TRBOnet Watch

User Guide

Version 3.2

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Contents

1 Introduction 1
1.1 About This Guide 1
1.2 About TRBOnet 1
1.3 Contacts 1
2 Overview 2
2.1 About TRBOnet Watch 2
2.2 Features 3
2.3 Architecture 3
2.4 Hardware and Software Requirements 4
2.5 Compatibility with MOTOTRBO Firmware Versions 4
2.6 Licensing 5
2.7 System Monitoring Levels 5
3 Installation and Upgrade 8
3.1 Installing TRBOnet Watch 8
3.2 Repairing TRBOnet Watch 8
3.3 Uninstalling TRBOnet Watch 8
3.4 Upgrading TRBOnet Watch 9
4 TRBOnet Watch Server 10
4.1 Launching TRBOnet Watch Server 10
4.2 Managing the Software License 10
4.3 Configuring the IP Network Settings 11
4.4 Creating a TRBOnet Watch Database 11
4.5 Creating a Windows Service 14
4.6 Changing the Language 15
4.7 Setting the Logging Level 15
4.8 Enabling Extended Diagnostics 16
4.9 Registering Radio Systems 16
4.10 Managing Registered Systems 33
4.11 Registering TRBOnet Plus/Enterprise 35
4.12 Configuring SNMP Communication 37

5 TRBOnet Watch Console 40
5.1 Configuration 40
5.2 Live Monitor 42
5.3 Reports and Analytics 60
5.4 Administration 75
6 TRBOnet Watch Mobile 84
6.1 Installation 84
6.2 Configuration 84
6.3 Operation 84
Appendix A: Analytics and Reports 86
A.1 Analytics 86
A.2 Reports 102
A.3 Supported Maps 110
Appendix B: SNMP Support 111
B.1 MIB Files 111
B.2 MIB Objects 112
B.3 Alarms 113
B.4 Examples 115
Appendix C: RCM Messages 117
Appendix D: Glossary of Acronyms 119

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

Region	Phone	Email & Support
EMEA	+44 203 608 0598	info@trbonet.com — general and commercial inquiries support@trbonet.com — technical support https://trbonet.com/kb/ — online knowledge base
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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.

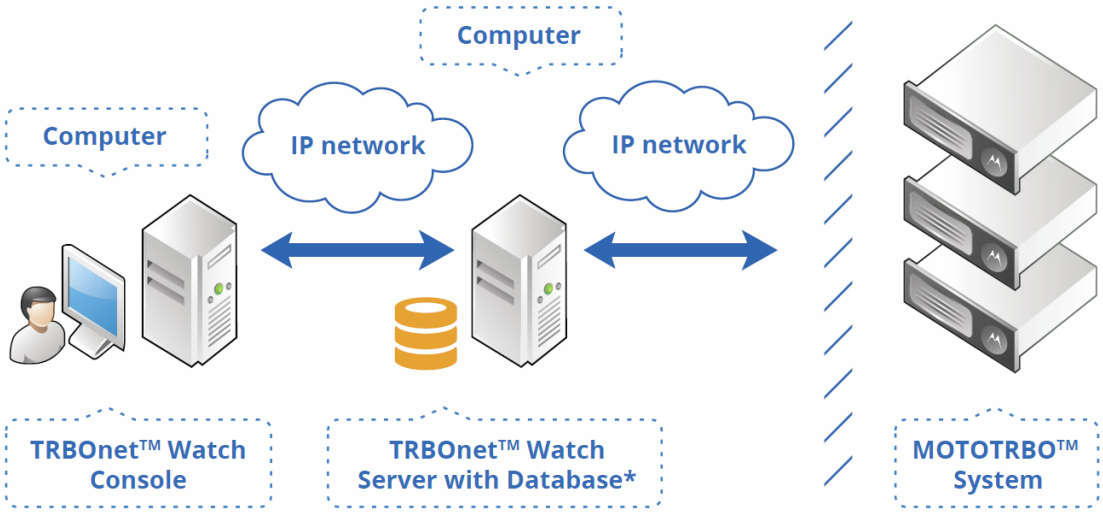


Figure 1: TRBOnet Watch architecture

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 hardware and software requirements

TRBOnet Watch Server			
Channels	Less than 50	Greater than 51 but 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 7/8.x/10, Windows Server 2012/2016/2019 Note: Windows Server 2012/2016/2019 requires Desktop Experience Role/Feature installed.		
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 7/8.x/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 Single Site, Capacity Plus Multi-Site, Connect Plus, Extended Range Direct Mode (ERDM), 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 Single Site	Capacity Plus Multi-Site	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	
3.2	2.10.0.13				2.10.0.13	

2.6 Licensing

When you purchase TRBOnet Watch, you obtain a permanent (non-expiring) license that specifies functional modules and types of radio networks available for users. 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
- Watch for mobile devices

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 features available in TRBOnet Watch Console depend on the system type as well as 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
Recognized traffic:							
▪ Location	-	-	-	-	Yes		Yes
▪ System	Yes	Yes	Yes	Yes	Yes		Yes
▪ Voice	Yes	Yes	Yes	Yes	Yes		Yes
▪ Data	Yes	Yes	Yes	Yes	Yes		Yes
Call parsing	Not supported						
Reports:							
RSSI Levels: GPS	Yes	Yes	Yes	Yes (with TRBOnet PLUS only)	-		Yes (with TRBOnet PLUS only)
RSSI Levels: Map	Yes	Yes	Yes		-		
GPS Data	-	-	-	-	-		-
Text Messages	-	-	-	-	-		-
Charts	All	All	All	All	All		All

TRBOnet Watch feature	IP Site Connect	ERDM	Capacity Plus	LCP	Connect Plus (XRC)	Connect Plus (XRT)	Capacity Max
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:							
▪ Registration	Yes	Yes	Yes				
▪ Telemetry	Yes	Yes	Yes				
▪ Text	Yes	Yes	Yes				
▪ Location	Yes	Yes	Yes				
▪ 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				

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 Console and Server**: Choose to install both the server and client software on one computer.
   - **TRBOnet Watch Console**: Choose to install only 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 10).

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 4.5, Creating a Windows Service (page 14).

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 8).
2. Install the TRBOnet Watch as described in section 3.1, Installing TRBOnet Watch (page 8).
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 4.5, Creating a Windows Service (page 14).
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 Server** icon on the desktop, or click **All Programs** and then navigate to **Neocom Software** and **Watch Server** on the **Start** menu.

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

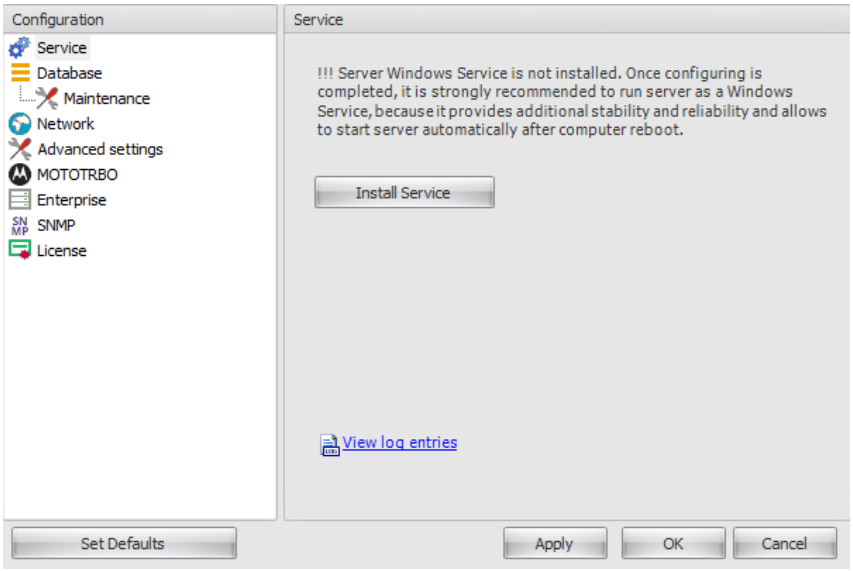


Figure 2: TRBOnet Watch Server

4.2 Managing the Software License

TRBOnet Watch contains a free trial license that allows you to evaluate the product.

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 the request. This can be done by opening the **License** tab, clicking **Copy to Clipboard**, and inserting 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 navigate to the license file.
5. Click **Next**, then click **Finish**.

4.3 Configuring the IP Network Settings

Perform the following steps to configure IP communications between TRBOnet Watch Server and TRBOnet Watch Consoles.

To specify the IP network settings:

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

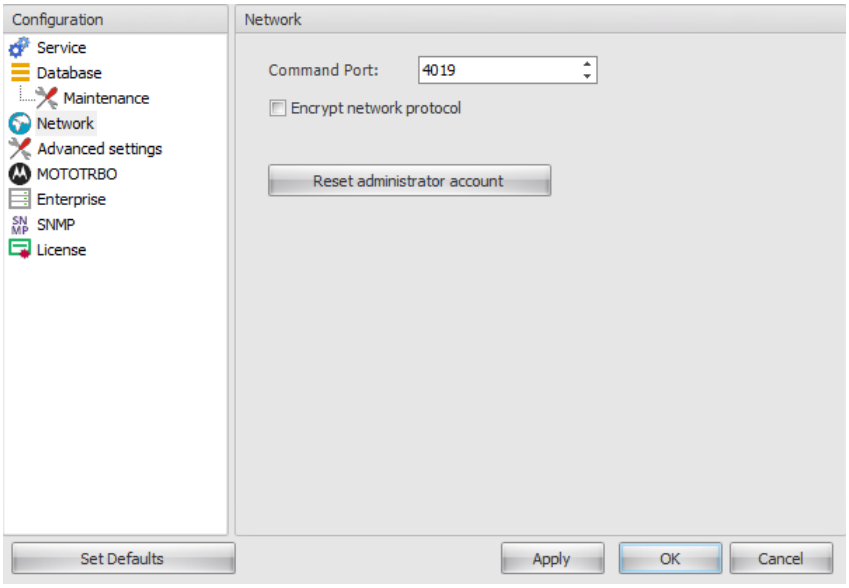


Figure 3: Configuring the Network settings

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

4.4 Creating a TRBOnet Watch Database

Perform the following steps to create a TRBOnet Watch database.

Note: Before creating a database, make sure that an SQL Server application is 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:

1. In the **TRBOnet Watch Server** window, select **Database** in the **Configuration** pane.
2. Specify the following database connection properties:

Table 4: 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.
Authorization	The authorization method. Select the preferred option: ▪ **Windows Authorization**: TRBOnet Watch will use your Windows credentials to access the database. To use Windows authorization, the Local System account must be granted MS SQL Server administrator privileges. For details, refer to section 4.4.2, Configuring the Local System Account (page 12). ▪ **SQL Server Authorization**: TRBOnet Watch will use an MS SQL Server user account to access the database. To use SQL Server Authorization, the MS SQL Server user account must be granted MS SQL Server administrator privileges.
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.
Database	The preferred database name. Follow the naming rules specific to the selected SQL Server edition. Type the new database name, and click **Create**.

3. Configure how the TRBOnet Watch database will be maintained. For details, refer to section 4.4.3, Configuring Database Maintenance (page 13).

4.4.1 Updating TRBOnet Watch Database

To update a previously created TRBOnet Watch database:

- Click the arrow on the right of the **Database** box, and from the list, select the Watch database, and click **Test**.

Note: If the test fails because of an incorrect database version, you will be prompted to start the wizard to update the database to the correct version (**Fix with the wizard**).

4.4.2 Configuring the Local System Account

If the TRBOnet Watch database connection uses Windows authentication, verify that the list of MS SQL Server administrators includes the Local System account. Otherwise, the following error message will be displayed when attempting to connect to the database:

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

Privileges for the Local System account can be configured (granted) 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 4: 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.

4.4.3 Configuring Database Maintenance

To prevent data loss and reduce the size of the TRBOnet Watch database, regularly create database backups and delete old data. You can do it at your convenience (unscheduled), or you can schedule regular database maintenance.

To configure database maintenance:

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

Table 5: TRBOnet Watch – database maintenance options

Action	Description
Back up database	Select this option to back up the database to the default local folder. To save the 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 this option to remove old data from the database. Configure the options: ▪ **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.
Clear log	Select this option to clear the transaction log. Configure the options: ▪ **Clear log if its size 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 **Database Maintenance** window.

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

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

4.5 Creating a Windows Service

TRBOnet Watch runs as a Windows service and this 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.

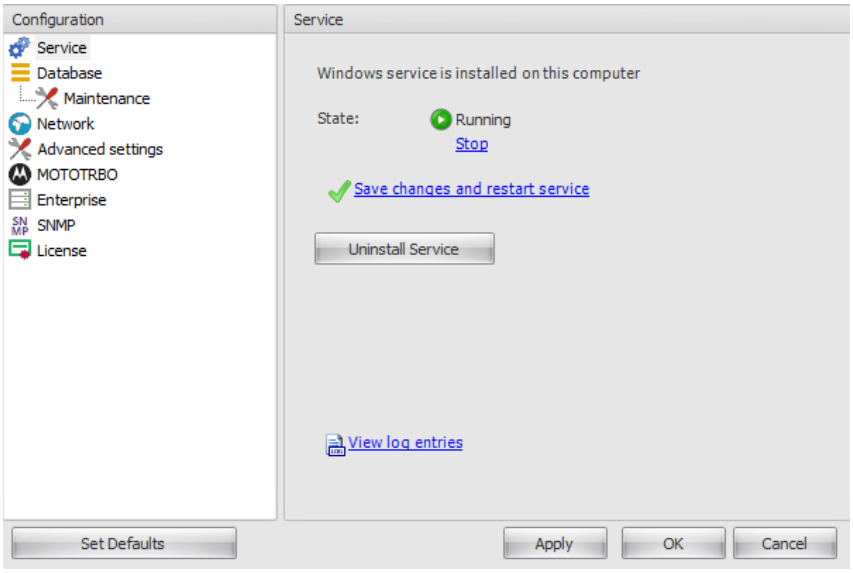


Figure 5: Managing the Windows service

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 configuration changes to the local CONFIG file and to restart the service with the updated settings.
- **Uninstall Service**: Click to remove the service.
- **View log entries**: Click this link to open the TRBOnet Watch Server system log in the **View log entries** dialog box. The log may be requested by our technical support team, should the customer report any TRBOnet Watch issue.

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 **Configuration** pane.
2. From the **Language** drop-down list, 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 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 **Configuration** pane.

- From the **Logging level** drop-down list, select the preferred level of detail in the system log: **Debug**, **Information**, **Warning** (default), or **Error**. Use the default **Warning** option unless you are requested by the technical support team to select a different level.

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

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).

Note: The **Diagnostics** tab is unavailable for Capacity Max systems.

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 6: 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. This value must be unique among the repeaters and software agents in the radio system.

Property	Description
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** label to see the generated physical 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 111).
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: ▪ **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. ▪ **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. For details, refer to section 2.7, System Monitoring Levels (page 5).

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 17).
6. Specify the filtering rules for traffic monitoring and data storage as described in section 4.9.1.2, Configuring Data Storage (page 18).
7. Add system peers as described in section 4.9.1.3, Adding Peers (page 21).

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 7: Privacy settings of the MOTOTRBO repeater

Property	Description
Privacy Type	The type of privacy as specified in the repeater configuration. Options: ▪ **None**: Privacy is disabled. ▪ **Basic**: Basic Privacy (utilizes a Motorola proprietary non-cryptographic algorithm to encrypt and protect voice and data). ▪ **Enhanced**: Enhanced Privacy (utilizes a cryptographic algorithm to encrypt and protect 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: ▪ **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 FFFFFFFFFE.

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, select the type of 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 8: 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:

Tab name	Instructions
	▪ 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 19).
All Call	Configure monitoring and data storage of All Calls. ▪ **Show in Console**: Select to display All Calls in the console.
Advanced	Configure storage of repeater call monitoring (RCM) messages. ▪ **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.

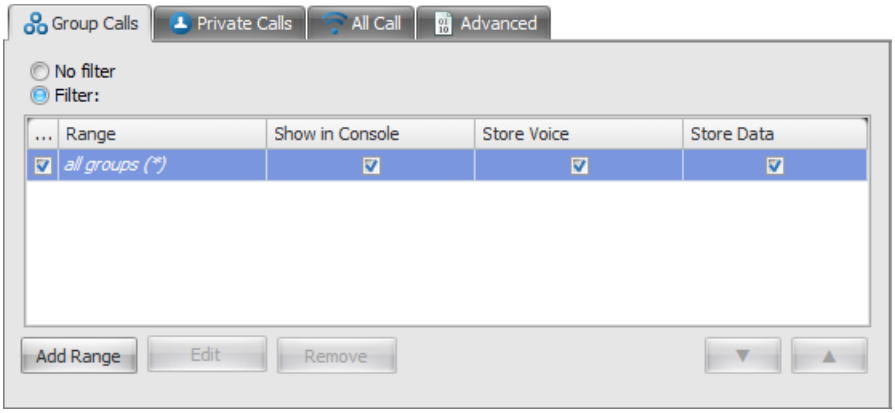


Figure 6: Filtering rules for group calls

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 IDs (*all groups*) or subscriber IDs (*all subscribers*) covered by this rule.

If necessary, create custom rules for smaller ranges or for individual IDs and set options for each ID 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 ID or the subscriber ID, or the first and last ID in the range. Click **OK**.

Table 9: 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 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.
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 ID matches a rule, this rule is applied and the rules with lower priority are not checked. If the calling ID does not match a rule in the list, the default rule will be 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 20).

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. 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:

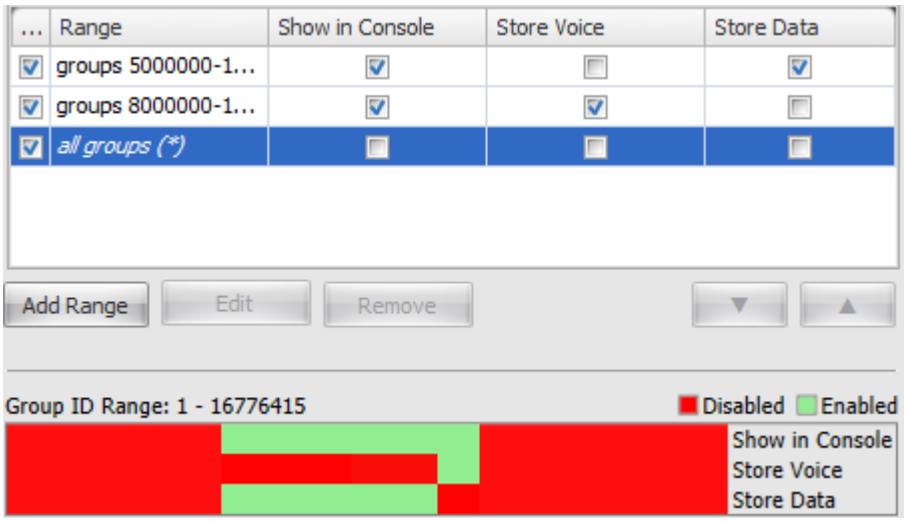


Figure 7: Ordering rules with overlapping ranges

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 ID in the system. In case of private calls, the horizontal axis shows subscriber IDs from 1 (left) to the maximum possible ID. 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 IDs 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. For details, refer to section 5.3.3.2, Adjusting Filter Settings (page 67).

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 gateway between TRBOnet Watch and the radio system. The XRT gateway 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 gateway as described in section 4.9.2.1, Adding an XRT (page 22).

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 24). 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 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.

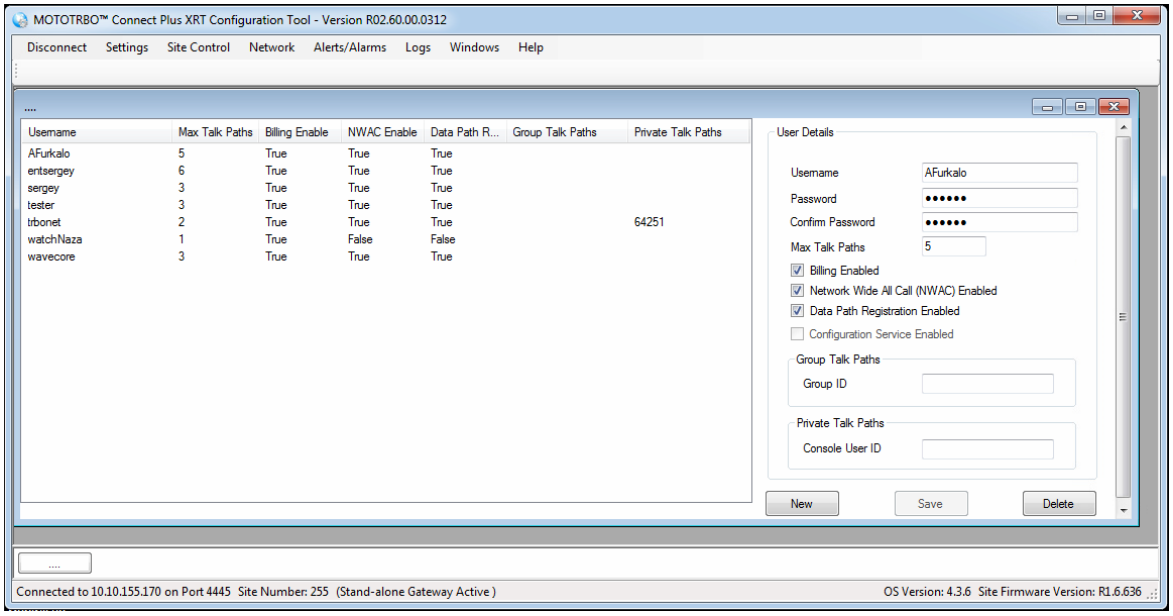


Figure 8: XRT user accounts

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

To register a MOTOTRBO XRT gateway:

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 10: XRT gateway 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: ▪ **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.

Property	Description
	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.
	▪ **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 24).

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.

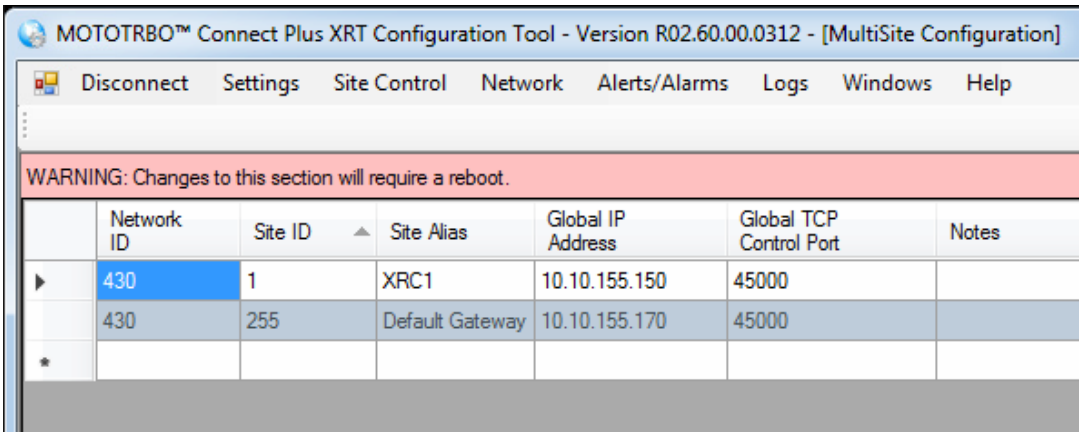


Figure 9: Connect Plus multi-site configuration tool

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 11: 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 9).

Property	Description
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 111).
Monitoring level	The monitoring level of the site. Options: ▪ **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 XRT configuration (Figure 9).
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 in the radio network.
XRC RDAC Port	The RDAC UDP Listen Port of the XRC controller (Figure 10, page 26). 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.

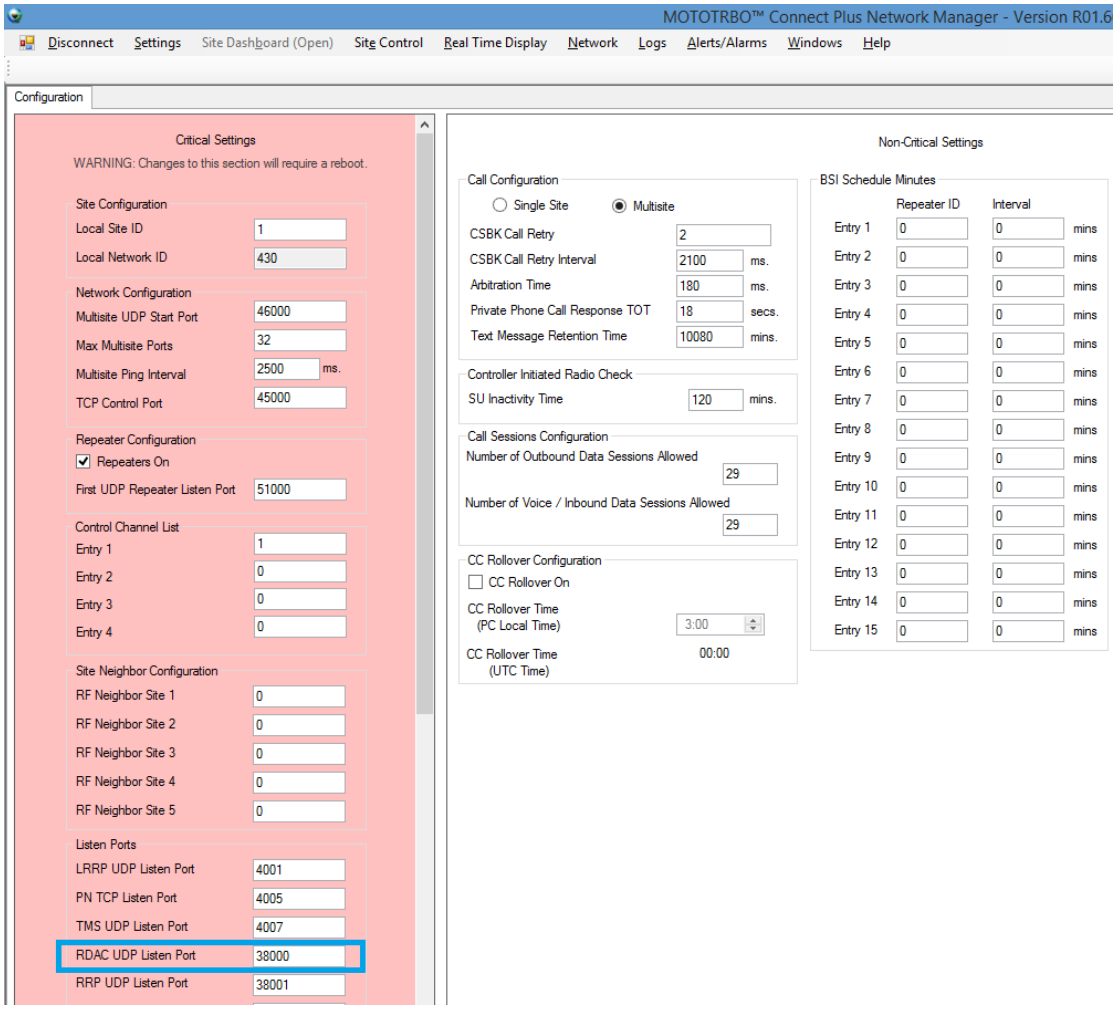


Figure 10: RDAC UDP Listen Port of the XRC controller

4.9.3 Registering MOTOTRBO Capacity Max

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

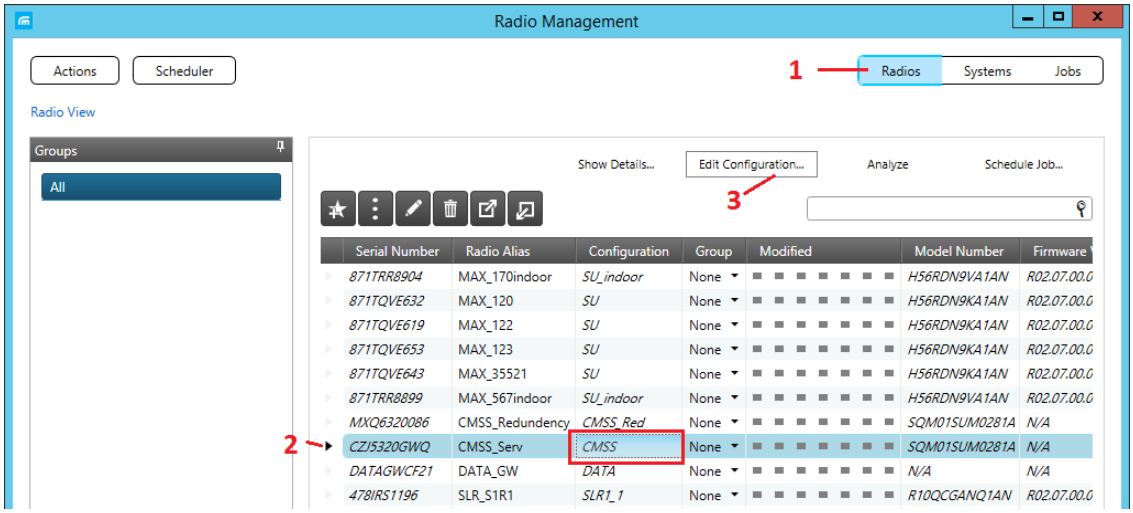


Figure 11: Opening the Capacity Max system configuration

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

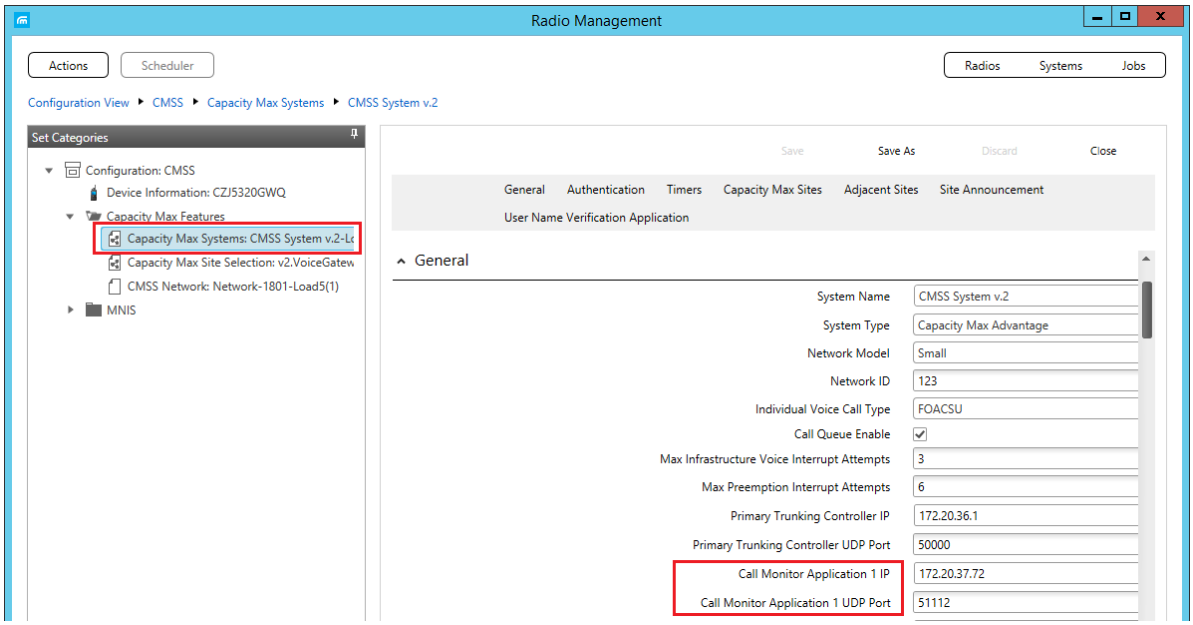


Figure 12: Opening the general settings of the Capacity Max system

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 **Configuration** 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 12: 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 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.
Enable status control for system components using ICMP ping	If this option is selected, the system components will be periodically pinged to check their status.
Enable status control for redundancy system components using ICMP ping	If this option is selected (available only if the above option is selected), the redundancy system components will also be pinged to check their status.
Interval	Specify the ping interval, in seconds

3. Add all RF sites as described in section 4.9.3.1, Adding an RF Site (page 28).
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 from your Capacity Max system, use Radio Management to open the system configuration for all the any repeaters registered in that system to view the information about those repeaters.

To open the Capacity Max configuration for a repeater:

1. Launch the Radio Management software. Click **Radios** (Figure 13, step 1).
2. In the right panel, click the arrow in front of an entry with the repeater configuration (Figure 13, step 2). Make sure that the entire line is selected.
3. Click the **Edit Configuration** button (Figure 13, step 3).

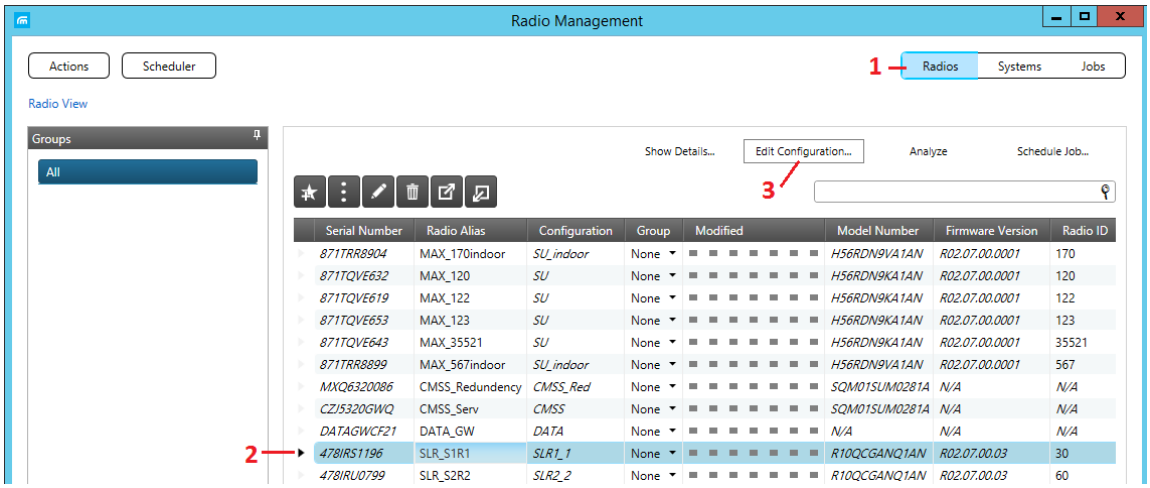


Figure 13: Opening the Capacity Max configuration for a repeater

4. In the left pane, expand **Capacity Max Features** and click **Capacity Max Systems** (Figure 14, step 1).

5. In the right pane, click **Capacity Max Sites** (Figure 14, step 2).

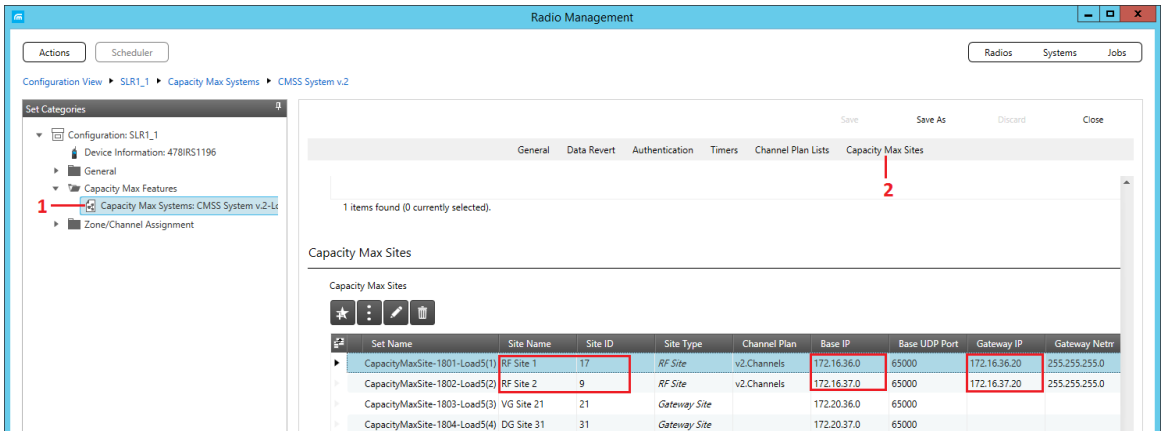


Figure 14: Opening the system sites

Register the repeater information in TRBOnet Watch for all RF sites that are displayed in the **Capacity Max Sites** list.

Perform the following steps to register an RF Site in TRBOnet Watch:

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

Table 13: 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 14).
Base IP	The base IP address of the RF site. This setting must match the **Base IP** value in the Radio Management tool (Figure 14).
Router IP	The IP address for the site router. This setting must match the **Gateway IP** value in the Radio Management tool (Figure 14).

4. In the left pane, click **Peers** under your RF site.
5. In the right pane, use the **Add** button to add information for all the 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

Perform the following steps to register a Trunking Controller:

1. Open the Capacity Max system configuration as described in section 4.9.3, Registering MOTOTRBO Capacity Max (page 26).

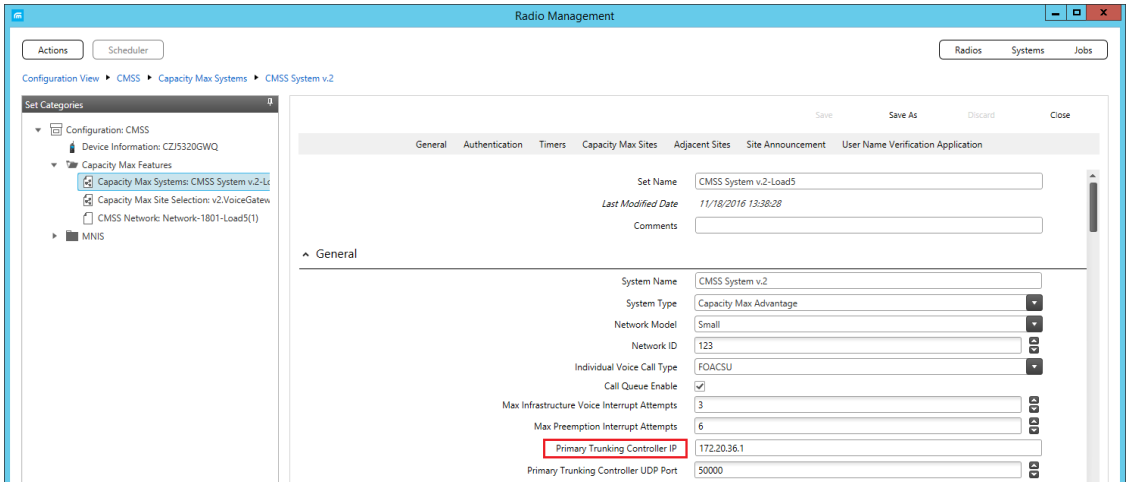


Figure 15: The IP address of the Trunking Controller

2. In the left **Configuration** 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 14: 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 15).

4.9.3.3 Adding a VRC Gateway

Perform the following steps to register a VRC Gateway:

1. Open the Capacity Max system configuration as described in section 4.9.3, Registering MOTOTRBO Capacity Max (page 26).
2. In the left panel, click **CMSS Network** under **Capacity Max Features** (Figure 16).

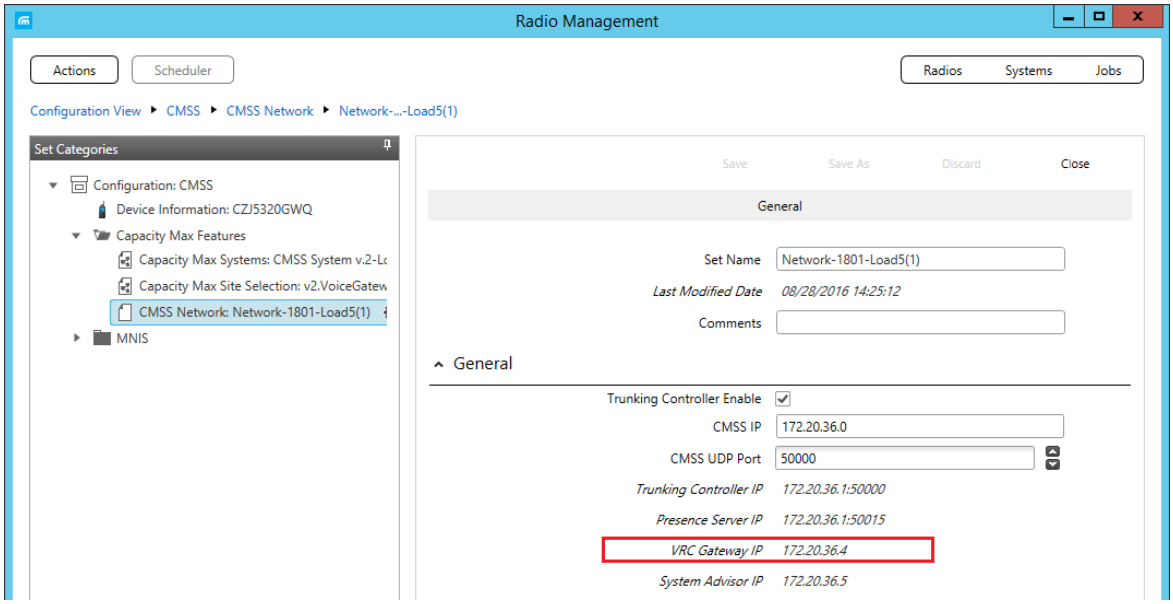


Figure 16: The IP address of the VRC Controller

3. In the **Configuration** 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 15: 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 28).
IP	The IP address of the VRC Controller as specified in the Capacity Max system configuration (Figure 16).

4.9.3.4 Adding a Data Gateway

Perform the following steps to register a Data Gateway:

1. In the **Configuration** 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 16: 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 28).
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 the traffic of a hardware RoIP gateway that connects a MOTOTRBO two-way radio to the system's IP network. To monitor an RoIP gateway, register the respective hardware unit - TRBOnet Swift Agent A100/A200 or Friendly FS-1000.

4.9.4.1 Registering a TRBOnet Swift Agent

Perform the following steps to register a TRBOnet Swift Agent:

1. In the **TRBOnet Watch Server** window, click **MOTOTRBO** in the left **Configuration** 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 17: 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.

Property	Description
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: ▪ **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) ▪ **PIN 4**: Pin 3 (CTRL1) or pin 8 (CTRL2) Note: To learn more about the TRBOnet Swift Agent connector pin-outs, refer to the *TRBOnet Swift Agent A100/A200 User Manual*.
Pin name	The pin name to be displayed in the TRBOnet Watch Console. Editable. Default: **PIN 0** to **PIN 4**.
Pin value	The active level of the input pin. Values: Low level, High level. Select Low level for all pins by default. Note: Contact your administrator to verify the actual active levels for these pins.

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

4.9.4.2 Registering a Friendly FS-1000

Perform the following steps to register a Friendly FS-1000:

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

Table 18: 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

4. 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.

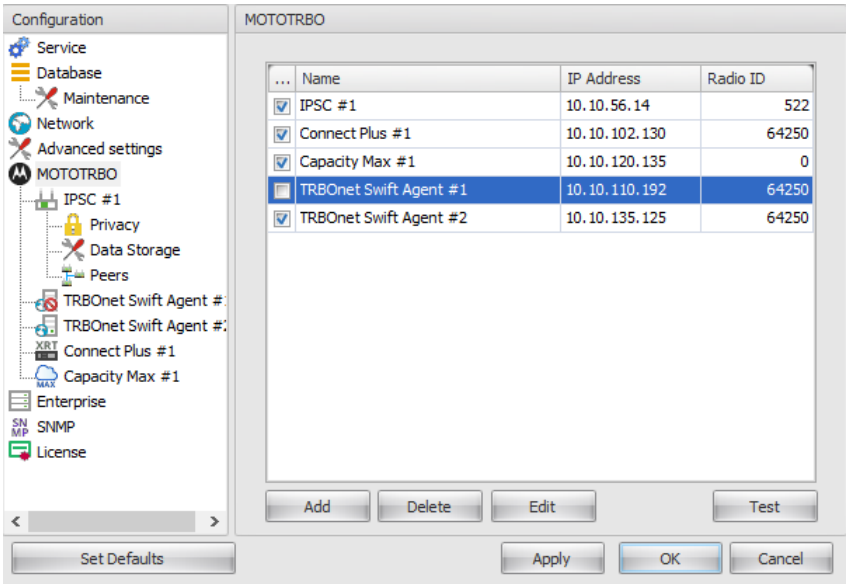


Figure 17: Viewing registered systems in the MOTOTRBO pane

If you click **MOTOTRBO** in the **Configuration** pane, the right pane will display all the registered systems of each 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 of the registered controller.

To exclude a system from monitoring, clear the checkbox in front of the system name (Figure 17), 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 determine 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 only monitor the allowed number of systems, starting 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.

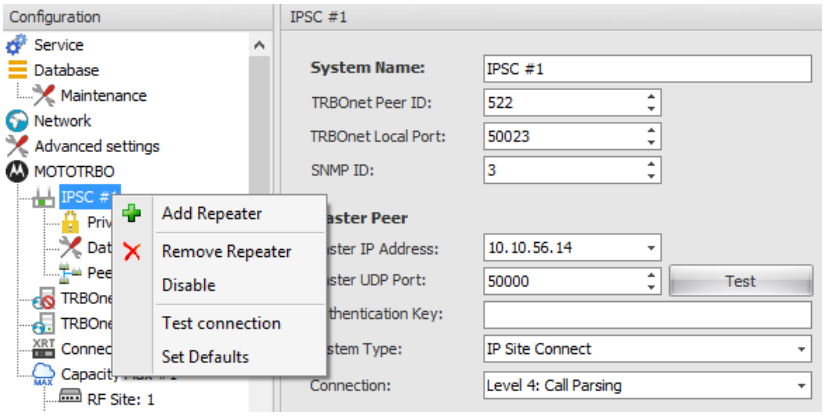


Figure 18: Using the context menu in the Configuration pane

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 (for example, Peer ID and Local Port) of the selected system to their default values.

4.11 Registering TRBOnet Plus/Enterprise

If your Linked Capacity Plus or Capacity MAX radio systems are using the NAI protocol to transfer data (Location, ARS, TMS), then in order to build repots and RSSI analytics, you'll have to connect to the appropriate TRBOnet Plus/Enterprise.

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

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

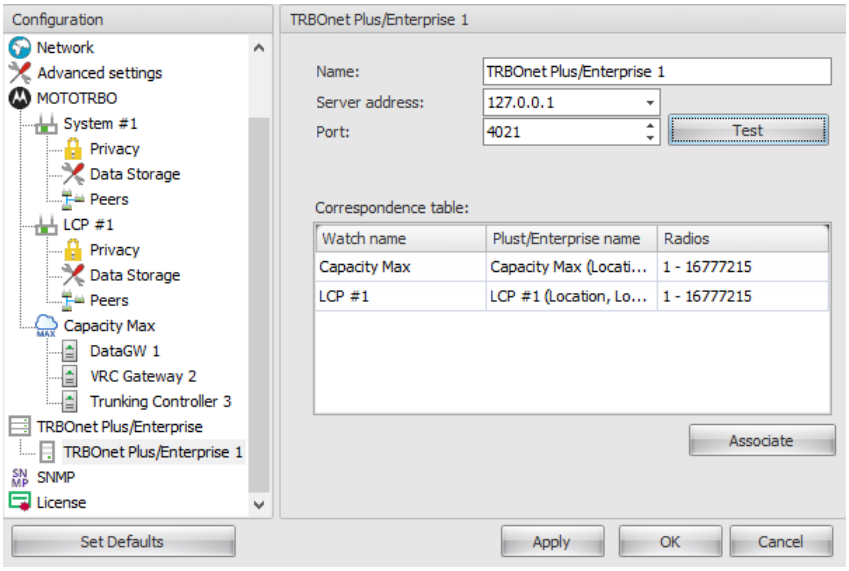


Figure 19: Adding TRBOnet Plus/Enterprise

- In the 'TRBOnet Plus/Enterprise' pane, specify the following parameters:
  - **Name**
    Enter a name for the TRBOnet Plus/Enterprise you are connecting to.
  - **Server address**
    Enter the IP address of the PC with TRBOnet Plus/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 Plus/Enterprise and available Location services.

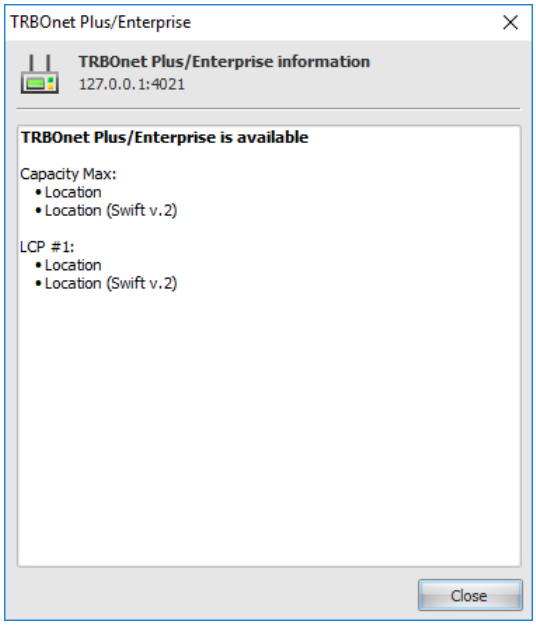


Figure 20: Testing TRBOnet Enterprise

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

- **Watch name**
  The name of the radio system in TRBOnet Watch.
- **Plus/Enterprise name**
  The name of the radio system in TRBOnet Plus/Enterprise. Click the arrow on the right, and from the drop-down list select the name of the appropriate radio system in TRBOnet Plus/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 Plus/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 112).

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 111).

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 19: SNMP configuration settings

Setting	Description
System Parameters section: Includes basic settings that will be visible in an NMS. Except **sysObjectID**, these settings can be modified in NMS.	
sysDescr	Specify a description of the TRBOnet Watch solution. Default: The full name and version of TRBOnet Watch.
sysObjectID	TRBOnet Watch OID. Read-only. 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 name of the SNMP Agent.
sysLocation	The descriptive physical location of the SNMP Agent. Default: "Default location".
Engine ID	The identifier of the SMNP Agent. Specify the value that contains 10 to 64 hex characters, or use the default value. Default: 80000AD0431AF108. Note: If SNMPv3 is enabled, the **Engine ID** value must match the appropriate setting in NMS.
SNMP Agent section: Enable the SNMP Agent and configure the NMS connection.	
Enabled	Select to run the SNMP Agent.
SNMPv3 Only	Select to use the SNMPv3 protocol for (encrypted if required) communication between the remote NMS and TRBOnet Watch. The SNMPv3 Agent will ignore all unauthorized requests, including notification requests (if configured to do so). Note: If you select this option, fill out the fields in the **SNMPv3 User** section and the **Engine ID** field.
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	Select to enable the SNMP Agent to send notifications in case of unsuccessful authentication on the agent. Note: This option also requires that the **SNMPv3 Only** option is selected.
To	The IPv4 address to which the SNMP Agent sends notifications. The UDP port is 162. Note: Click **Test** to send a test notification to the recipient.
Version	The SNMP protocol version for sending notifications. Values: SNMPv2, SNMPv3.

Setting	Description
	Note: If you select **SNMPv3**, fill out the fields in the **SNMPv3 User** section.
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).
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 different system types, building analytics and reports, and diagnostics.

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.

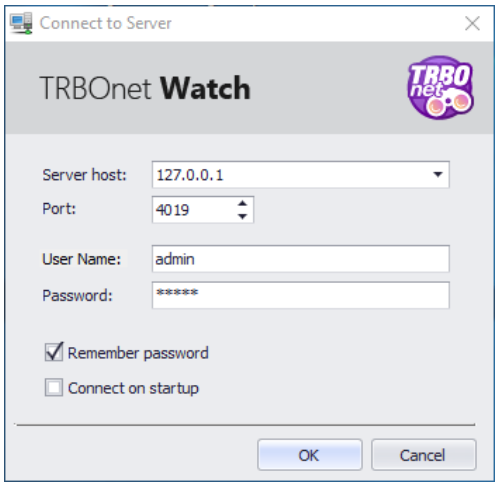


Figure 21: The Connect to Server dialog box

- 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 in 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 4.3, Configuring the IP Network Settings (page 11).

  - **User Name**
    Enter the User Name registered in the TRBOnet Watch Console Users list.
  - **Password**
    Enter the User Password.

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

  - **Connect on startup**
    Select this option to launch the Watch Console without having to type the User Name 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**.

5.1.2 Connecting to a Different Server

To connect to a different TRBOnet Watch Server after the application has been launched:

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

5.1.3 Changing the Language

You can configure 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**.
- From the drop-down list, select the preferred language.
- Click **OK**.

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

5.1.4 Configuring Audio Settings

You can modify the audio settings for playing notification sounds (see section 5.4.3, Managing Notifications).

- 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 PC.
  - **Network interface**: Select the network to which your TRBOnet Watch Server is connected.
- Click **OK**.

5.2 Live Monitor

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

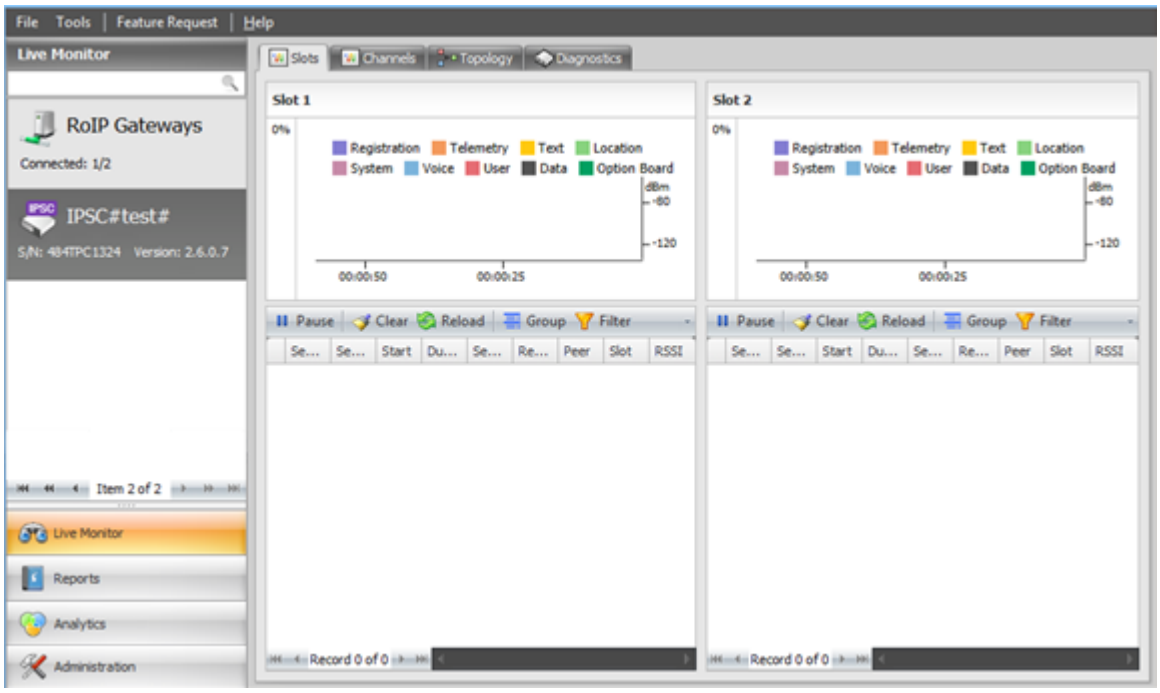


Figure 22: Live Monitor

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

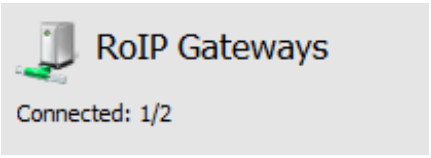
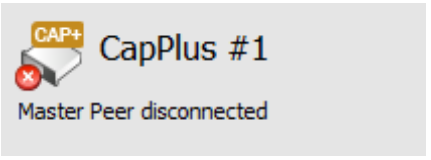
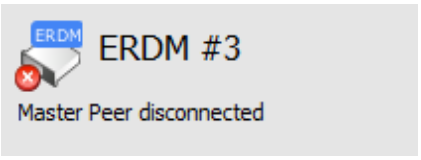
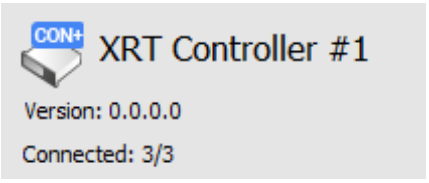
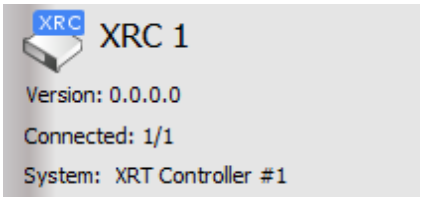
 Figure 23: RoIP gateways	RoIP gateways (all available) **Connected: 1/2**: Two gateways are selected for monitoring and one of them is connected to the IP network.
 Figure 24: A Capacity Plus system	Capacity Plus system The system name is displayed next to the icon. Displayed below the icon is the serial number and firmware version of the master repeater.

 Figure 25: An LCP system	Linked Capacity Plus system The system name is displayed next to the icon. Displayed below the icon is the serial number and firmware version of the master repeater.

 Figure 26: An IP Site Connect system	IP Site Connect system The system name is displayed next to the icon. Displayed below the icon is the serial number and firmware version of the master repeater.
 Figure 27: An Extended Range Direct Mode system	Extended Range Direct Mode system The system name is displayed next to the icon. Displayed below the icon is the serial number and firmware version of the master repeater.
 Figure 28: A Connect Plus system	Connect Plus system The system name is displayed next to the icon. **Version**: Always 0.0.0.0. **Connected: 3/3**: Three of three connected sites are available in the system.
 Figure 29: A site in a Connect Plus system	Connect Plus site The site name is displayed next to the icon. **Version**: Always 0.0.0.0. **Connected: 1/1**: One of one connected repeater available on the site. **System**: System name.
 Figure 30: A Capacity Max system	Capacity Max system The system name is displayed next to the icon. **Connected: 3/3**: Three of three connected RF sites available in the system.
 Figure 31: An RF site in a Capacity Max system	RF site (Capacity Max) The RF site name is displayed next to the icon. **Connected: 3/3**: Three of three connected repeaters 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.

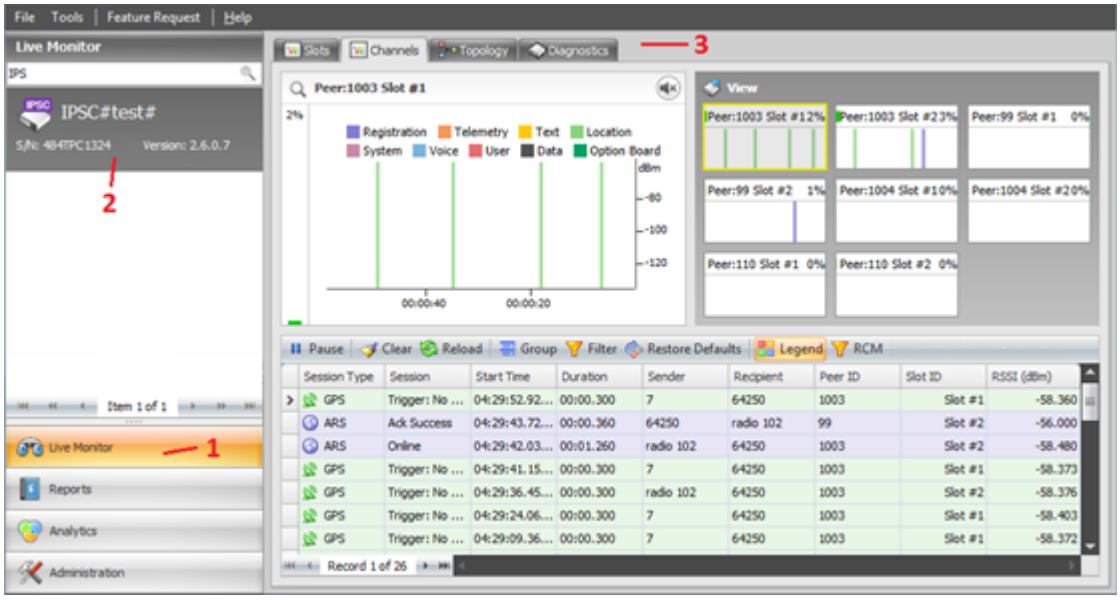


Figure 32: Monitoring MOTOTRBO systems

To monitor activity in a MOTOTRBO system:

- In the lower-left pane, click **Live Monitor** (Figure 32, step 1) and then click the tab with the system name (Figure 32, step 2).
- In the right pane, click the respective tab (Figure 32, step 3):
  - **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 44).
  - **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 46).
  - **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 56).
  - **Diagnostics**: Open this tab to view the configuration settings and connection and alarm statuses of all of the system's peers. Also, use this tab to manage repeaters remotely. For details, refer to sections 5.2.1.3, Viewing Diagnostics (page 47) and 5.2.1.4, Controlling Repeaters Remotely (page 50).

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 each include a real-time traffic monitor and a list of calls transmitted in the given time slot. Drag the bars between the panes to adjust their width and height.

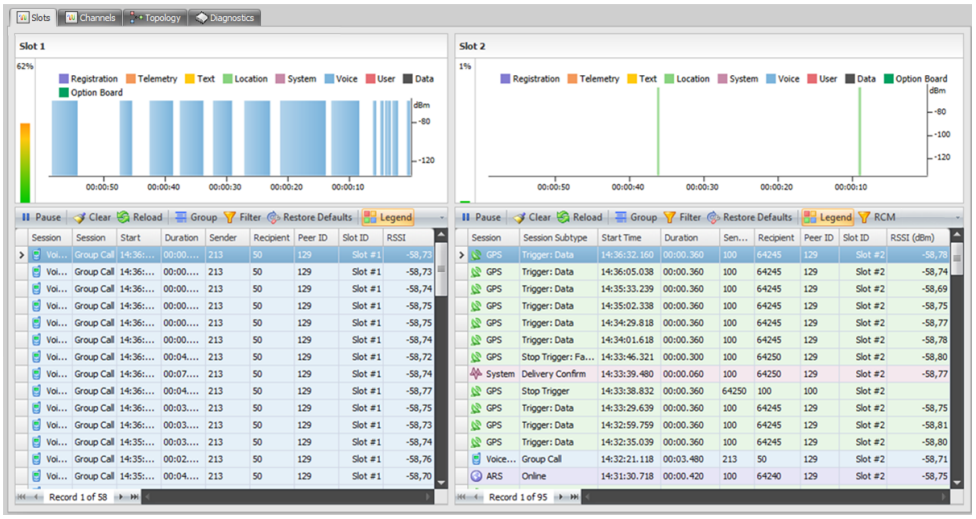


Figure 33: Slots tab

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, call types that are unrecognizable 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 is located on the left of the image of each slot, and the percentage value in each monitor indicates 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 IDs of the transmitted the calls, and the signal strength measured by the repeater.

The toolbar for the list includes the following:

Table 20: 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 content of the list will stop updating.
Clear	Click the **Clear** button to remove all entries from the list.

Button	Description
Reload	Click the **Reload** button to undo the **Clear** command.
Group	Click the **Group** button to toggle entering or exiting the grouping mode. To group the list entries by any column, drag the column header to the grouping area above the list header.
Filter	Click the **Filter** button to toggle entering or exiting the filtering mode. To filter the list, do any of the following: ▪ 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 below the column header. All entries not including the specified value in the column will be hidden. Note: Click the down arrow in the **Session Type** column header for a drop-down list of possible choices.
Restore Defaults	Click the **Restore Defaults** button to undo grouping and filtering changes.
Legend	Click the **Legend** button to toggle between showing/hiding the legend in the monitor pane.
RCM	Click the **RCM** button to toggle hiding/displaying the RCM messages in the list along with other entries. For the description of RCM messages, refer to Appendix C: RCM Messages (page 117).

When you close 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 60).

5.2.1.2 Viewing System Channels

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

Figure 34: Channels tab

The **View** pane displays all system peers that can transmit calls, including software peers such as TRBOnet Plus/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**.

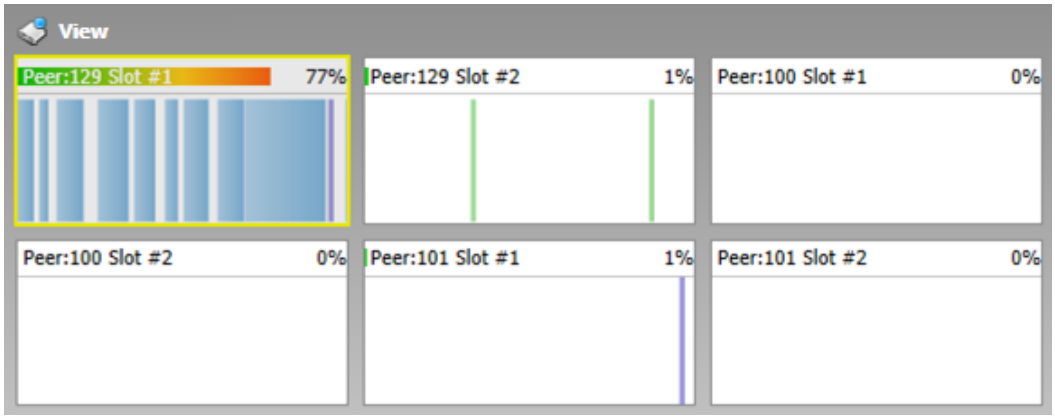


Figure 35: The view of all system peers

If a peer is disconnected, its monitors will be shaded pink and the message "Feed Offline" will be displayed.

Click on a small monitor in the **View** pane to display the traffic in the selected peer slot in the larger monitor. The behavior and features of this monitor are described in section 5.2.1.1, Viewing IPSC System Slots (page 44).

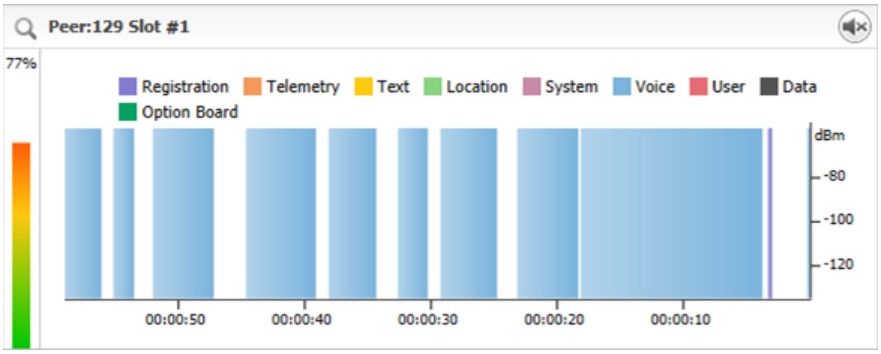


Figure 36: The real-time monitor displays traffic in the slot selected in the View pane

The real-time monitor includes an audio **Mute** button. The mute mode is selected by default. Click this button to unmute voice transmissions on the channel in order to listen to a conversation.

Note: Toggling the **Mute** button has no effect if your system is monitored on Level 3 or lower. The levels of system monitoring are described 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 toolbar buttons are described in section 5.2.1.1, Viewing IPSC System Slots.

5.2.1.3 Viewing Diagnostics

The **Diagnostics** tab displays the diagnostic information from all MOTOTRBO systems registered in your TRBOnet Watch. This tab shows alarms from repeaters and helps to pinpoint configuration problems.

Additionally, use the **Diagnostics** tab to manage repeaters remotely. To learn more about this option, refer to section 5.2.1.1, Viewing IPSC System Slots (page 44).

Note: The **Diagnostics** tab is unavailable for Capacity Max systems.

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.

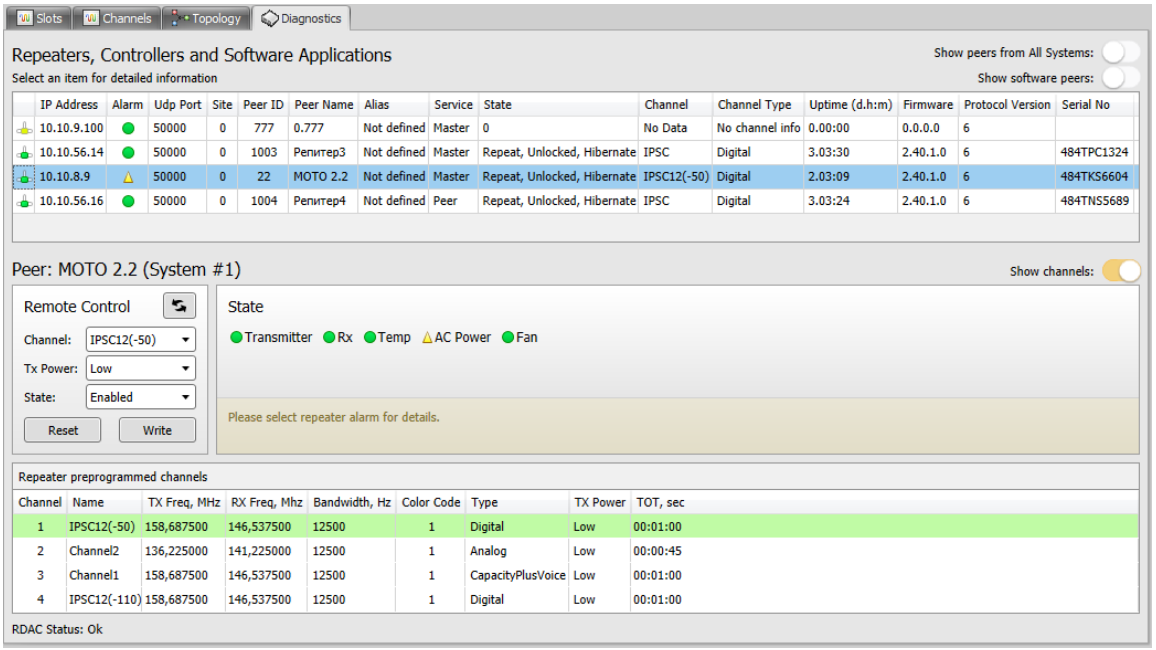


Figure 37: The Diagnostics tab

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

Table 21: Repeaters, Controllers and Software Applications list - settings

Setting	Description
Icon	The connection status of the peer. ▪  (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. Note: Point at the icon with the mouse cursor to see the tooltip with the description of the state.
IP Address	The IP address of the peer.
Alarm	The alarm status of the repeater. The severity is indicated by the icon as follows: ▪ 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.

Setting	Description
	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. Note: Alarm icons are for repeaters only. Other peers always display the "green circle" icon ("no alarm").
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 78).
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.

Setting	Description
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 16).

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 50).
- **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 21 (page 48). Point at a particular alarm with the mouse cursor to get more information.

Figure 38: 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 50).

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.

Note: The **Diagnostics** tab is unavailable for Capacity Max systems.

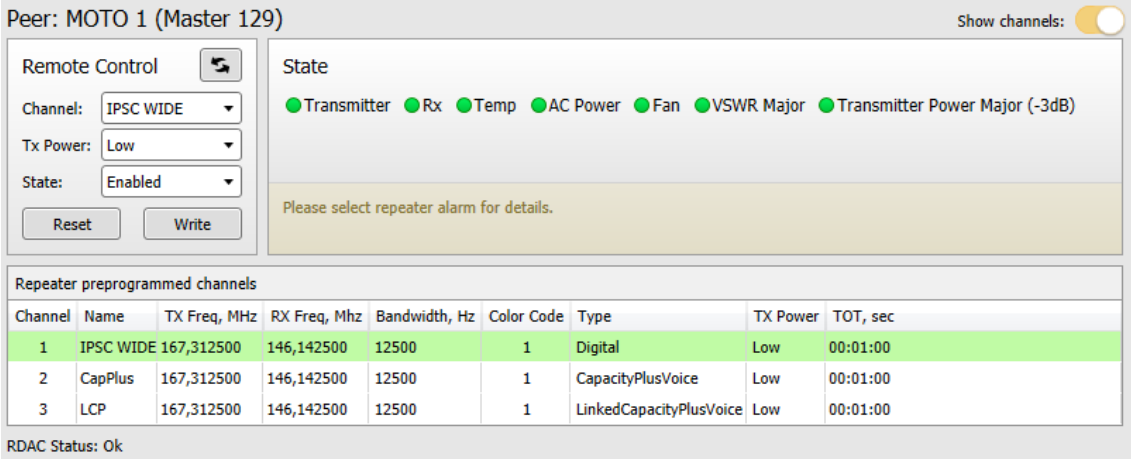


Figure 39: Remote Control

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, in seconds, during which the radio can continuously transmit before transmission terminates automatically.

You can perform the following remote operations with a repeater:

Table 22: Remote operations with repeaters

To do this:	Perform these steps:
Configure a repeater to use a different channel	1. Select the repeater in the **Repeaters, Controllers and Software Applications** list. 2. In the **Remote Control** panel, expand the **Channel** drop-down menu and click a different channel.

To do this:	Perform these steps:
	3. Click the **Write** button. The repeater configuration update may take more than a minute. 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 16). Note: The channel type is displayed in the **Type** field of the **Repeater preprogrammed channels** list.
Configure the transmission power of the repeater	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. To configure the transmission power of the repeater: 1. Select the repeater in the **Repeaters, Controllers and Software Applications** list. 2. In the **Remote Control** panel, expand the **Tx Power** drop-down menu and click the preferred option: **High** or **Low**. 3. Click the **Write** button.
Enable/ disable the repeater	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 diagnostics to sending alarms. To enable or disable the repeater: 1. Select the repeater in the **Repeaters, Controllers and Software Applications** list. 2. In the **Remote Control** panel, expand the **State** drop-down menu and click a different option: **Enabled** or **Disabled**. 3. Click the **Write** button.
Reboot the repeater remotely	1. Select the repeater in the **Repeaters, Controllers and Software Applications** list. 2. Click the **Reset** button in the **Remote Control** panel.
Reload the configuration settings	1. Select the repeater in the **Repeaters, Controllers and Software Applications** list. 2. Click  in the **Remote Control** panel. The latest configuration settings of the repeater are loaded to the **Remote Control** panel and to the **Repeater Preprogrammed Channels** list.

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 53).
- **Diagnostics**: Open this tab to view 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 53).
- **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 56).
- **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 55).

5.2.2.1 Viewing Channels

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

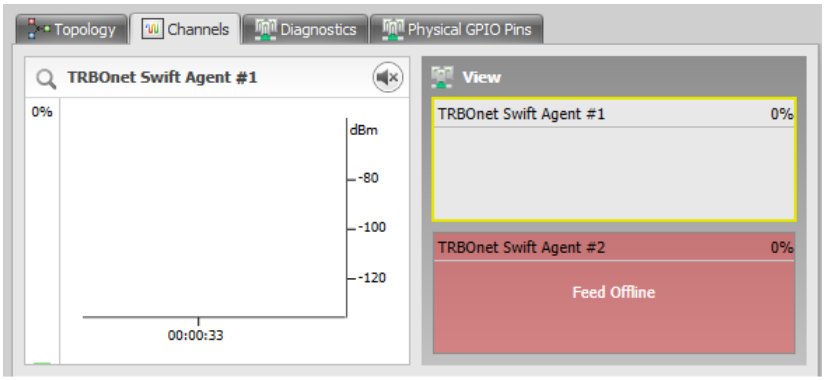


Figure 40: Monitoring traffic of a RoIP gateway

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 44).

5.2.2.2 Viewing Diagnostics

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

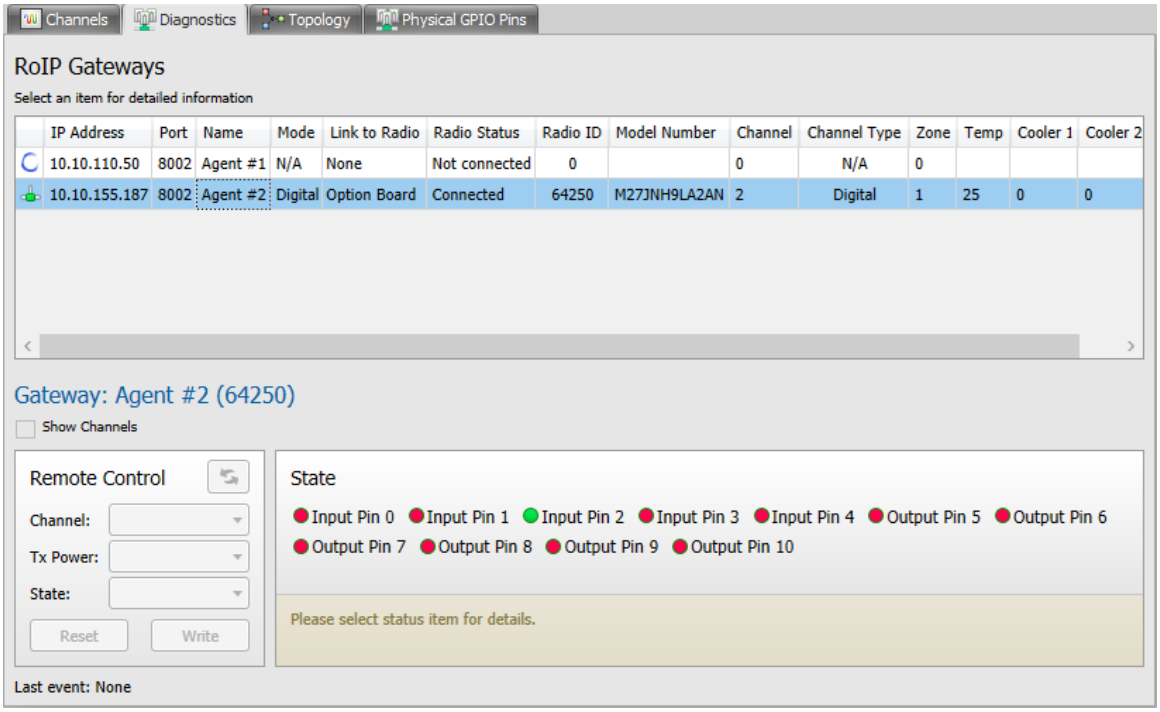


Figure 41: Diagnostic information for all RoIP gateways

The RoIP Gateways list displays the following diagnostic information:

Table 23: RoIP Gateways list – fields

Field	Description
Icon	The IP connection of the RoIP gateway. ▪ (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.

Field	Description
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)"

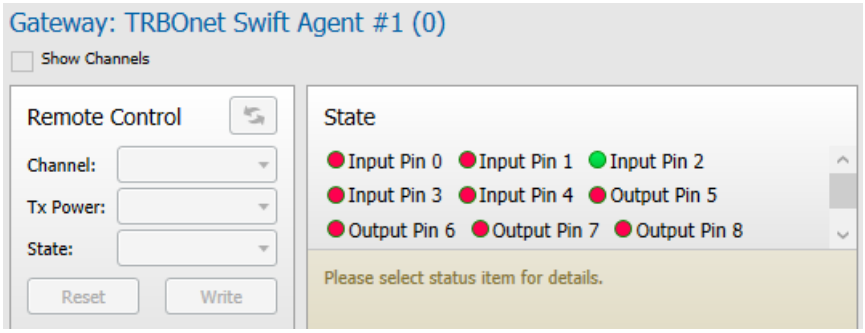


Figure 42: Gateway information and physical pins

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 32).

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 55).

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 24: Physical GPIO pins list - fields

Field	Description
Icon	The connection status of the RoIP gateway. ▪ (green icon): Normal IP connection. ▪ (blue circle icon): No IP connection.

Field	Description
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. For details, refer to section 4.9.4.1, Registering a TRBOnet Swift Agent (page 32).
Input <1-5>: Value	The pin status: ▪ 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 32).

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.

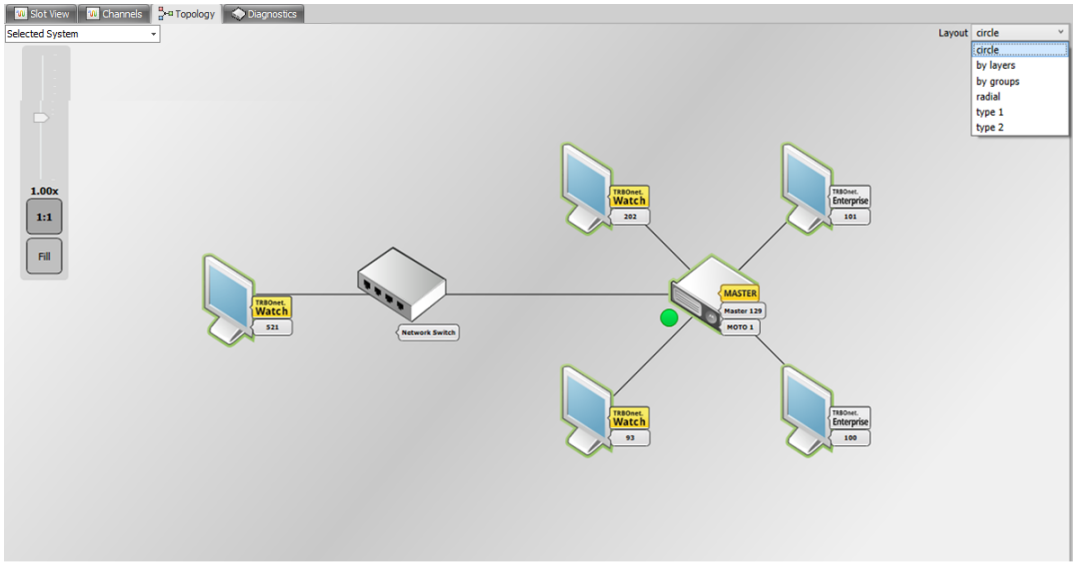


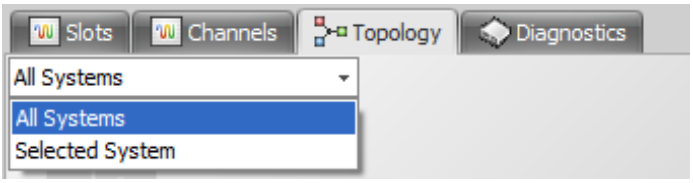
Figure 43: Topology of a MOTOTRBO IP Site Connect system

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 25.

Table 25: Adjusting the view of the Topology tab

Operation	Description
Adjust the scope of displayed systems	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:  Figure 44: 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.
Adjust the layout	You can select a different layout of elements from the **Layout** drop-down list.
Rescale the map	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.
Remove disconnected elements	You can remove disconnected peers (marked with a red outline) that are not relevant to your system, such as software applications connected to a given master repeater over IP. ▪ 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**. 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.

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 outlines provide information 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.

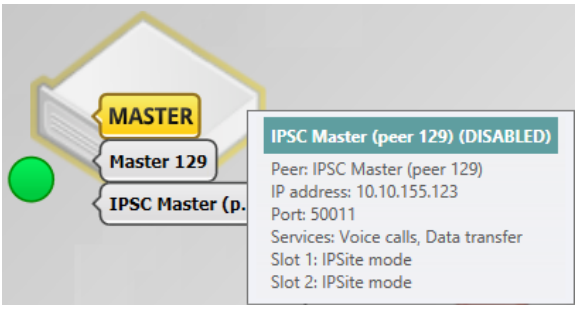


Figure 45: A cursor pointed at the image shows the tooltip with details

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

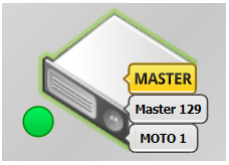
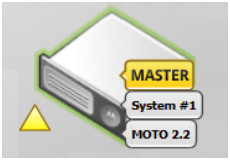
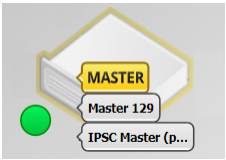
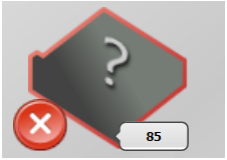
 Figure 46: Master repeater (normal state)	Image: Repeater Labels: ▪ Master: Master repeater in the system ▪ Master 129: System name ▪ MOTO 1: Peer alias Icon: Normal condition, no RDAC issues Green outline: Repeater enabled, normal IP connection
 Figure 47: Master repeater (reloading)	Image: Repeater Green outline: Normal IP connection Icon: No RDAC connection
 Figure 48: Master repeater (alarm)	Image: Repeater Green outline: Normal IP connection Icon: RDAC issue, minor severity level ("attention")
 Figure 49: Master repeater (disabled)	Image: Repeater Yellow outline: Repeater disabled Icon: Normal condition, no RDAC issues
 Figure 50: Unknown element	Image: Unknown (not registered) element Labels: ▪ 85: Peer ID Red outline: No IP connection with TRBOnet Watch Icon: No IP connection

 Figure 51: Software peer (normal state)	Image: Software peer Labels: ▪ TRBOnet. Watch: TRBOnet Watch application ▪ 93: Peer ID Green outline: Normal IP connection
 Figure 52: Software peer (disconnected)	Image: Software peer Red outline: No IP connection. The reason may be the IP address or port specified incorrectly. Icon: No IP connection

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 outline 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.

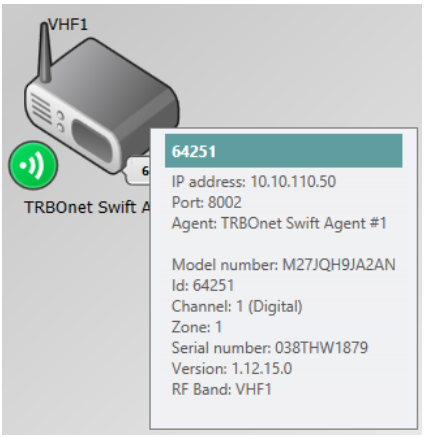
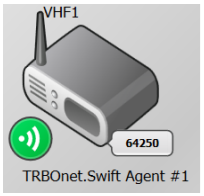


Figure 53: A pointed image shows the tooltip with details

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

 Figure 54: IP connection, no radio	Image: Radio not connected Text: System name of the RoIP gateway Green outline: Normal IP connection

 Figure 55: No IP connection, no radio	Image: Radio not connected Text: System name of the RoIP gateway Red outline: No IP connection with TRBOnet Watch Icon: No XNL connection
 Figure 56: 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 57: 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 is 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 of any aspect of system monitoring. By setting filters, you can adjust reports and charts to include specific 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 86).

5.3.1 Building Reports

To create reports, click **Reports** in the left pane of 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.

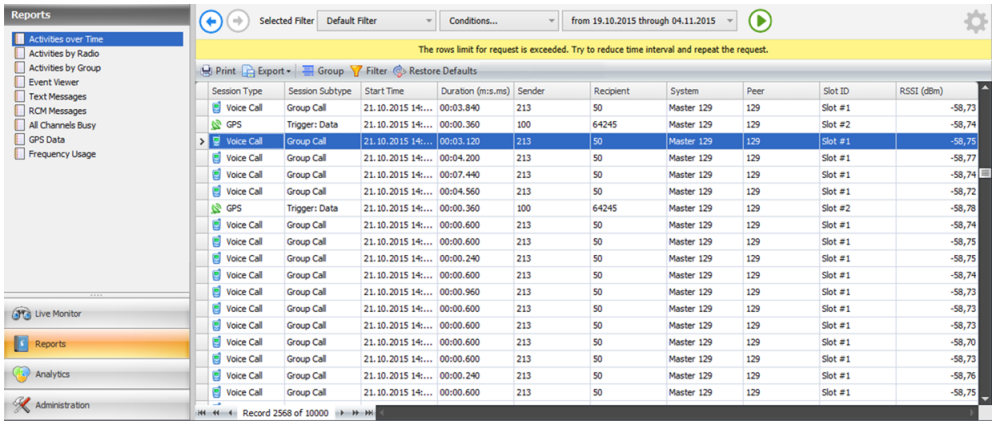


Figure 58: Reports

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 66).

The right pane displays the generated report. The message line (yellow) displays a warning about the generated report.

You can perform the following operations with reports:

Table 26: Operations with reports

Operation	Description
Build a report	1. Click a predefined report in the **Reports** pane. 2. Expand the **Filter** menu and select the filter. 3. Expand the **Conditions** menu and adjust the filter settings. For details, refer to section 5.3.3.2, Adjusting Filter Settings (page 67). 4. Expand the **Date and Time** menu and adjust the time settings. For details, refer to section 5.3.3.3, Adjusting Time Settings (page 70). 5. Click the **Start** button. The generated report appears in the right pane.
Switch between different versions of a report	If you generate more than one report, for instance, using different filter settings, you can switch between these versions using the **Previous** and **Next** buttons. The filter settings in the **Conditions** and **Date and Time** menus match the currently opened version of the report.

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**.

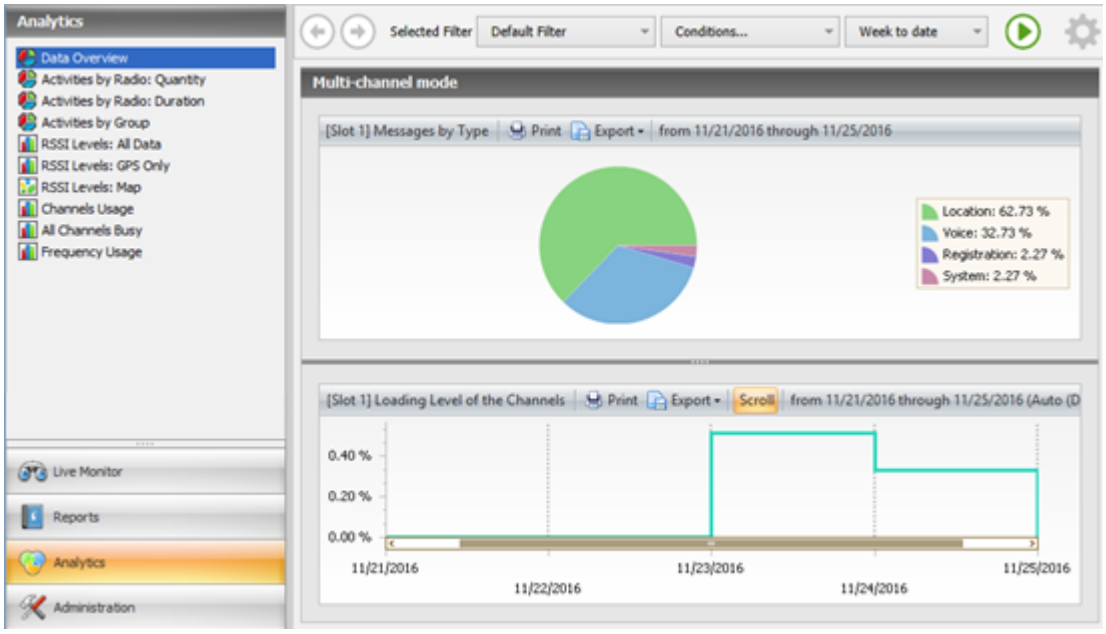


Figure 59: Analytics tab

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 86).

The filter toolbar provides controls for managing filters and for building charts and reports. For details about setting filters, see section 5.3.3, Using Filters (page 66).

The bar above the display of the charts indicates the channel mode:

- Multi-channel mode (Figure 59): 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 a set of two charts, each related to a certain time slot of the master repeater.

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

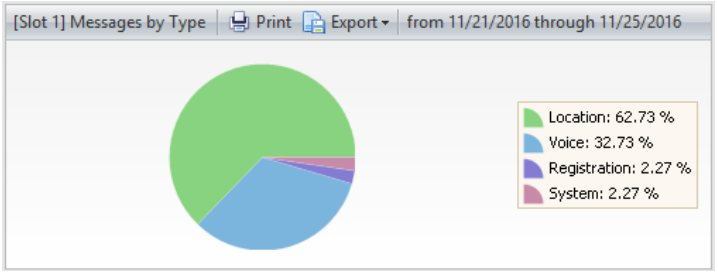
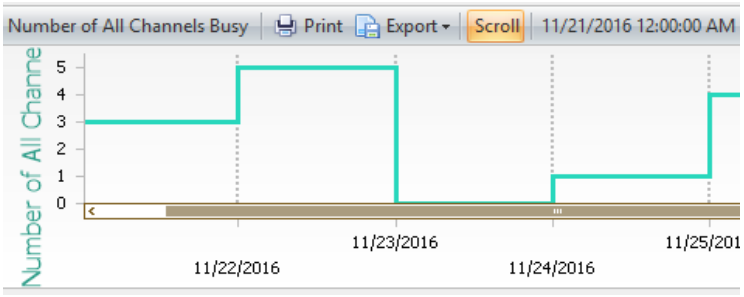
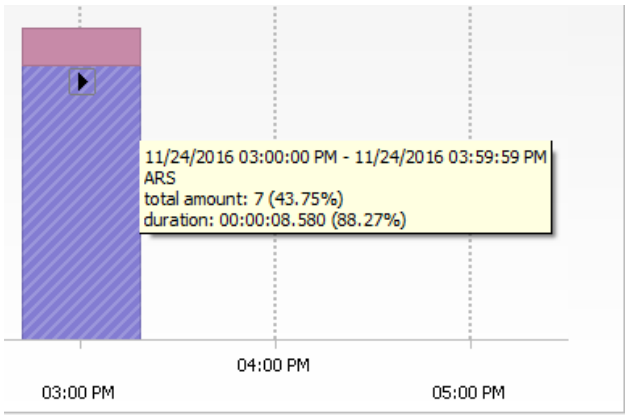


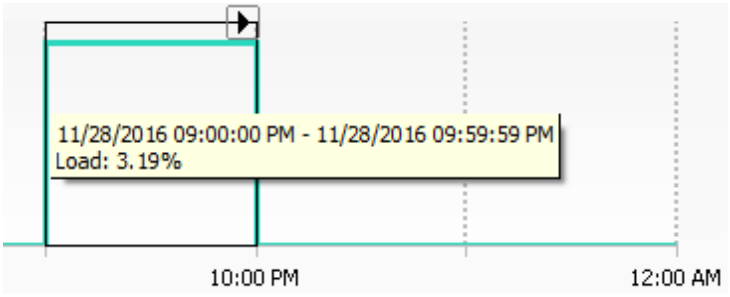
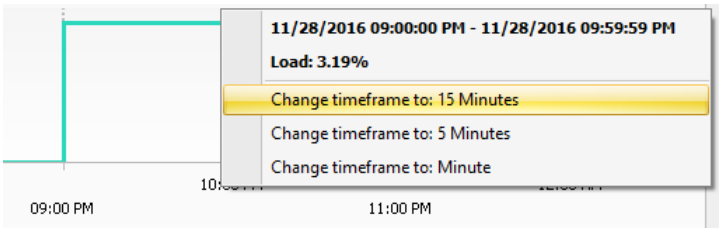
Figure 60: A Messages by Type chart in a separate pane with a toolbar

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 27: Operations with charts

Operation	Description
Build a chart	1. Select a chart in the **Analytics** pane. 2. Select a filter from the **Filter** menu. 3. Verify the filter settings. For details, refer to section 5.3.3.2, Adjusting Filter Settings (page 67). 4. Verify the time settings. For details, refer to section 5.3.3.3, Adjusting Time Settings (page 70). 5. For an RSSI Levels chart, specify the RSSI settings as described in section 5.3.2.1, Configuring RSSI Settings (page 64). 6. For RSSI Levels: Map, configure the map settings as described in section 5.3.4.1, Configuring Map Usage (page 73). 7. Click **Start**. The charts appear in the right pane.
Switch between different versions of a chart	If you generate more than one chart, for instance, using different filter settings, you can switch between these versions using the **Previous** and **Next** buttons. With each button click, the filter and time settings inside the menus **Conditions** and **Date and Time** are updated to be in sync with the currently opened version of the chart.
Show or hide the scroll bar	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.  Figure 61: The Scroll button
Drill down into a more detailed chart	If the mouse is pointed to a section of a pie or bar chart and that section changes to a different pattern (for example, striped), then clicking on this section will open a new chart with additional details about the pointed section.  Figure 62: Drill-down in a bar chart

Operation	Description
	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.  Figure 63: Drill-drown in a line chart Or, click the "arrow" button and select the preferred timeframe of the new chart on the context menu.  Figure 64: Drill-down with the preferred timeframe ▪ The time axis's scale in the new chart equals to the length of the clicked (selected) timeframe. ▪ Or, if you click the line rather than the "arrow" button, the new timeframe will be one scale smaller than the clicked timeframe. Note: The timeframes are ranged as follows: Week, Day, 4 Hours, 2 Hours, Hour, 45 Minutes, 30 Minutes, 15 Minutes, 5 Minutes, Minute. The filter and time settings are updated inside the menus **Conditions** and **Date and Time** with each drill-down and will be in sync with the current chart.
Undo drill-down	To return to the top-level chart, click the **Previous** button (arrow located at the upper-left side of the charts).

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 color. The default RSSI levels and colors are preinstalled. You can define your own RSSI levels and assign the color for each.

To configure the RSSI properties:

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

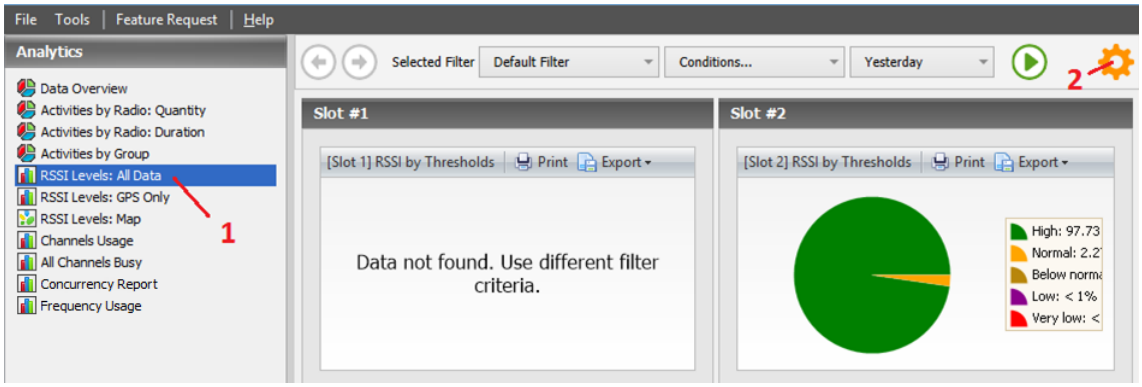


Figure 65: Opening the RSSI settings

3. In the **Rssi Levels** dialog box, configure the properties as required:

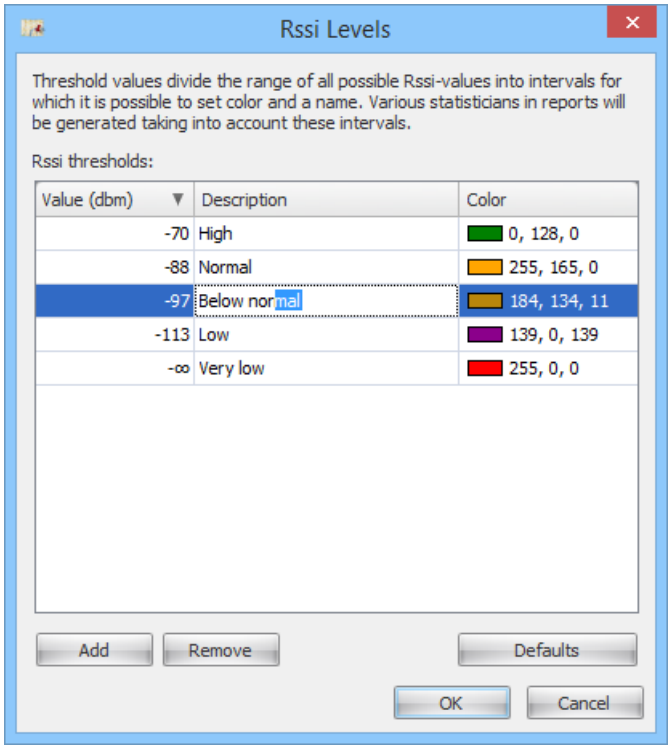


Figure 66: Configuring the RSSI levels

Table 28: 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, click in the field and type the preferred value or description, respectively. The **Value (dbm)** field specifies the lower boundary 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 will 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 get the required information from the database. Before generating **Reports** or **Analytics** outputs, select a filter from the **Selected Filter** drop-down menu and configure the filter and time settings on the filter toolbar.

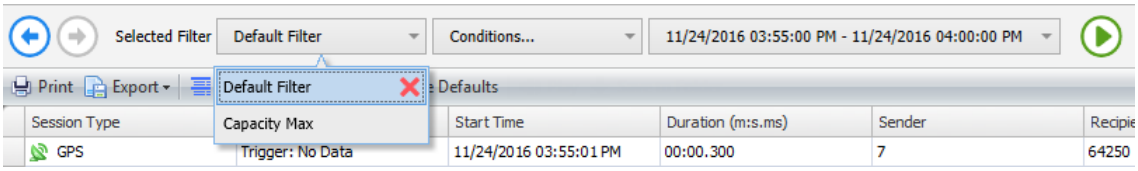


Figure 67: Filter toolbar

The filter toolbar includes the following controls:

Table 29: Filter toolbar - controls

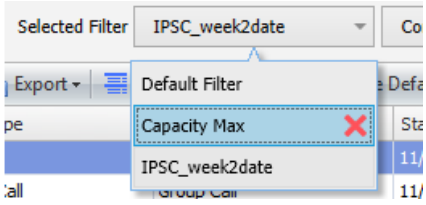
Control	Description
	**Previous** and **Next** buttons are used to switch between the generated versions of a report or a chart.
Selected Filter	The list of filters. You can add more filters and remove unnecessary filters. For details, refer to section 5.3.3.1, Managing Filters (page 66).
Conditions	The filter settings grouped in tabs. For each report and chart, only applicable tabs are visible. You can modify the filter settings as described in section 5.3.3.2, Adjusting Filter Settings (page 67).
Date and Time	The time settings. Reports and charts will include data with timestamps that fall within the specified time range. For details, refer to section 5.3.3.3, Adjusting Time Settings (page 70).
	**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 30: Managing filters

To do this:	Take these steps:
Add a new filter	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.
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.

To do this:	Take these steps:
	 Figure 68: List of filters

5.3.3.2 Adjusting Filter Settings

The filter settings under the **Conditions** menu are displayed on tabs. Depending on the selected **Reports** or **Analytics** chart, some tabs may not appear in the list of menu items. Settings will only be displayed for the selected report or chart. Tabs for the settings that are not relevant to the selected report or chart's subject will not be displayed and will be hidden.

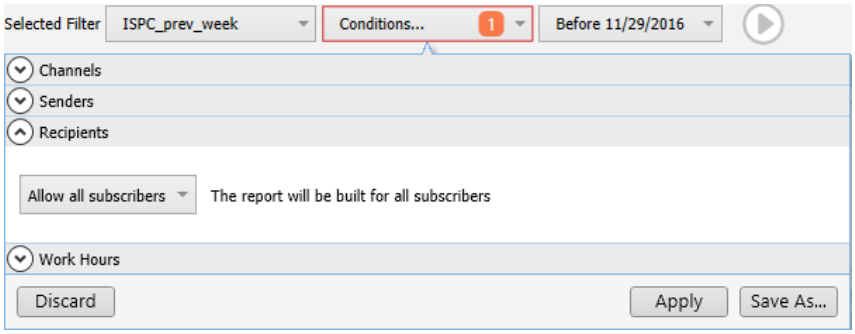
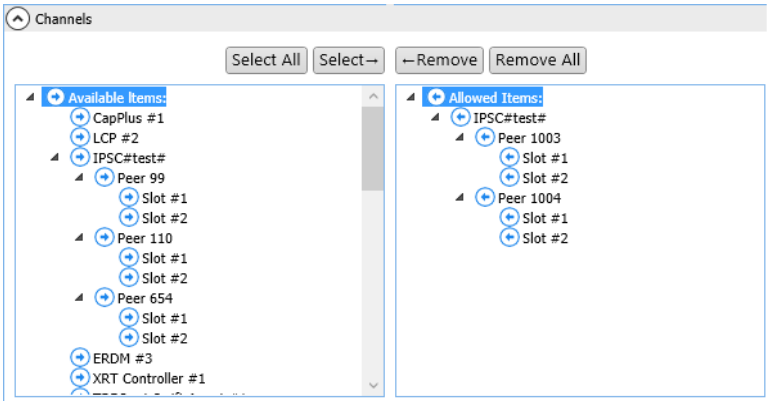
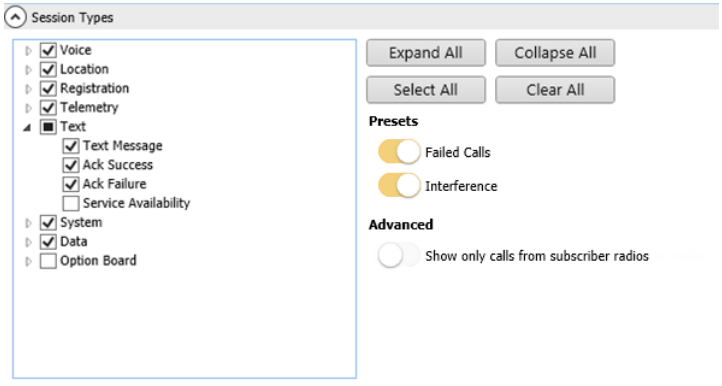


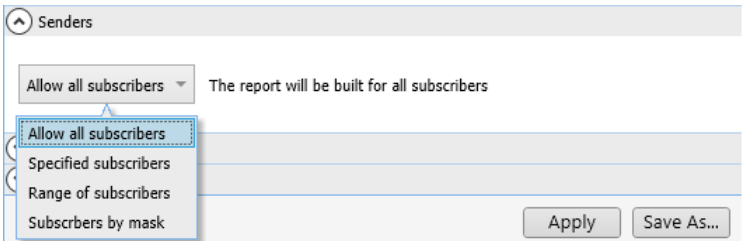
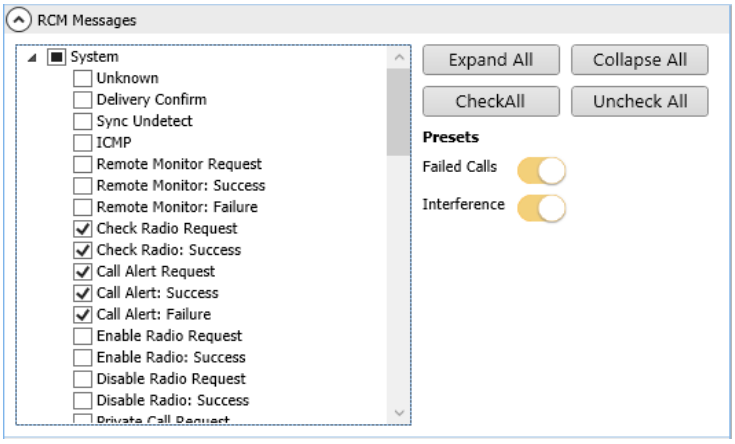
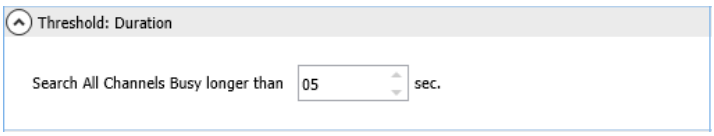
Figure 69: The filter is missing one mandatory setting

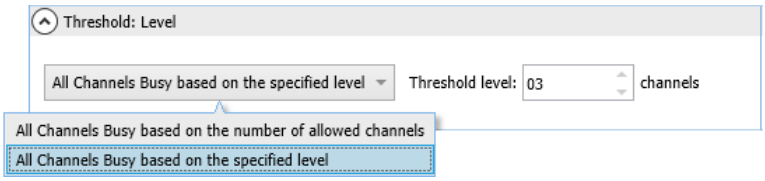
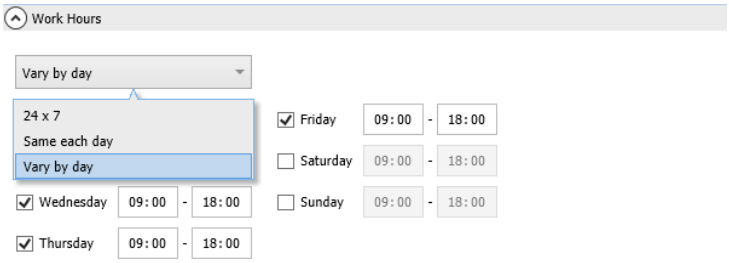
You cannot generate a report or a chart until all mandatory filter settings are set properly. If any mandatory filter setting is not specified, the **Conditions** box displays the flashing icon with the count of settings that are missing. If you move the mouse cursor over the highlighted box, the tooltip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

To specify the filter settings on each tab, see Table 31.

Table 31: Filter settings

Tab	Description
Channels	Select the radio channels to be included in reports and charts.  Figure 70: The Channels tab 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 21). 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. 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. Use the **<Removed>** item to select all systems and peers already deleted from the TRBOnet Watch configuration.
Systems (**Event Viewer** report)	This tab is similar to the **Channels** tab (above), except all displayed items are systems. Move all systems to be included in reports to the **Allowed Items** panel. 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 71: The Session Types tab

Tab	Description
	Use presets **Failed Calls** and **Interference** to select the respective messages in the **System** section. Use **Show only calls from subscriber radios** to avoid duplication of calls in a report for the case when a multi-site system is used and radio calls are routed to multiple sites.
Senders	Select subscribers whose outgoing traffic will be included in reports and charts.  Figure 72: The Senders tab To specify a mask, use digits and the following wildcards: ▪ % to replace any number of digits in the subscriber number ▪ _ (underscore) to replace one digit in the subscriber number For instance, enter the mask _12%34_6 to filter out subscriber numbers 112003406, 91263476, and others.
Recipients	Select subscribers whose incoming traffic will be included in reports and charts. To specify a mask, see the **Senders** tab (above).
RCM Messages (**RCM Messages** report)	Select system messages to be included in reports.  Figure 73: The RCM Messages tab Use presets **Failed Calls** and **Interference** to select the respective system messages.
Threshold: Duration (**All Channels Busy** report and chart)	Specify the minimum length (in seconds) of an All Channels Busy event to be included in reports and charts.  Figure 74: The Threshold: Duration tab Select "0" to include All Channels Busy events of any duration.

Tab	Description
Threshold: Level (**All Channels Busy** report and chart)	Specify the number of channels that should be busy at the same time to report an All Channels Busy case.  Figure 75: The Threshold: Level tab Options: ▪ **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	Specify the timeframe(s) during each reported day that will be included in reports and charts.  Figure 76: The Work Hours tab This filter applies after the time settings specified on the **Date and Time** menu.

5.3.3.3 Adjusting Time Settings

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

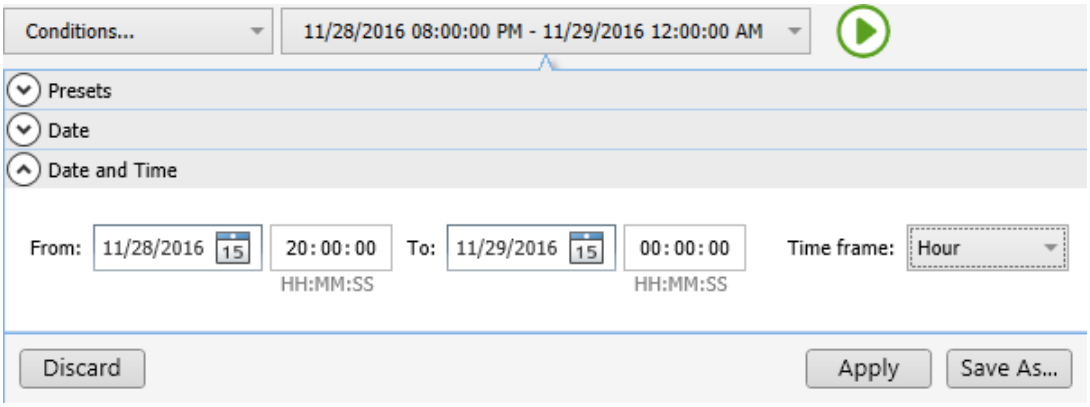


Figure 77: Date and Time menu

The menu includes the tabs described in Table 32. Applied are the time settings from the last updated menu tab. The settings on other menu tabs are ignored.

Table 32: 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. Expand the **Time frame** menu and click the preferred timeframe for your report or chart. Click **Apply**.
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 vizualize 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 86).

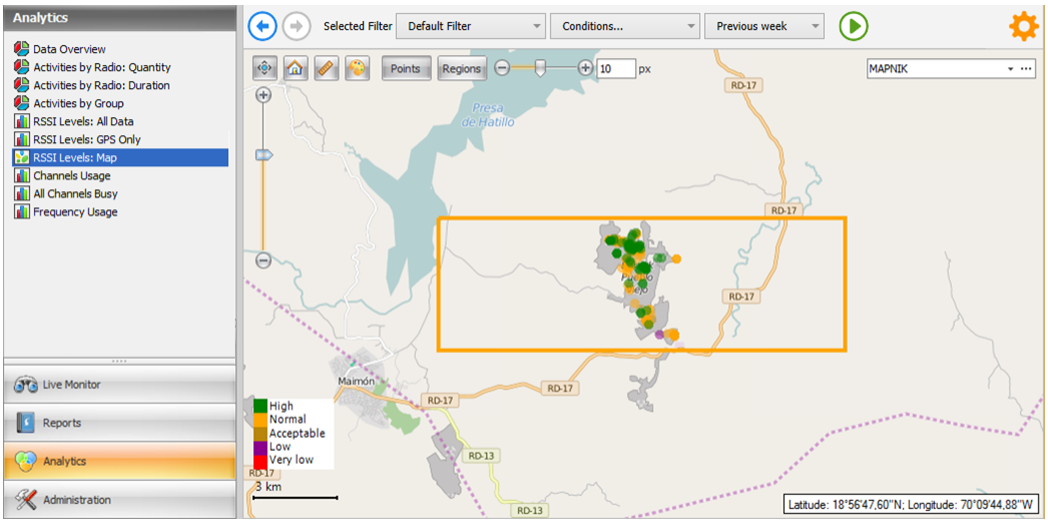


Figure 78: RSSI Levels Map

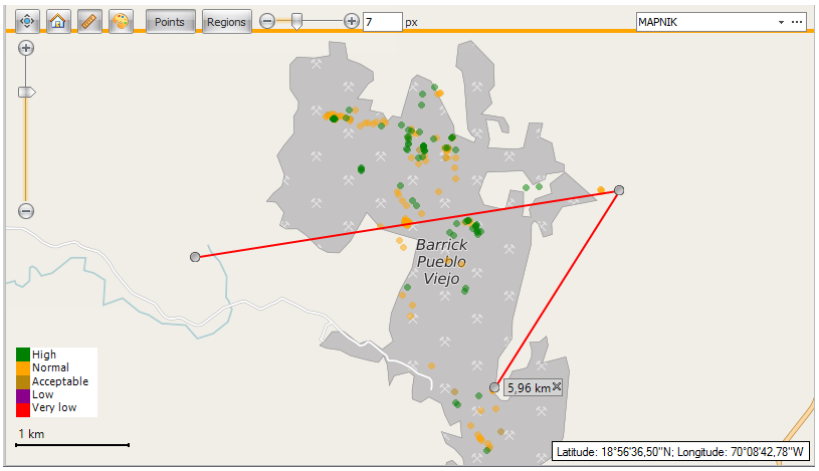
The coverage zone is presented on the map by the colored symbols (points or regions) in a rectangular frame.

- A point is the exact location of the RSSI signal.
- A region is 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 signal is detected in this area. If pointed to with a mouse cursor, the region shows its square outline, the number of RSSI signals, and the average RSSI level.

The color of the symbol indicates the RSSI level. The corresponding color legend is displayed in the lower-left corner 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 73).

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

Table 33: Using RSSI Levels: Map features and modes

Feature	Description
Zoom	You can rescale the map using zoom controls. The actual scale is shown in the lower-left corner of the map. The following zoom options are supported: ▪ Click buttons **Zoom Out** and **Zoom In** to rescale the map accordingly. ▪ Move the scroll button to rescale the map in smaller step sizes. ▪ Draw a rectangle over the map, keeping the secondary (right) mouse button pressed. The selected area is rescaled to the map size. Note: If the distance measure mode is enabled, you cannot rescale the selected area.
Pan	You can drag the map with the mouse, keeping the primary (left) mouse button pressed. While in the panning mode, the mouse cursor looks like a "pan" icon. Release the primary (left) mouse button to exit the panning mode.
Moving to the next RSSI site	You can navigate between multiple RSSI site locations where RSSI signals were detected. The map displays the current RSSI site in a rectangular frame. To relocate to the next RSSI site, click the **Move to next RSSI site** button.
Distance measure	You can measure the distance between two or more points on the map. 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 at the next point of the measured path. The path and the tooltip showing the incremented distance will be displayed.  Figure 79: Distance measuring 4. Exit the distance measure mode by clicking the **Distance measure** button again, or by clicking the **Pan** button. The measured path will be erased from the map.

Feature	Description
	To start a new measurement, enable the distance measure mode again.
Fill mode	You can fade out the map to see the colored RSSI symbols (points or regions). ▪ 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. 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 73).
Symbols	Choose **Points** or **Regions** to see the RSSI signals on the map as dots or rectangular areas. Note: You can configure the size of RSSI symbols as described in section 5.3.4.1, Configuring Map Usage (page 73).
Replaceable maps	Expand the list of maps and select the preferred map. The selected map replaces the previous one automatically. Note: The list of maps can be configured. For details, refer to section 5.3.4.1, Configuring Map Usage (page 73).
Cursor coordinates	When you move the mouse cursor over the map, you can see the geographical coordinates of the cursor in the right lower corner. You can show or hide the cursor coordinates as described in section 5.3.4.1, Configuring Map Usage (page 73).

5.3.4.1 Configuring Map Usage

RSSI Levels: Map can display all kinds of geographical maps that you can download and use. You can configure automatic update of the maps and also 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 34: 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: ▪ **Points**: Select to display RSSI signals as points. Readjust the point size (in pixels) if necessary. ▪ **Regions**: Select to display RSSI signals in rectangular areas (regions). Readjust the rectangle size (in meters) if necessary. Note: When you open the map, the selected symbols are used by default. You can switch between points and regions on the map.

Control/operation	Description
Rssi thresholds	Configure RSSI thresholds as described in section 5.3.2.1, Configuring RSSI Settings (page 64).
Maps tab Configure the list of geographical maps that you can use in RSSI Levels: Map.	
Add an online map	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: ▪ **Predefined**: Select to restore an online map that was installed with the product and later 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. Note: Learn more about supported online maps at page 110.
Add a T-Map	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**. Note: Learn more about supported offline maps at page 110.
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 71).
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.

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

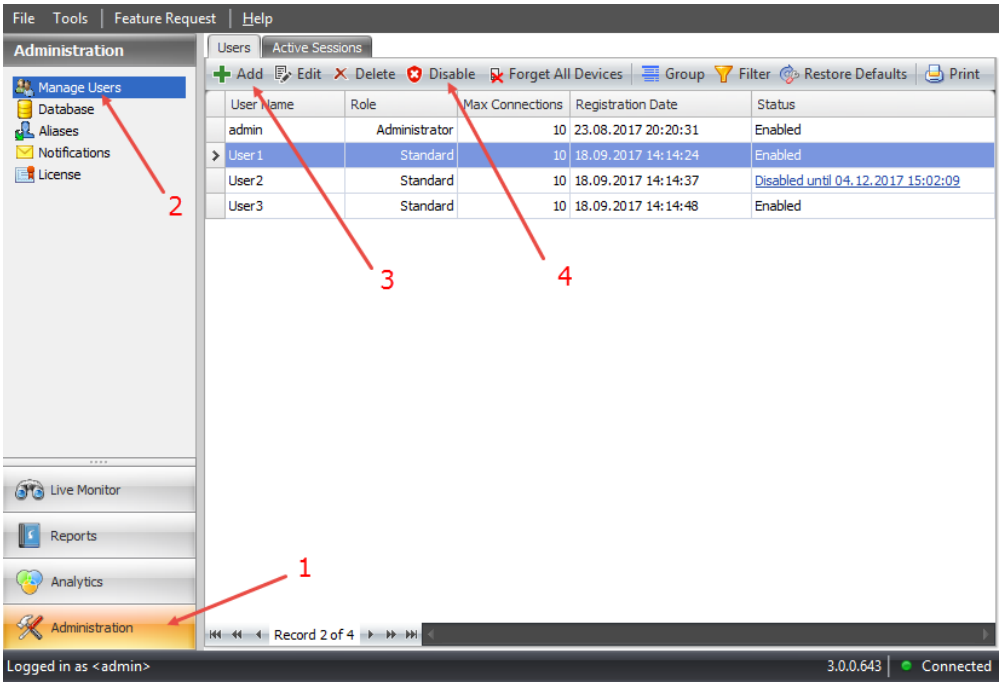
5.4 Administration

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

5.4.1 Managing Users

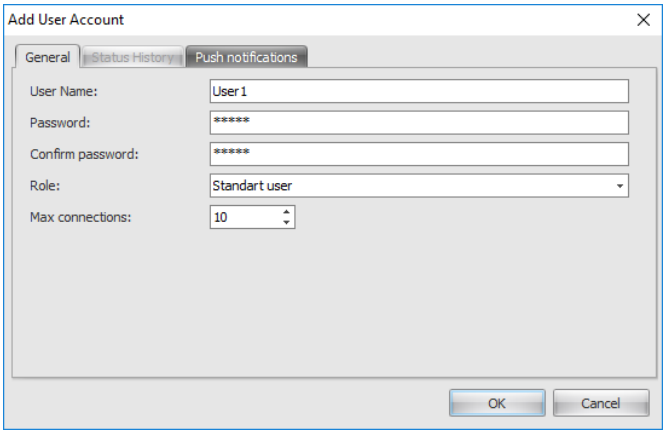
The administrator can add, edit, and delete users in the TRBOnet Watch Console. In addition, the administrator can ban users for a certain time period.

- 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.

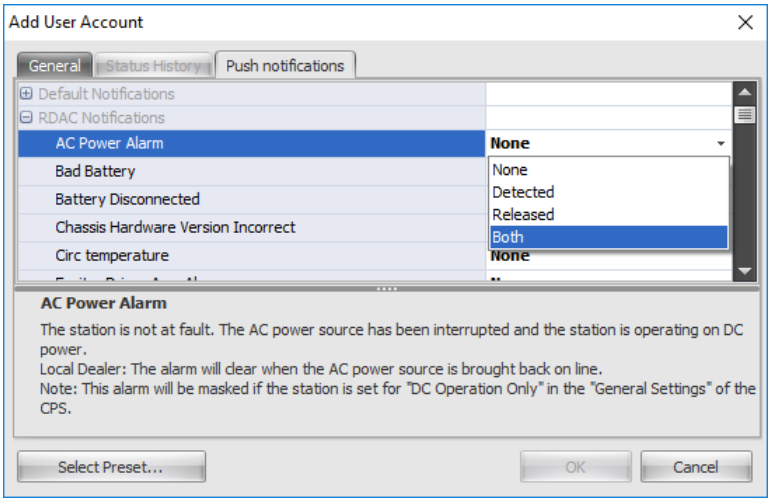
Note: The user name must not contain white spaces (blanks).

- **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.

Configuring Push Notifications

When adding/editing a user, you can configure the push notifications that will be sent to that user.

- In the 'Add User Account' dialog box, click the **Push notifications** tab.



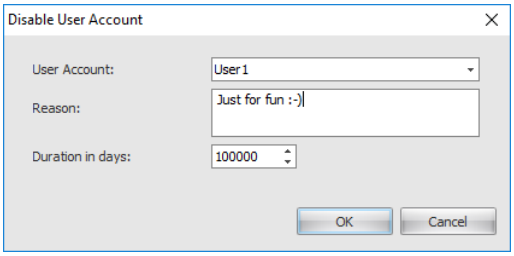
The **Default Notifications** list includes hardware events that can be raised in particular or all types of systems. Expand the list and click the arrow in the field next to the event that you need to handle. Select **True** to select the event; select **False** otherwise.
The **RDAC Notifications**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

5.4.1.2 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.

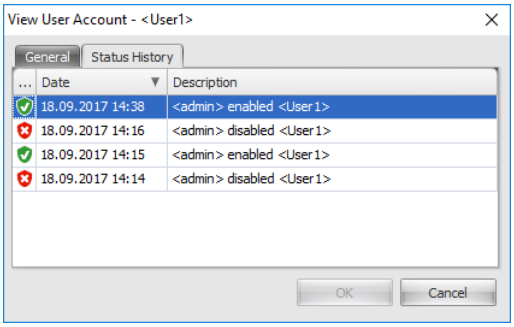
5.4.1.3 Enabling a User Account

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

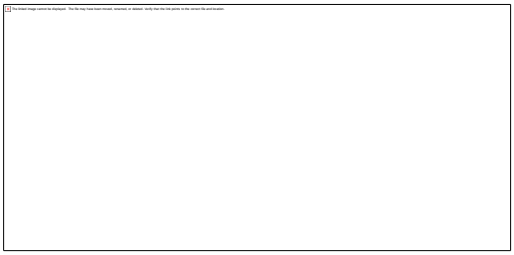
- Select a user with the status "Disabled" (5) and click the **Enable** button (which appears on the toolbar in place of the **Disable** button when the selected user is disabled).

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.



5.4.1.5 Detaching Mobile Devices from a User Account

In addition, you can detach mobile devices that have ever been used to connect to TRBOnet Watch Server via the given user account. Just select an account in the list and click the **Forget All Devices** button. As a result, all mobile devices will be detached from the account and thus won't receive any push notifications configured for this account.

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 to easily identify objects in Live Monitor, reports, and 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's configuration is not affected.

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

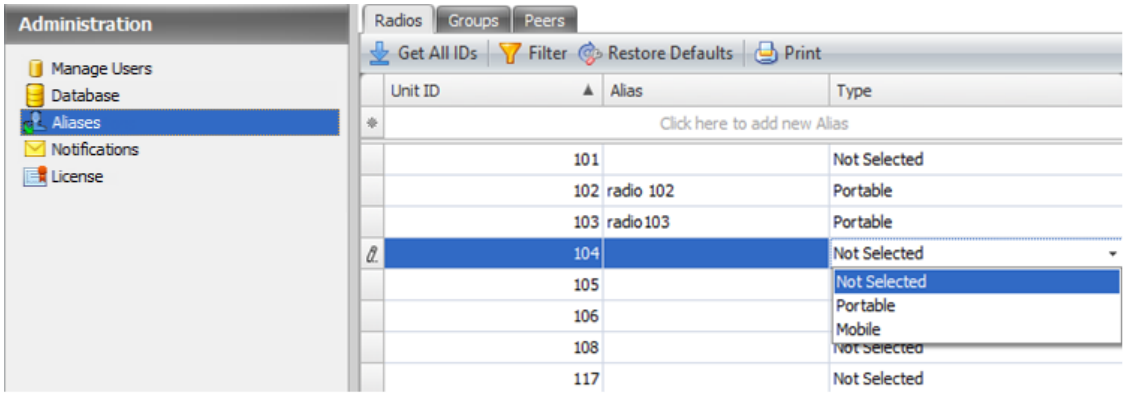


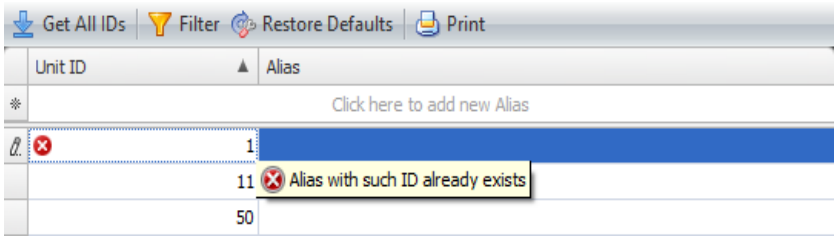
Figure 80: Managing aliases

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 35: Operations with aliases

Operation	Description
Add a new entry	Click the **Click here to add new Alias** in the first line in the list to start adding items. Then enter unique values in the new line. Press **Enter** or click any other row to complete this entry. The list will be resorted automatically by the field's **Unit ID** in an ascending order. The new row will be inserted to a position according to the value of the entered ID.
Add an alias	Click the **Alias** field and type in the alias. To leave the edit mode, press Enter, or move to another row, or click in any other field.

Operation	Description
	Note: If click in the **Unit ID** field, the field will be cleared. You must enter a unique ID. If you are entering an existing ID or leaving the field blank, an error like "Wrong ID" or "Alias with such ID already exists" will be displayed.  To resolve this error, press Alt or click the **Get All IDs** toolbar button.
Delete a row	Select the row(s) and press the Delete button on the keyboard. Confirm the deletion in the popup box. Note: The deleted row cannot be restored with the Undo command.
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 detected in the system.

- Sound notifications are played at TRBOnet Watch Console. A popup box will also be displayed providing the operator a means to stop the audio alert.
- Email notifications are sent to the preconfigured email addresses.

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

Sound notification

Sound notification is enabled if the "**Sound notification enabled**" message is present in the Notifications pane.

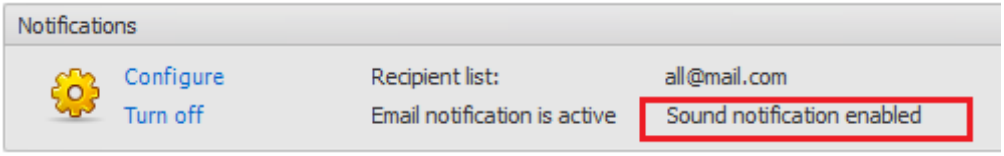


Figure 81: Sound notification status

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 unselected. For details, refer to section 5.4.3.2, Selecting Notifications (page 81).

Email notification

Email notification is enabled if the "**Email notification is active**" message is present in the Notifications pane.

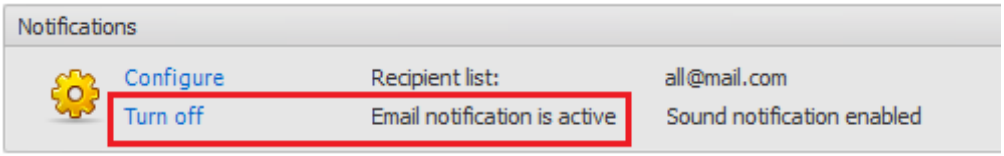


Figure 82: Email notification status

To use email notification:

1. Specify the mail server settings, the email sender and email recipients. For details, refer to section 5.4.3.1, Configuring Email Settings (page 80).
2. Select email notifications as described in section 5.4.3.2, Selecting Notifications (page 81).
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 36: Email connection settings

Setting	Description
SMTP server host or IP	The host name or IP address of the SMTP server.
Encryption	From the drop-down list, select either 'Implicit', 'Explicit', or 'None' (not to use SSL encryption).
SMTP server port	The port of the SMTP server. Default: 25 for non-SSL communication, 465 for SSL.
Authentication type	The type of authentication on the SNMP server side. Options: ▪ Anonymous access: Login to SNMP server anonymously. ▪ Windows authentication: Login to SNMP server as a Windows user. ▪ 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.

Setting	Description
Recipients	The list of email recipients. ▪ To add a recipient, click **Add** and in the dialog box that opens, enter recipient in the **Specify Email address** field. Click **OK**. ▪ To remove a recipient, click on the email address in the list, then click **Delete**.
Send Text Message	Click this button to test if the email server has been configured correctly.

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 view all predefined sound notifications. To view 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. Expand the list and click the arrow in the field next to the event that you need to configure. Select **True** to enable the event; select **False** otherwise.

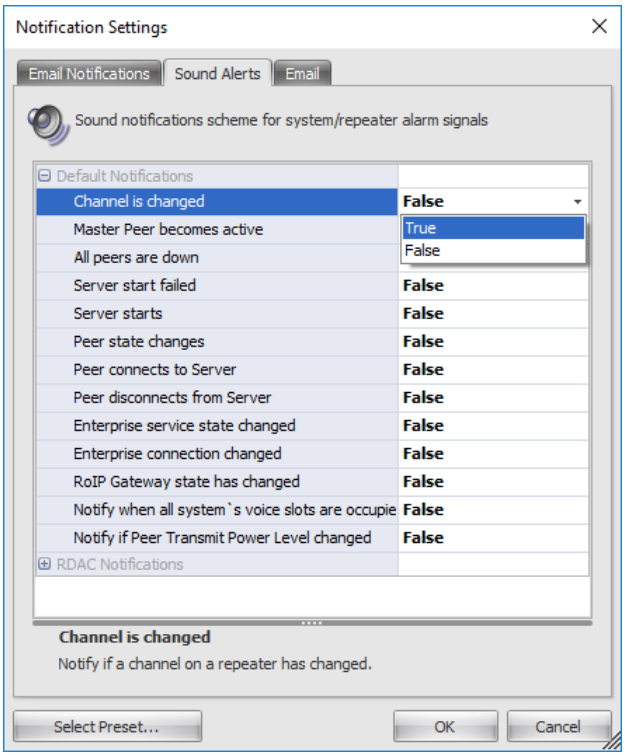


Figure 83: Configuring sound notifications

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 configure. 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.

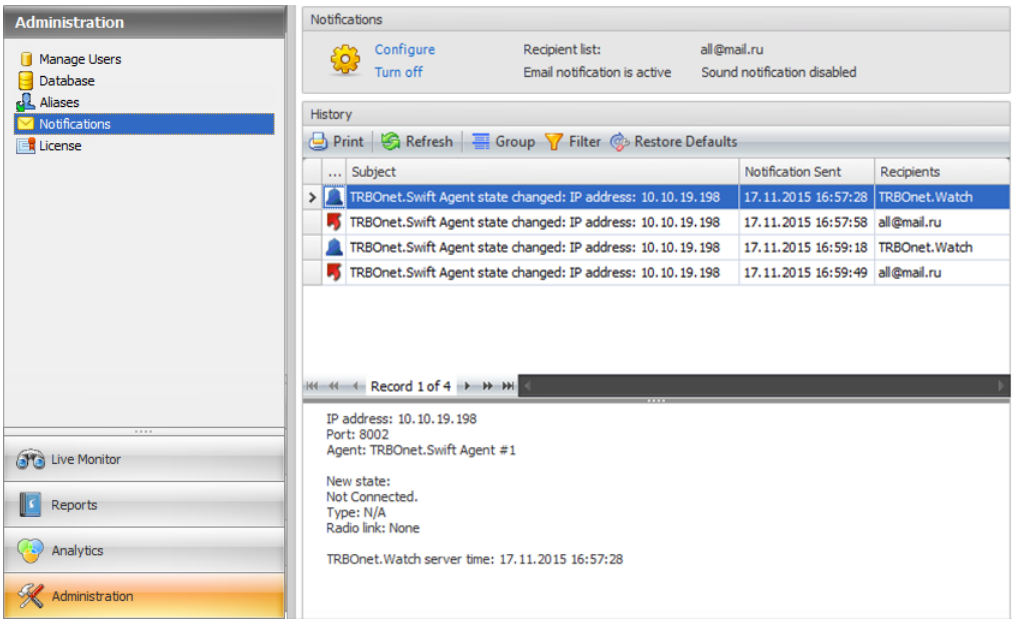


Figure 84: Viewing notifications

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 4.4.3, Configuring Database Maintenance (page 13).

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 and iOS 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 the Google Play Store or the Apple App Store.

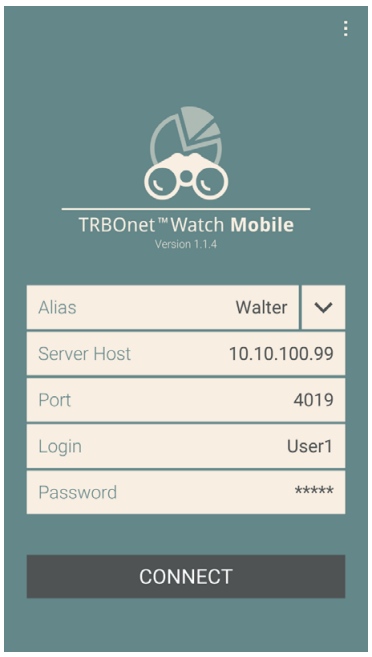
To install TRBOnet Watch Mobile:

1. Visit Google Play Store or Apple App Store 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.



- **Alias**
  Select the alias that is associated with the account settings.
- **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 75).
- **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.

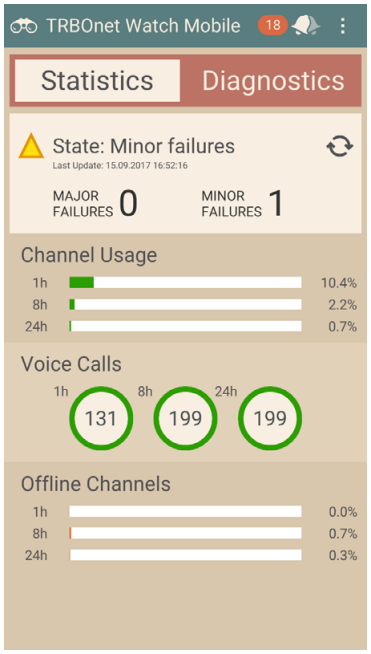
  The main page of the application appears on the screen.

6.3 Operation

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

6.3.1 Statistics

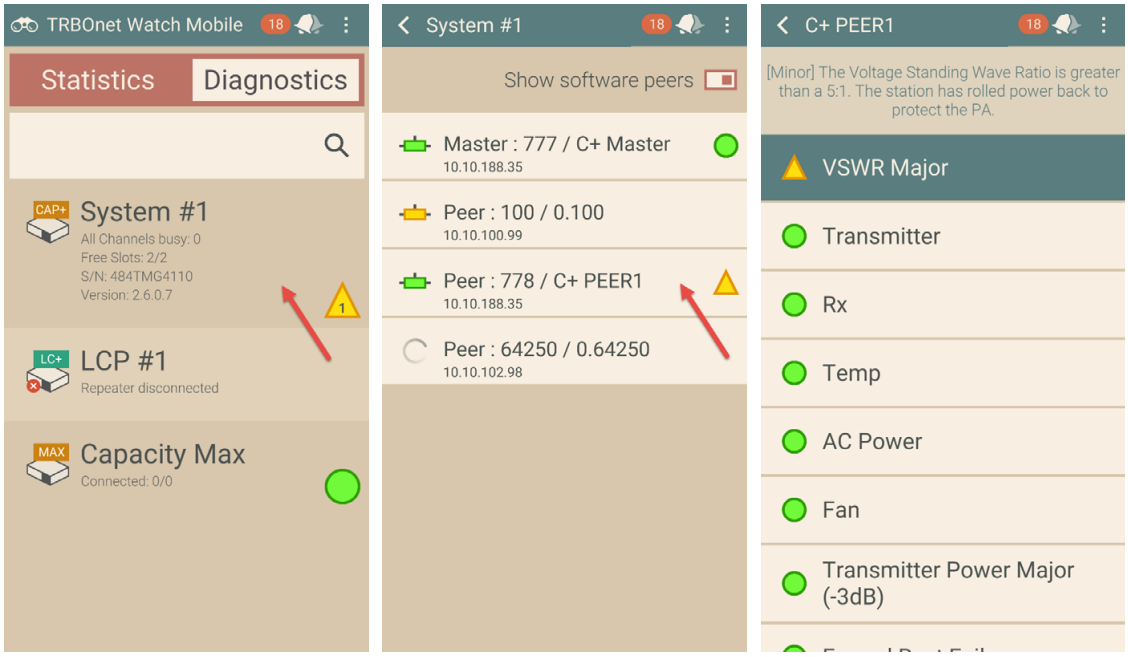
On the Statistics screen, you will see the following information:



- **State**
  Displays the state of the radio systems connected to TRBOnet Watch Server. If there are any failures, their number and severity will be displayed.
- **Channel Usage**
  Displays the statistics for busy channels in 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 (1 h, 8 h, and 24 h), in amount.
- **Offline Channels**
  Displays the statistics for disconnected channels in the radio systems during the specified periods (1 h, 8 h, and 24 h), in percent.

6.3.2 Diagnostics

On the Diagnostics screen, you will 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 describes all of the predefined charts that TRBOnet Watch can generate. Presented below are the detailed descriptions of all the 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 66).

A.1.1 Data Overview

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

Table 37: Data Overview charts – filter settings

Setting	Description
Channels	The channels whose traffic is shown in the charts.
Work Hours	The time interval(s) within the reported time that is used 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 traffic in all monitored channels adds up to 100%.

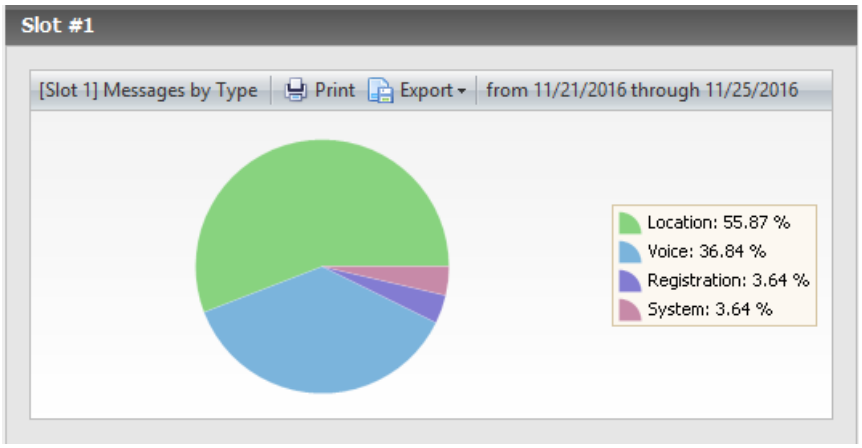


Figure 85: Messages by Type chart

- The reported time is displayed on the chart's toolbar.
- The colored sectors indicate the amount of each type of traffic.
- The legend shows the color, the type of traffic, and the percentage of this type of traffic.

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.

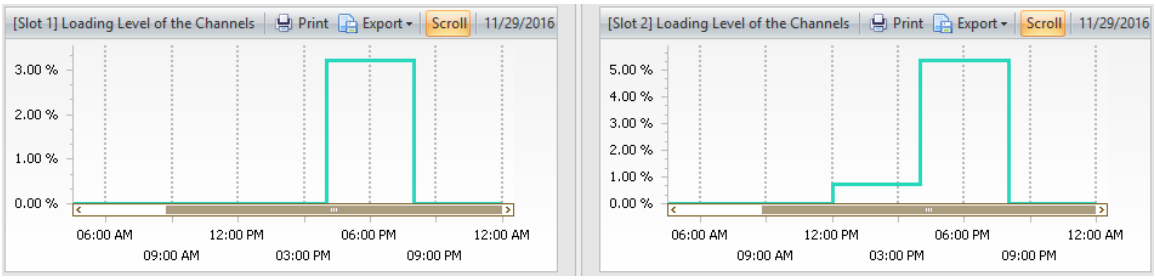


Figure 86: The loading level in the time slots of a MOTOTRBO IPSC system

- 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). A 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 on the blue line in that timeframe. You cannot drill down into a timeframe where the line is red ("no connection").

A.1.2 System Overview

The **System Overview** chart helps you understand how busy your system was for a selected period, from a few minutes to a year or even more. You can easily spot peak times when the system was used at its full capacity, which means that the available radio system might not be sufficient to handle all calls. The graph shows information about the number of channels that were disconnected or busy at any moment within the selected period, in other words, the number of channels that were not available for voice or data traffic.

The bar charts reflect the number of channels that were disconnected or busy, thus being unavailable for radio communication. The color saturation gives you an idea about the relative duration of time when this number of channels were disconnected (red) or busy (blue)- the darker the shade, the longer the period.

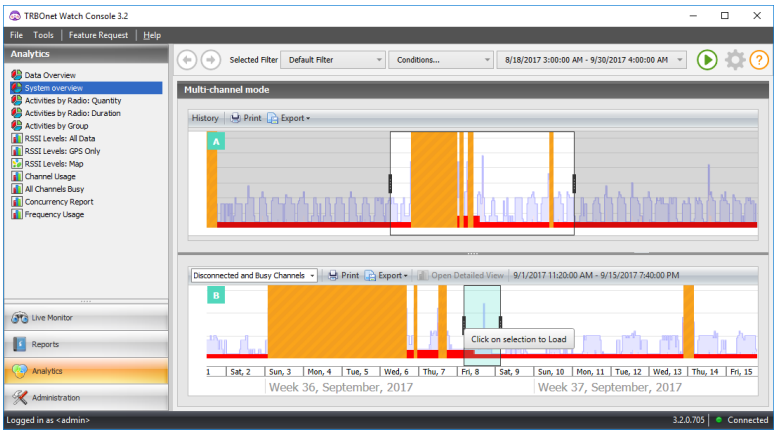
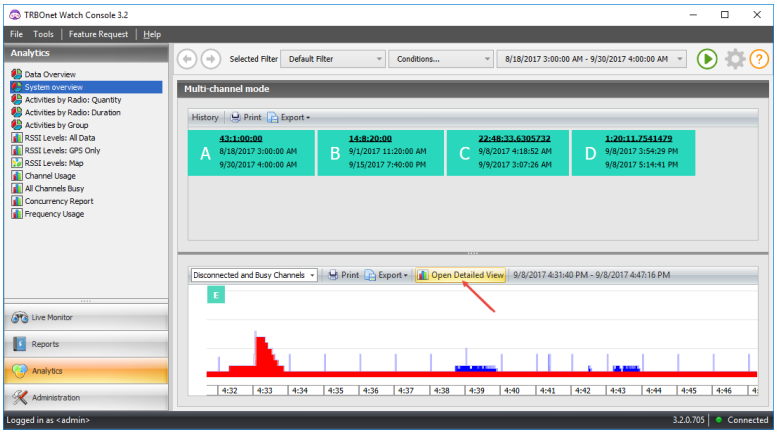


Figure 87 System Overview charts

Table 38: System Overview 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.
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.

Once you have generated the report, you will see two charts below: A and B. Chart A represents the whole time period specified in the chart filter. Chart B represents the time period selected in Chart A. To change a selection in a chart, drag a new selection and click on it. Clicking on a selection in chart B will open Chart C, and so on (D, E, etc.). As soon as you reach the most detailed time frame, you won't be able to make further selections in the chart. In this case, the **Open Detailed View** button will become active in the chart's toolbar.



A.1.2.1 Detailed View

The **Detailed View** can be used by an experienced user to perform a more detailed analysis of the channel states at a 1:1 timescale.

- Click the **Open Detailed View** button in the last, most detailed chart.

  As a result, the **Detailed View** window will open.

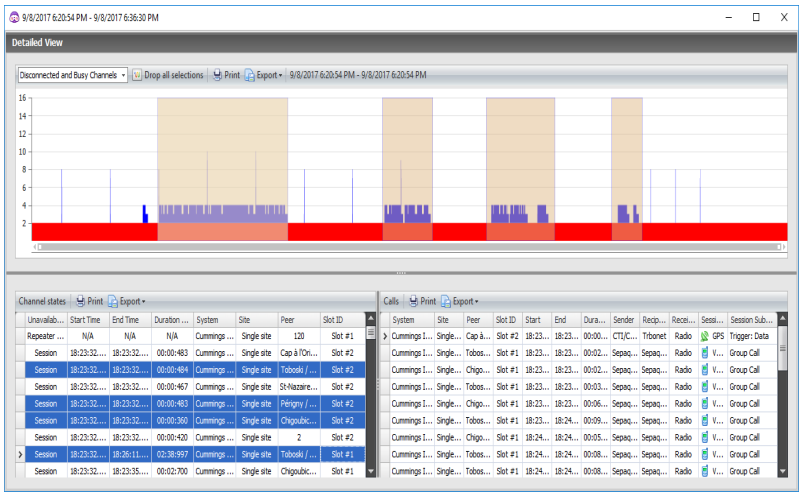


Figure 88: Detailed View window

- Make a selection or multiple selections (by clicking/dragging) in the upper chart.

  The collective selection in the chart will be represented in the **Channel states** table (information on the sessions, such as start/end times, duration, etc.). If you select a record or multiple records in the **Channel states** table, the **Calls** table will represent the calls (start/end times, duration, sender, recipient, session type, etc.) occurred within the selected session(s).

  The contents of both tables can also be printed and exported to PNG bitmaps.

A.1.3 Activities by Radio: Quantity

The **Activities by Radio: Quantity** charts show the quantities of different types of traffic produced by the most active radios on 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.1.3.1 Top 5 Most Active Radios

The **Top 5 Most Active Radios** pie charts show information about the five most active radios that are sending the following types of traffic – voice, GPS, ARS, other types, and a total of all types (summary). Each pie chart shows the percentage of traffic generated by each radio in the monitored channel(s) within the reported time.

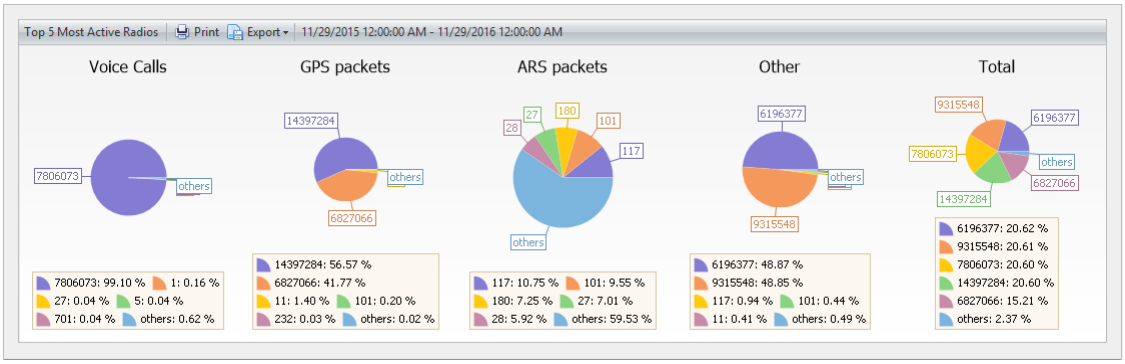


Figure 89: The percentage of call sessions initiated by the 5 most active radios

- In each chart, the total amount of all call sessions made by all active radios is 100%.
- Each radio is presented by a sector 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 sector in any chart.

A.1.3.2 Activity by Radio

The **Activity by Radio** list (located below the pie charts) shows in a tabular format the number and duration of call sessions (voice, GPS, ARS, all other, total) made by each top five active radio in the reported time.

Table 40: Activity by Radio list - fields

Field (level1)	Field (level 2)	Description
Radio	**ID**	The radio ID of the top five active radios.
Voice calls, total	**Quantity**	The number of voice calls made 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 made by the radio. Format: dd.hh:mm:ss.ms

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

To drill down into details about a particular radio, click the respective line in the list. Two charts will be displayed for that particular radio: **Voice Activity for radio** and **Data Activity for radio**.

A.1.3.3 Voice Activity for Radio

The **Voice Activity for Radio** chart shows the number of Group calls, Private calls, and Broadcast (All) calls made by the radio in each timeframe of the reported time.

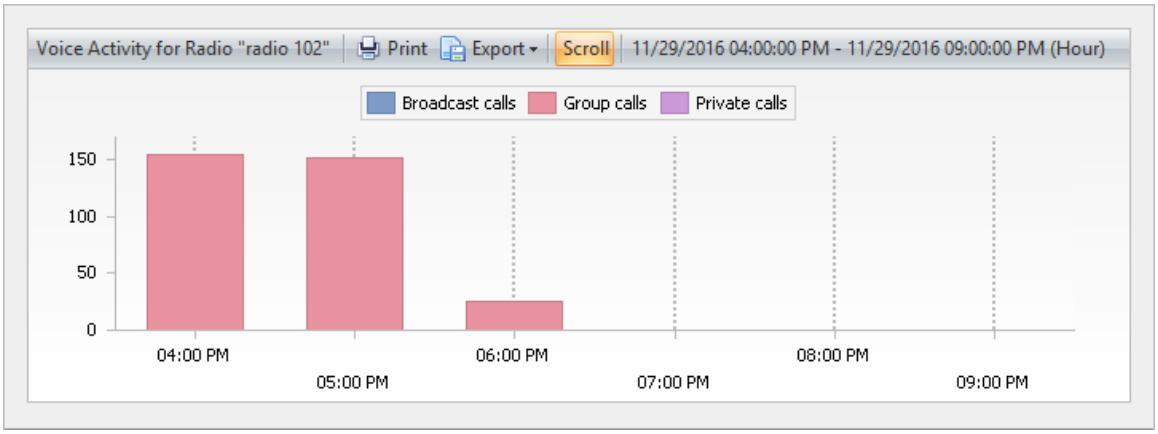


Figure 90: Voice activity of "radio 102"

- 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 made by the radio.

- If the cursor points on a bar, a pop-up tip will show 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 on the bar and click the arrow. Click the preferred timeframe on the context menu.

A.1.3.4 Data Activity for Radio

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

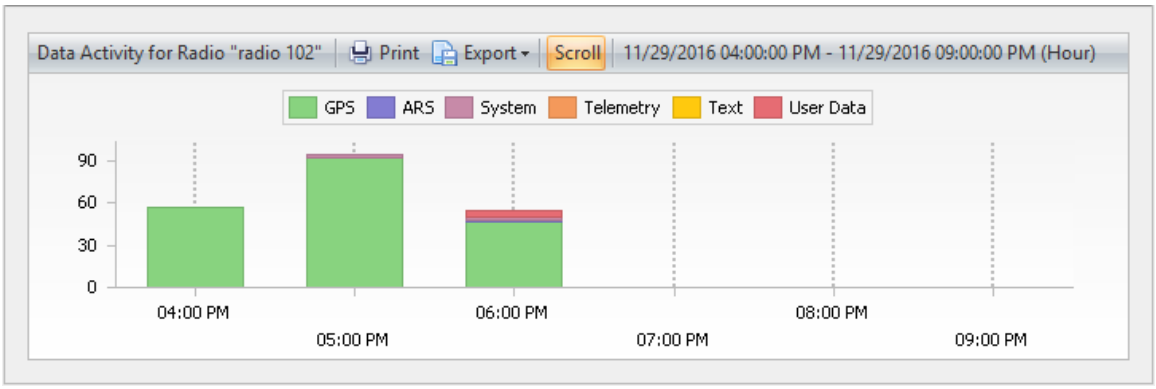


Figure 91: Data activity of "radio 102"

- 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 made by the radio.
- If the cursor points on a bar, a pop-up tip will show 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.1.4 Activities by Radio: Duration

The **Activities by Radio: Duration** charts show how long the specified channels were busy with traffic from each of the five most active radios.

The filter settings and the included charts are similar to the ones described in section A.1.3, 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.1.5 Activities by Group

The **Activities by Group** charts show the traffic of 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.1.5.1 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 on the selected channel(s) during the reported time. Traffic generated by all talk groups totals 100%.

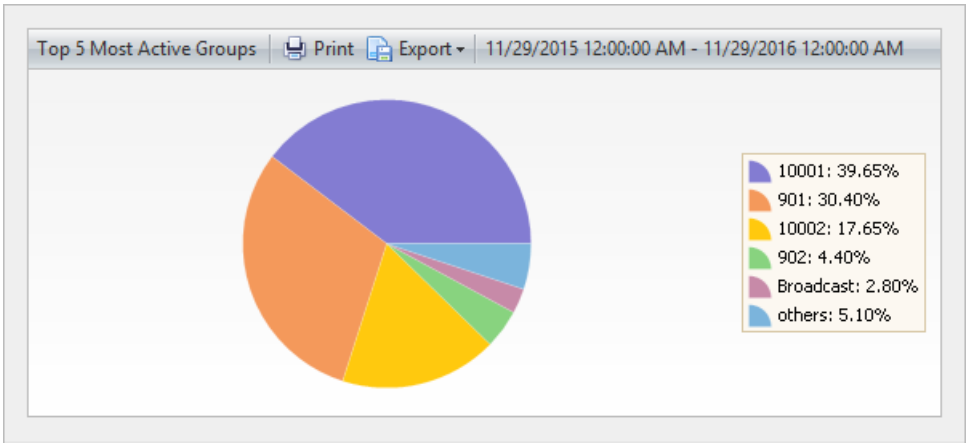


Figure 92: The percentage of traffic generated by the five most active groups

- Each talk group is represented by a sector 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.1.5.2 Group's Activity

The **Group's Activity** list located below the pie chart shows the number and duration of group calls on each of the five most active talk groups during the reported time. The list also shows the share (%) of each talk group in the voice traffic generated by all of the 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 made by the talk group in the reported time.
	Duration (d.h:m:s.ms)	The duration of all voice calls made by the talk group during the reported time.
	Average duration (d.h:m:s.ms)	The average duration of a voice call made by the talk group.

Field (level1)	Field (level 2)	Description
Total	**%**	The percentage of voice traffic (%) generated by the talk group during the reported time. Traffic generated by all talk groups makes 100%.

A.1.6 RSSI Levels: All Data

The **RSSI Levels: All Data** charts show 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. For details, refer to section 5.3.2.1, Configuring RSSI Settings (page 64).

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 a measurable signal strength. Otherwise, the "Data not found" message will be displayed.

A.1.6.1 RSSI by Thresholds

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

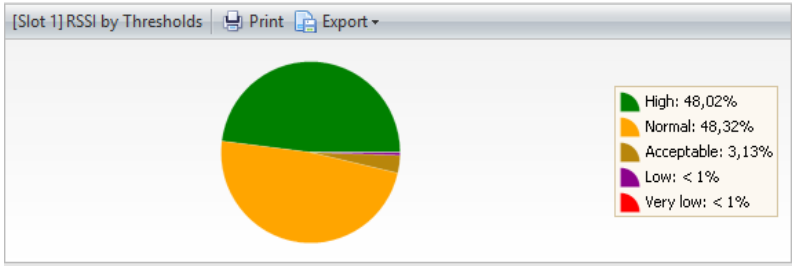


Figure 93: The amount of traffic per RSSI level band

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

A.1.6.2 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.

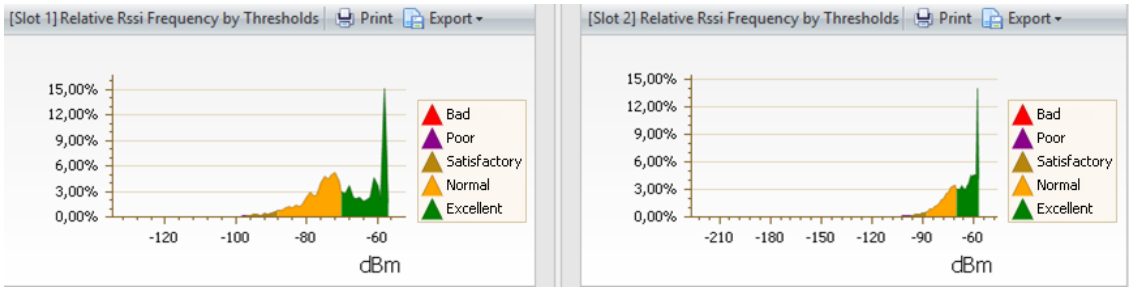


Figure 94: A MOTOTRBO IPSC system traffic ranged by RSSI level thresholds

- 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 on the selected channels during the reported time add up to 100%.
- The color indicates a particular RSSI level. The ranges of each level are preconfigured. The legend indicates the colors of all RSSI levels.

A.1.7 RSSI Levels: Map

RSSI Levels: Map loads the geographical map to show the location of calls with different RSSI levels that are 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.

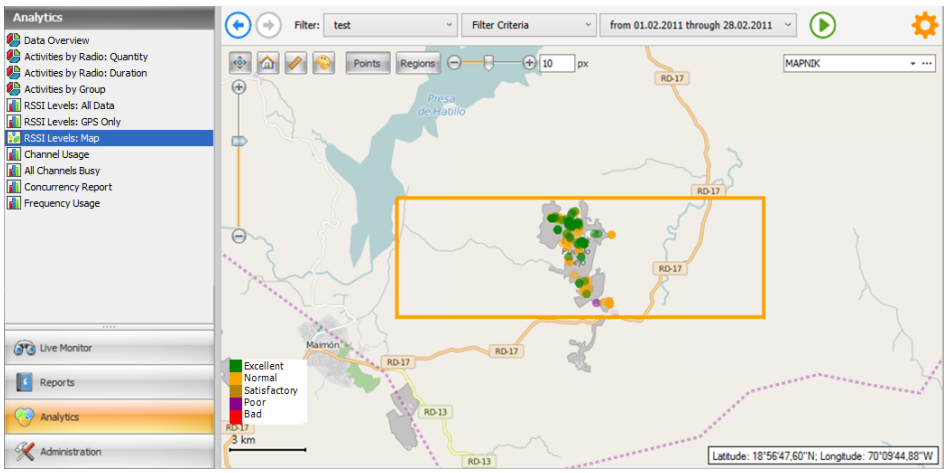


Figure 95: RSSI Levels: Map

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 73).
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. Note that the maps are interchangeable. **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 show.
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 71).

A.1.8 RSSI Levels: GPS Only

The **RSSI Levels: GPS Only** charts show 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. For details, refer to section 5.3.2.1, Configuring RSSI Settings (page 64).

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

A.1.9 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.1.9.1 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.

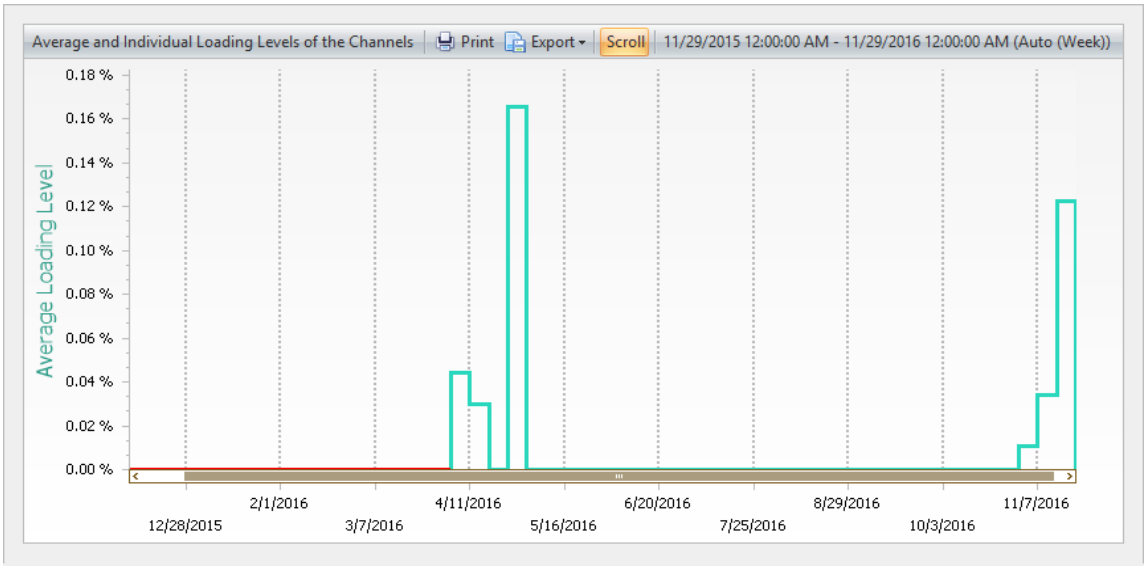


Figure 96: Average and Individual Loading Levels of the Channels chart

- 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). A 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 to the line and click the arrow. Point to the preferred timeframe on the context menu.

A.1.10 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.1.10.1 Number of All Channels Busy

The **Number of All Channels Busy** chart is a sum of All Channels Busy events detected in each timeframe of the reported time. An event is added to this sum if the channels (in an amount not less than specified in the **Threshold: Level** filter setting) remain unavailable during the time specified by the **Threshold: Duration** filter setting, or longer.

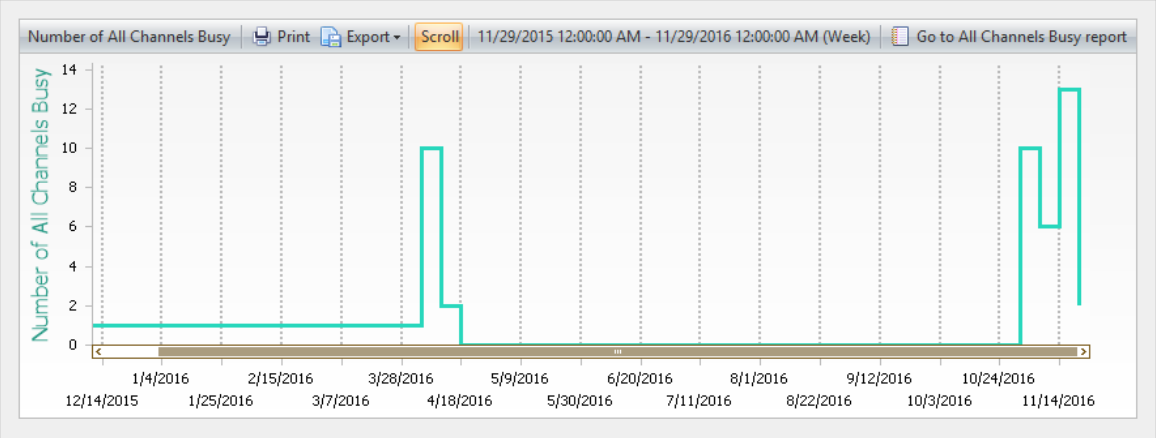


Figure 97: Number of All Channels Busy chart

- 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 to 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 an event lasts through several timeframes, it will be added to in each timeframe as an independent event.

To drill down into a particular timeframe, click on 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 to 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.1.10.2 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. When building the chart, the threshold filter settings are not considered. The **Threshold: Level** is displayed in the chart as a dotted line.

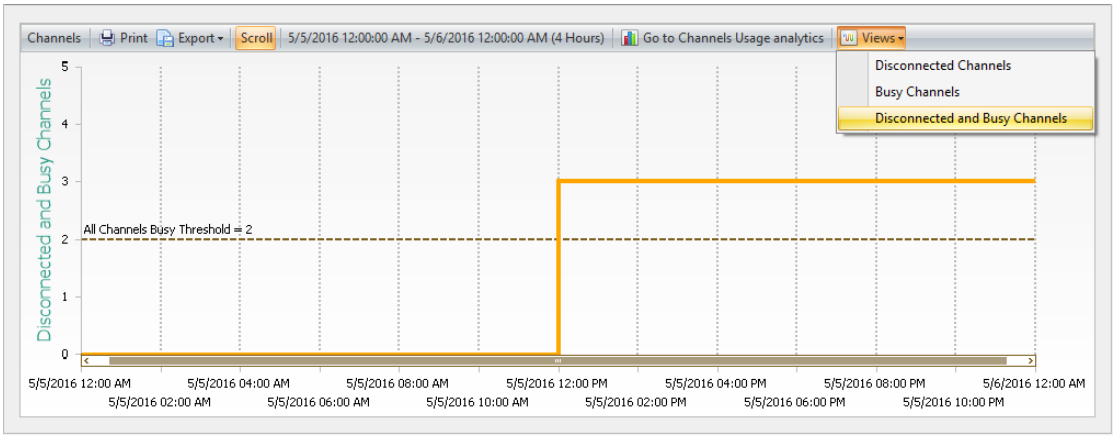


Figure 98: Channels chart (Disconnected and Busy Channels mode)

- 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 number 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 number 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 number 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 on the line in that timeframe. To choose the timeframe of the new chart to which you drill down, point to the line and click on 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.1.11 Concurrency Report

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

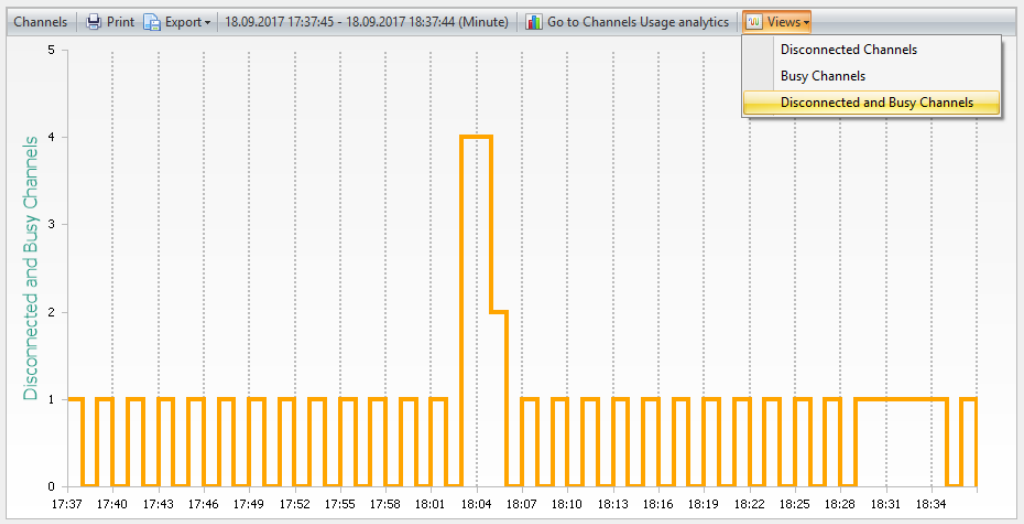


Figure 99: Concurrency Report chart (Disconnected and Busy Channels mode)

- 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 number of channels that were disconnected for any time within the timeframe.
  - In the **Busy Channels** mode, the green line in each timeframe is the number 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 number of the channels that were simultaneously unavailable (disconnected or busy) for the subscribers for any time during the timeframe.

A.1.12 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.

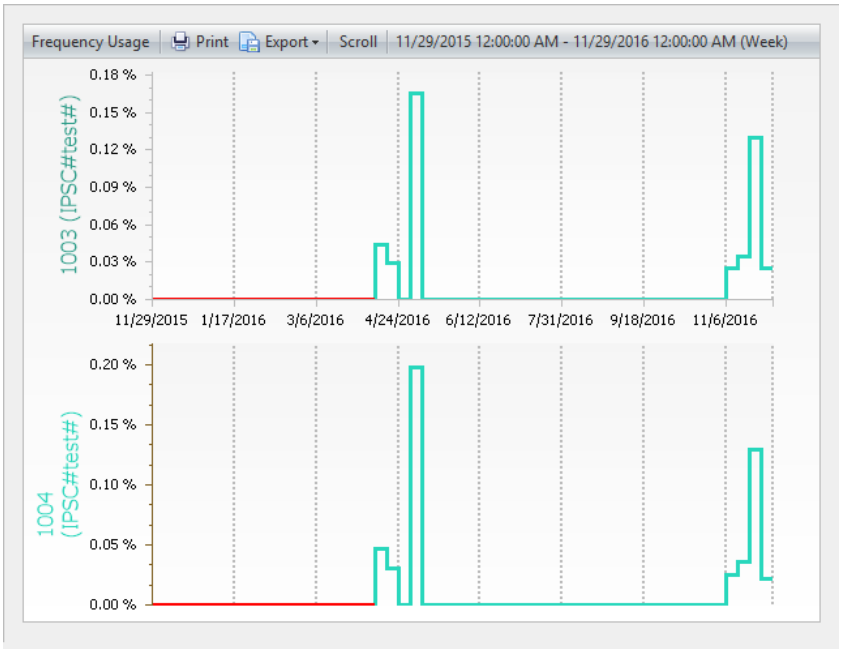


Figure 100: Frequency usage by two peers

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. A 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 choose the timeframe of the new chart to which you drill down, point to 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 66).

A.2.1 Activities over Time

The **Activities over Time** report shows all types of voice and data calls transmitted on 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.
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.

Field (level1)	Field (level 2)	Description
	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 (level1)	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.
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 Call Interruptions

The **Call Interruptions** report shows all call interrupt events occurred in the systems during the reported time.

Note: The **Call Interruptions** reports are supported only for **IPSC** and **Capacity Plus** systems with the **Level 4: Call Parsing** monitoring level.

Table 57: Call Interruptions report – filter settings

Setting	Description
Systems	The list of system names.
Work Hours	The time intervals within the reported time to be included in the report.
Date and Time	The reported time.

Table 58: Call Interruptions report – fields

Field	Description
Event type	The type of event (Interrupt or Dekey). Note: The Interrupt type means stopping a transmission and placing one's own voice transmission on the current channel, whereas the Dekey type means stopping a transmission in order to free up the channel.
Interrupter	The radio that interrupted a voice transmission.
Source	The radio that initiated the transmission that was interrupted.
Target	The target ID of the transmission that was interrupted.
Duration	The duration of the voice transmission that was interrupted.
Timestamp	The date and time when the interrupt event occurred.
System	The name of the system where the interrupt event occurred.
Site	The site where the interrupt event occurred.
Peer ID	The system peer related to the event. Is set to "N/A" if not a peer event.
Session Type	The type of traffic that was interrupted.
Session Subtype	The subtype of the interrupted traffic.
Result	The result of the event (Success or Failure).

A.2.6 Text Messages

The **Text Messages** report shows all text messages sent by subscribers on 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 text.

Table 59: 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 60: 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.2.7 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 18).

Table 61: 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 62: 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 117).
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.2.8 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 63: 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.
Threshold: Level	The number of channels that should be busy at the same time to report an All Channels Busy event.

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

Table 64: 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: ▪ **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: ▪ 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.2.9 GPS Data

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

Table 65: 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 66: GPS Data report – fields

Field	Description
Session Type	GPS transmission.
Session Subtype	The type of 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.2.10 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 67: 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 68: 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. ▪ **Connection**: The peer is connected to TRBOnet Watch over IP. A RoIP getaway is connected to the radio.

Field (level1)	Field (level 2)	Description
		Note: If the peer had no activity during the reported timeframe, the Activity status is not displayed.
<Peer ID> (<system >)	**Duration h:m:s.ms**	The total time the peer was active or connected within the timeframe.
	Duration %	The meaning depends on the state of the peer: ▪ **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 of online and offline maps supported by the **RSSI Levels: Map** chart.

Table 69: Online maps supported by RSSI Levels: Map

Resource	Description
OpenStreetMaps	Free online map. Includes MAPNIK, CYCLE, TRANSPORT, LANDSCAPE and MAPQUEST subtypes. Official website: http://www.openstreetmap.org
Microsoft BING	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. To get the Basic Key, visit http://msdn.microsoft.com/en-us/library/ff428642.aspx

Table 70: Offline maps supported by RSSI Levels: Map

Resource	Description
T-Map	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. The TRBOnet.Map Edit tool ships with TRBOnet Enterprise and is described in the TRBOnet Enterprise documentation. For all questions about creating TMAP files, contact the support team of Neocom Software, Ltd.

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 NMS.

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.

The 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 71: 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 ceAlarmIndicate and ceAlarmClear traps generated by the agent.	CISCO-ENTITY-ALARM-MIB
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 37).			
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 72: 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

Alarm	Decimal code
PA_EEPROM_Corruption_Type_3	8
Exciter_EEPROM_Corruption_Type_1	9
Exciter_EEPROM_Corruption_Type_2	10
Exciter_EEPROM_Corruption_Type_3	11
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 73: 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	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	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	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: ▪ **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 Passw**d: Show the values specified in TRBOnet Watch configuration. Note: For the description of TRBOnet Watch SNMP configuration settings, refer to section 4.12, Configuring SNMP Communication (page 37). 4. Click **OK**.
Read the list of alarms from a ceAlarmList	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. Note: If no alarm is set, ceAlarmList will contain an empty string (zero length). 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 08 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

To do this:	Take these steps:
	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. Calculate the alarm code: 13*8 (the number of 'zero' bits prior to byte '08') + 3 (00001000)= 107 Look for code 107 in Table 70 (page 113). This code indicates the PeerDisconnected alarm.

Appendix C: RCM Messages

When the system is unable to set up the call or continue the requested call, 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 74: 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 on 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 on 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 experiencing an FCC type I or II interference. In Capacity Plus /LCP systems, this scenario applies to setting up a new call on 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 on the rest channel only.
TOT Expiry Premature Call End Failure	The call ended because the TOT timer expired.
Transmit Interrupted Call Failure	The Call Setup request with interrupt access failed to interrupt the ongoing OTA 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	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. This scenario applies to setting up a new call on the rest channel in Capacity Plus /LCP systems only.
Non-Rest Channel Repeater	The Call Setup request is received on the non-rest channel repeater. This scenario applies to Capacity Plus /LCP systems only.
Destination Site/Sites Busy	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. This scenario applies to setting up a new call on the rest channel in Capacity Plus /LCP systems only.
Long Under Run Condition	The repeater ends the call due to jitter buffer under-runs occurring continuously for over 720 ms. This may be due to network congestion.
Undefined Call Failure	Any other failures.
All Call Ongoing or In-progress	The Call Setup request is declined because All Call is ongoing. This scenario applies to setting up a new call on the rest channel in Capacity Plus /LCP systems only.
RCM REPEAT BLOCKED INDICATION	
Start of Signal Interference (FCC Type I)	Signal interference is strong enough and blocks the repeater operation (FCC Type I).
End of Signal Interference (FCC Type I)	Signal interference is weak enough where the repeater resumes over-the-air operation (FCC Type I).
Start of Signal Interference (FCC Type II)	Signal interference is strong enough and blocks the repeater operation (FCC Type II).
End of Signal Interference (FCC Type II)	Signal interference is weak enough where the repeater resumes over-the-air operation (FCC Type II).
Start of CWID/BSI Repeat	The repeater has to transmit CWID/BSI and begins to block the repeater operation.
End of CWID/BSI Repeat	The repeater has ended its transmission of the CWID/BSI and resumes normal repeater operation.
Signal Interference Failure	Broadcast of the calls into the air is intermitted.

Appendix D: Glossary of Acronyms

Table 75: 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 (also known as 'Capacity Plus Multi-Site')
MIB	Management Information Base
NAI	Network Application Interface
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 Control Protocol
TOT	Time-Out Timer
UDP	User Datagram Protocol
URL	Uniform Resource Locator
XCMP	Extended Command and Management Protocol
XNL	XCMP Network Layer