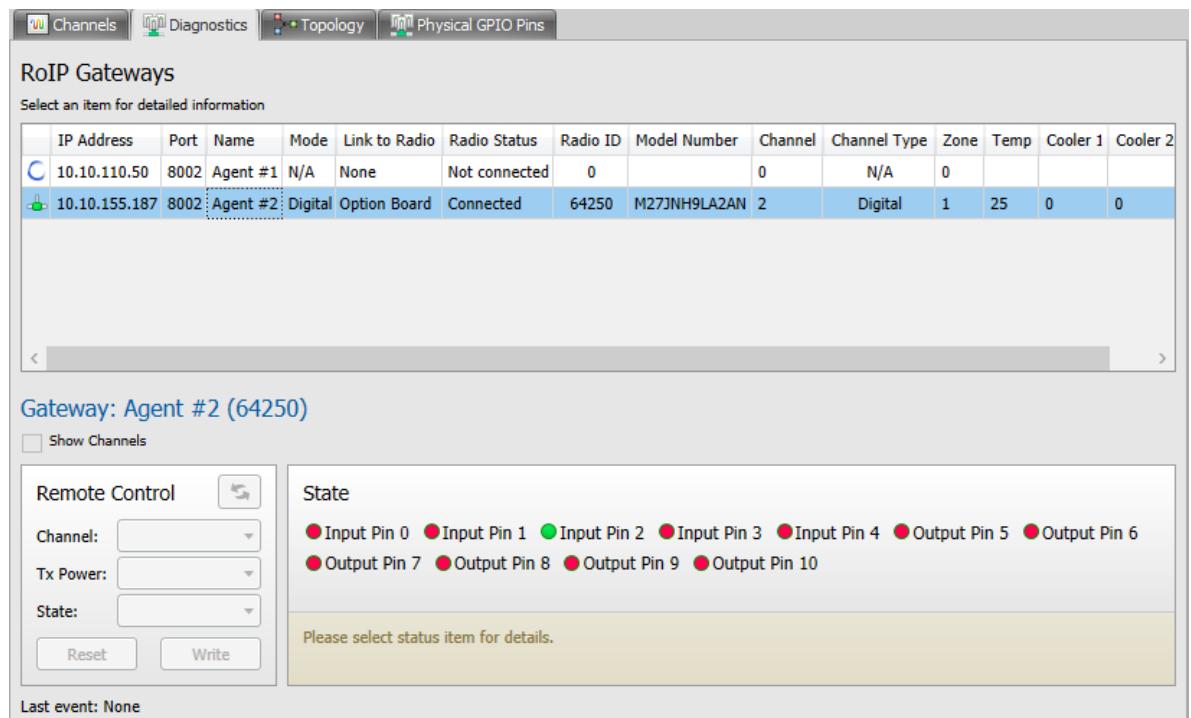


Figure 42: Diagnostic information for all RoIP gateways

The RoIP Gateways list displays the following diagnostic information:

Table 24: RoIP Gateways list – fields

Field	Description
Icon	The IP connection of the RoIP gateway. <ul style="list-style-type: none"> ▪  (green icon): Normal IP connection. ▪  (blue circle icon): No IP connection.
IP Address	The IP address of the RoIP gateway.
Port	The IP port of the RoIP gateway.
Name	The gateway name.
Mode	The operational mode. Values: Digital, Analog, N/A.
Link to Radio	The way the radio is connected to the physical RoIP gateway. Values: Option Board (wireless), GPIO (cable), None.
Radio Status	The radio connection status. Values: Connected, Not connected.
Radio ID	The ID of the connected radio. Is set to "0" if no radio is connected to the RoIP gateway.
Model Number	The model number of the connected radio. Empty if no radio is connected to the RoIP gateway.
Channel	The ordinal number of the channel currently selected on the connected radio.
Channel Type	The channel type. Values: Digital, Analog, N/A.
Zone	The zone of the connected radio.
Temperature °C	The temperature measured inside the hardware RoIP gateway (TRBOnet Swift Agent only).
Cooler 1, rpm	The speed of cooler 1 connected to the TRBOnet Swift Agent (rotations per minute)
Cooler 2, rpm	The speed of cooler 2 connected to the TRBOnet Swift Agent (rotations per minute)

Select a RoIP gateway in the list. The information about the RoIP gateway appears below the list in the format "Gateway: <system name> (<connected radio ID>|0)"

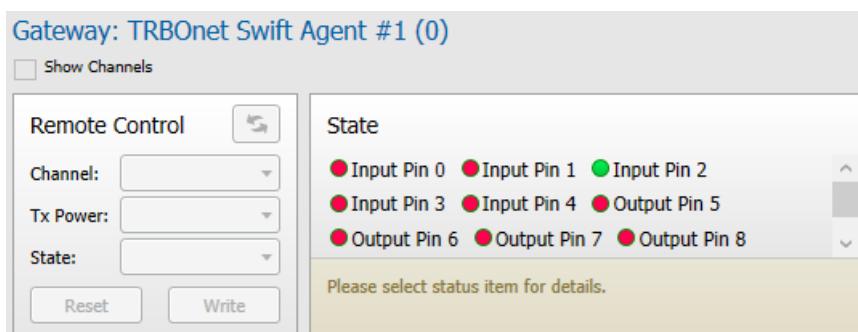


Figure 43: Gateway information and physical pins

For instance, you may see "Gateway: TRBOnet Swift Agent #1 (0)" if a radio is not connected to the TRBOnet Swift Agent.

The **State** panel displays the statuses of physical pins on the hardware RoIP gateway (applies to TRBOnet Swift Agent only). The pin statuses are updated in real time. The green icon indicates telemetry transmission. The red icon indicates no transmission.

Note: Output pins and disabled input pins are not monitored and are always displayed with the red icon ("no signal"). The physical input pins displayed in the **State** panel are described in section [4.9.4, Registering Radio-over-IP Gateways](#) (page 33).

Point at the pin name with the mouse cursor to see the tooltip with the description of the pin. To monitor the statuses of input pins, use the **Physical GPIO Pins** tab. For details, refer to section [5.2.2.3, Viewing Physical GPIO Pins](#) (page 57).

5.2.2.3 Viewing Physical GPIO Pins

The **Physical GPIO Pins** tab displays all hardware RoIP gateways (TRBOnet Swift Agents only) that can receive telemetry to their GPIO pins from external hardware devices. The **Physical GPIO Pins** list allows you to monitor the statuses of input pins on each RoIP gateway in real time.

Table 25: Physical GPIO pins list - fields

Field	Description
Icon	The connection status of the RoIP gateway. <ul style="list-style-type: none"> ▪  (green icon): Normal IP connection. ▪  (blue circle icon): No IP connection.
IP Address	The IP address of the RoIP gateway.
Port	The IP port of the RoIP gateway.
Name	The name of the RoIP gateway specified in the TRBOnet Watch configuration.
Mode	The operational mode. Values: Digital, Analog, N/A.
Input <1-5>: Name	The pin name specified in the TRBOnet Watch configuration. Find the details in section 4.9.4.1, Registering a TRBOnet Swift Agent (page 33).
Input <1-5>: Value	The pin status: <ul style="list-style-type: none"> ▪ Green icon: Telemetry transmission ▪ Red icon: No transmission

Note: The relation between each logical pin displayed in the **Physical GPIO Pins** list and the physical input pin on the TRBOnet Swift Agent is explained in section [4.9.4, Registering Radio-over-IP Gateways](#) (page 33).

5.2.3 Viewing System Topology

The **Topology** tab allows you to inspect the topology and connection statuses of all MOTOTRBO system peers and RoIP gateways monitored in TRBOnet Watch.

To open the topology of all monitored systems:

- Click **Live Monitor** in the left pane of the TRBOnet Watch Console.
- Click any system in the left pane.
- Select the **Topology** tab in the right pane.

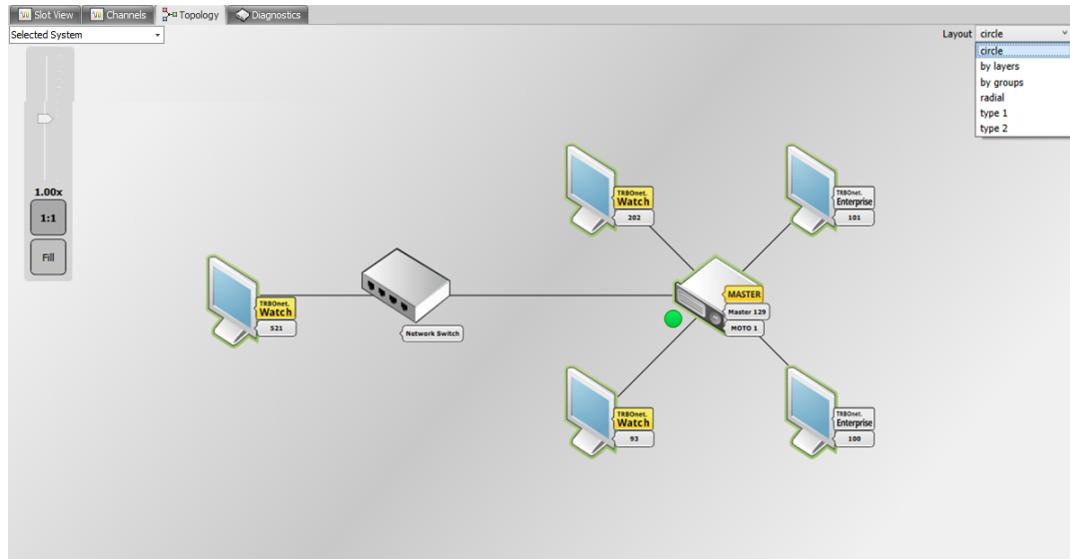


Figure 44: Topology of a MOTOTRBO IP Site Connect system

This section describes how to adjust the view of the topology and how to interpret the graphics elements representing the radio system components.

5.2.3.1 Adjusting the Topology View

You can adjust the view of the topology as described in Table 26.

Table 26: Adjusting the view of the Topology tab

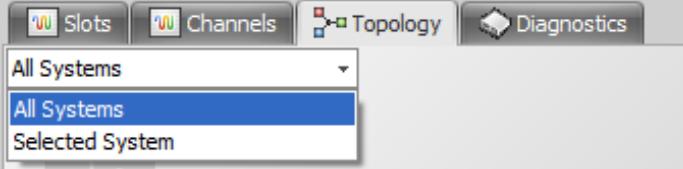
Operation	Description
Adjust the scope of displayed systems	<p>By default, the topology map includes all systems monitored in your TRBOnet Watch. To adjust the scope of displayed systems, expand the drop-down menu on top of the tab and select the required option:</p> 
Adjust the layout	<p>You can select a different layout of elements on the Layout drop-down menu.</p>
Rescale the map	<p>You can zoom the topology view using the scroll button. To fit the displayed system(s) to the window, click the Fill button. To return to the original scaling, click the 1:1 button.</p>

Figure 45: Selecting the scope of displayed MOTOTRBO systems

- **All Systems:** The topology displays all monitored MOTOTRBO systems.
- **Selected System:** The topology displays the selected system only.

Operation	Description
Remove disconnected elements	<p>You can remove disconnected peers (marked with a red rim) that are not relevant to your system, such as software applications connected to a given master repeater over IP.</p> <ul style="list-style-type: none"> ▪ To remove a particular peer, right-click it and click Remove Peer From Map on the context menu. ▪ To remove all disconnected peers, right-click any peer and click Remove All Disconnected Peers. <p>Note: If a disconnected peer restores connection to the repeater after the removal, it appears on the topology view automatically next time you launch the TRBOnet Watch Console.</p>

5.2.3.2 Graphics for MOTOTRBO Systems

MOTOTRBO system elements are presented in the **Topology** view by graphical images connected over IP.

- The shape of the image classifies the element as a repeater, or hardware, or software, or an unknown item (a non-registered element detected in the IP network).
- Labels identify the element as a master or peer.
- Icons and color rims tell you about the connection status of the element.

If you point at an element with the mouse cursor, the tooltip shows the information about the peer (ID and alias), the IP connection settings, and system settings.

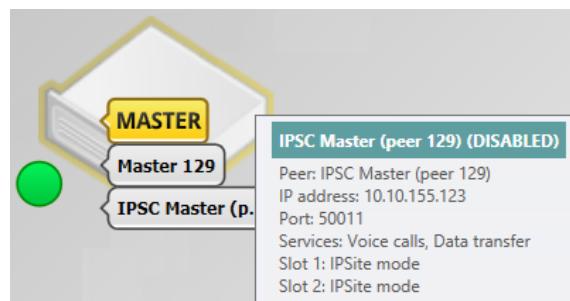
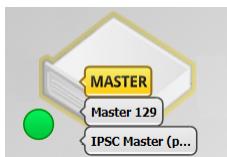


Figure 46: A cursor pointed at the image shows the tooltip with details

The following examples explain how to read the information in the topology view.

 Figure 47: Master repeater (normal state)	Image: Repeater Labels: <ul style="list-style-type: none"> ▪ Master: Master repeater in the system ▪ Master 129: System name ▪ MOTO 1: Peer alias Icon: Normal condition, no RDAC issues Green rim: Repeater enabled, normal IP connection
 Figure 48: Master repeater (RDAC issue)	Image: Repeater Green rim: Normal IP connection Icon: No RDAC connection

Figure 48: Master repeater (reloading)	
	Image: Repeater Green rim: Normal IP connection Icon: RDAC issue, minor severity level ("attention")
Figure 49: Master repeater (alarm)	
	Image: Repeater Yellow rim: Repeater disabled Icon: Normal condition, no RDAC issues
Figure 50: Master repeater (disabled)	
	Image: Unknown (not registered) element Labels: <ul style="list-style-type: none">■ 85: Peer ID Red rim: No IP connection with TRBOnet Watch Icon: No IP connection
Figure 51: Unknown element	
	Image: Software peer Labels: <ul style="list-style-type: none">■ TRBOnet. Watch: TRBOnet Watch application■ 93: Peer ID Green rim: Normal IP connection
Figure 52: Software peer (normal state)	
	Image: Software peer Red rim: No IP connection. The reason may be the IP address or port specified incorrectly. Icon: No IP connection
Figure 53: Software peer (disconnected)	

5.2.3.3 Graphics for RoIP Gateway

The topology displays the RoIP gateways as graphical images connected to TRBOnet Watch over IP. The shape of the image indicates if a radio is connected to the gateway:

- The "radio" image means an established radio connection. The label near the image displays the radio ID. Icons near the image describe the mode of the connected radio (digital, analog) and the XCMP/XNL connection status.
- The "box" image means no radio connection. The color of the rim around the image describes the IP connection status.

Point at the image with the mouse cursor to see the tooltip with details about the hardware and the connected radio.

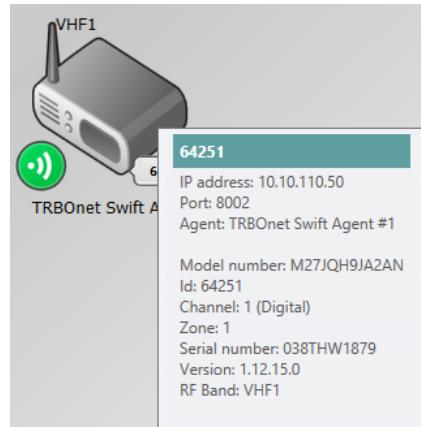


Figure 54: A pointed image shows the tooltip with details

The following examples explain how to read the information about RoIP gateways from the topology view.



Figure 55: IP connection, no radio

Image: Radio not connected
Text: System name of the RoIP gateway
Green rim: Normal IP connection



Figure 56: No IP connection, no radio

Image: Radio not connected
Text: System name of the RoIP gateway
Red rim: No IP connection with TRBOnet Watch
Icon: No XNL connection



Figure 57: Radio connected, digital mode

Image: Radio connected
Text:

- RF band
- System name of the RoIP gateway

Label: Radio ID
Icon: Digital mode, normal XCMP connection



Figure 58: Radio connected, analog mode

Image: Radio connected
Text: System name of the RoIP gateway
Icons:

- Analog mode, GPIO wired connection
- RoIP gateway is powered

Note: TRBOnet Watch implies that the RoIP gateway is powered from the radio. Because the RoIP gateway is powered, TRBOnet Watch assumes that the radio is powered and connected to the gateway with the cable. However, the RoIP gateway and the radio can be powered from different sources. If this be the case, the "Radio" image and the "question" icon should be interpreted as "RoIP gateway is powered, radio connection status is unknown".

5.3 Reports and Analytics

TRBOnet Watch comes with a set of predefined reports and charts to help you instantly retrieve and visualize the database information on any aspect of system monitoring. By setting filters, you can adjust reports and charts to include the required channels, types of traffic, and time settings.

This section describes how to build and analyze reports and charts, and how to retrieve the required scope using filters.

For a detailed description of each report and chart, refer to [Appendix A: Analytics and Reports](#) (page 88).

5.3.1 Building Reports

To create reports, click **Reports** in the left pane of the TRBOnet Watch Console. To open reports in a separate window, right-click the **Reports** pane header and click **Open in New Window** on the context menu.

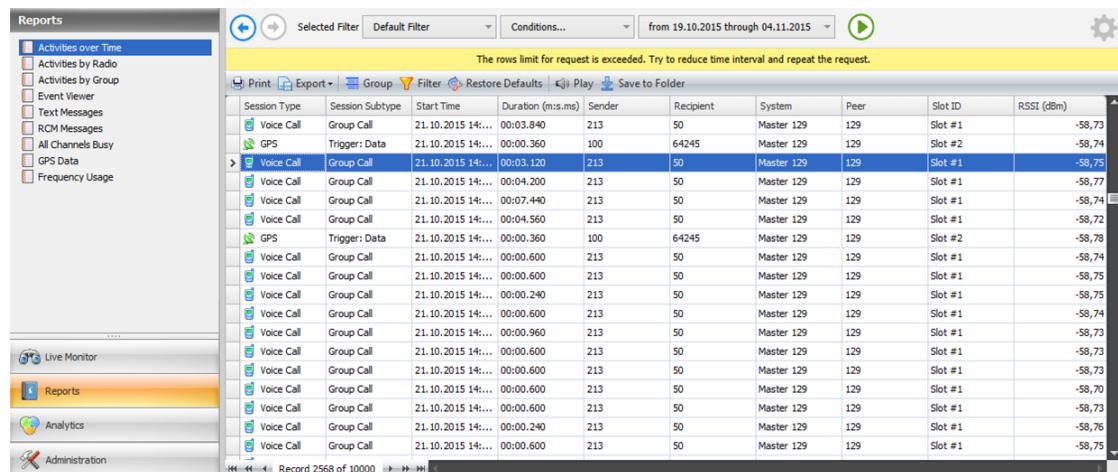


Figure 59: Reports

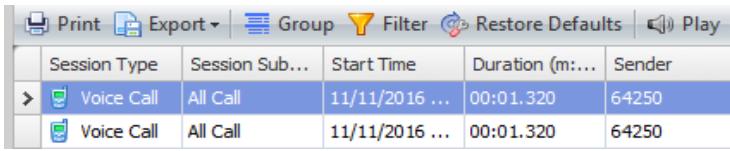
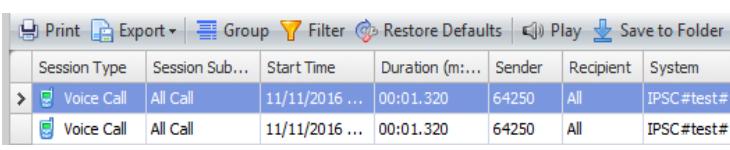
The left pane displays all predefined reports. You cannot add custom reports or delete any report from this list.

The filter toolbar provides controls for managing filters and for building charts and reports. Learn more about filters in section [5.3.3, Using Filters](#) (page 68).

The right pane displays the generated report. The message area (yellow tap) appears to display a warning about the generated report.

You can perform the following operations with reports:

Table 27: Operations with reports

Operation	Description
Build a report	<ol style="list-style-type: none"> Click a predefined report in the Reports pane. Expand the Selected Filter menu and select the filter. Expand the Conditions menu and adjust the filter settings. Find the details in section 5.3.3.2, Adjusting Filter Settings (page 69). Expand the Date and Time menu and adjust the time settings. Find the details in section 5.3.3.3, Adjusting Time Settings (page 72). Click the Start button. The generated report appears in the right pane.
Switch between different versions of a report	<p>If you generate a report more than once, for instance, using different filter settings, you can switch between these versions using the Previous and Next buttons.</p> <p>The filter settings in the Conditions and Date and Time menus match the currently opened version of the report.</p>
Play back voice calls (Activities over Time report only)	<p>Select a voice call in the list and click the Play button on the toolbar.</p>  <p>The call is played back in a voice player in a popup window.</p>
Export voice calls (Activities over Time report only)	<ol style="list-style-type: none"> Select a voice call in the report and click the Save to Folder button on the toolbar. Point the destination folder in the dialog box and click OK.  <p>The selected voice call is saved to the specified direction as a WAV file. The file name format is configured as described in section 5.1.4, Setting the Audio Output File Name Format (page 42).</p>

5.3.2 Building Charts

To create charts, click **Analytics** in the left pane of the console. To open charts in a separate window, right-click the **Analytics** pane header and click **Open in New Window**.

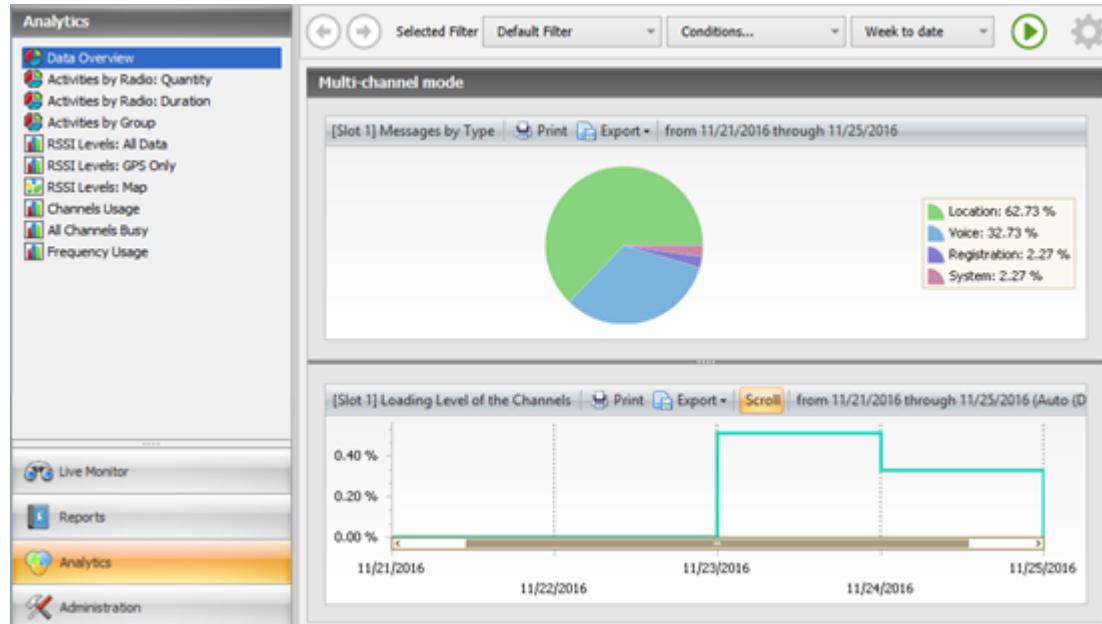


Figure 62: Analytics tab

The left pane of the **Analytics** tab displays all predefined charts. You cannot delete predefined charts or add custom charts to the list. For a detailed description of each chart, refer to [Appendix A: Analytics and Reports](#) (page 88).

The filter toolbar provides controls for managing filters and for building charts and reports. Learn more about filters in section [5.3.3, Using Filters](#) (page 68).

The bar above all charts indicates the channel mode:

- Multi-channel mode (Figure 62): Charts are generated for multiple selected systems or for a single system other than IP Site Connect.
- Slot #<1|2>: Charts are generated for a single IP Site Connect system. The layout shows the double set of charts, each related to a certain time slot of the master repeater.

The generated charts appear each in a separate pane with a toolbar.

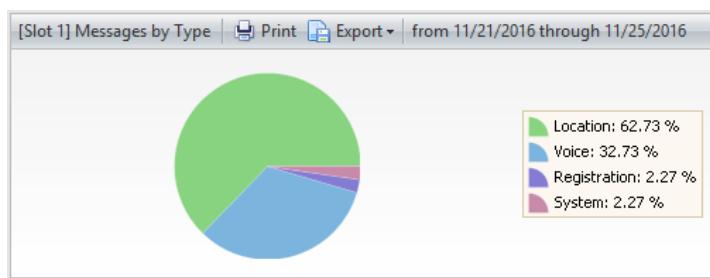


Figure 63: A Messages by Type chart in a separate pane with a toolbar

The information on the chart's toolbar includes (from left to right): the title of the chart, buttons **Print**, **Export** and others, the time of the chart, and optionally the timeframe in braces (Day, Hour, Minute).

You can perform the following operations with charts:

Table 28: Operations with charts

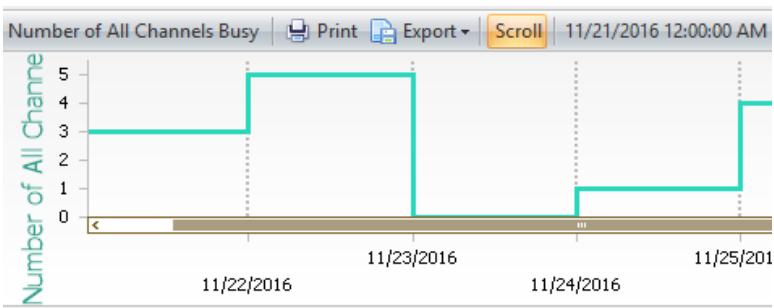
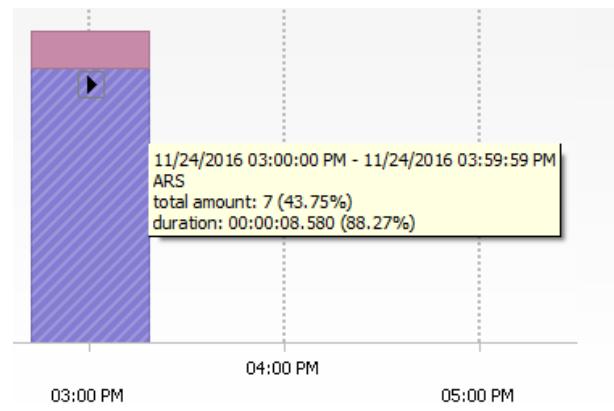
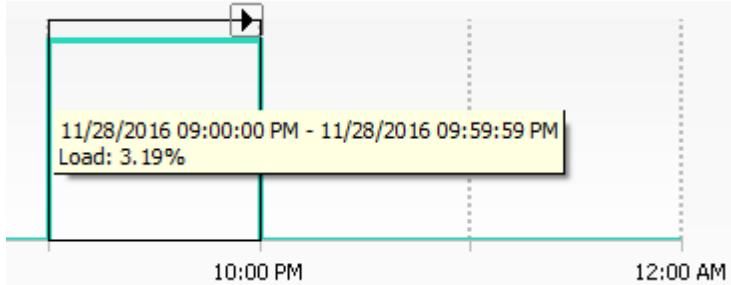
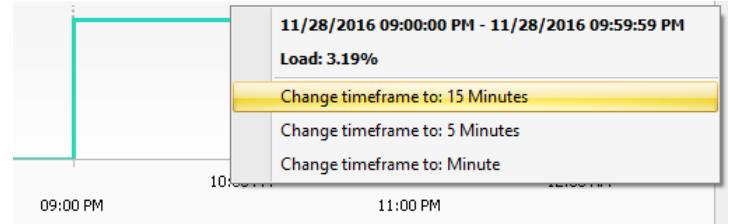
Operation	Description
Build a chart	<ol style="list-style-type: none"> Select a chart in the Analytics pane. Select a filter from the Selected Filter menu. Verify the filter settings. Find the details in section 5.3.3.2, Adjusting Filter Settings (page 69). Verify the time settings. Find the details in section 5.3.3.3, Adjusting Time Settings (page 72). For an RSSI Levels chart, specify the RSSI settings as described in section 5.3.2.1, Configuring RSSI Settings (page 66). For RSSI Levels: Map, configure the map settings as described in section 5.3.4.1, Configuring Map Usage (page 75). Click Start. The charts appear in the right pane.
Switch between different versions of a chart	<p>If you generate a chart more than once, for instance, using different filter settings, you can switch between these versions using the Previous and Next buttons.</p> <p>The filter and time settings are updated inside the menus Conditions and Date and Time with each button click to be in sync with the currently opened version of the chart.</p>
Show or hide the scroll bar	<p>Click the Scroll button to hide or show the scroll bar below the chart. This button appears in the toolbar of any chart with the X-axis.</p> 
Drill down into a more detailed chart	<p>Point at a chart with the mouse cursor. If a pie chart or a bar chart highlights the pointed section with a different color pattern, click this section and get to another chart that includes data about the pointed section only.</p> 

Figure 64: The Scroll button

Operation	Description
	<p>In a line chart, if a pointed section shows the frame with an "arrow" button, click the line within the frame to drill down into the highlighted section.</p>  <p>10:00 PM 12:00 AM</p>
	<p>Figure 66: Drill-down in a line chart</p> <p>Or, click the "arrow" button and select the preferred timeframe of the new chart on the context menu.</p>  <p>09:00 PM 10:00 PM 11:00 PM</p>
	<ul style="list-style-type: none"> ▪ The time axis in the new chart equals to the length of the clicked timeframe. ▪ The timeframe of the new chart is the selected one. Or, if you clicked the line rather than the arrow button, the timeframe is one step smaller than the clicked timeframe. <p>Note: The timeframes are ranged as follows: Week, Day, 4 Hours, 2 Hours, Hour, 45 Minutes, 30 Minutes, 15 Minutes, 5 Minutes, Minute.</p> <p>The filter and time settings are updated inside the menus Conditions and Date and Time with each drill-down to be in sync with the current chart.</p>
Undo drill-down	To return to the top-level chart, click the Previous button.

5.3.2.1 Configuring RSSI Settings

All charts that have "RSSI Levels" in their names display the RSSI data evaluated to a particular level and colored accordingly. The default RSSI levels are preinstalled. You can define your own RSSI levels and assign the color for each.

To define RSSI levels:

1. Go to **Analytics** and click **RSSI Levels: All Data** or **RSSI Levels: GPS Only** in the left pane.
2. Click the **Settings** button.

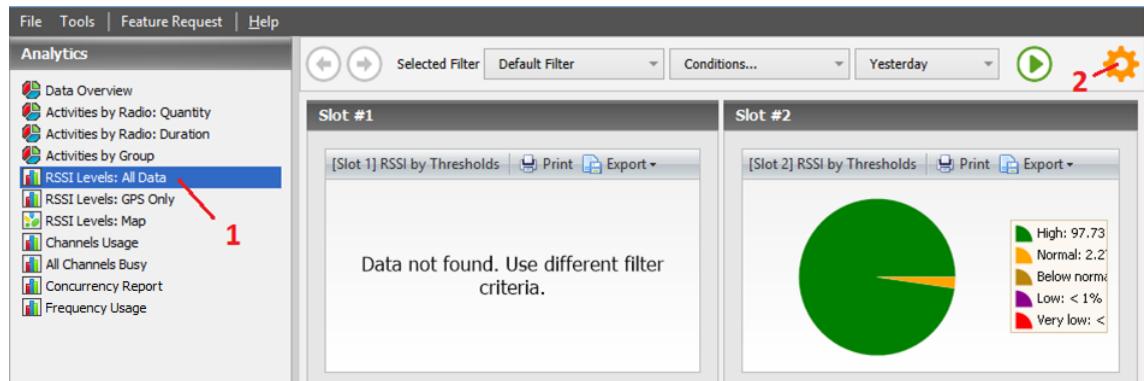


Figure 68: Opening the RSSI settings

3. In the **Rssi Levels** dialog box, define the levels as required:

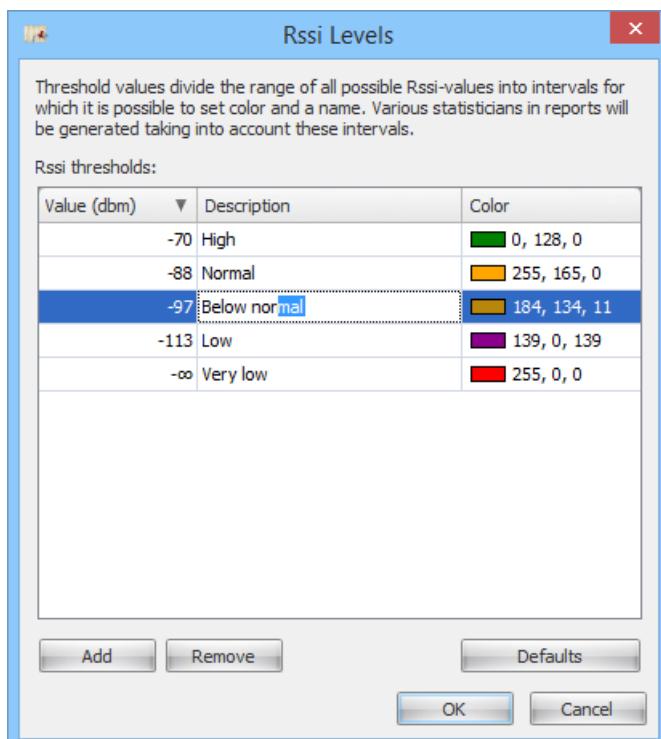


Figure 69: Configuring the RSSI levels

Table 29: Operations with RSSI levels

Operation	Steps
Add a level	Click the Add button to insert a new level with the default properties on top of the list.
Remove a level	Select the level and click the Remove button.
Edit the RSSI level properties	To edit the threshold value or description, drop the cursor in the field and type the preferred value. The Value (dbm) field specifies the lower border of the level. Fractions are not accepted. To edit the color of an RSSI level, click the respective field and choose the color on the drop-down menu.
Restore the default RSSI settings	Click the Defaults button to reset all changes and get back to the preinstalled RSSI level settings.

4. Click **OK** to save the settings and exit the dialog box, or click **Cancel** to exit without saving.

All RSSI Levels charts update their legend to display the RSSI levels as specified in the chart settings.

5.3.3 Using Filters

Reports and charts use filters to fetch the required information from the database. Before generating output on the **Reports** or **Analytics** tab, select a filter and adjust the filter settings and time settings on the filter toolbar.

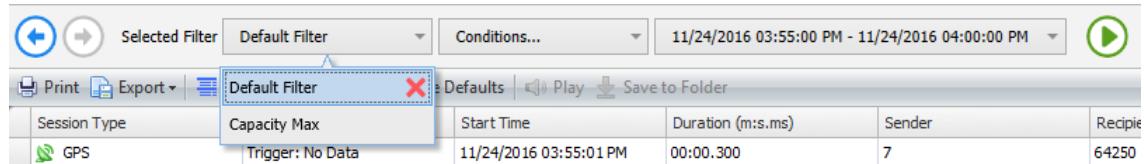


Figure 70: Filter toolbar

The filter toolbar includes the following controls:

Table 30: Filter toolbar - controls

Control	Description
	Previous and Next buttons serve to switch between the generated versions of a report or a chart.
Selected Filter	The list of filters. You can add more filters and remove unnecessary filters. Find the details in section 5.3.3.1, Managing Filters (page 68).
Conditions	The filter settings grouped in tabs. For each report and chart, only applicable tabs are visible. You can modify the filter settings as described section 5.3.3.2, Adjusting Filter Settings (page 69).
Date and Time	The time settings. Reports and charts will include data with timestamps that fall within the specified time range. Find the details in section 5.3.3.3, Adjusting Time Settings (page 72).
	Start button. Click this button to generate the selected report or chart.
	Settings button opens the configuration of RSSI charts. This button is not available (grayed out) for reports and other charts.

5.3.3.1 Managing Filters

To generate a report or chart, you can use any existing filter, changing the filter settings as necessary. You can also create a special filter for a particular use case.

Table 31: Managing filters

To do this:	Take these steps:
Add a new filter	<ol style="list-style-type: none"> 1. On the Conditions or Date and Time menu, click Save As. 2. Enter a unique name of the filter and click OK. The new filter is added to the list of filters. The name of the new filter appears in the Selected Filter field as the currently selected filter.

To do this:	Take these steps:
Delete a filter from the list	Expand the list of filters and point at the filter with the mouse cursor. Click the "cross" icon next to the filter.

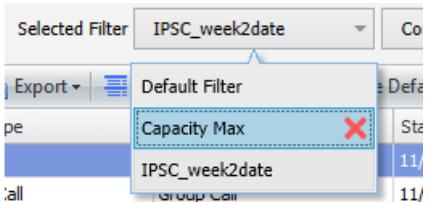


Figure 71: List of filters

5.3.3.2 Adjusting Filter Settings

The filter settings on the **Conditions** menu are displayed on tabs. Depending on the selected report or chart, some tabs may not appear on the menu. The selected report or chart can use the displayed settings only. Hidden tabs include the settings that are not relevant to the subject.

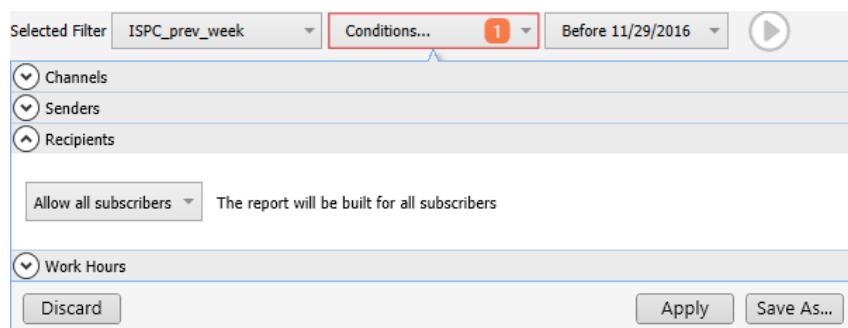


Figure 72: The filter is missing one mandatory setting

You cannot generate a report or a chart until all mandatory filter settings are set properly. If any mandatory filter setting is not specified, the **Conditions** box displays the flashing icon with the count of settings that are missing. If you move the mouse cursor over the highlighted box, the tooltip displays the description of the problem.

To specify the filter settings on each tab, see Table 32.

Table 32: Filter settings

Tab	Description
Channels	Select the radio channels to be included in reports and charts.

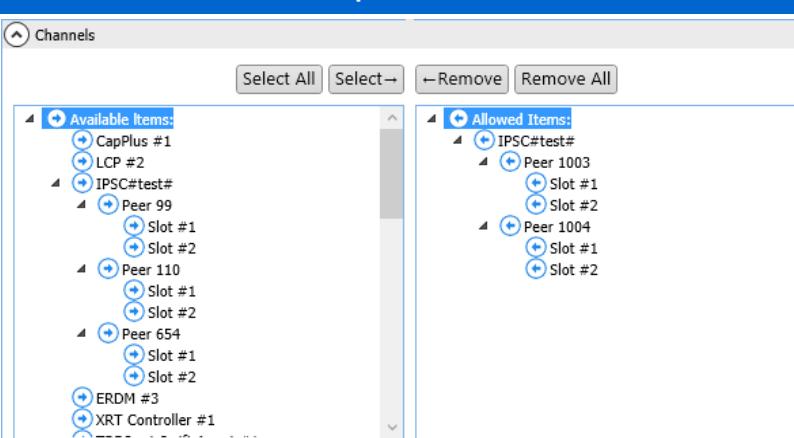
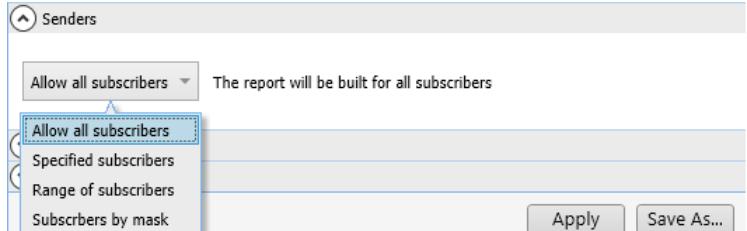
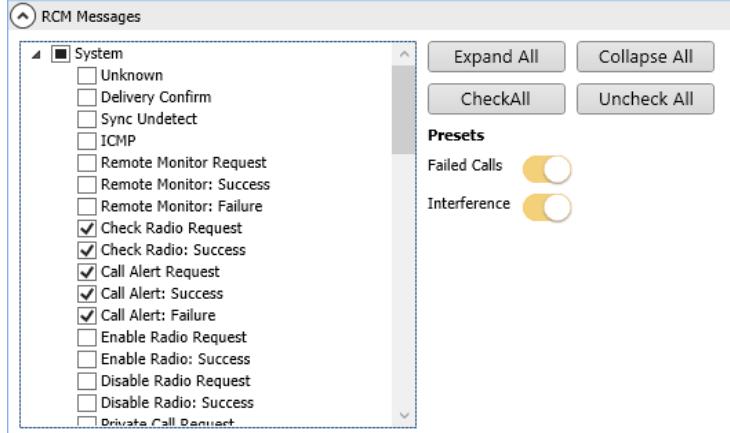
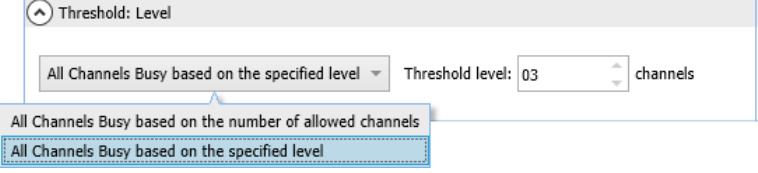
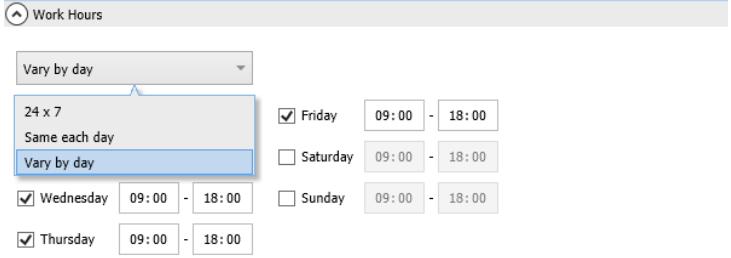
Tab	Description
	 <p>The Available Items panel displays all items (systems, peers, and channels) available for monitoring in TRBOnet Watch. System peers are displayed if they were added as described in section 4.9.1.3, Adding Peers (page 23).</p> <p>The Allowed Items panel displays all items (systems, peers, and channels) selected from the Available Items panel. The selected channels will be included in reports and charts.</p> <p>To move items between the panels, click the "arrow" icon of the item, or select the item and use buttons Select and Remove. Use buttons Select All and Remove All to move all items.</p> <p>Use the <Removed> item to select all systems and peers already deleted from the TRBOnet Watch configuration.</p>
Systems (Event Viewer report)	This tab is similar to the Channels tab (above), except all displayed items are systems. Move to the Allowed Items panel all systems to be included in reports. Use < Removed > to include in reports all systems already deleted from the TRBOnet Watch configuration.
Peers (Frequency Usage report and chart)	This tab is similar to the Channels tab (above), except all displayed items are systems and peers. Move to the Allowed Items panel all systems peers to be included in reports and charts.
Session Types	Select the types of traffic to be included in reports and charts.

Figure 74: The Session Types tab

Tab	Description
	<p>Use presets Failed Calls and Interference to select the respective messages in the System section.</p> <p>Use Show only calls from subscriber radios to avoid multiplication of calls in a report for the case when a multi-site system is used and radio calls are transferred over sites.</p>
Senders	<p>Select subscribers whose outgoing traffic will be included in reports and charts.</p>  <p>To specify a mask, use digits and the following wildcards:</p> <ul style="list-style-type: none"> ▪ % to replace any number of digits in the subscriber number ▪ _ (undrescore) to replace one digit in the subscriber number <p>For instance, enter the mask _12%34_6 to filter out subscriber numbers 112003406, 91263476, and others.</p>
Recipients	<p>Select subscribers whose incoming traffic will be included in reports and charts. To specify a mask, see the Senders tab (above).</p>
RCM Messages (RCM Messages report)	<p>Select system messages to be included in reports.</p>  <p>Use presets Failed Calls and Interference to select the respective system messages.</p>
Threshold: Duration (All Channels Busy report and chart)	<p>Specify the minimum length (in seconds) of an All Channels Busy event to be included in reports and charts.</p>  <p>Select "0" to include All Channels Busy events of any duration.</p>

Tab	Description
Threshold: Level (All Channels Busy report and chart)	<p>Specify the number of channels that should be busy at the same time to report an All Channels Busy case.</p>  <p>Figure 78: The Threshold: Level tab</p> <p>Options:</p> <ul style="list-style-type: none"> ▪ All Channels Busy based on the number of allowed channels: The report and chart will include all channels specified on the Channels tab. ▪ All Channels Busy based on the specified level: The report and chart will include the number of channels specified in the Threshold level field rather than all selected channels.
Work Hours	<p>Specify the timeframe(s) during each reported day that will be included in reports and charts.</p>  <p>Figure 79: The Work Hours tab</p> <p>This filter applies after the time settings specified on the Date and Time menu.</p>

5.3.3.3 Adjusting Time Settings

To adjust the time settings of a report or a chart, expand the **Date and Time** menu.

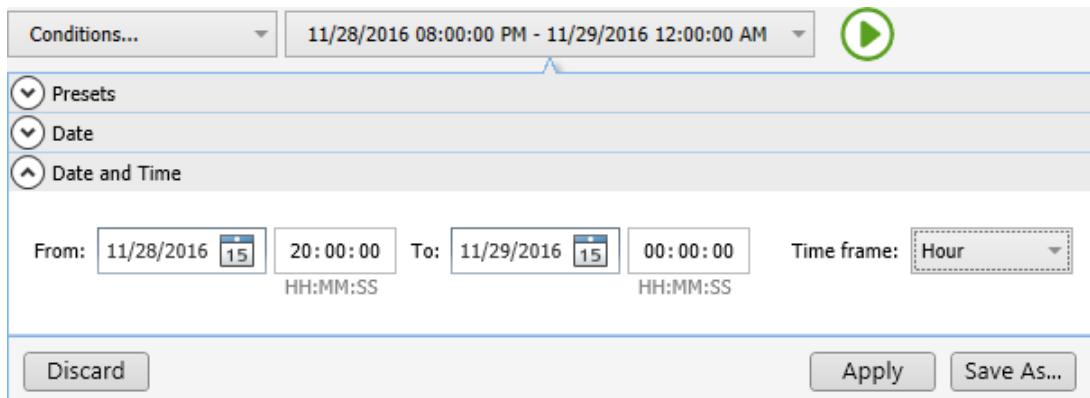


Figure 80: Date and Time menu

The menu includes the tabs described in Table 33. Applied are the time settings from the last updated menu tab. The settings on other menu tabs are ignored.

Table 33: Time settings

Tab	Description
Presets	Select the predefined time range. Note: Options Week to date and Business week to date start from Sunday and Monday, respectively. Options Month to date and Year to date start from the first day of the current month and year, respectively.
Date	Choose the operator (Between , Particular Date , Since , Before) and specify the start and/or end dates, or a particular date for your report or chart. Expand the Time frame menu and click the preferred timeframe for your report or chart. Click Apply .
Date and Time	Specify the start and end date and time for your report or chart. Expand the Time frame menu and click the preferred timeframe for your report or chart. Click Apply .

5.3.4 Using RSSI Levels Map

Use RSSI Levels: Map to visualize the actual coverage zone of your radio network on the electronic map. You can see on the map the RSSI levels measured in the selected system(s) during the predefined date and time range. The filter settings of RSSI Levels: Map are described in [Appendix A: Analytics and Reports](#) (page 88).

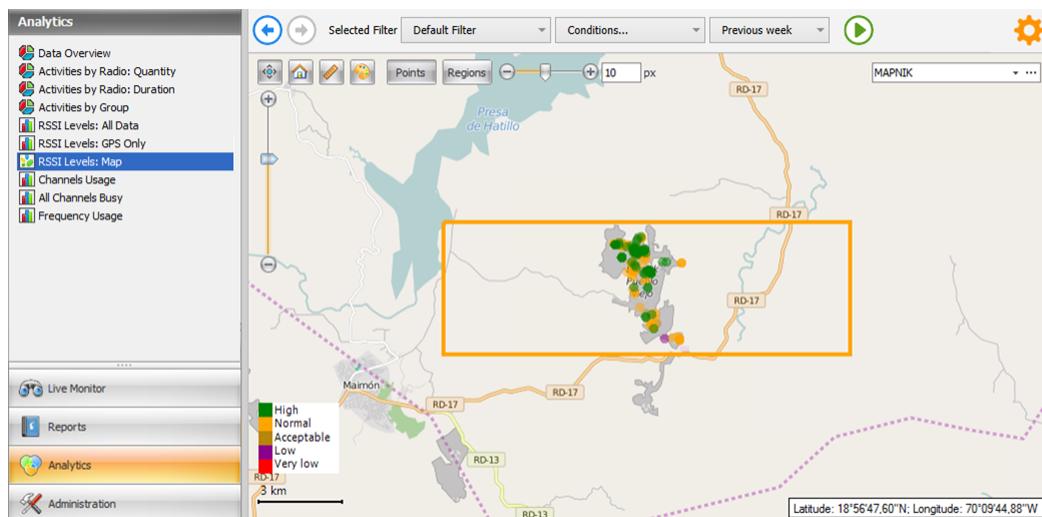


Figure 81: RSSI Levels Map

The coverage zone is presented on the map by the colored symbols (points or regions) in a rectangular frame.

- A point indicates the exact location of the RSSI signal.
- A region indicates a rectangular area where the RSSI signals are measured. The map is divided into regions of equal size. A region is colored if any RSSI signals are detected in this area. If pointed with a mouse cursor, the region shows its square, the number of RSSI signals, and the average RSSI level.

The color of the symbol informs you about the RSSI level. The colors of all RSSI level groups appears in the legend in the left corner at the bottom of the map. The threshold values that define the RSSI groups are configured in the map settings. For details, refer to section [5.3.4.1, Configuring Map Usage](#) (page 75).

When working with RSSI Levels: Map, you can utilize the following features and modes.

Table 34: Using RSSI Levels: Map features and modes

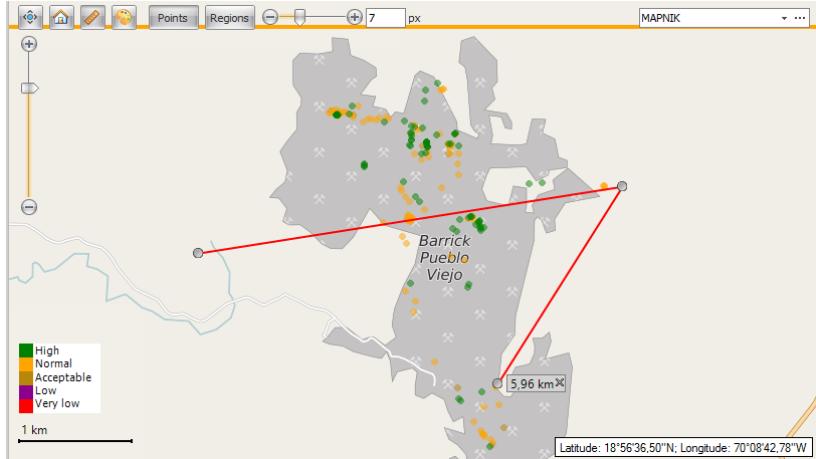
Feature	Description
Zoom	<p>You can rescale the map using zoom controls. The actual scale is shown in the left corner at the bottom of the map.</p> <p>The following zoom options are supported:</p> <ul style="list-style-type: none"> ▪ Click buttons Zoom Out and Zoom In to rescale the map accordingly. ▪ Move the scroll button to rescale the map with a smaller step. ▪ Draw a rectangle over the map, keeping the secondary mouse button pressed. The selected area is rescaled to the map size. <p>Note: If the distance measure mode is enabled, you cannot rescale the selected area.</p>
Pan	<p>You can drag the map with the mouse, keeping the primary mouse button pressed. While in the panning mode, the mouse cursor looks like a "pan" icon. Release the primary mouse button to exit the panning mode.</p>
Moving to the next RSSI site	<p>You can automatically navigate between multiple RSSI sites –the distant locations where the RSSI signals were detected. The map displays the current RSSI site in a rectangular frame.</p> <p>To relocate to the next RSSI site, click the Move to next RSSI site button.</p>
Distance measure	<p>You can measure the distance between two or more points on the map.</p> <ol style="list-style-type: none"> 1. Click the Distance measure button to enable the distance measure mode. 2. Double-click the starting point of the path. The tooltip shows the distance of 0.00 km. 3. Double-click every next point of the measured path and see the path and the tooltip showing the incremented distance.  <p>The screenshot shows a map interface with a legend on the left indicating RSSI levels: High (green), Normal (yellow), Acceptable (orange), Low (purple), and Very low (red). A red line represents a distance measurement path. A tooltip on the path indicates a distance of 5.96 km. The map includes geographical features like 'Barrick Pueblo Viejo' and a scale bar for 1 km. The top of the interface has various toolbars and a status bar showing coordinates.</p>

Figure 82: Distance measuring

Feature	Description
	<p>4. To stop, exit the distance measure mode by clicking the Distance measure button again, or by clicking the Pan button. The measured path disappears from the map.</p> <p>To start a new measurement, enable the distance measure mode again.</p>
Fill mode	<p>You can fade out the map to see the colored RSSI symbols (points or regions).</p> <ul style="list-style-type: none"> ▪ To fade out the map, click the Fill mode button and enable the fill mode. ▪ To exit the fill mode, click the Fill mode button again. <p>Note: The fill mode feature needs to be enabled and configured in the RSSI Levels: Map settings. For details, refer to section 5.3.4.1, Configuring Map Usage (page 75).</p>
Symbols	<p>Choose Points or Regions to see the RSSI signals on the map as dots or rectangular areas.</p> <p>Note: You can configure the size of RSSI symbols as described in section 5.3.4.1, Configuring Map Usage (page 75).</p>
Replaceable maps	<p>Expand the list of maps and select the preferred map. The selected map replaces the previous one automatically.</p> <p>Note: The list of maps can be configured. For details, refer to section 5.3.4.1, Configuring Map Usage (page 75).</p>
Cursor coordinates	<p>When you move the mouse cursor over the map, you can see the geographical coordinates of the cursor in the right lower corner.</p> <p>You can show or hide the cursor coordinates as described in section 5.3.4.1, Configuring Map Usage (page 75).</p>

5.3.4.1 Configuring Map Usage

RSSI Levels: Map can display all kinds of geographical maps that you download and select for use. You can configure automatic update of the selected maps and enable other map features.

To configure map settings:

1. Go to **Analytics** and click **RSSI Levels: Map** in the **Analytics** pane.
2. Click the **Settings** button on the navigation toolbar.
3. In the **Map settings** dialog box, configure the following settings:

Table 35: Configuring RSSI map settings

Control/operation	Description
RSSI Coverage tab	Configure RSSI thresholds and graphical indication of RSSI signals on the map.
Symbol	Select the symbols to show the location of the measured RSSI signals on the map. Options: <ul style="list-style-type: none"> ▪ Points: Select to display RSSI signals as points. Readjust the point size (in pixels) if necessary.

Control/operation	Description
	<ul style="list-style-type: none"> ▪ Regions: Select to display RSSI signals in rectangular areas (regions). Readjust the rectangle size (in meters) if necessary. <p>Note: When you open the map, the selected symbols are used by default. You can switch between points and regions on the map.</p>
Rssi thresholds	Configure RSSI thresholds as described in section 5.3.2.1, Configuring RSSI Settings (page 66).
Maps tab	Configure the list of geographical maps that you can use in RSSI Levels: Map.
Add an online map	<ol style="list-style-type: none"> 1. Click the Add button and click Add Online Map on the context menu. 2. In the Add Map dialog box, specify the type of map: <ul style="list-style-type: none"> ▪ Predefined: Select to restore an online map installed with the product and then removed. Expand the drop-down list and select the map to add. ▪ Custom: Specify the URL of the preferred online map. 3. Click OK to close the dialog box. <p>Note: Learn more about supported online maps at page 109.</p>
Add a T-Map	<ol style="list-style-type: none"> 1. Click Add and then click Add T-Map on the context menu. 2. Navigate to the TMAP file stored in the local folder and click Open. <p>Note: Learn more about supported offline maps at page 109.</p>
Remove a map from the list	Select the map in the list and click the Remove button.
Reorder the maps in the list	Select the map. Click the Up and Down buttons to change the position of the selected map in the list. The maps appear in the drop-down list in RSSI Levels: Map on the configured position.
Advanced tab	Configure automatic update for online maps, the use of fill mode, and the use of the cursor coordinates.
Cache folder	Specify the cache folder for downloading online maps automatically.
Update	Specify the period (in days) for automatic online map updates.
Bing key	Enter the Bing Maps key. Click the link below to see how to get a Bing Maps key.
Map overlay	Expand the dropdown menu and click No fill to disable the use of the fill mode in RSSI Levels: Map, or select Fill all map to enable it. To learn more about the fill mode, refer to section 5.3.4, Using RSSI Levels Map (page 73).
Color	If the fill mode is allowed, click to select the web color for the fill layer.
Transparency	If the fill mode is allowed, adjust the transparency of the fill layer.
Show cursor coordinates	Select this option to show the coordinates of the mouse cursor moved over the map. Clear the box to hide the coordinates.

3. Click **OK** to save the settings and exit the dialog box, or click **Cancel** to exit without saving.

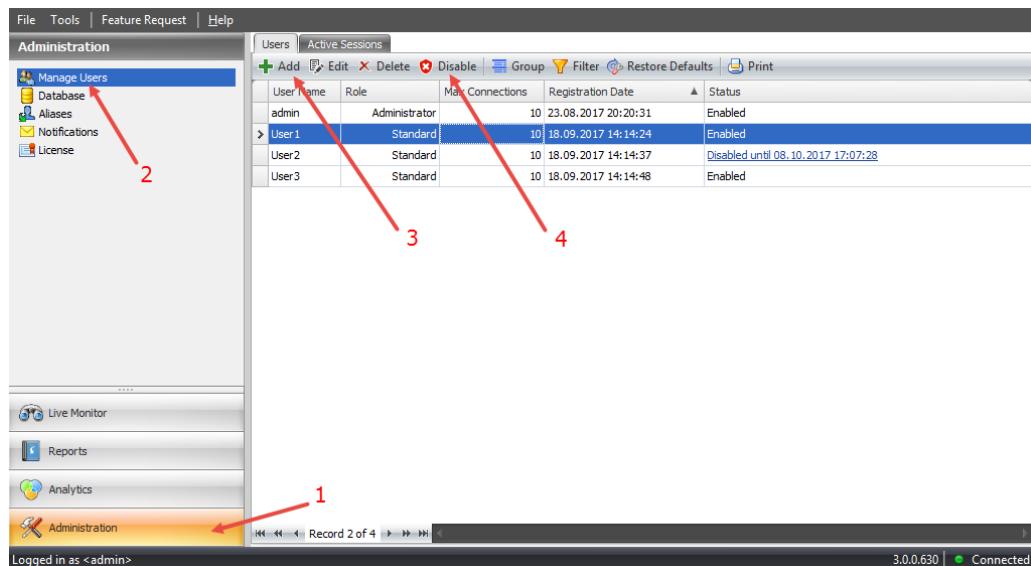
5.4 Administration

This section describes the administrator's operations in the TRBOnet Watch Console.

5.4.1 Managing Users

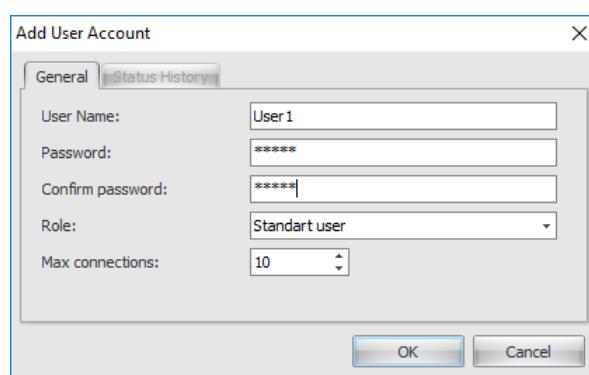
The administrator can add, edit, and delete users in the TRBOnet Watch Console. In addition, the administrator can ban users for a certain time period.

- Click **Administration** (1) and in the Administration pane click **Manage Users** (2).



5.4.1.1 Adding a User Account

- In the right pane, click the **Add** button (3).



In the 'Add User Account' dialog box, specify the following parameters:

▪ **User Name**

Enter a name for the user.

Note: The user name must not contain white spaces.

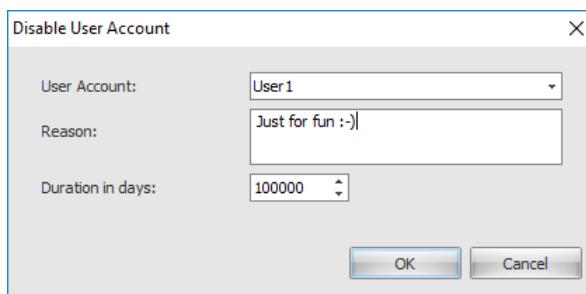
▪ **Password**

Type in the individual password for the user.

- **Confirm password**
Enter the password again.
- **Role**
From the drop-down list, select the role of the user you are adding (Administrator or Standard user).
- **Max connections**
Specify the maximum number of connections to the Watch Console from the user account.

5.4.1.2 Disabling a User Account

- Select the user and click the **Disable** button (4).



In the 'Disable User Account' dialog box, specify the following parameters:

- **Reason**
Enter the reason you are disabling the user.
- **Duration in days**
Enter the number of days during which the user will not be allowed to connect to the Watch Console.

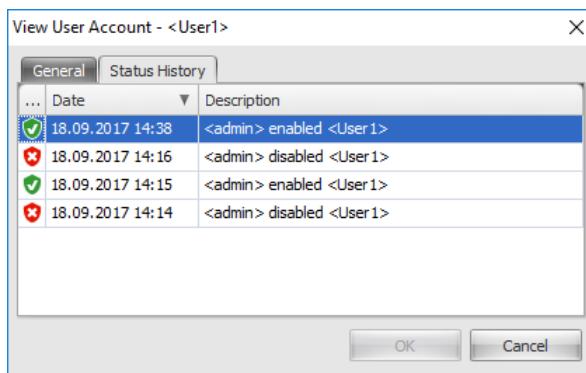
5.4.1.3 Enabling a User Account

To re-enable a disabled user before the disability duration expires:

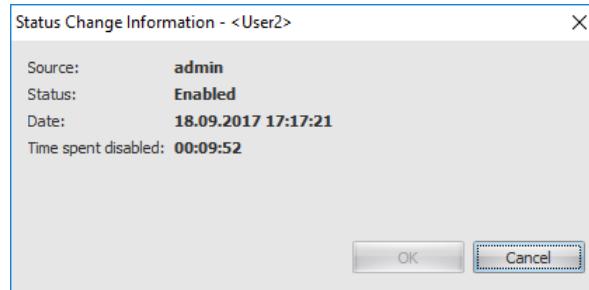
- Select a user with the status "Disabled" (5) and click the **Enable** button (which appears on the toolbar in place of the **Disable** button when the selected user is disabled).

5.4.1.4 Inspecting a User Account

- Double-click the desired record in the list of users.
- In the 'View User Account' dialog box, click the Status History tab.



- Double-click the entry of interest in the history list.



5.4.2 Managing Aliases

Aliases are the descriptive names that you can optionally assign to system peers, radios, and talk groups. Compared to numeric object identifiers, aliases help you easier identify objects in Live Monitor, in reports, and in the TRBOnet Watch configuration.

Note: Aliases that you assign in the TRBOnet Watch Console are only visible in your console and in other consoles connected to your TRBOnet Watch Server. If you assign an alias to a repeater, the repeater configuration is not affected.

To assign or edit aliases in the TRBOnet Watch Console, click **Administration** and then **Aliases** in the left panel. The right panel includes tabs **Radios**, **Groups**, and **Peers** that have similar controls.

Note: Avoid creating aliases for instances that you do not monitor regularly. Using aliases slows down the update of Watch console tabs where aliases are displayed.

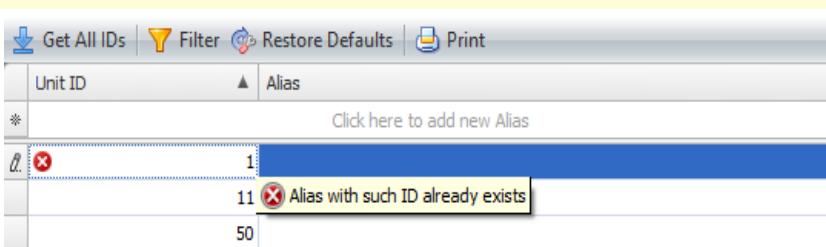
Unit ID	Alias	Type
Click here to add new Alias		
101		Not Selected
102	radio 102	Portable
103	radio103	Portable
104		Not Selected
105		Not Selected
106		Portable
108		Mobile
117		Not Selected

Figure 83: Managing aliases

The list displays all system objects particular to the selected tab – radios, or talk groups, or peers. The list columns include:

- **Unit ID:** The identifier of the system object.
- **Alias:** The alias assigned to the object, or an empty field.
- **Type:** Appears on the **Radios** tab only. Expand the **Type** menu and specify the type of the radio – portable or mobile. All radios have their types set to "Not Selected" by default.

Table 36: Operations with aliases

Operation	Description
Add a new entry	<p>Click the Click here text to add a new alias to the first line in the list. Then enter unique values in the new line. Press Enter or click any other row.</p> <p>The list is resorted by field Unit ID in the ascending order. The new row is inserted to the position according to the entered Id.</p>
Type an alias	<p>Select the row and start typing, or click the Alias field and type the alias. To leave the edit mode, press Enter, or move to another row, or click any other field.</p> <p>Note: If you have dropped the cursor to the Unit ID field, the field is cleared. You must enter a unique ID. An attempt to enter the cleared or existing ID or leave the field without editing will result in the error message Wrong ID or Alias with such ID already exists.</p>  <p>To resolve this error, press Alt or click the Get All IDs toolbar button.</p>
Delete a row	<p>Select the row(s) and press Del. Confirm the deletion in the popup box.</p> <p>Note: The deleted row cannot be restored with the Undo command.</p>
Restore an ID	If you have modified or deleted an ID that was loaded automatically, restore it by clicking the Get All IDs toolbar button.

5.4.3 Managing Notifications

TRBOnet Watch can send a sound and/or email notification if a particular alarm is raised in the system.

- Sound notifications are played back to TRBOnet Watch Console operators. A popup box appears in the console to let the operator stop the sound alert.
- Email notifications are sent to the preconfigured email addresses.

In the left pane of the TRBOnet Watch Console, click Administration and then Notifications.

Sound notification

Sound notification is enabled if you see the "Sound notification enabled" message in the Notifications pane.

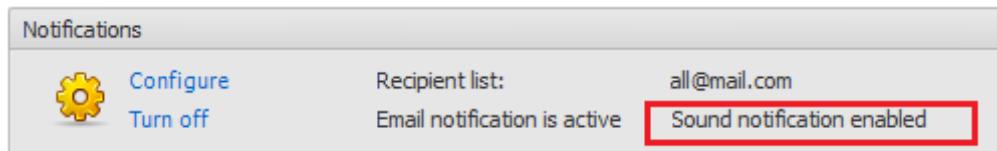


Figure 84: Sound notification status

This feature is activated automatically when at least one sound notification is selected for use in the settings. To deactivate the feature, keep all sound notifications not selected. Find the details in section [5.4.3.2, Selecting Notifications](#) (page 82).

Email notification

Email notification is enabled if you see the "Email notification is active" message in the Notifications pane.

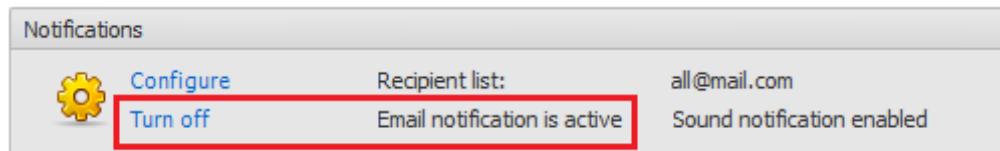


Figure 85: Email notification status

To use email notification:

1. Specify the mail server settings and the email sender and email recipients. Find the details in section [5.4.3.1, Configuring Email Settings](#) (page 81).
2. Select email notifications as described in section [5.4.3.2, Selecting Notifications](#) (page 82).
3. Activate the email notification feature by clicking Turn on in the Notifications panel. To deactivate the feature, click Turn off in the Notifications panel.

5.4.3.1 Configuring Email Settings

To be able to send email notifications, specify the mail server connection and email message fields.

To configure email settings:

1. In the left pane of the TRBOnet Watch Console, click **Administration** and then **Notifications**.
2. Click **Configure** in the **Notifications** panel.
3. In the **Notification Settings** dialog box, click **Email**.
4. Specify the following email connection settings:

Table 37: Email connection settings

Setting	Description
SMTP server host or IP	The host name or IP address of the SMTP server.
SMTP server port	The port of the SMTP server. Default: 25 for non-SSL communication, 465 for SSL.
Use SSL	Select to enable the use of SSL protocol; leave empty otherwise.
Authentication type	The type of authentication on the SNMP server side. Options: <ul style="list-style-type: none"> ▪ Anonymous access: Login to SNMP server anonymously. ▪ Windows authentication: Login to SNMP server as a Windows user.

Setting	Description
	<ul style="list-style-type: none"> ▪ SNMP user name and password: Login to SNMP server as an SNMP user. Specify the user name and password in the fields below.
User name	The name of the SNMP user.
Password	The password of the SNMP user.
Sender	The email address to be shown in the From field of each email notification.
Recipients	<p>The list of email recipients.</p> <ul style="list-style-type: none"> ▪ To add a recipient, click Add and enter the email address of the notification in the popup window. Click OK. ▪ To remove a recipient, click it in the list and then click Delete.

5. Click **OK** to save the settings and close the dialog box.

5.4.3.2 Selecting Notifications

In the TRBOnet Watch Console, click Administration and then Notifications in the left pane. Click **Configure** in the **Notifications** panel.

In the **Notification Settings** dialog box, click **Sound Alerts** to see all predefined sound notifications. To see all email notifications, click **Email Notifications**. The lists of predefined notifications are similar on both tabs.

The **Default Notifications** list (Figure 86) includes hardware events that can be raised in particular or all types of systems. Expand the list and click the arrow in the field next to the event that you need to handle. Select **True** to select the event; select **False** otherwise.

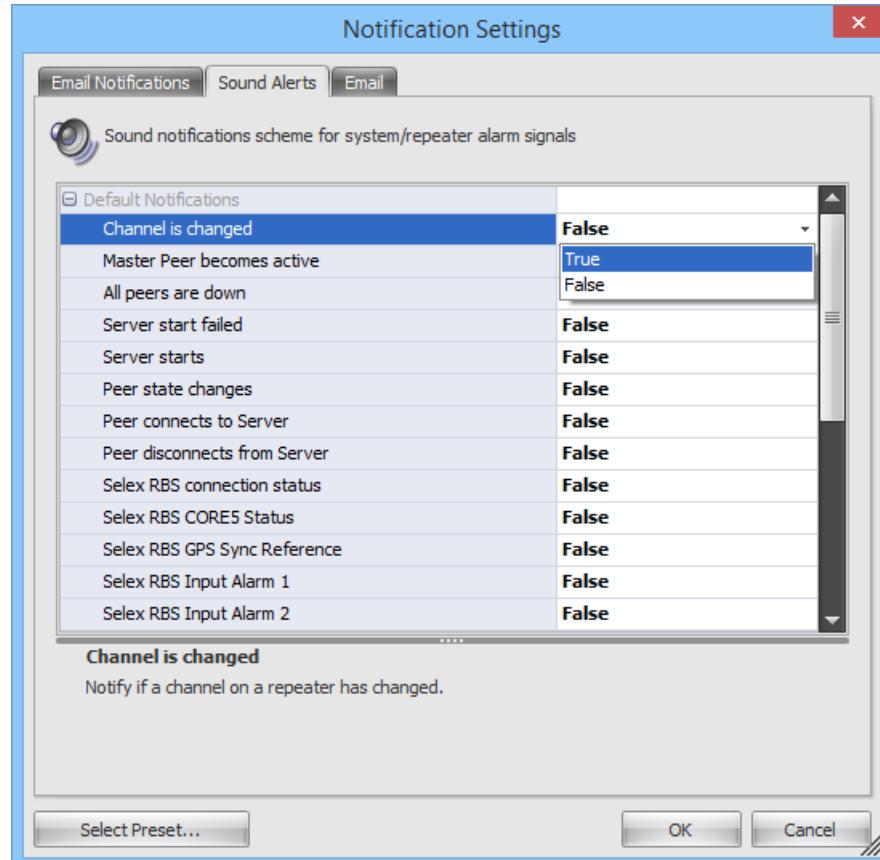


Figure 86: Configuring sound notifications

The **RDAC Notifications** list includes repeater events. Expand the list and click the arrow in the field next to the event that you need to handle. Select the required option:

- **None:** The notification is not selected.
- **Detected:** The notification is sent when the repeater issue is detected.
- **Released:** The notification is sent when the repeater issue is released.
- **Both:** The notification is sent in both above cases.

To quickly select all notifications, or high or medium severity notifications in all lists, click **Select Preset** and select the respective option. RDAC notifications are selected as **Both** by default.

To undo all selections in all lists, click **Select Preset** and select **None**.

5.4.3.3 Monitoring Notifications

To monitor notifications in the TRBOnet Watch Console, click **Administration** and then **Notifications** in the left pane.

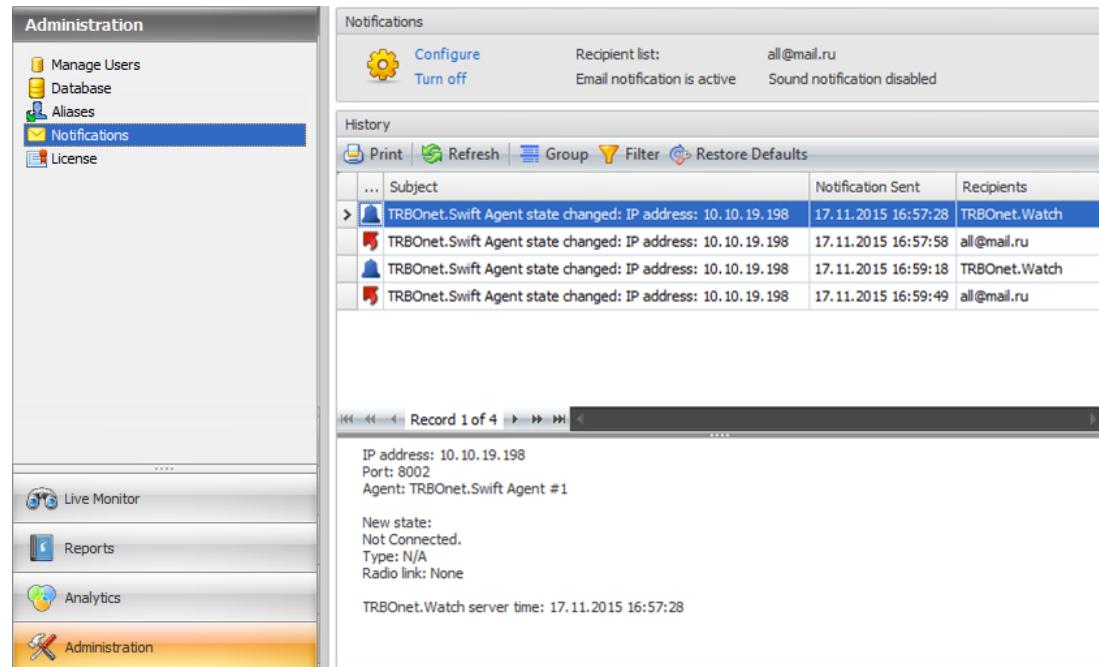


Figure 87: Viewing notifications

The **History** panel displays the list of generated notifications sorted by date and time. The "bell" icon indicates a sound notification, the green "arrow" icon indicates a sent email notification, the red "arrow" indicates an email notification not sent. The remaining fields are:

- **Subject:** The notification subject.
- **Notification Sent:** The date and time when the notification was sent to the recipient.
- **Recipients:** The notification recipients. Sound notifications always show TRBOnet.Watch and email notifications show the list of email recipients.

If you select a notification, the notification details appear in the pane below the list.

5.4.4 Viewing the License Information

To see the current license permissions in the TRBOnet Watch Console, click **Administration** in the left pane of the TRBOnet Watch Console, then click **License**.

5.4.5 Viewing the Database Information

To see the information about the TRBOnet Watch database, click **Administration** in the left pane of the TRBOnet Watch Console, then click **Database**.

The **Database** pane displays the information about the installed SQL Server application, the size of the database and transaction logs, and the date of the last backup. Check with these figures to plan the next date of maintenance or to adjust the existing maintenance schedule.

To learn more about maintenance of the TRBOnet Watch database, refer to section [4.5.2, Configuring Database Maintenance](#) (page 15).

Note: The information in the **Data size**, **Log size**, and **Backup date** fields is updated every time you open the **Database** pane. This data is not updated in real time.

6 TRBOnet Watch Mobile

This section describes how to install and configure TRBOnet Watch Mobile which is a software application for Android smartphones that provides important TRBOnet Watch information.

6.1 Installation

The latest version of the TRBOnet Watch Mobile software application is available for download on Google Play ([Google Play](#)).

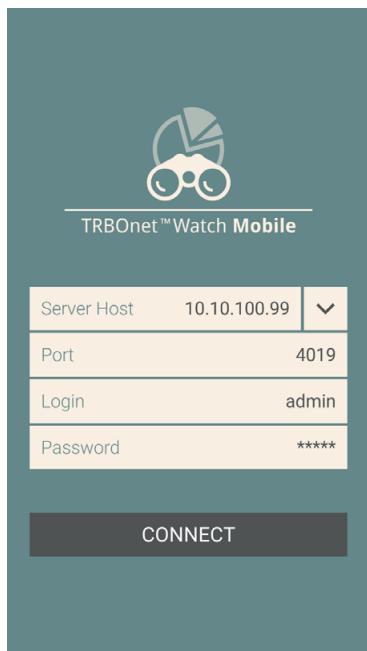
To install TRBOnet Watch Mobile:

1. Visit [Google Play](#) from your mobile device.
2. Type "TRBOnet Watch Mobile" in the **Search** box and run the search.
3. Tap the TRBOnet Watch Mobile application, then tap the **Install** button.

6.2 Configuration

6.2.1 Connecting to TRBOnet Watch Server

When you launch TRBOnet Watch Mobile, the Connect page appears on the screen.



- **Server Host**

Enter the IP address of the PC where TRBOnet Watch Server is running.

- **Port**

Enter the port number that TRBOnet Watch Server uses for communication.

- **Login**

Enter the login registered in the TRBOnet Watch Console Users list (see section [5.4.1, Managing Users](#) on page 77).

- **Password**

Enter the appropriate user password.

Note: The default Administrator credentials are **admin** for the login and **admin** for the password.

- Tap the **Connect** button.

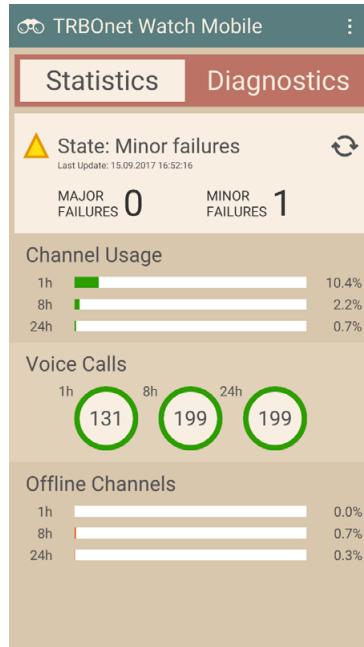
The main page of the application appears on the screen.

6.3 Operation

Once you have connected to TRBOnet Watch Server, you'll see the following screens.

6.3.1 Statistics

On the Statistics screen, you see the following information:



- **State**

Displays the state of the radio systems connected to TRBOnet Watch Server. If there are some failures, their number and severity will be displayed below.

- **Channel Usage**

Displays the statistics for busy channels over the radio systems during the specified periods (1 h, 8 h, and 24 h), in percent.

- **Voice Calls**

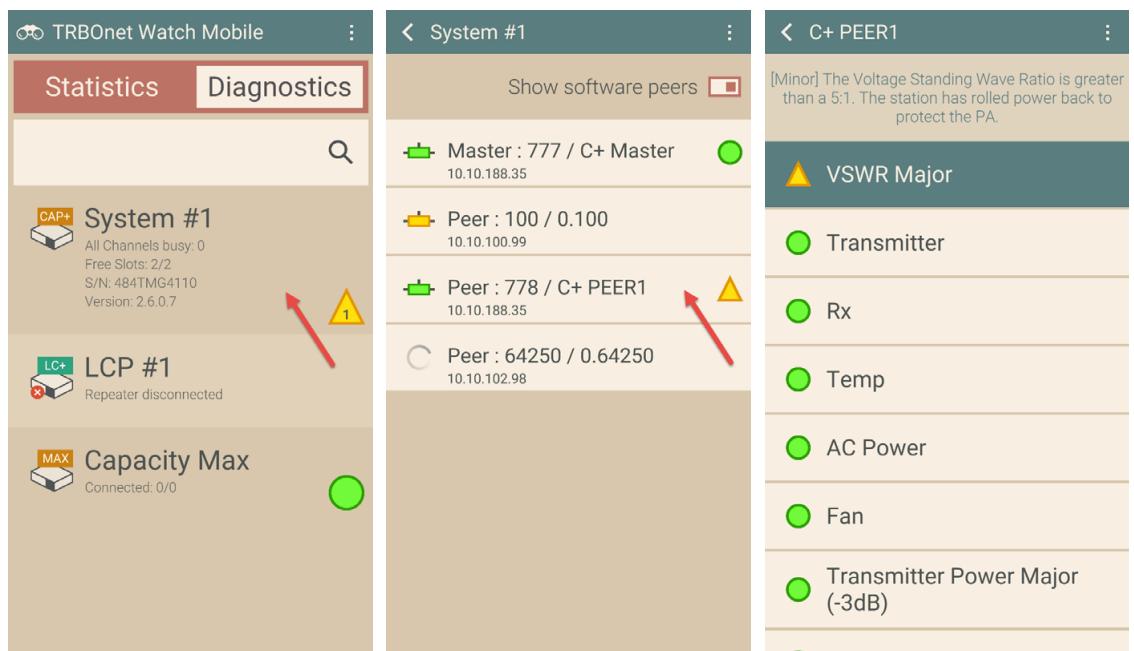
Displays the total number of voice calls made over the radio systems during the specified periods.

- **Offline Channels**

Displays the statistics for disconnected channels over the radio systems during the specified periods, in percent.

6.3.2 Diagnostics

On the Diagnostics screen, you see a list of radio systems connected to TRBOnet Watch Server. Tap the desired system and then tap the repeater to be diagnosed.



For the meaning of alarm icons, see section [5.2.1.3, Viewing Diagnostics](#).

Appendix A: Analytics and Reports

A.1 Analytics

This section includes the description of all predefined charts that TRBOnet Watch can generate. Presented below are the detailed descriptions of all charts, including their goals, required filter settings, chart settings, and supported features.

To learn more about the filter settings, refer to section [5.3.3, Using Filters](#) (page 68).

A.1.1 Data Overview

The Data Overview charts summarize the workload of the specified channel(s) and show traffic in these channels sorted by type.

Table 38: Data Overview charts – filter settings

Setting	Description
Channels	The channels whose traffic is included in the charts.
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

A.1.1.1 Messages by Type

The Messages by Type pie chart shows the percentage of each type of traffic in the monitored channel(s) during the reported time. The whole traffic in all monitored channels makes 100%.

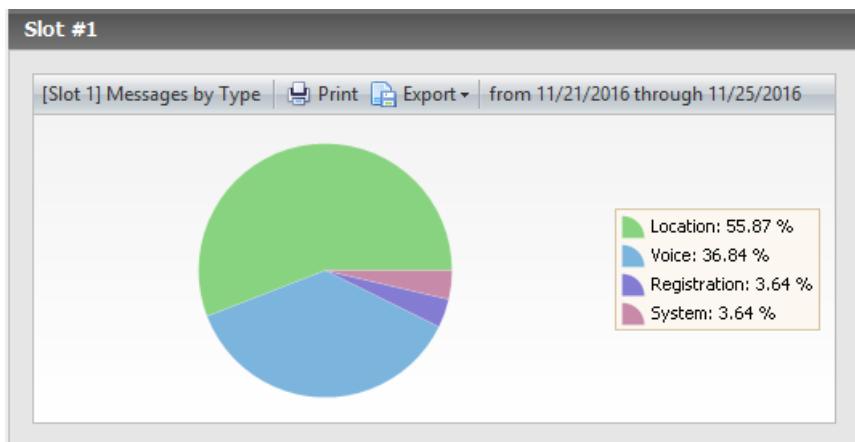


Figure 88: Messages by Type chart

- The reported time is displayed on the chart's toolbar.
- The colored slices indicate the amount of each type of traffic transmitted in the selected channels during the specified time.
- The legend shows the color, the type of traffic, and the percentage of this type of traffic in the pie chart.

A.1.1.2 Loading Level of the Channels

The Loading Level of the Channels line chart shows the workload (%) of the selected channel(s) during the reported time.

The number of channels affects the layout of the chart:

- For a MOTOTRBO IPSC system, two charts (Slot 1 and Slot 2) are displayed.
- If a single IP gateway or multiple systems are selected, the chart calculates and displays the average workload for all channels.

Note: To get the individual workload of each channel in a multi-channel configuration, use the Channels Usage chart.

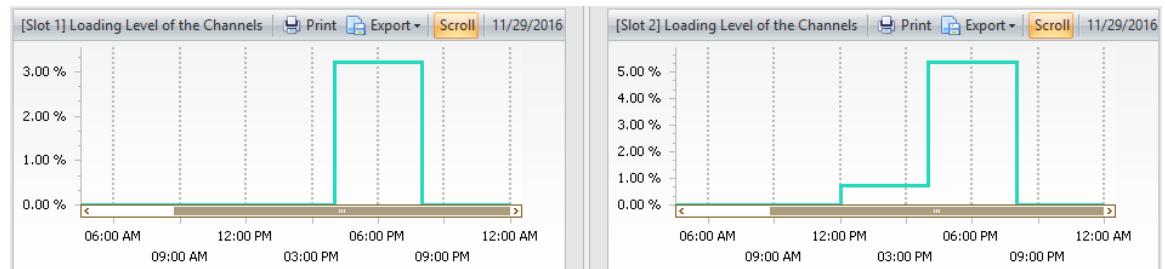


Figure 89: The loading level in the time slots of a MOTOTRBO IPSC system

- The X-axis shows the reported time divided into timeframes. These time settings are displayed on the chart's toolbar next to the **Scroll** button.
- The Y-axis shows the workload (%) of the selected channel(s). The workload is calculated in each timeframe as the total time when the channels were loaded, divided by the total time when they were connected.
- The color of the line indicates the connection status of the channel(s). The red line indicates that all reported channels were disconnected during the entire timeframe. If any channel was connected even for a minimum time interval within the timeframe, the line is blue.

Note: A channel is disconnected if the repeater is not connected to TRBOnet Watch over IP or if the IP gateway is not connected to a radio.

To drill down into a particular timeframe, click the blue line in that timeframe. You cannot drill down into a timeframe where the line is red ("no connection").

A.1.2 Activities by Radio: Quantity

The Activities by Radio: Quantity charts visualize the amounts of different types of traffic created by the most active radios in the specified channels during the reported time.

Table 39: Activities by Radio: Quantity charts – filter settings

Setting	Description
Channels	The channels whose traffic is included in the charts.
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

A.1.2.1 Top 5 Most Active Radios

The Top 5 Most Active Radios pie charts show the five most active radios in sending each type of traffic – voice, GPS, ARS, all other types, and all types (summary). Each type of traffic is presented by a pie chart where the slices show the percentage of traffic generated by each radio in the monitored channel(s) within the reported time.

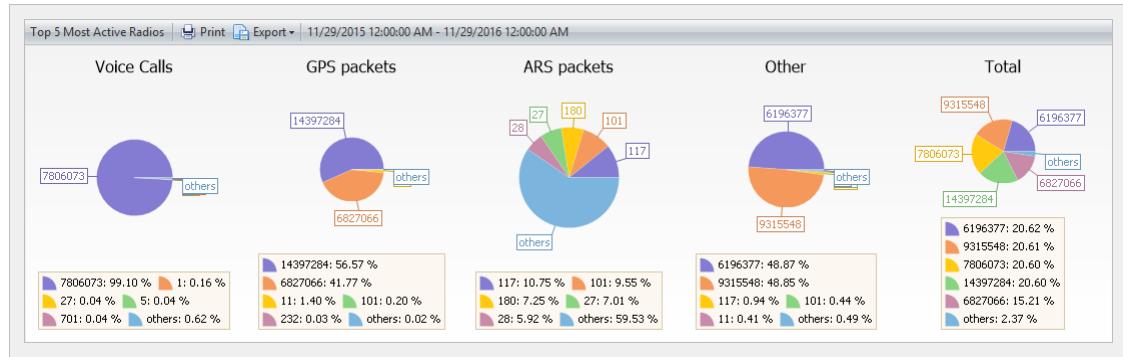


Figure 90: The percentage of call sessions initiated by 5 most active radios

- In each chart, all call sessions initiated by all active radios make 100%.
- Each radio is presented by a slice of a different color.
- The legend indicates the color and the radio ID, and the percentage of call sessions of a given type initiated by this radio.
- The reported time is displayed on the chart's toolbar.

To drill down into voice and data activity of a particular radio, click the respective slice in any chart.

A.1.2.2 Activity by Radio

The Activity by Radio list shows the number and duration of call sessions (voice, GPS, ARS, all other, all) initiated by each top five active radio in the reported time.

Table 40: Activity by Radio list - fields

Field (level 1)	Field (level 2)	Description
Radio	ID	The radio ID of the top five active radio.
Voice calls, total	Quantity	The number of voice calls initiated by the radio in the reported time.
	Duration	The duration of all voice calls initiated by the radio in the reported time. Format: dd.hh:mm:ss.ms
	Average duration	The average duration of a voice call initiated by the radio. Format: dd.hh:mm:ss.ms
GPS packets, total	Quantity	The number of GPS calls initiated by the radio in the reported time.
	Duration	The total duration of GPS calls initiated by the radio in the reported time. Format: dd.hh:mm:ss.ms
	Quantity	The number of ARS calls initiated by the radio in the reported time.

Field (level1)	Field (level 2)	Description
ARS packets, total	Duration	The total duration of ARS calls initiated by the radio in the reported time. Format: dd.hh:mm:ss.ms
Other, total	Quantity	The number of calls other than voice, GPS, and ARS, initiated by the radio in the reported time.
	Duration	The total duration of calls other than voice, GPS, and ARS, initiated by the radio in the reported time. Format: dd.hh:mm:ss.ms
Total	Quantity (%)	The total amount of all traffic (%) generated by the radio in the selected channel(s) during the reported time. Traffic generated by all most active radios makes 100%.
	Duration (%)	The total duration of all calls initiated by the radio in the reported time.

To drill down into details about a particular radio, click the respective line in the list.

A.1.2.3 Voice Activity for Radio

The Voice Activity for Radio chart shows the number of group calls, private calls, and All Calls initiated by the radio in each timeframe of the reported time.

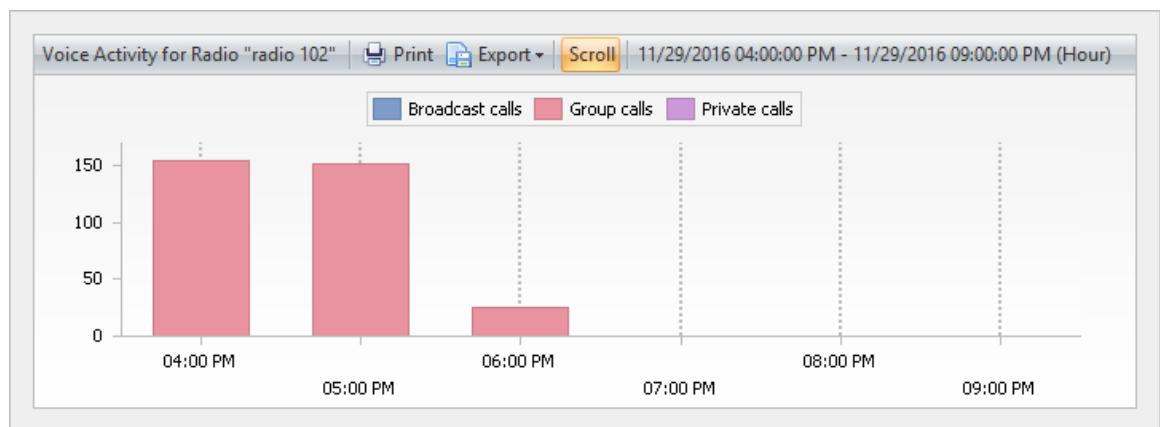


Figure 91: Voice activity of "radio 102"

- The legend indicates the color for each voice call type.
- The X-axis shows the reported time divided into timeframes.
- The Y-axis shows the number of voice calls.
- The height of each bar indicates the total number of calls made in the timeframe. Bars may include sections of different colors, indicating different call types initiated by the radio.
- The cursor pointed at a bar shows the tip that reveals the call details (the timeframe, the call type, the number of calls and their total duration).

To drill down into a particular timeframe, click the respective bar. If the bar has sections of different color, click any section. To define the timeframe of the new chart to which you drill down, point the bar and click the arrow. Click the preferred timeframe on the context menu.

A.1.2.4 Data Activity for Radio

The Data Activity for Radio chart shows the number of data calls of different types initiated by the radio in each timeframe of the reported time.

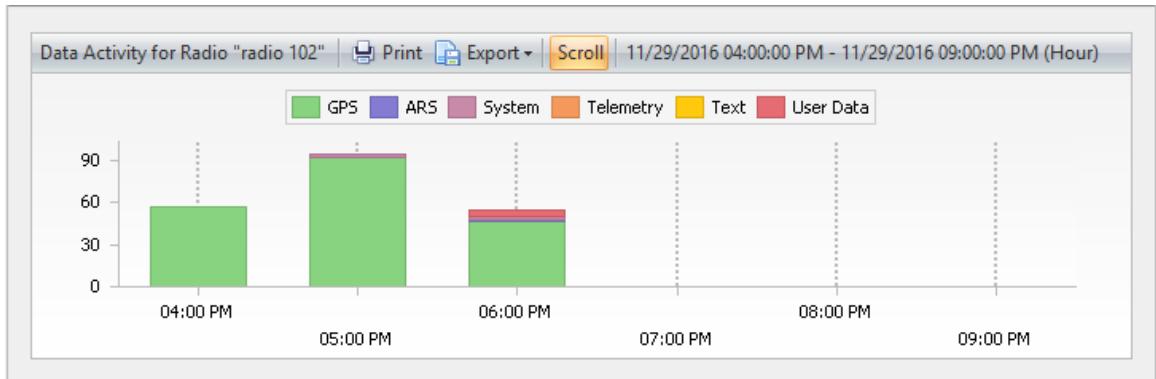


Figure 92: Data activity of "radio 102"

- The legend indicates the color for each data call type.
- The X-axis shows the reported time divided into timeframes.
- The Y-axis shows the number of data calls.
- The height of each bar indicates the total number of data calls made within the timeframe. Bars may include sections of different colors, indicating different call types initiated by the radio.
- The cursor pointed at a bar shows the tip with the call details (the timeframe, the data call type, the number of calls and their total duration).

To drill down into a particular timeframe, click the respective bar. If the bar has sections of different color, click any section. To define the timeframe of the new chart to which you drill down, point the bar and click the arrow. Click the preferred timeframe on the context menu.

A.1.3 Activities by Radio: Duration

The Activities by Radio: Duration charts visualize for how long the specified channels were busy transferring traffic of each of the five most active radios.

The filter settings and the included charts are similar to the ones described in section [A.1.2, Activities by Radio: Quantity](#) (page 89). The major difference is that the Activities by Radio: Duration charts show the duration of call sessions rather than their quantity. The Activity by Radio list is completely identical to the one included in the Activities by Radio: Quantity charts.

A.1.4 Activities by Group

The Activities by Group charts visualize the traffic in the most active talk groups in the selected channels during the reported time.

Table 41: Activities by Group chart – filter settings

Setting	Description
Channels	The channels whose traffic is included in the charts.
Work Hours	The time interval(s) within the reported time to be included in the charts.

Date and Time	The reported time and the timeframe.
----------------------	--------------------------------------

A.1.4.1 Top 5 Most Active Groups

The Top 5 Most Active Groups pie chart shows the percentage of voice traffic generated by each of the most active talk groups in the selected channel(s) during the reported time. Traffic generated by all talk groups makes 100%.

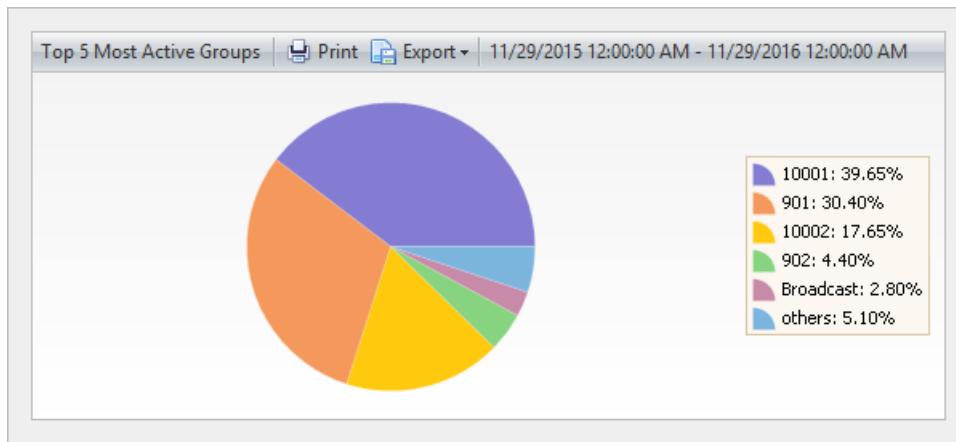


Figure 93: The percentage of traffic generated by the five most active groups

- Each talk group is presented by a slice of a different color.
- The legend indicates the color of the talk group, the talk group name, and the percentage of traffic generated in the talk group.
- The reported time is displayed on the chart's toolbar.

A.1.4.2 Group's Activity

The Group's Activity list shows the number and duration of group calls in each of the five most active talk groups during the reported time. The list also shows the share (%) of each talk group in the common voice traffic generated by all most active groups.

Table 42: Group's Activity list - fields

Field (level1)	Field (level 2)	Description
Group	ID	The talk group number.
Voice calls	Quantity	The number of voice calls initiated in the talk group in the reported time.
	Duration (d.h:m:s.ms)	The duration of all voice calls initiated in the talk group during the reported time.
	Average duration (d.h:m:s.ms)	The average duration of a voice call initiated in the talk group.
Total	%	The percentage of voice traffic (%) generated by the talk group during the reported time. Traffic generated by all talk groups makes 100%.

A.1.5 RSSI Levels: All Data

The RSSI Levels: All Data charts visualize the quality of voice and data calls in the selected channels based on the signal strength. Calls with the measured signal strength are evaluated to one of the preconfigured RSSI levels and displayed in the charts with a particular color. Find the details in section [5.3.2.1, Configuring RSSI Settings](#) (page 66).

Table 43: RSSI Levels: All Data chart – filter settings

Setting	Description
Channels	The channels whose traffic is included in the charts.
Senders	The radio ID whose outgoing traffic is included in the charts.
Recipients	The radio ID whose incoming traffic is included in the charts.
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

Note: The RSSI Levels: All Data charts require at least 10 calls with the measured signal strength. Otherwise, you get the "Data not found" message.

A.1.5.1 RSSI by Thresholds

The RSSI by Thresholds pie chart shows the percentage of calls with different RSSI levels transferred in the selected channels within the reported time.

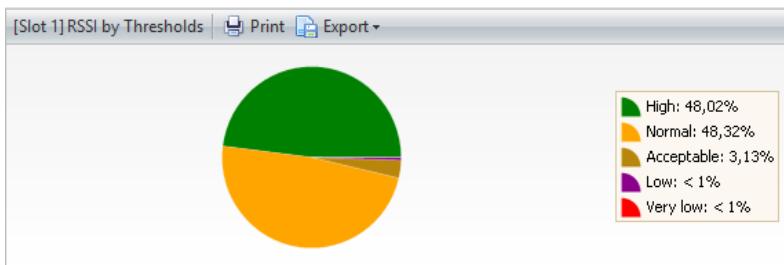


Figure 94: The amount of traffic per RSSI level band

- The colored slices indicate calls evaluated to different RSSI levels.
- The legend indicates the color and the name of the RSSI level, and the percentage of voice and data calls with this RSSI level.

A.1.5.2 Relative Rssi Frequency by Thresholds

The Relative Rssi Frequency by Thresholds area chart shows the distribution of calls by RSSI levels in the selected channels(s) during the reported time.

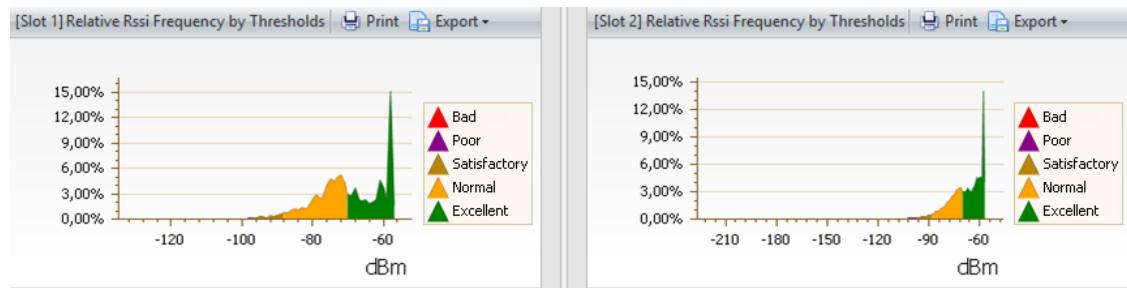


Figure 95: A MOTOTRBO IPSC system traffic ranged by RSSI level thresholds

- The X-axis shows the RSSI scale (dBm).
- The Y-axis shows the percentage of calls with the given RSSI level. All calls with the measured RSSI transferred in the selected channels during the reported time make 100%.
- The color indicates a particular RSSI level. The boundaries of each level are preconfigured. The legend indicates the colors of all RSSI levels.

A.1.6 RSSI Levels: Map

RSSI Levels: Map loads the geographical map to visualize the location of calls with different RSSI levels transmitted in the selected system(s) during the reported time.

Table 44: RSSI Levels: Map – filter settings

Setting	Description
Channels	The channels whose traffic is included in the charts.
Senders	The radio ID whose outgoing traffic is included in the charts.
Recipients	The radio ID whose incoming traffic is included in the charts.
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

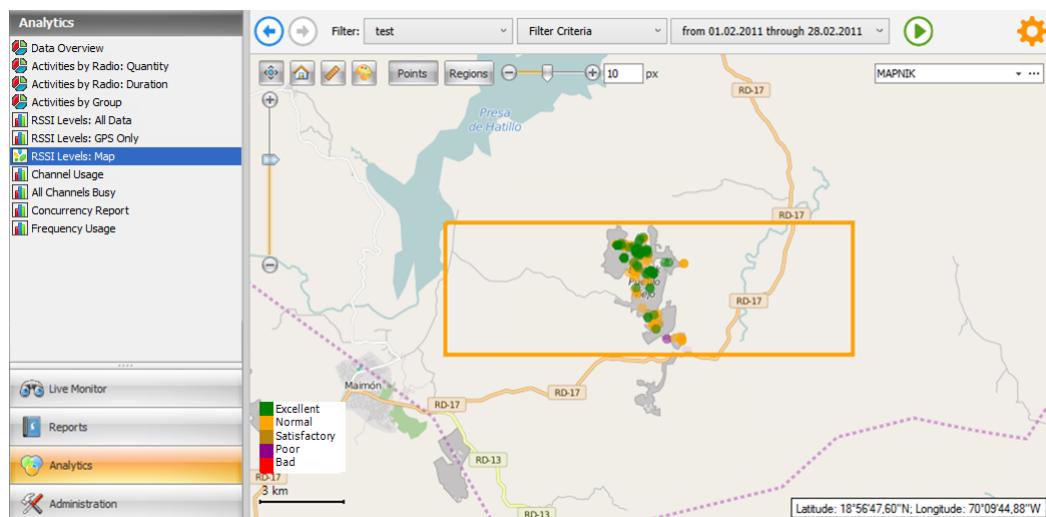


Figure 96: RSSI Levels: Map

Table 45: RSSI Levels: Map – features

Feature	Description
Settings	RSSI Levels: Map settings can be configured. For details, refer to section 5.3.4.1, Configuring Map Usage (page 75).
Map features	RSSI Levels: Map supports zooming, panning mode, shows the coordinates of the mouse cursor (option), and shows all measured RSSI as symbols with configurable shape, size, and color. Maps are replaceable. RSSI Levels: Map displays all maps available for choice on a drill-down menu.
Move to the next RSSI site	RSSI Levels: Map can analyze the distance between the measured RSSI signals, show all RSSI signals belonging to one site, and navigate you between RSSI sites.
Distance measure	In the distance measure mode, a double click on the map sets a point. A series of points is connected with a red line, and the total distance between the first and last point is calculated and visualized.
Fill mode	In the fill mode, RSSI Levels: Map displays an additional layer between the map and RSSI symbols. This mode helps you find all RSSI symbols on the map. The color and transparency of the additional layer can be configured in the RSSI Levels: Map settings.

For details about the RSSI Levels: Map features, refer to section [5.3.4, Using RSSI Levels Map](#) (page 73).

A.1.7 RSSI Levels: GPS Only

The RSSI Levels: GPS Only charts visualize the quality of GPS calls based on the signal strength. GPS calls with the measured signal strength are evaluated to one of the preconfigured RSSI levels and displayed in the charts with a particular color. Find the details in section [5.3.2.1, Configuring RSSI Settings](#) (page 66).

The included charts are identical to RSSI Levels: All Data, except the traffic analyzed the RSSI Levels: GPS Only charts is restricted to GPS calls only.

A.1.8 Channels Usage

The Channels Usage charts show the average loading level and individual levels for all selected channels within the reported time.

Table 46: Channels Usage charts – filter settings

Setting	Description
Channels	The channels whose traffic is included in the charts.
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

A.1.8.1 Average and Individual Loading Levels of the Channels

The Average and Individual Loading Levels of the Channels line chart shows the average loading level of all selected channels during the reported time. The individual loading levels of all channels are displayed below as line charts.

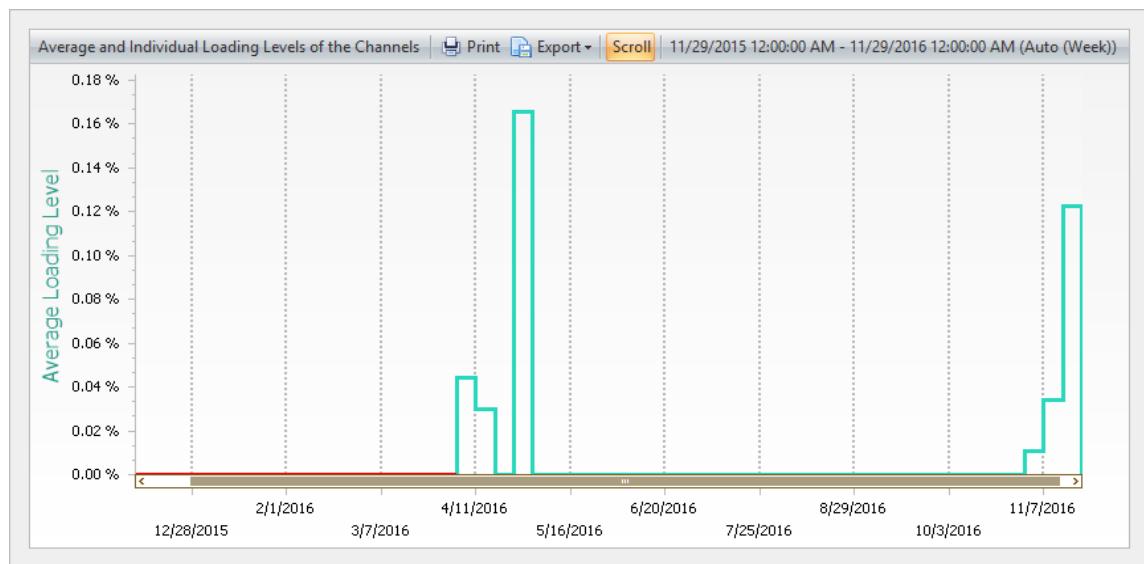


Figure 97: Average and Individual Loading Levels of the Channels chart

- The X-axis shows the reported time divided into timeframes. The time settings are displayed on the chart's toolbar next to the **Scroll** button.
- The Y-axis shows the workload (%) of all selected channel(s). The workload is calculated in each timeframe as the total time when the channels were loaded, divided by the total time when they were connected.
- The color of the line indicates the connection status of the channel(s). The red line indicates that all reported channels were disconnected during the entire timeframe. If a channel was connected even for a short time interval within the timeframe, the line is blue.

Note: A channel is disconnected if the repeater is not connected to TRBOnet Watch over IP or if the IP gateway is not connected to a radio.

To drill down into a particular timeframe, click the blue line in that timeframe. You cannot drill down into a timeframe where the line is red ("no connection"). To define the timeframe of the new chart to which you drill down, point the line and click the arrow. Point the preferred timeframe on the context menu.

A.1.9 All Channels Busy

The All Channels Busy charts show all cases within the reported time when all selected channels were unavailable for radio users longer than the specified threshold value.

Table 47: All Channels Busy charts – filter settings

Setting	Description
Channels	The channels to be included in the charts. You need to indicate at least two channels for this type of analysis.
Threshold: Duration	The minimum duration (seconds) of an All Channels Busy event to be included in the charts. If set to 0, All Channels Busy events with any duration are included.
Threshold: Level	The minimum number of channels unavailable simultaneously that make an All Channels Busy event.

Setting	Description
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

A.1.9.1 Number of All Channels Busy

The Number of All Channels Busy chart is a counter of All Channels Busy events detected in each timeframe of the reported time. An event is counted if the channels not less in number than specified in the **Threshold: Level** filter setting all remain unavailable during the time specified by the **Threshold: Duration** filter setting, or longer.

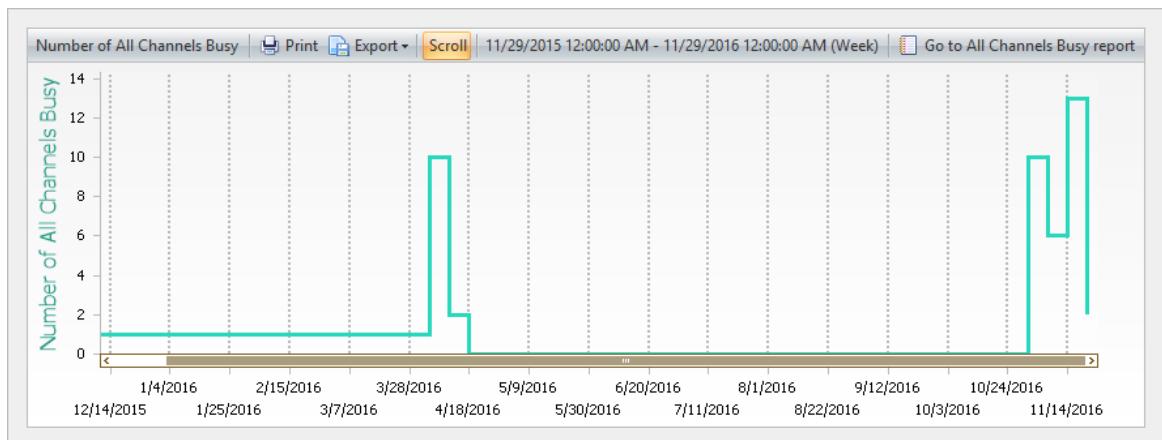


Figure 98: Number of All Channels Busy chart

- The X-axis shows the reported time divided into timeframes. The time settings are displayed on the chart's toolbar next to the **Scroll** button.
- The Y-axis shows the number of All Channels Busy events in each timeframe.
- If pointed with the mouse cursor, a timeframe with All Channel Bus events displays a tooltip with the timestamps of the frame, the number of calculated All Channels Busy events, and the total duration of all calculated events.
- If lasts through several timeframes, an event is calculated in each timeframe as an independent event.

To drill down into a particular timeframe, click the blue line in that timeframe. You cannot drill down into a timeframe where the line lies on the X-axis ("no All Channel Busy events"). To define the timeframe of the new chart to which you drill down, point the line and click the arrow. Click the preferred timeframe on the context menu.

To learn the details about the All Channel Busy events displayed in the chart, build the All Channels Busy report by clicking the **Go to All Channels Busy** button on the toolbar above the chart. To understand what caused an All Channels Busy event, build the Event Viewer report.

A.1.9.2 Channels

The Channels chart displays the number of disconnected and/or busy channels in each timeframe of the reported time. The line chart is built for all selected channels. The

threshold filter settings are not considered. The **Threshold: Level** filter setting appears in the chart as a dotted line.

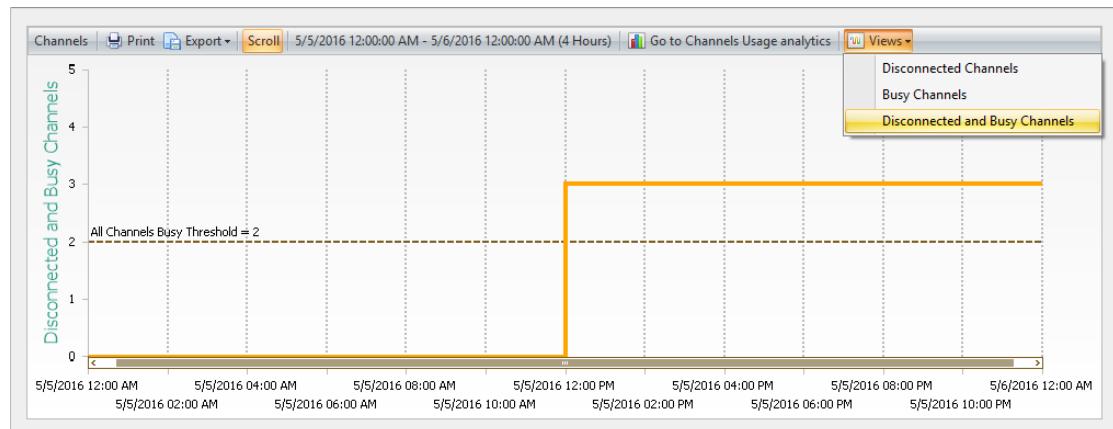


Figure 99: Channels chart (Disconnected and Busy Channels mode)

- The X-axis shows the reported time divided into timeframes. The time settings are displayed on the chart's toolbar next to the **Scroll** button.
- The Y-axis shows the number disconnected and/or busy channels within each timeframe.
- The **Views** button opens the menu where you can select the preferred view mode. The name of the selected mode appears near the Y-axis.
 - In the **Disconnected Channels** mode, the red line in each timeframe is the counter of channels that were disconnected (not necessarily all together) for any time within the timeframe.
 - In the **Busy Channels** mode, the green line in each timeframe is the counter of channels that were busy (simultaneously or not) for any time during the timeframe.
 - In the **Disconnected and Busy Channels** mode, the yellow line in each timeframe is the counter of channels that were unavailable (disconnected or busy) for the subscribers for any time during the timeframe.

To drill down into a particular timeframe, click the line in that timeframe. To define the timeframe of the new chart to which you drill down, point the line and click the arrow. Click the preferred timeframe on the context menu.

To learn the details about the usage of the selected channels, build the Channels Usage charts by clicking the **Go to Channels Usage Analytics** button on the toolbar above the chart.

A.1.10 Concurrency Report

The Concurrency Report charts show all cases of concurrent usage of the disconnected and/or busy channels over the reported time range.

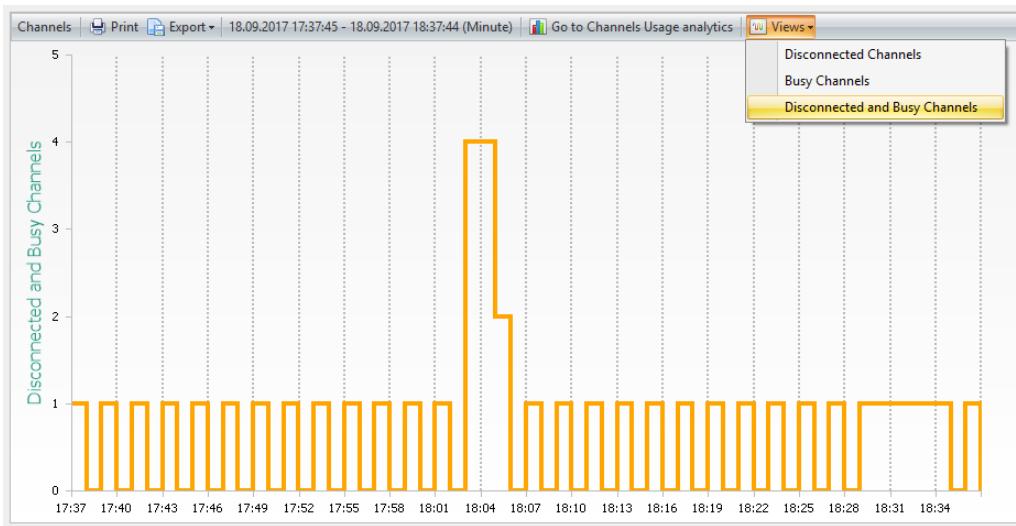


Figure 100: Concurrency Report chart (Disconnected and Busy Channels mode)

- The X-axis shows the specified time range. The time settings are displayed on the chart's toolbar next to the **Export** button.
- The Y-axis shows the total number of simultaneously disconnected and/or busy channels.
The total number of simultaneously disconnected and/or busy channels is computed at each timepoint. The obtained function is then divided into time segments of a length equal to the specified timeframe. Note that for each time segment, a maximum number of the simultaneously used channels is obtained. Also note that for a series of disconnected and busy channels, the maximum number on each time segment is obtained after totaling the series of disconnected and busy channels.
- The **Views** button opens the menu where you can select the preferred view mode. The name of the selected mode appears along the Y-axis.
 - In the **Disconnected Channels** mode, the red line in each timeframe is the counter of channels that were disconnected for any time within the timeframe.
 - In the **Busy Channels** mode, the green line in each timeframe is the counter of channels that were simultaneously busy for any time during the timeframe.
 - In the **Disconnected and Busy Channels** mode, the yellow line in each timeframe is the counter of the channels that were simultaneously unavailable (disconnected or busy) for the subscribers for any time during the timeframe.

A.1.11 Frequency Usage

The Frequency Usage chart shows the frequency usage (%) of each selected peer in the reported time.

Table 48: Frequency Usage chart – filter settings

Setting	Description
Peers	Peers included in the chart.
Work Hours	The time interval(s) within the reported time to be included in the charts.
Date and Time	The reported time and the timeframe.

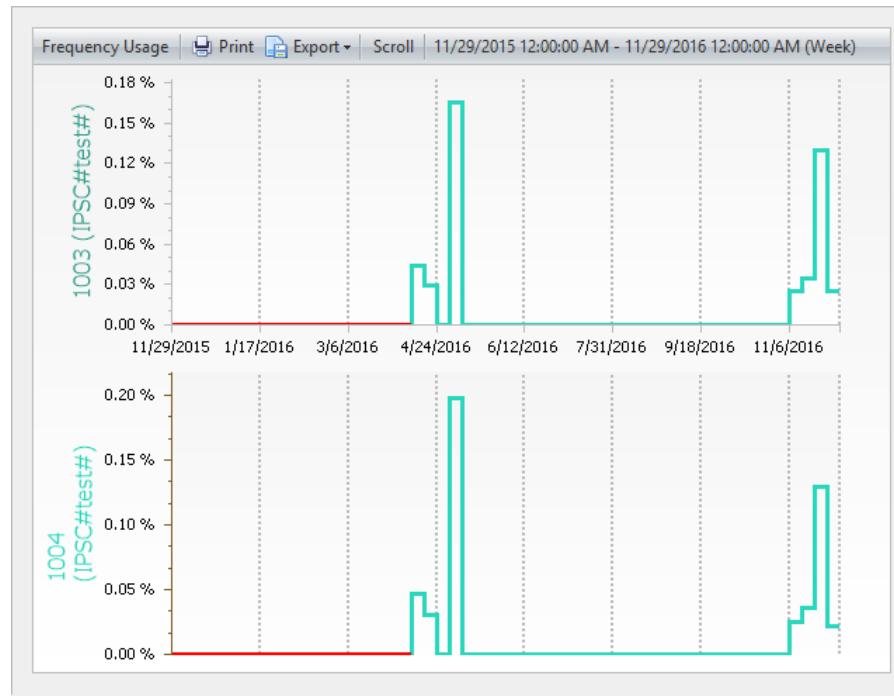


Figure 101: Frequency usage by two peers

Each selected peer is displayed in a separate line chart. The name of the peer is displayed near the Y-axis in each chart.

- The X-axis shows the reported time divided into timeframes. The time settings are displayed on the chart's toolbar next to the **Scroll** button.
- The Y-axis shows the frequency usage (%). The value is calculated in each timeframe as activity time divided by the time when the peer stayed connected.
- The color of the line indicates the connection status of the peer. The red line means that the peer was disconnected during the entire timeframe. If the peer was connected even for a short time within the timeframe, the line is blue.

To drill down into a particular timeframe, click the blue line in that timeframe. To define the timeframe of the new chart to which you drill down, point the line and click the arrow. Click the preferred timeframe on the context menu.

Note: You cannot drill down into a timeframe where the line is red ("no connection") or where the frequency usage equals to 0.00% ("no activity").

A.2 Reports

This section includes the description of each report that can be generated in the TRBOnet Watch Console. For each report, the section describes its goal, filter settings, and included fields.

To learn more about filter settings, refer to section [5.3.3, Using Filters](#) (page 68).

A.2.1 Activities over Time

The Activities over Time report shows all types of voice and data calls transmitted in the radio channels between the parties (radios and software). For each transmission, the report shows when it happened, how long the channel was busy, which peers were involved, which system channel was used, and what signal strength was detected.

Table 49: Activities over Time report – filter settings

Setting	Description
Channels	The system channels whose traffic is included in the report.
Messages	The types of traffic such as Voice, Data, Telemetry and other and, optionally, the types of calls included in the report.
Senders	The radio ID of subscribers whose outgoing traffic is included in the report.
Recipients	The radio ID of subscribers whose incoming traffic is included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 50: Activities over Time report – fields

Field	Description
Session Type	The type of traffic.
Session Subtype	The type of call.
Start Time	The start time of call transmission.
Duration (m:s.ms)	The duration of the call (including hang time).
Sender	The radio ID of the sender.
Recipient	The radio ID of the recipient (if applicable).
System	The name of the system whose channel was used to transmit the call.
Peer	In MOTOTRBO systems, the ID of the peer that repeated the call. Is set to 0 for other systems.
Slot ID	The time slot of the repeater in which the call was repeated.
RSSI (dBm)	The incoming signal strength measured in the MOTOTRBO repeater slot. Is set to "N/A" if not applicable.
Received from	The type of the call sender ("Radio" or "Site").

A.2.2 Activities by Radio

The Activities by Radio report calculates and shows for each radio how many voice calls and GPS and ARS messages were transmitted and how much time it took to transmit each type of traffic during the reported time. The report also summarizes all types of traffic initiated by each radio and the share (%) of each radio in the overall system traffic.

Table 51: Activities by Radio report – filter settings

Setting	Description
Channels	The system channels whose traffic is included in the report.
Messages	The types of traffic such as Voice, Data, Telemetry and other and, optionally, the types of calls included in the report.
Senders	The radio ID of subscribers whose outgoing traffic is included in the report.
Recipients	The radio ID of subscribers whose incoming traffic is included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 52: Activities by Radio report – fields

Field (level1)	Field (level 2)	Description
Radio	ID	The radio whose outgoing traffic is reported.
Voice calls, total	Quantity	The number of voice calls initiated by the radio during the reported time.
	Duration (d:h:m:s.ms)	The total duration of voice calls initiated by the radio.
	Average duration (d:h:m:s.ms)	The average duration of a voice call initiated by the radio.
GPS packets, total	Quantity	The number of GPS messages sent by the radio during the reported time.
	Duration (d:h:m:s.ms)	The total duration of GPS traffic initiated by the radio.
ARS packets, total	Quantity	The number of ARS messages sent by the radio during the reported time.
	Duration (d:h:m:s.ms)	The total duration of ARS traffic initiated by the radio.
Other, total	Quantity	The number of other data calls sent by the radio during the reported time.
	Duration (d:h:m:s.ms)	The total duration of other data calls initiated by the radio.

Field (level 1)	Field (level 2)	Description
Total	Quantity (%)	The share of traffic (%) generated by the radio in the system during the reported time. The value is calculated for all kinds of traffic.
	Duration (%)	The total duration of calls (%) initiated by the radio in the system during the reported time.

A.2.3 Activities by Group

The Activities by Group report calculates and shows for each talk group how many voice calls were made during the reported time. Also, the report calculates the share (%) of each talk group in the overall voice traffic transmitted in the system.

Table 53: Activities by Group report – filter settings

Setting	Description
Channels	The system channels whose traffic is included in the report.
Messages	The types of traffic such as Voice, Data, Telemetry and other and, optionally, the types of calls included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 54: Activities by Group report – fields

Field (level 1)	Field (level 2)	Description
Group	ID	The talk group whose outgoing voice traffic is summarized.
Voice calls	Quantity	The number of voice calls initiated by the talk group members during the reported time.
	Duration (d:h:m:s.ms)	The total duration of voice calls initiated by the talk group members.
	Average duration (d:h:m:s.ms)	The average duration of a voice call initiated in the talk group.
Total	%	The share (%) of the talk group in the overall voice traffic transmitted in the system during the reported time.

A.2.4 Event Viewer

The Event Viewer report allows you to trace all events that occurred in particular systems during the reported time.

Table 55: Event Viewer report – filter settings

Setting	Description
Systems	The list of system names.

Setting	Description
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 56: Event Viewer report – fields

Field	Description
System	The name of the system where the event occurred.
Timestamp	The date and time when the event occurred.
Peer ID	The system peer related to the event. Is set to "N/A" if not a peer event.
Peer Type	The type of the system peer related to the event. Options: Hardware, Software, N/A (if not a peer event or the peer is unknown).
Event Type	The type of event.
Description	The description of the event.

A.2.5 Text Messages

The Text Messages report shows all text messages sent by subscribers in the selected system channels. For each message, the report shows the sender, the recipient, the time when the message was sent, the system slot that was used, and the transferred text.

Table 57: Text Messages report – filter settings

Setting	Description
Channels	The system channels whose traffic is included in the report.
Senders	The radio ID of subscribers whose outgoing traffic is included in the report.
Recipients	The radio ID of subscribers whose incoming traffic is included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 58: Text Messages report – fields

Field	Description
Sender	The radio ID of the sender.
Recipient	The radio ID of the recipient.
Start Time	The timestamp of the message.
System	The name of the system in which the message was sent.
Peer	The ID of the peer that repeated the text message.
Slot ID	The channel that transmitted the message.
Text	The text of the message (appears if the message can be parsed).

A.2.6 RCM Messages

The RCM Messages report shows Repeater Call Monitoring (RCM) messages transmitted in the selected system(s) during the reported time.

Note: MOTOTRBO systems included in this report should have the "Store Repeater Call Monitoring messages" feature enabled in the TRBOnet Watch configuration settings. For details, refer to section [4.9.1.2, Configuring Data Storage](#) (page 20).

Table 59: RCM Messages report – filter settings

Setting	Description
Channels	The system channels whose traffic is included in the report.
Senders	The radio ID of subscribers whose outgoing traffic is included in the report.
Recipients	The radio ID of subscribers whose incoming traffic is included in the report.
RCM Messages	The RCM messages to be included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 60: RCM Messages report – fields

Field	Description
Session Subtype	The type of RCM. For a brief description of all RCM messages, refer to Appendix C: RCM Messages (page 116).
Start Time	The time when the message was sent.
Duration (m:s.ms)	The duration of the message transmission.
System	The name of the MOTOTRBO system in which the repeater sent the RCM message.
Peer	The peer ID of the repeater that sent the RCM message.
Slot ID	The time slot in which the message was transmitted.

A.2.7 All Channels Busy

The All Channels Busy report shows the occurrences of All Channels Busy cases in the selected channels during the reported time.

Table 61: All Channels Busy report – filter settings

Setting	Description
Channels	The system channels to be included in the report. You need to indicate at least two channels for this report.
Threshold: Duration	The minimum duration (in seconds) of an All Channels Busy event to be included in the report. If set to "0", any duration is included.

Setting	Description
Threshold Level	The number of channels that should be busy at the same time to report an All Channels Busy event.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 62: All Channels Busy report – fields

Field	Description
Subscriber activity while all channels are busy	Click the Load... value to see activity of subscribers in the busy channels. The selected field can show any of the following: <ul style="list-style-type: none"> ▪ No activity: No subscriber activity was registered in the busy channels. ▪ Collapse: The expanded list shows the subscribers whose traffic made the channels busy. The included fields are: <ul style="list-style-type: none"> ▪ Protocol: The type of traffic. ▪ Subprotocol: The type of call or message. ▪ Start: The start time of the transmission. ▪ Duration: The duration of the transmission (including hang time). ▪ Sender: The radio ID of the sender. ▪ Recipient: The radio ID of the recipient. ▪ System: The system that transmitted the call or message. ▪ Site: For Linked Capacity Plus systems, the site where the transmission occurred. Not relevant to other system types (set to 0). ▪ Peer: The peer ID of the repeater that transmitted the call or message. ▪ Slot: The time slot that was busy.
Start Time	The date and time when all selected channels became busy.
End Time	The date and time when any selected channel became available after all of them were busy.
Duration	The total time during which the selected channels were busy. Format: DD.HH:MM:SS

A.2.8 GPS Data

The GPS Data report shows all GPS messages transmitted in the selected channels during the reported time.

Table 63: GPS Data report – filter settings

Setting	Description
Channels	The channels included in the report.
Senders	The radio ID of subscribers whose outgoing traffic is included in the report.
Recipients	The radio ID of subscribers whose incoming traffic is included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 64: GPS Data report – fields

Field	Description
Session Type	GPS transmission.
Session Subtype	The type of a GPS message.
Start Time	The start time of the GPS transmission.
Duration	The total time during which the repeater used the channel to transmit the GPS message. Hang time is included.
Sender	The radio ID that sent the GPS message.
Recipient	The radio ID that received the GPS message.
System	The name of the system that transmitted the GPS message.
Peer	The peer ID of the repeater that transmitted the GPS message.
Slot ID	The time slot that transmitted the GPS message.
RSSI (dBm)	The incoming signal strength detected by the repeater.
Longitude	The GPS longitude of the sender.
Latitude	The GPS latitude of the sender.
Radius, m	The tracking inaccuracy (in meters) of the GPS coordinates. This report includes all GPS transmissions where the tracking inaccuracy does not exceed 15 meters; records with greater inaccuracy are not included in the report.

A.2.9 Frequency Usage

The Frequency Usage report shows for all selected peers:

- The total time during which every peer was connected to the network, and the duration (%) of the connected state
- The total time during which every peer was active
- The percentage of the "activity" time relative to the connection time

Table 65: Frequency Usage report – filter settings

Setting	Description
Peers	The system peers included in the report.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time and the timeframe.

Table 66: Frequency Usage report – fields

Field (level1)	Field (level 2)	Description
Timeframe		The timeframe of the report per which the activity and connection of each peer is evaluated.
State		The state of the peer in each timeframe. Values: ▪ Activity: The peer transmits traffic.

Field (level1)	Field (level 2)	Description
		<ul style="list-style-type: none"> ▪ Connection: The peer is connected to TRBOnet Watch over IP. A RoIP getaway is connected to the radio. <p>Note: If the peer had no activity during the reported timeframe, the Activity status is not displayed.</p>
<Peer ID> (<system >)	Duration, h:m:s.ms	The total time the peer was active or connected within the timeframe.
	Duration, %	<p>The meaning depends on the state of the peer:</p> <ul style="list-style-type: none"> ▪ Connection: The percentage of time in the timeframe when the peer was connected. ▪ Activity: The percentage of the connection time within the given timeframe when the peer was active.

A.3 Supported Maps

This topic describes all types online and offline maps supported by chart RSSI Levels: Map.

Table 67: Online maps supported by RSSI Levels: Map

Resource	Description
OpenStreetMaps	<p>Free online map. Includes MAPNIK, CYCLE, TRANSPORT, LANDSCAPE and MAPQUEST subtypes.</p> <p>Official website: http://www.openstreetmap.org</p>
Microsoft BING	<p>Commercial maps by Microsoft. Include BING_ROAD, BING_AREA and BING_HYBRID subtypes. User can try BING Maps for 90 days and then get a Basic Key.</p> <p>To get the Basic Key, visit http://msdn.microsoft.com/en-us/library/ff428642.aspx</p>

Table 68: Offline maps supported by RSSI Levels: Map

Resource	Description
T-Map	<p>Offline maps created from raster graphics images (for instance, from a scanned paper map) using the TRBOnet.Map Edit tool. The output files have the TMAP extension.</p> <p>The TRBOnet.Map Edit tool ships with TRBOnet Enterprise and is described in the TRBOnet Enterprise documentation.</p> <p>For all questions about creating TMAP files, contact the support team of Neocom Software, Ltd.</p>

Appendix B: SNMP Support

B.1 MIB Files

To configure communication with the TRBOnet Watch SNMP Agent, you need to upload and install on the NMS system the following MIB files:

- *common\ns_00_INET-ADDRESS-MIB.mib*
- *common\ns_01_CISCO-SMI.mib*
- *common\ns_02_CISCO-TC.mib*
- *common\ns_03_RMON-MIB.mib*
- *common\ns_04_TOKEN-RING-RMON-MIB.mib*
- *common\ns_05_SNMP-FRAMEWORK-MIB.mib*
- *common\ns_06_RMON2-MIB.mib*
- *common\ns_07_ENTITY-MIB.mib*
- *common\ns_08_CISCO-ENTITY-ALARM-MIB.mib*
- *common\ns_09_ALARM-MIB[rfc3877].mib*
- *ns_10_NEOCOM-SMI.MIB*
- *ns_11_NEOCOM-PRODUCTS-MIB.MIB*

The latest version of MIB files can be obtained at the following URL:

http://s3.trbonet.com/download/watch/snmp_tools/NeocomMIBs.zip

MIBs numbered 08-09 and all references (00-07 files) are contained in the *MIB\Common* folder. The number in the file name indicates the compilation order on a remote MNS.

NEOCOM-PRODUCTS-MIB (11) describes TRBOnet Watch and determines the scope of ENTITY-MIB and CISCO-ENTITY-ALARM-MIB (08) functionality implemented in the current version of the product.

ENTITY-MIB (07) contains information for managing physical entities in the system. It also arranges the entities into a containment tree that depicts their hierarchy and relationship to each other. The MIB supports the *entPhysicalTable* table.

entPhysicalTable describes each physical component (entity) in the system. The table contains an entry for the top-level entity (master repeater) and for each entity connected to the master (hardware peers, applications, and other). Each entry provides information about the entity: its name, type, vendor, and a description, and describes how the entity fits into the hierarchy of system entities.

CISCO-ENTITY-ALARM-MIB (08) provides the information about all types of alarms in the system. This information serves for the following:

- Monitoring when alarms are asserted and cleared.
- Obtaining alarm history information.
- Tracking alarm statistics and counts.
- Generating SNMP traps and syslog messages in response to alarms.

B.2 MIB Objects

TRBOnet Watch works with the MIB objects listed in the table below.

Table 69: MIB objects related to TRBOnet Watch

Object Name	Object ID	Description	MIB file
entPhysicalTable	1.3.6.1.2.1.47.1.1.1	The Physical Entity (Overall System Topology) Table. Describes each physical component (entity) in the system.	ENTITY-MIB
ceAlarmDescrMapTable	1.3.6.1.4.1.9.9.138.1.1.1	The mapping between an alarm description and a vendor type.	CISCO-ENTITY-ALARM-MIB
ceAlarmDescrTable	1.3.6.1.4.1.9.9.138.1.1.2	Alarm Description Table.	CISCO-ENTITY-ALARM-MIB
ceAlarmTable	1.3.6.1.4.1.9.9.138.1.2.5	Alarm control and status information related to the corresponding physical entity, including a list of alarms currently being asserted by that physical entity.	CISCO-ENTITY-ALARM-MIB
ceAlarmHistTable	1.3.6.1.4.1.9.9.138.1.3.3	This table contains a history of ceAlarmsIndicate and ceAlarmClear traps generated by the agent.	CISCO-ENTITY-ALARM-MIB
<p>The following objects are the notifications expected on a remote NMS if SNMP notification is enabled in the TRBOnet Watch Server configuration. For details, refer to section 4.12, Configuring SNMP Communication (page 38).</p>			
ceAlarmAsserted	1.3.6.1.4.1.9.9.138.2.0.1	Alarm Enabled	CISCO-ENTITY-ALARM-MIB
ceAlarmCleared	1.3.6.1.4.1.9.9.138.2.0.2	Alarm Disabled	CISCO-ENTITY-ALARM-MIB
entConfigChange	1.3.6.1.2.1.47.2.0.1	Generated when entPhysicalTable modified	ENTITY-MIB

B.3 Alarms

An alarm contains the following information:

- Type: A unique code that identifies the alarm
- Severity: The severity of the condition causing the alarm
- Description: The information about the condition that caused the alarm

Alarm state

The alarm state indicates the current state of the condition that caused the alarm:

- Asserted: The condition currently exists.
- Cleared: The condition has been resolved.

Alarm severity

The severity of the alarm indicates the type of condition the alarm represents.

- Critical (1): A severe, service-affecting condition that requires immediate corrective action.
- Major (2): A hardware or software condition that indicates a serious disruption of service or the malfunctioning or failure of important hardware. Although less serious than a critical alarm, a major alarm requires immediate attention and response of a technician to restore or maintain system capability.
- Minor (3): A condition or problem that does not seriously affect customer service, or occurs on nonessential hardware.
- Info (4): The information message concerning the event that improves operation, or the indication of a condition that could cause a problem.

Interpreting alarm information in CISCO-ENTITY-ALARM-MIB

To determine if any alarms are currently being asserted, read the ceAlarmTable object values.

Each entry in the table contains information about the alarms currently being asserted by each physical entity. Each entry is indexed by object entPhysicalIndex (ENTITY-MIB) of the entity.

To obtain information about individual alarms, read the ceAlarmDescrSeverity and ceAlarmDescrText object values.

TRBOnet Watch Alarm Codes

Table 70: TRBOnet Watch alarm decimal codes

Alarm	Decimal code
TxAlarm	1
RxAlarm	2
Temp_Alarm	3
AC_Power_Alarm	4
FanAlarm	5
PA_EEPROM_Corruption_Type_1	6
PA_EEPROM_Corruption_Type_2	7
PA_EEPROM_Corruption_Type_3	8
Exciter_EEPROM_Corruption_Type_1	9
Exciter_EEPROM_Corruption_Type_2	10
Exciter_EEPROM_Corruption_Type_3	11

Alarm	Decimal code
Receiver_EEPROM_Corruption_Type_1	12
Receiver_EEPROM_Corruption_Type_2	13
Receiver_EEPROM_Corruption_Type_3	14
PA_Voltage_Alarm_High	16
PA_Voltage_Minor_Alarm	17
PA_Voltage_Major_Alarm	18
VSWR_Minor_Alarm	19
VSWR_Major_Alarm	20
Transmitter_Power_Minor_Alarm_2db	21
Transmitter_Power_Minor_Alarm_3db	22
Transmitter_Power_Major_Alarm_3db	23
Interoperability_Between_Exciter_and_PA	24
Incorrect_Carrier_Frequency	25
Incorrect_Codeplug_for_MTR2000_PA	26
Reference_Incompatibility	30
Exciter_Driver_Amp_Alarm	31
Exciter_Final_Amp_Alarm	32
Volt_8_Supply_Alarm	33
Volt_10_Supply_Alarm	34
RF_Power_Control_Alarm	35
PA_Gain_Alarm	36
Ext_Circulator_Temp	37
PA_Revision	38
Exciter_Revision	39
RxRevision	40
PeerDisconnected	107

B.4 Examples

The following examples demonstrate how to configure an NMS for SNMP communication with TRBOnet Watch.

Note: All examples use SNMPC Enterprise by Castle Rock Computing. For details, refer to <http://www.castlerock.com/products/snmpc/>.

Table 71: Examples of configuring an NMS for SNMP communication with TRBOnet Watch

To do this:	Take these steps:
Install custom MIBs in the SNMP management console	<ol style="list-style-type: none"> 1. Copy all MIB files from the MIB folder to the ... \ SNMPc Network Manager\mibfiles\ folder. 2. Launch the management console. 3. On the main menu, choose Config and then Mib Database. 4. In the dialog box, click Add and choose all necessary files from the list. Click OK. 5. Click the Compile button to recompile the MIB database.
Add TRBOnet Watch to the list of monitored entities	<ol style="list-style-type: none"> 1. Launch the management console. 2. On the main menu, select Insert and then Map Objects and Device. 3. In the dialog box, specify the IP address and the name of TRBOnet Watch. Click OK.
Configure SNMPv3 protocol for authentication and confidentiality	<ol style="list-style-type: none"> 1. Launch the management console. 2. In Root Subnet, right-click the Watch object and select Properties. 3. In the dialog box, click the Access tab and specify the following fields. For instance, you can show the following values: <ul style="list-style-type: none"> ▪ Read Access Mode: Set to SNMP V3 Priv-DES Auth-MD5. ▪ Read/Write Access Mode: Set to SNMP V3 Priv-DES Auth-MD5. ▪ V3 Engineid: Show the value specified in TRBOnet Watch configuration (default: 80000AD0431AF108). ▪ V3 Auth/Prive Security Name, V3 Auth Passwd, V3 Priv Passwd: Show the values specified in TRBOnet Watch configuration. 4. Click OK. <p>Note: For the description of TRBOnet Watch SNMP configuration settings, refer to section 4.12. Configuring SNMP Communication (page 38).</p>
Read the list of alarms from a ceAlarmList	<p>The ceAlarmList object (ceAlarmTable, Oid: 1.3.6.1.4.1.9.9.138.1.2.5.1.3) contains alarms as 32-byte strings in hexadecimal format.</p> <p>Note: If no alarm is set, ceAlarmList will contain an empty string (zero length).</p> <p>The ordinal bits in the string specify the alarm code. For example, you get an alarm encoded in the following string: 00 00 00 00 00 00 00 00 00 00 00 00 00 08 00 00 00 00 00 00 00 00 00 00 </p> <p>You see 13 bytes holding zeroes and then a byte holding information. In this byte, (08) stands for (00001000) in binary format. Bits in the byte '08' are indexed from right to left, so the position of the ordinal bit is 3.</p> <p>Calculate the alarm code:</p>

To do this:	Take these steps:
	<p>13*8 (the number of 'zero' bits prior to byte '08') + 3 (00001000)= 107</p> <p>Look for code 107 in Table 70 (page 112). This code indicates the PeerDisconnected alarm.</p>

Appendix C: RCM Messages

When the system is unable to set up the call or continue the call requested, it declines the call setup request with the reason code. TRBOnet Watch Console displays such reason codes in Live Monitor and includes them in reports as RCM messages.

The following table describes all RCM messages that can be displayed in the TRBOnet Watch Console.

Table 72: RCM messages

RCM Message (Reason Code)	Failure Scenario
CALL TRANSMISSION STATUSES	
Race Condition Failure	The Call Setup request is rejected during Arbitration.
Invalid/Prohibited Call Failure	Incorrect or forbidden format.
Destination Slot Busy Failure	The destination channel is busy.
Destination Group Busy Failure	The Call Setup request is declined because the destination Group is busy on another channel. This scenario applies to setting up a new call in the rest channel in Capacity Plus/LCP systems only.
All Channels Busy Failure	The Call Setup request is declined because all the channels at the site are busy. The rest channel is busy. This scenario applies to setting up a new call in the rest channel in Capacity Plus /LCP systems only.
OTA Repeat Disabled Failure	The Call Setup request is declined because the repeater where the request is sent is momentarily disabled by a system monitoring application.
Signal Interference Failure	The Call Setup request is declined because the repeater where the request is sent is suffering FCC type I or II interference. In Capacity Plus /LCP systems, this scenario applies to setting up a new call in the rest channel only.
CWID In Progress Failure	The Call Setup request is declined because the repeater where the request is sent is transmitting CWID. In Capacity Plus /LCP systems, this scenario applies to setting up a new call in the rest channel only.
TOT Expiry Premature Call End Failure	The call sending is ended because of the TOT timer expiry.
Transmit Interrupted Call Failure	The Call Setup request with interrupt access failed to interrupt the ongoing OTA interrupt voice call.
Higher Priority Call Takeover Failure	The call is preempted by another call with higher priority such as Emergency call.

RCM Message (Reason Code)	Failure Scenario
Local Group Call Not Allowed	<p>The Call Setup request for starting a Local Group call is declined because the site where the request is sent is reserved for Wide Area or Private calls.</p> <p>This scenario applies to setting up a new call in the rest channel in Capacity Plus /LCP systems only.</p>
Non-Rest Channel Repeater	<p>The Call Setup request is received on the non-rest channel repeater.</p> <p>This scenario applies to Capacity Plus /LCP systems only.</p>
Destination Site/Sites Busy	<p>The Call Setup request to start a wide area group call is declined because the destination sites of the group do not have channels available.</p> <p>This scenario applies to setting up a new call in the rest channel in Capacity Plus /LCP systems only.</p>
Long Under Run Condition	<p>The repeater ends the call due to jitter buffer under-runs occurring continuously for over 720 ms. This may be due to the network congestion.</p>
Undefined Call Failure	Any other failures.
All Call Ongoing or In-progress	<p>The Call Setup request is declined because All Call is ongoing.</p> <p>This scenario applies to setting up a new call in the rest channel in Capacity Plus /LCP systems only.</p>
RCM REPEAT BLOCKED INDICATION	
Start of Signal Interference (FCC Type I)	Signal interference is strong enough and begins to block repeat (FCC Type I).
End of Signal Interference (FCC Type I)	Signal interference is weak enough and the repeater resumes over-the-air repeat (FCC Type I).
Start of Signal Interference (FCC Type II)	Signal interference is strong enough and begins to block repeat (FCC Type II).
End of Signal Interference (FCC Type II)	Signal interference is weak enough and the repeater resumes over-the-air repeat (FCC Type II).
Start of CWID/BSI Repeat	The repeater has to transmit CWID/BSI and begins to block repeat.
End of CWID/BSI Repeat	Broadcast of the calls into the air is intermittent.
Signal Interference Failure	The repeater finishes CWID/BSI transmission and resumes over-the-air repeat.