neocom software

TRBOnet

TRBOnet Watch

User Guide

Version 2.3.5

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MOTOROLA PROFESSIONAL RADIO APPLICATION partner

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Contents

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
Americas	+1 872 22 28 726	support@trbonet.com — technical support
APAC	+61 28 6078325	http://kb.trbonet.com — online knowledge base

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 voice 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.

TRBOnet Watch features include:

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

2.2. 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.

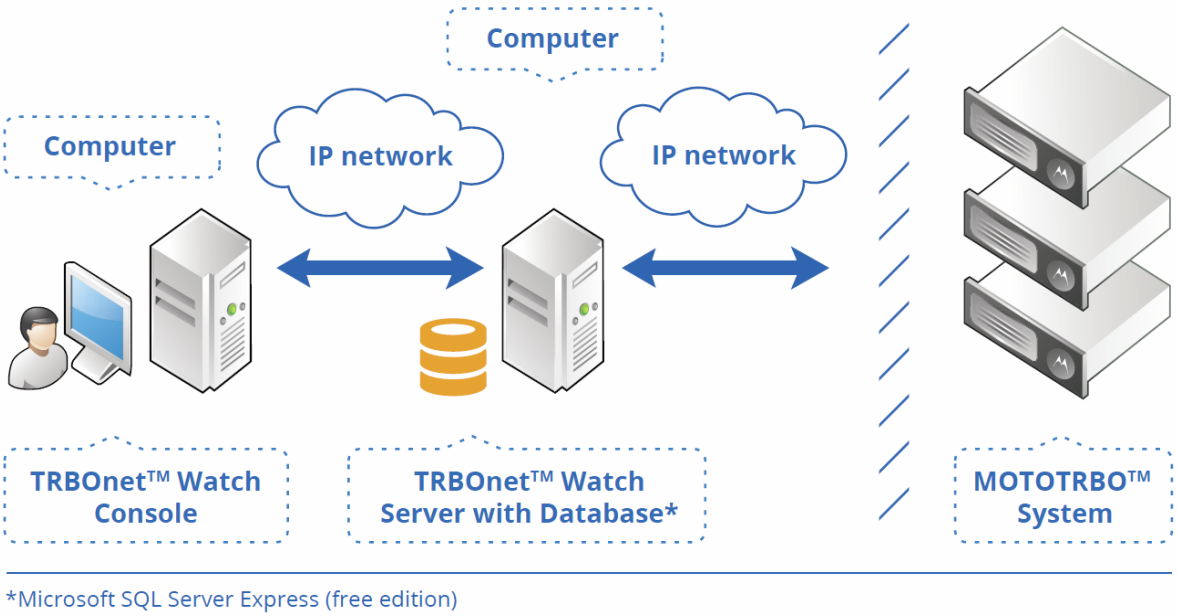


Figure 1: TRBOnet Watch architecture

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.

2.3. Hardware and Software Requirements

Table 1: TRBOnet Watch 2.3 hardware and software requirements

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

2.4. Compatibility with MOTOTRBO Firmware Versions

TRBOnet Watch can monitor all kinds of traffic on MOTOTRBO IP Site Connect, Capacity Plus, Linked Capacity Plus, and Connect Plus systems. 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	MOTOTRBO system			
	IPSC	Capacity Plus	LCP	Connect Plus
2.3.5	02.40.12	02.40.12	02.40.12	02.40.12

2.5. Licensing

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

The list of optional features includes:

- Additional repeater connections
- Additional consoles
- Voice Recording
- RSSI monitoring

2.6. Features Available for MOTOTRBO System Types

The following table summarizes the availability of TRBOnet Watch features for each supported MOTOTRBO system type.

Table 3: TRBOnet Watch features available for MOTOTRBO system types

Feature	IP Site Connect	Capacity Plus	Linked Capacity Plus	Connect Plus
Monitoring traffic in master repeater slots in real time	Yes	Yes	Yes	No
Monitoring traffic in system channels in real time	Yes	Yes	Yes	Yes
Monitoring types of traffic	All types	All types	Voice traffic only. All other types of traffic are considered data.	All types
Listening to voice transmitted in the channel	Yes	Yes	No	Yes
RSSI Levels: GPS report	Yes	Yes	No	Yes
Displaying the coverage zone on the map	Yes	Yes	No	Yes
GPS Data report	Yes	Yes	No	Yes
Text Messages report	Yes	Yes	No	Yes
All Channels Busy report and analytics	Yes	Yes	Yes	No
Frequency Usage report and analytics	Yes	Yes	Yes	No
Channels Usage analytics	Yes	Yes	Yes	No

2.7. Functionality Available for 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 call traffic in the system channels. Traffic is not parsed, Watch recognizes voice and data traffic only.
- **Level 4: Call Parsing**: Watch monitors all IP and RDAC connections in the system and call traffic in the system channels. Traffic is parsed, all types of traffic are recognized.

The following table summarizes the functionality available for the TRBOnet Watch console operator at each level of system monitoring.

Table 4: TRBOnet Watch console functionality available on each system monitoring level

System Monitoring Level	TRBOnet Watch Console		
	Live Monitor	**Reporting and Analytics**	**Voice Recording**
Level 1: Link establishment	**Diagnostics**, **Topology** tabs: only IP connections are displayed Other tabs: no data	Reports: **Event Viewer** Other reports and charts: no data	Not supported
Level 2: Diagnostics	**Diagnostics**, **Topology** tabs: full-featured Other tabs: no data	Reports: **Event Viewer** Other reports and charts: no data	Not supported
Level 3: Call monitoring (not available for Connect Plus)	**Diagnostics**, **Topology** tabs: full-featured **Slots**, **Channels** tabs: all monitors display voice and data only	Reports: all except **Text Messages** and **GPS Data**. Only voice and data in **Activities.** Charts: all. Only voice and data in **Data Overview** and **Activities**.	Not supported

System Monitoring Level	TRBOnet Watch Console		
	Live Monitor	**Reporting and Analytics**	**Voice Recording**
Level 4: Call parsing (not available for LCP)	**Slots**, **Channels**, **Diagnostics**, **Topology** tabs: full-featured	Full-featured	Full-featured

2.8. Glossary

This section lists all abbreviations used in this document.

Table 5: Abbreviations

Term	Description
ARS	Automatic Registration Service
ACB	All Channels Busy
BCI	Base Station Identification
CPU	Central Processing Unit
CWID	Continuous Wave Identification
GPIO	General Programmable Input Output
GPS	Global Positioning System
HDD	Hard Disk Drive
IP	Internet Protocol
IPSC	IP Site Connect
LCP	Linked Capacity Plus
MIB	Management Information Base
NAI	Network Advertising Initiative

Term	Description
NMS	Network Management Station
NSCP	Neocom Software Control Protocol
OID	Object Identifier
OS	Operating System
RCM	Repeater Control Message
RoIP	Radio-over-IP
RSSI	Received Signal Strength Indicator
SMS	Short Message Service
SNMP	Simple Network Management Protocol
TCP	Transmission Internet Protocol
TOT	Time-Out Timer
UDP	User Datagram Protocol
URL	Uniform Resource Locator
XCMP	Extended Command and Management Protocol
XNL	XCMP Network Layer

3. Installation and Upgrade

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

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 Hardware and Software Requirements.

To install TRBOnet Watch:

1. Double-click the **TRBOnet.Watch_<version>.exe** file to run the **TRBOnet Watch 2.3. Setup** wizard. Click **Next**.
2. Accept the terms in the license agreement. Click **Next**.
3. Select the installation type:
   - **TRBOnet Watch 2.3. Console and Server**: Choose to install both the server and client software on one computer.
   - **TRBOnet Watch 2.3. Console**: Choose to install the client software on the computer, for instance, on the dispatcher's desktop.

   Click **Next**.
4. 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 TRBOnet Watch Server of this guide.

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 2.3. 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 Creating a Windows Service.

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 2.3. 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 database.

3.4. Upgrading TRBOnet Watch

To upgrade TRBOnet Watch:

1. Uninstall the current version of TRBOnet Watch as described in Uninstalling TRBOnet Watch.
2. Install the TRBOnet Watch as described in Installing TRBOnet Watch.
3. Launch the TRBOnet Watch server.

   Note: 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. Select **Database** in the **Configuration** pane.
5. In the **Database** pane, click **Upgrade Database**.

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 2.3 server icon on the desktop, or select **All Programs** and then **Neocom Software** and **Watch 2.3 Server** from the **Start** menu.

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

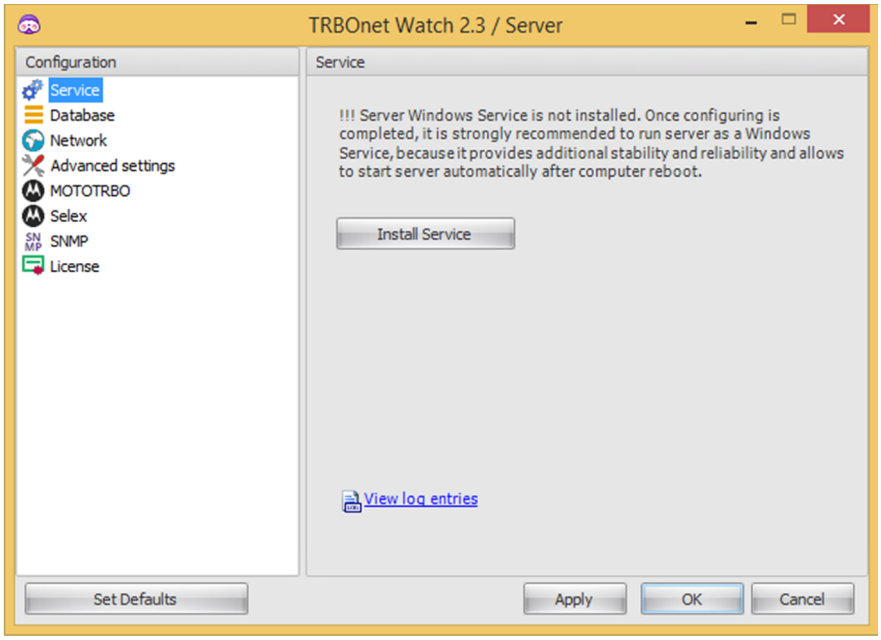


Figure 2: TRBOnet Watch Server window

4.2. Managing the Software License

The trial TRBOnet Watch contains a free trial license valid within a week from the installation date. The trial license has some functional restrictions such as no support for remote agent connections and the limited number of radios and master repeaters allowed.

To start using TRBOnet Watch with a trial license:

1. In the **TRBOnet Watch Server** window, select **License** in the **Configuration** pane.
2. Click **License Manager**. The **License Manager** dialog box appears.
3. Click **Next**. Click the search button next to the **License file** field and click the license file located in the installation package.
4. Click **Next**, then click **Finish**.

To update the license:

1. Copy the new license file to a local folder. If this folder contains other license files, delete them.
2. Follow the instructions for the trial license.

For all questions regarding TRBOnet Watch licensing, contact your reseller or Neocom Software, Ltd directly. You need to include the information about your current license in your request. To do this, open the **License** tab and click **Send Email** to copy the details into a new email message. Or, click **Copy to Clipboard** and insert the copied details where necessary.

4.3. Creating a Windows Service

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

To run the TRBOnet Watch server as a Windows service:

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

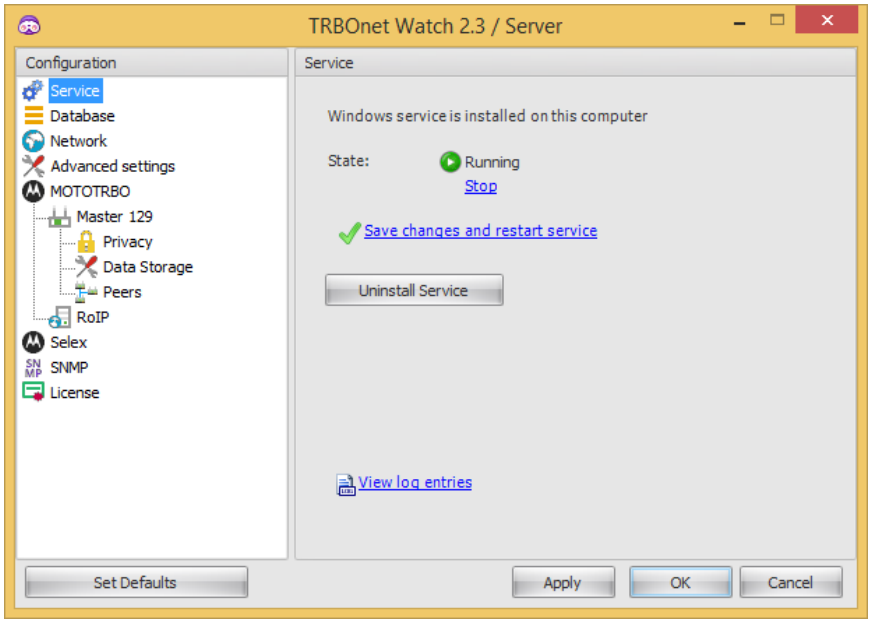


Figure 3: Managing the Windows service

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

- **Start / Stop**: Click to start or stop the Windows service.
- **Save changes and restart service**: Click to save the recent configuration changes to the local CONFIG file and restart the service.

- **Uninstall Service**: Click to remove the service. After that, the TRBOnet Watch server continues working as a desktop application.
- **View log entries**: Click to open the TRBOnet Watch server system log in the **View log entries** dialog box. The log may be requested by the technical support, should the customer report any TRBOnet Watch issue.

4.4. Setting Up the IP Network

To specify the IP network settings:

1. In the **TRBOnet Watch Server** window, select **Network** in the **Configuration** pane.
2. In the **Network** pane, specify the following parameters:
    - **Command Port**: Specify the IP port for the TRBOnet Watch server to communicate with a networked TRBOnet Watch console (default value: 4019).
    - **Encrypt network protocol**: Select to transfer encrypted data over IP network.

4.5. Creating a TRBOnet Watch Database

Creating a TRBOnet Watch database is a mandatory configuration step.

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

To create a TRBOnet Watch database:

1. In the **TRBOnet Watch Server** window, select **Database** in the **Configuration** pane.
2. In the **Database** pane, specify the following parameters:
    - **SQL Server**: Select the SQL Server from the list of database management systems detected across your network.
    - **Database**: Specify the preferred name for the database. Follow the naming rules specific to the selected SQL Server edition.
    - **Authorization**: Select the authorization method:
        - **Windows Authorization**: TRBOnet Watch will use your Windows credentials to access the database.

> **Note**: To use Windows authorization, the Local System account must be granted MS SQL Server administrator privileges. For details, refer to Configuring the Local System Account.

- **SQL Server Authorization**: TRBOnet Watch will use a database user account to access the database.

  - **User Name**: If **SQL Server Authorization** is selected, specify a valid database user name.
  - **Password**: If **SQL Server Authorization** is selected, specify a valid database user password.

3. Click **Create Database**. The database with the specified name is created.
4. Click **Test Connection**.
5. Configure maintenance of the TRBOnet Watch database. For details, refer to Configuring Database Maintenance.

4.5.1. Configuring the Local System Account

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

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

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

To grant administrator rights to Local System when installing the database:

1. Run MS SQL Server setup. Select **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 the database installation:

1. Run MS SQL Server Management Studio from the **Start** menu.

2. In the **Connect to Server** dialog, expand the **Server name** drop-down list and select the SQL Server instance on which the TRBOnet database is created. Click **Connect**.

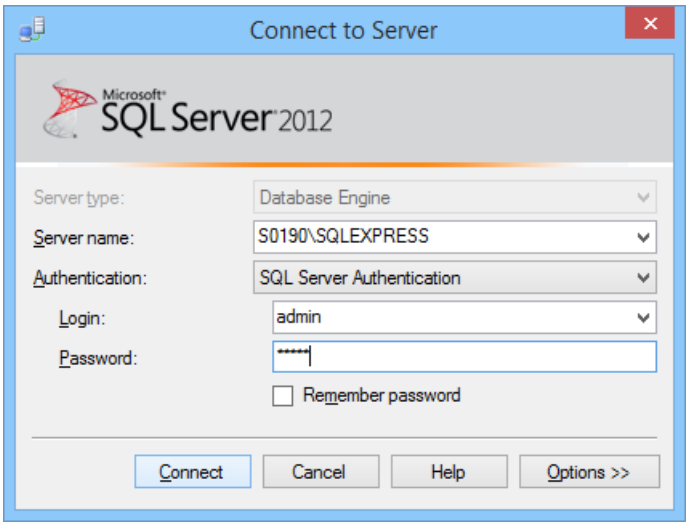


Figure 4: Connecting to the SQL Server instance

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

4.5.2. Configuring Database Maintenance

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

To configure database maintenance, launch TRBOnet Watch Server and select **Maintenance** under the **Database** section in the **Configuration** pane.

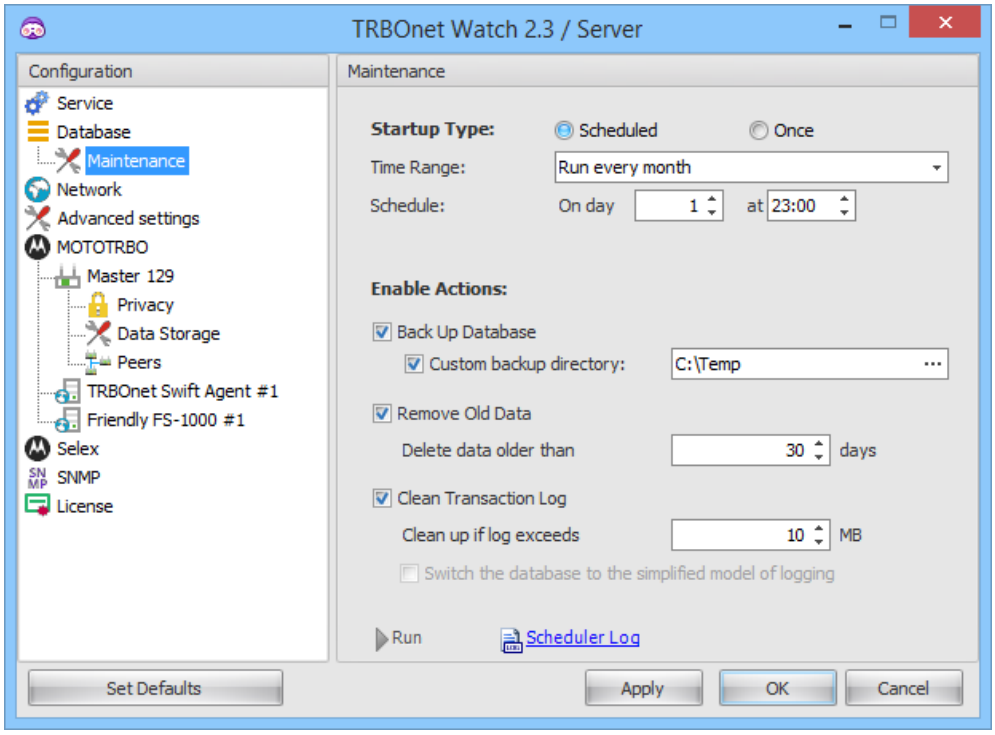


Figure 5: Configuring TRBOnet Watch database maintenance

The maintenance options are available in the **Enabled Actions** section of the **Maintenance** pane. You can enable all options or only the required ones.

Table 6: TRBOnet Watch – database maintenance options

Action	Description
Back Up Database	Select to back up the database to the default local folder. To save backup to a particular folder, select **Custom backup directory**, click the **Search** button in the edit box, and select the preferred folder.
Remove Old Data	Select to remove old data from the database. Configure the options: ▪ **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.

Action	Description
Clean Transaction Log	Select to clear the transaction log. Configure the options: ▪ **Clean up if log exceeds:** Specify the maximum allowed size of the log. 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. **Note**: If the database uses the simplified logging model, this option is unavailable.

Note: The database maintenance options are executed in the order they appear in the **Maintenance** pane. If backup is enabled, the data to be removed is backed up first.

To schedule database maintenance:

1. In the **Maintenance** 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 **Maintenance** pane, click the **Once** option.
2. Select the actions to be executed.
3. Click **Run** to start maintenance.

The **Maintenance In Progress** window appears to report the execution of the selected actions. When maintenance is complete, the **Results** area displays the maintenance log record.

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

4.6. Changing the Language

To change the language of the TRBOnet Watch server:

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

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

4.7. Setting the Logging Level

The TRBOnet Watch server logs specific information that can help the technical support of Neocom Software, Ltd to investigate a customer reported issue. The level of detail in the system log depends of the **Logging level** settings.

To select the preferred logging level:

1. In the **TRBOnet Watch Server** window, select **Advanced settings** in the **Configuration** pane.
2. In the **Logging level** drop-down menu, select the preferred level of detail in the system log: **Debug**, **Information**, **Warning** (default), or **Error**.

It is recommended to keep the default **Warning** settings unless requested by the technical support to select a different level.

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

4.8. Registering Radio Systems

Indicate the radio system(s) whose channels you want to monitor in the TRBOnet Watch console. This requires radio network elements be registered in the **TRBOnet Watch Server** window.

Note: Depending on your license, you can monitor one system or multiple systems. Check your license as described in Viewing the License Information.

The sections below describe how to register different types of radio systems.

4.8.1. Registering MOTOTRBO IP Site Connect, Capacity Plus, and LCP

To register a MOTOTRBO IP Site Connect, Capacity Plus, or Linked Capacity Plus system for monitoring, indicate the master repeater of that system in the **TRBOnet Watch Server** window.

In the Connect Plus mode, add each XRC controller as a master repeater.

To monitor a MOTOTRBO repeater:

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

Table 7: MOTOTRBO system parameters

Parameter	Description
System Name	The name of the system that includes the master repeater. The system name will appear 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 for non-Capacity Plus systems: 1 to 16777215. Range for Capacity Plus: 1-65535. Default: 200. The selected value must be unique (not used) within the radio network.
TRBOnet Local Port	The IP port of the TRBOnet Watch server used for connection with a radio network. **Note**: Use a unique port for each connection with a repeater if there are several master repeaters to be monitored.
SNMP ID	Any value within the valid range used to generate the repeater's physical index. Valid range: 1 to 127. **Note**: Hover over SNMP ID to view the generated index stored in the physical entity table (object entPhysicalTable) of SNMP Agent. To learn more about SNMP communication with TRBOnet Watch, refer to Appendix B: SNMP Support.

Parameter	Description
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 or XRC. Range: 1024 to 65535. Default: 50000. Default for XRC: 38000.
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, Connect Plus.
Connection	Select the level of monitoring in the system. Choosing a low level helps reduce traffic and the database volume. Note: Choosing a low level of monitoring restricts the TRBOnet Watch console functionality. Find the details in Functionality Available for System Monitoring Levels. 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 traffic in the channels. Only voice and data types of traffic are recognized. Voice recording is disabled. Note: Not available for Connect Plus systems. ▪ **Level 4: Call Parsing**: Select to leverage the full-featured monitoring in the system. Note: Not available for LCP systems.

Parameter	Description
Controller section: *The XRT-9xxx Controller section only appears if you select Connect Plus as the system type.*	
Add Controller	Click to register an XRT controller as described in Registering MOTOTRBO Connect Plus. Then go back to the XRC controller. Note: This link appears if no XRT is registered yet.
Controller	The name of the XRT controller connected to the XRC.

4. Click **Test** to test the UDP/IP connection to the master repeater. The result appears in a popup window. If successful, the firmware version and serial number are shown. Click **Close** to close the popup window.
5. Specify the Privacy settings of the repeater as described in Configuring Privacy Settings.
6. Specify the filtering rules for the repeater as described in Configuring Data Storage.
7. Add peers to be included in reports and analytics as described in Adding Peers.

4.8.1.1. Configuring Privacy Settings

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

To configure Privacy settings:

1. In the **TRBOnet Watch Server** window, select **MOTOTRBO** in the **Configuration** pane, then select the system, and then **Privacy**.
2. In the **Privacy** pane, specify the following parameters:

Table 8: Privacy settings of the MOTOTRBO repeater

Parameter	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 transform protected voice and data).

Parameter	Description
	▪ **Enhanced**: Enhanced Privacy (utilizes a cryptographic algorithm to transform protected voice and data).
Basic Privacy Key ID	Applies to Basic Privacy only. The privacy key specified in the repeater configuration. Valid range: 1 to 255.
Enhanced Algorithm	Applies to Enhanced Privacy only. The encryption algorithm specified in the repeater configuration. Options: ARC4, DES, AES 128, AES 256.
Enhanced Privacy Keys	The Enhanced Privacy key(s) specified in the repeater configuration. Applies to Enhanced Privacy only. Click **Add** and enter 1 to 16 Enhanced Privacy keys. Each key appears in the table with the following parameters: ▪ **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. Lies within the range of 1 to FFFFFFFFFE.

4.8.1.2. Configuring Data Storage

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

To avoid full-volume monitoring and storage, you can set up filtering rules. For instance, rules help you define:

- Groups and subscribers whose calls you are (not) interested to view in the console.
- Groups and subscribers whose calls should (not) be stored in the database.
- If the All Calls log should be displayed in the console.
- If All Calls voice recordings should be stored in the database.
- If repeater control messages should be stored in the database.

To configure monitoring and data storage for a system:

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

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

Tab name	Instructions
Group Calls/ Private Calls	In each tab, do any of the following: ▪ 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 Creating Rules.
All Call	Configure monitoring and data storage of All Calls. ▪ **Show in Console**: Select to display All Calls in the console. ▪ **Store Voice**: Select to store All Calls in the database. Note: If you disable **Show in Console**, storing voice is not available.
Advanced	Configure storage of repeater call monitoring messages. ▪ **Store Repeater Call Monitoring messages**: Select to store the RCM messages. **Note**: Enable the **Store Repeater Call Monitoring messages** option to show RCM data for the given system in the All Channels Busy report.

4.8.1.2.1. Creating Rules

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

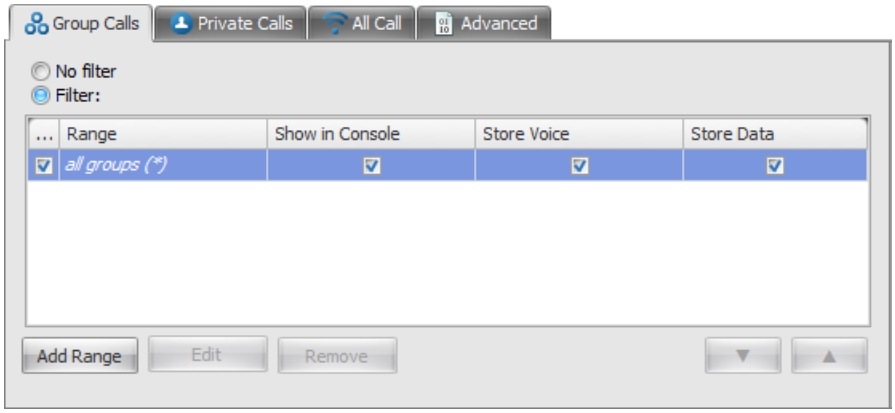


Figure 6: Filtering rules for group calls

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

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

To create a new rule:

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

Note: The range of numbers depends on the system type.

Table 10: Number ranges allowed in MOTOTRBO system types

Topology	Group range	Subscriber number range
IP Site Connect, Connect Plus	1-16,776,415	1-16,777,215
Capacity Plus, LCP	1-254	1-65,535

3. Enable or disable the rule options. These options will apply to a call of the respective type if the calling number matches the rule range:

   - **Show in Console**: If enabled (selected), the call is displayed in the console.
   - **Store Voice**: If enabled, the voice call is stored as an AMBE+2 file in the database.

     Note: Allowing voice call storage on a wide range of subscriber numbers will have impact on the database size.

   - **Store Data**: If enabled, the data call is stored in the database.

     Note: 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. Entries higher in the list have 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 in the respective tab. If the calling number matches any rule, this rule is applied and further rule evaluation stops. If none of the rules is triggered, the default rule for this type of calls is applied. The default rule always takes the last position in the list and cannot be moved.

   Note: If the rules have overlapping ranges, set their priority as described in Ordering Rules with Overlapping Ranges.

To edit the rules, do the following:

- Click **Edit** to modify the range in the rule.
- Click **Remove** to delete the rule.
- Clear the checkbox to disable the rule. The disabled rules are not applied.

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

4.8.1.2.2. Ordering Rules with Overlapping Ranges

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

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

You need to create the following rules:

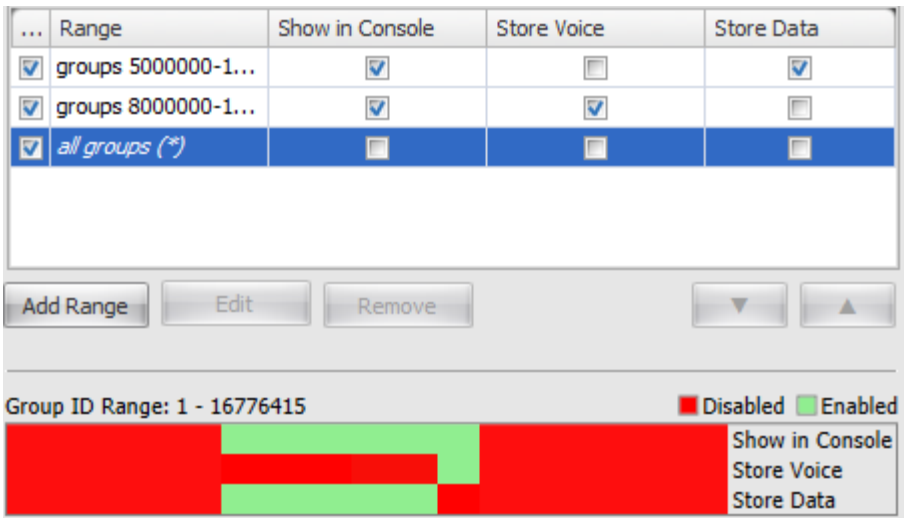


Figure 7: Ordering rules with overlapping ranges

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, the data will be stored in this range. If you move the rule “groups 8000000-11000000” to the top position, voice will be stored.

The color band below the rules visualizes the expected effect of the rule options. Options appear in the color band as three horizontal colored stripes: **Show in Console**, **Store Voice**, and **Store Data**. The length of each stripe stretches from group 1 (left) to the maximum possible number in the system. In case of private calls, the horizontal axis shows subscriber numbers from 1 (left) to the maximum possible number. Rules break the horizontal axis into ranges. Within each range, the color stripes are green or red, depending on the status of the respective rule option – enabled or disabled. If you hover over the colored stripe with the mouse cursor, the tip shows the range of group numbers where this option applies.

4.8.1.3. Adding Peers

Indicate all system peers that can be monitored and included in reports.

To specify the system peers:

1. In the **TRBOnet Watch Server** window, select **MOTOTRBO** in the **Configuration** pane, then the required system, and then **Peers**.
2. Use any of these options:
    - Find all system peers automatically by clicking **Load Peers** in the **Peers** pane.

Note: All TRBOnet Watch consoles and TRBOnet Enterprise applications with configured connection to the master repeater are considered system peers and loaded to the list.

- Click **Add** to add a new peer to the list.

3. If necessary, edit the list of peers using the **Add** and **Remove** buttons.

4.8.2. Registering Radio IP Gateways

To register a RoIP gateway, indicate the TRBOnet Swift Agent or the Friendly FS-1000 that connects to the mobile radio.

To register a Swift Agent:

1. In the **TRBOnet Watch Server** window, select **MOTOTRBO** in the **Configuration** pane.
2. In the **MOTOTRBO** pane, click **Add** and select **Add TRBOnet Swift Agent** in the drop-down menu.
3. In the **TRBOnet Swift Agent** pane, specify the following parameters:

Table 11: Swift Agent settings

Parameter	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 Swift Agents available in the network. Default: 192.168.0.100.
Port	The network port of the TRBOnet Swift Agent. Default: 8002.
Ignore voice data	When selected, this option prevents the TRBOnet Swift Agent from receiving voice calls from the connected radio. The light indicator of voice RX on the controller box remains on; however, the TRBOnet Watch console does not receive voice calls, and you cannot use Voice Recording.
VoIP port	The local port of the TRBOnet Swift Agent for Voice-over-IP communication. Default: 4000.
Input Pins	Select to allow the TRBOnet Swift Agent to transmit telemetry from the selected physical pins of a mobile radio.

Parameter	Description
PIN *<0-4>*	Select to enable telemetry from the given pin.
Pin name	The pin name describing the telemetry. Editable. Default: PIN0 to PIN4.
Pin value	The signal level to initiate transmission. Values: Low level, High level.

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

To register a Friendly FS-1000:

1. In the **TRBOnet Watch Server** window, select **MOTOTRBO** in the **Configuration** pane.
2. In the **MOTOTRBO** pane, click **Add** and select A**dd Friendly FS-1000** from the drop-down menu.
3. In the **Friendly FS-1000** pane, specify the following parameters:
   - **Name**: The system name of the RoIP gateway. Valid characters: spaces, alphanumeric and special characters.
   - **IP Address**: The IP address of the Friendly FS-1000. The expanded list shows all Friendly FS-1000 available in 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 to the Friendly FS-1000.

4.8.3. Registering MOTOTRBO Connect Plus

A Connect Plus radio network has mandatory elements that must be registered in TRBOnet Watch for the system to be monitored.

Table 12: Registering MOTOTRBO Connect Plus systems – high-level steps

Requirements	High-level steps
Connect Plus networks must have an XRT-9000/9100 controller between TRBOnet Watch and the radio system.	1. Register an XRT controller as described below.

Requirements	High-level steps
The XRT connects to one or more XRC controllers, each placed in front of a group of repeaters and playing the role of a master repeater in that group.	2. Register each XRC controller as a *master* repeater and point the above XRT as a parameter. For details, refer to Registering MOTOTRBO IP Site Connect, Capacity Plus, and LCP.

To register a MOTOTRBO XRT controller:

1. In the **TRBOnet Watch Server** window, select **MOTOTRBO** in the **Configuration** pane.
2. In the **MOTOTRBO** pane, click **Add** and select **Add XRT-9xxx Controller** from the drop-down menu.
3. In the **Controller** pane, specify the following parameters:
   - **System Name**: The name of the system that includes the XRT controller as a master peer. Valid characters: spaces, alphanumeric and special characters.
   - **Controller IP Address**: The IP address of the XRT.
   - **Controller TCP Port**: The TCP port of the XRT. Default: 10001.
   - **User Name**: The user name as specified in the configuration of the XRT.
   - **Password**: The user password as specified in the configuration of the XRT.
4. Click **Test** to check the specified IP connection.

4.8.4. Registering Selex Repeaters

To register a Selex repeater:

1. In the **TRBOnet Watch Server** window, select **Selex** in the **Configuration** pane.
2. Click **Add** in the **Selex** pane.
3. In the **System** pane, specify the following parameters:
   - **System Name**: The name of the system that will be displayed in the TRBOnet Watch console. Valid characters: spaces, alphanumeric and special characters.
   - **IP Address**: The IP address of the Selex repeater. Default: 192.178.1.1.
   - **UDP Port**: The UDP port of the Selex repeater. Default: 161.
4. Click **Test** to check the specified IP connection.

4.8.5. Managing Registered Systems

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

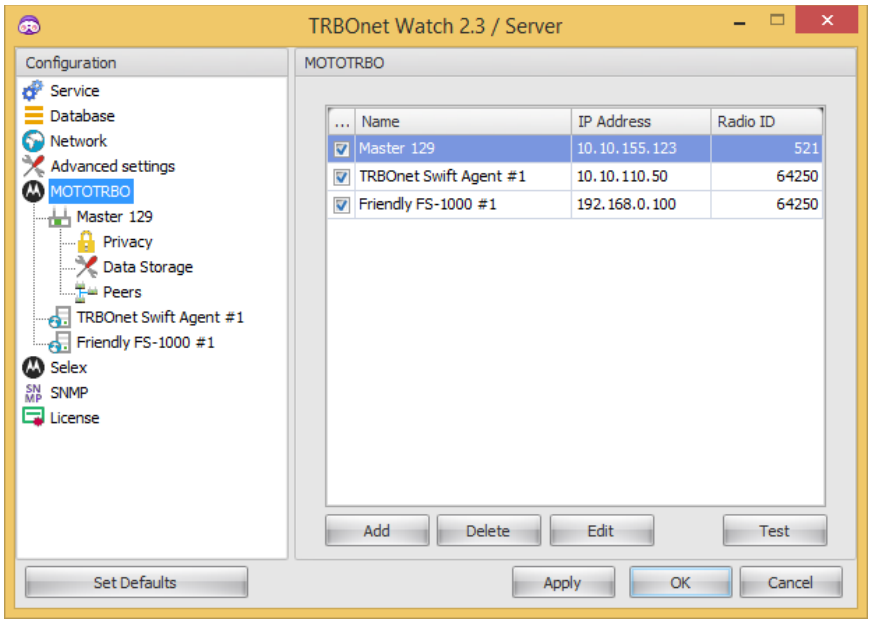


Figure 8: Viewing registered systems in the Configuration pane

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

- **Name**: The name that you give to the system when registering it.
- **IP Address**: The IP address of the system.
- **Radio ID**: The meaning varies for different systems.
    - In MOTOTRBO systems, the peer ID of the TRBOnet Watch console.
    - In RoIP gateways, the identifier of the radio station behind the registered controller.

Select the systems that you want to monitor. Depending on your license, you can monitor one system or multiple systems. If you select more systems than allowed by your license, the TRBOnet Watch console will monitor the allowed number of systems only, counting them from top of the **Configuration** panel, and ignore the systems that exceed the licensed limit.

Note: Check your license as described in Viewing the License Information.

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

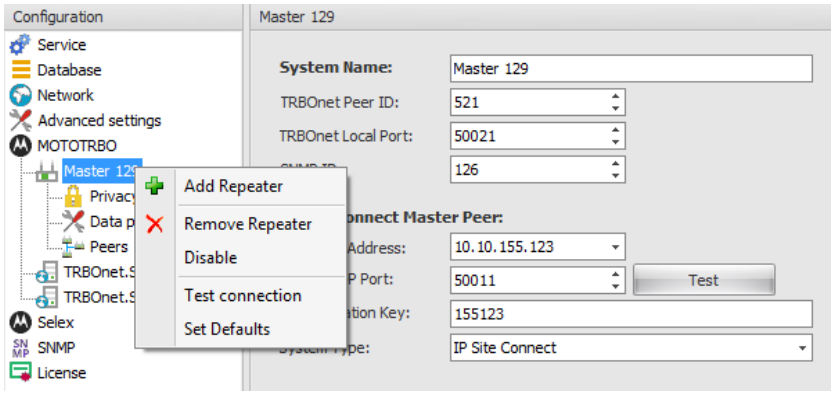


Figure 9: Using the context menu in the Configuration pane

Use the context menu commands as follows:

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

4.9. 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 MIB Objects (Appendix B).

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.

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, select **SNMP** in the **Configuration** pane. The **SNMP** pane loads the default SNMP communication parameters.
2. Update the following parameters where necessary:

Table 13: SNMP configuration settings

Parameter	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 the information describing your solution working with TRBOnet Watch. 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 full 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 stay with the default value. Default: 80000AD0431AF108. **Note**: If SNMPv3 is enabled, the **Engine ID** parameter must match the appropriate parameter in NMS.

Parameter	Description
SNMP Agent section: *Enable the SNMP Agent and configure the NMS connection.*	
Enabled	Select to run the SNMP Agent.
SNMPv3 Only	Select to force the use of the SNMPv3 protocol for encrypted communication between the remote NMS and TRBOnet Watch. The SNMP Agent will ignore all unauthorized requests, including notification requests. **Note**: If you select this option, specify 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 requires the **SNMPv3 Only** parameter 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. **Note**: If you select SNMPv3, specify the fields in the **SNMPv3 User** section.

Parameter	Description
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, administer, and use the TRBOnet Watch console for monitoring and diagnostics of different system types. This section also includes instructions for using voice recording and for building analytics and reports.

5.1. Configuration

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

5.1.1. Connecting to the TRBOnet Watch Server

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

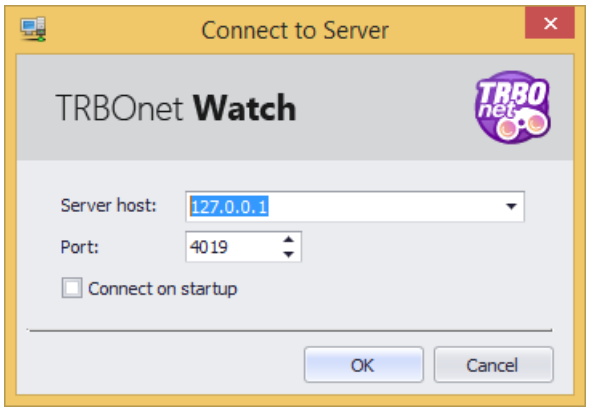


Figure 10: The Connect to Server dialog box

This dialog box shows the default server connection settings.

If you want to bypass this dialog box and connect to the server automatically, select **Connect on startup**.

To reconnect to a different TRBOnet Watch server:

1. Select **File** and **Connect to Server** on the menu bar.
2. Specify the following settings:
   - **Server host**: The IP address of the preferred TRBOnet Watch server. Select this address from the dropdown list or type it manually.
   - **Port**: The IP port of the preferred TRBOnet Watch server.
3. Click **OK**.

5.1.2. Changing the Language

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

To select a different language for the console:

1. Select **Tools** and **Language** on the menu bar.
2. Select the preferred language in the drop-down list.
3. Click **OK**.

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

5.1.3. Configuring Playback Settings

If the Voice Recording feature is enabled, you can listen to any voice call displayed in Live Monitor. The audio settings for playback can be viewed and modified.

To specify the playback preferences:

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

5.1.4. Setting the Audio Output File Name Format

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

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

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

The format string can include the following variables:

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

Each variable is embraced in the % (percentage) delimiters that do not appear in the resulting file name. The format string can include spaces and special characters that

improve the structure of the resulting file name. For example, the resulting file name for the above format string may look as follows:

‘126’ Group Call ‘1’ (13-50-30).<*extension*>

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

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

5.2. Live Monitor

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

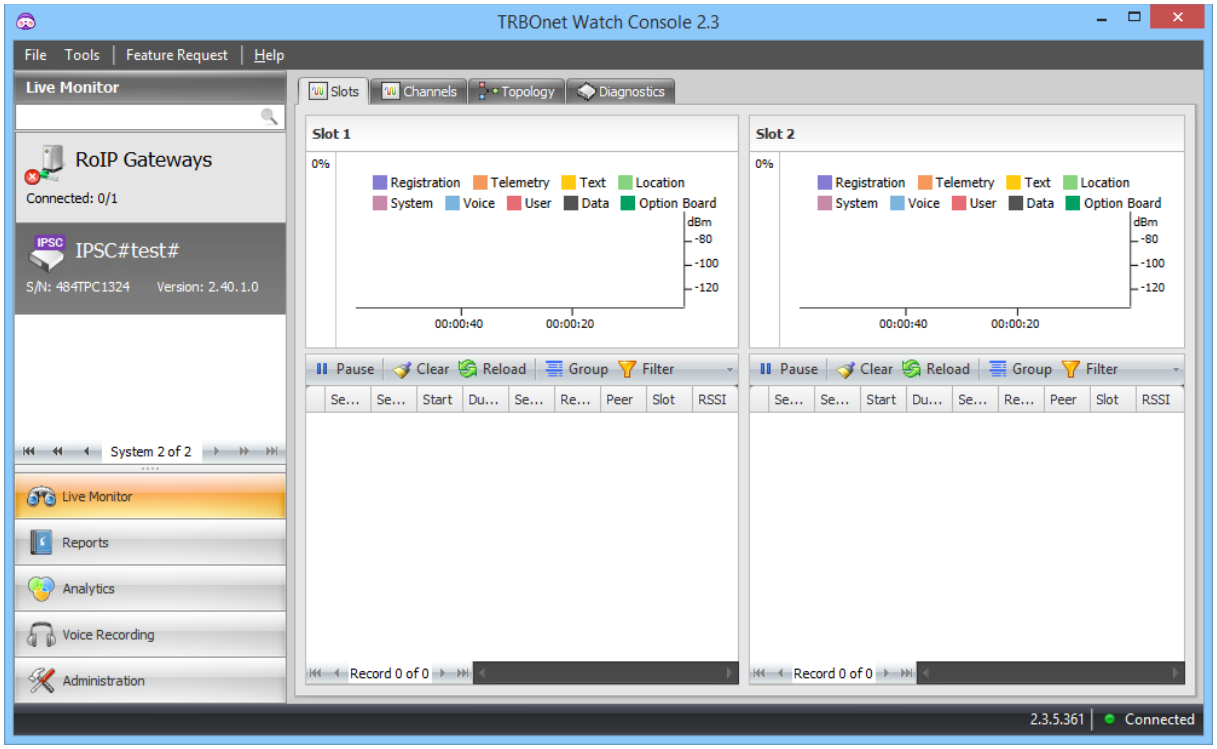


Figure 11: Live Monitor

The left pane displays tabs for all radio systems available for monitoring.

The system tabs can be as follows:

- **RoIP Gateways:** Shows all RoIP gateways currently monitored by TRBOnet Watch. The tab displays the number and the connection status of all RoIP gateways. For example, **Connected: 1/2** indicates two RoIP gateways, one of them currently connected to the IP network.
- A MOTOTRBO system tab shows an individual system. The tab indicates the system name, the system type, and the serial number and firmware version of the master repeater.

  Note: To find a system quickly, start typing the system name in the **Search** box. The filtered panel displays the tabs that include the entered string.

- **Selex**: Shows all Selex repeaters.

When you select a system from the left pane, the right pane displays monitors and views available for this system. To open a particular monitor, click the respective tab on top of the right pane.

Note: You can open a system in a separate window. In the left pane, right-click on the system tab and select **Open in New Window** from the context menu.

5.2.1. Monitoring Radio-over-IP Gateways

This section describes how to use Live Monitor for monitoring and diagnostics of the Radio-over-IP gateways.

To select RoIP gateways for monitoring:

1. Launch the TRBOnet Watch console.
2. In the left pane, select **Live Monitor** and then **RoIP Gateways**.
3. In the right pane, select the respective tab as follows:
   - **Channels** tab: Select this tab to monitor traffic in all RoIP gateways in real time. For details, refer to Viewing Channels.
   - **Diagnostics** tab: Select this tab to inspect the Select this tab to inspect the operations parameters, connection and alarm status of all RoIP gateways in real time. For details, refer to Viewing Diagnostics.
   - **Topology** tab: Select this tab to view the architecture of all monitored systems or of a particular IP gateway. For details, refer to Viewing System Topology.
   - **Physical GPIO Pins** tab: Select this tab to view the status of inbound pins for all relevant RoIP gateways. For details, refer to Viewing Physical GPIO Pins.

5.2.1.1. Viewing Channels

The **Channels** tab allows you to monitor traffic in the channels of all RoIP gateways.

The **View** pane displays all channels as small traffic monitors, each showing activity in the channel in real time. The name of the respective system appears on top each small monitor. RoIP gateways not connected to the radio show the **Feed Offline** message over the pink shading.

Click a particular channel in the **View** pane. The selected channel now shows its traffic in the left pane - real-time monitor. The display time for signals is equal to the length of the X-axis and can be adjusted in the range of 10 to 300 seconds by scrolling a mouse wheel in the monitor.

- The color-graded bar and the percentage value on the left side of the monitor indicate the workload of the channel.
- The received calls appear in the form as columns. The column height indicates the RSSI level (in dBm) of the received signal relative to the Y-axis. The column width corresponds to the duration of the signal (in milliseconds) relative to the X-axis. The column color indicates the protocol of transmitted information.

  Note: If the **Legend** button is pressed, you can view an indication of what each colored bar stands for.

- The **Mute/Unmute** button serves to enable or disable the mute mode. The mute mode is selected by default. If you click this button to unmute voice transmission in the channel, you can hear the conversation.

The grid below the monitors updates in real time to display voice and non-voice calls transmitted in all channels. The grid contains the detailed information about each call, including the protocol (**Session Type** field), the type of data (**Session Subtype** field), the time and duration of the transmission, the radio IDs of the sender and recipient, and the RoIP gateway in which the transmission occurred.

5.2.1.2. Viewing Diagnostics

The **Diagnostics** tab provides the full information about IP connections, connected radios, and operational parameters of the monitored TRBOnet Swift Agents and Friendly FS-1000.

To view the diagnostics of your RoIP gateways, open Live Monitor and select **RoIP Gateways** from the left pane. Click the **Diagnostics** tab in the right pane.

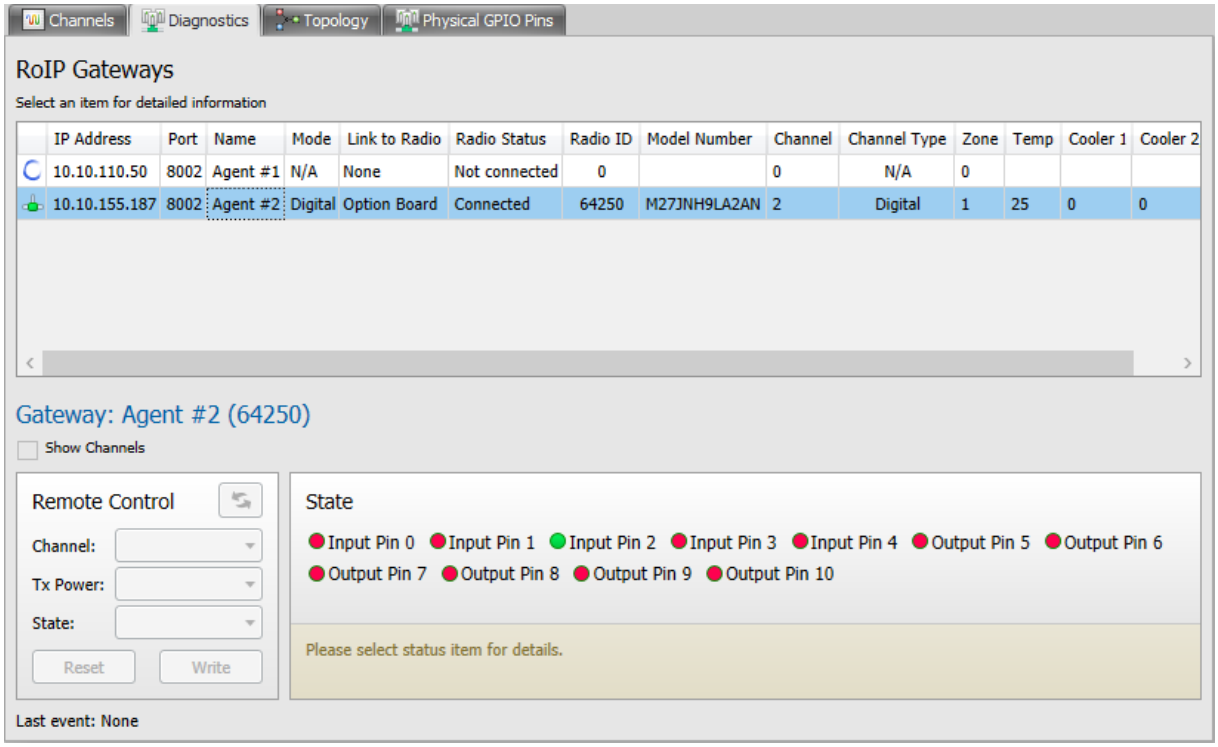


Figure 12: Diagnostic information for all RoIP gateways

All RoIP gateways are presented in the **RoIP Gateways** grid with the following fields.

Table 14: RoIP Gateways grid columns

Field	Description
Icon	The IP connection of the RoIP gateway. ▪ : Green icon indicates the normal IP connection. ▪ : Blue circle icon indicates no IP connection.
IP Address	The IP address of the RoIP gateway.
Port	The IP port of the RoIP gateway.
Name	The system name of the RoIP gateway specified in the TRBOnet Watch server configuration.
Mode	The operation mode. Values: Digital, Analog, N/A.
Link to Radio	The type of radio link. Values: Option Board, GPIO, None.

Field	Description
Radio Status	The status of the radio linking the TRBOnet Swift Agent or Friendly FS-1000. Values: Connected, Not connected.
Radio ID	The ID of the linked radio. Is set to 0 if no radio is linked to the TRBOnet Swift Agent or Friendly FS-1000.
Model Number	The model number of the linked radio. Empty if no radio is linked to the TRBOnet Swift Agent or Friendly FS-1000.
Channel	The ordinal number of the channel used by the linked radio.
Channel Type	The type of the channel. Values: Digital, Analog, N/A.
Zone	The zone of the linked radio.
Temperature ° C	The temperature of the Swift Agent.
Cooler 1, rpm	The speed of cooler 1 connected to the Swift Agent (rotations per minute)
Cooler 2, rpm	The speed of cooler 2 connected to the Swift Agent (rotations per minute)

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

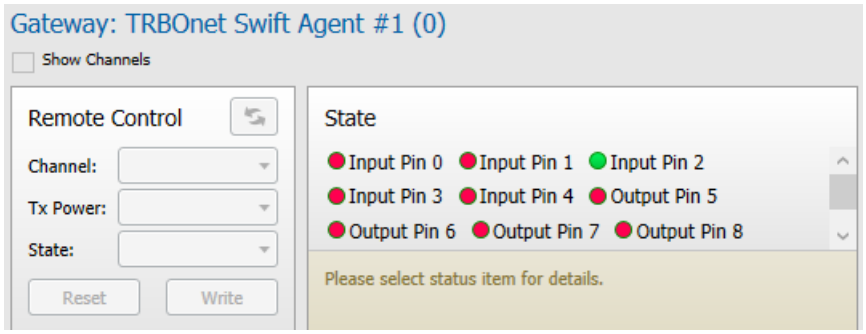


Figure 13: System information and physical pins

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

The **State** panel displays the states of input and output physical pins of the connected mobile radio. The pin states 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 always display the red icon (no signal state). To learn more about input pin configuration, refer to Registering Radio IP Gateways.

Point the mouse cursor at the pin name to see the tooltip with the description of the pin. To monitor the states of input pins, use the **Physical GPIO Pins** tab. For details, refer to Viewing Physical GPIO Pins.

5.2.1.3. Viewing Physical GPIO Pins

The **Physical GPIO Pins** tab displays all RoIP gateway systems that can transmit telemetry from the connected radios through physical pins. The **Physical GPIO Pins** grid allows you to monitor the state of input pins in real time.

Table 15: Physical GPIO pins - parameters

Parameter	Description
Icon	The connection status of the RoIP gateway. ▪  : Green icon indicates the normal IP connection. ▪  : Blue circle icon indicates no IP connection.
IP Address	The IP address of the RoIP gateway.
Port	The IP port of the RoIP gateway.
Name	The system name of the RoIP gateway specified in the TRBOnet Watch server configuration.
Mode	The operation mode. Values: Digital, Analog, N/A.
Input <*1-5*>: Name	The pin name indicating the event or command transmitted by the radio. Default: PIN0 to PIN4. Note: Pin names can be configured as described in Registering Radio IP Gateways.

Parameter	Description
Input <*1-5*>: Value	The pin value indicated by the color of the “circle” icon: ▪ Green icon: Telemetry transmission ▪ Red icon: No transmission

5.2.2. Monitoring MOTOTRBO Systems

This section describes how to use Live Monitor for monitoring and diagnostics of a MOTOTRBO system registered in the TRBOnet Watch server configuration.

To monitor activity in a MOTOTRBO system:

1. Launch the TRBOnet Watch console.
2. In the left pane, select **Live Monitor** and the tab with the system name. The tab also indicates the serial number and firmware version of the master repeater.
3. In the right pane, select the respective tab:
   - **Slots** tab: This tab is available for IP Site Connect systems only. Select this tab to monitor traffic in the slots of the master repeater of the IP Site Connect system. For details, refer to Viewing IPSC System Slots.
   - **Channels** tab: Select this tab to monitor traffic in all system channels in real time. For details, refer to Viewing System Channels.
   - **Topology** tab: Select this tab to view the architecture of all systems or of a particular MOTOTRBO system. For details, refer to Viewing System Topology.
   - **Diagnostics** tab: Select this tab to inspect the configuration settings, connection status, and alarm status of all system peers. Also, select this tab to modify the configuration of the master repeater remotely. For details, refer to Viewing Diagnostics and Controlling Repeaters Remotely, respectively.

5.2.2.1. 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 of the master repeater in the system.

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

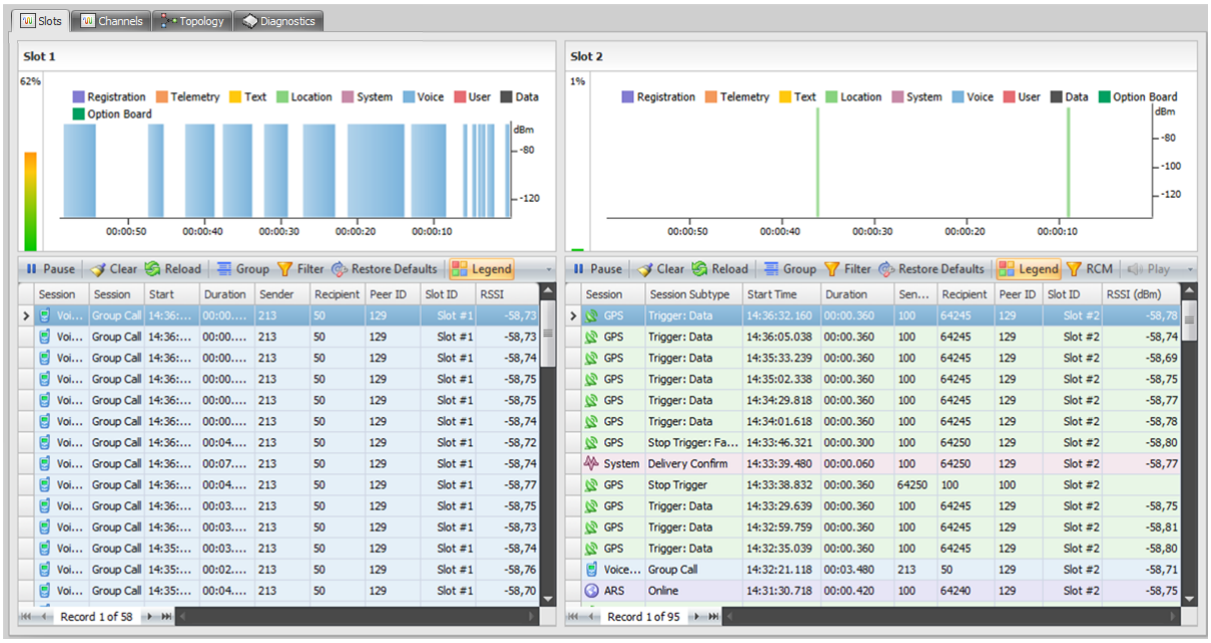


Figure 14: Slots tab

The real-time monitor displays activity in the slot in real time. The display time for signals is equal to the length of the X-axis. You can adjust the display time in the range of 10 to 300 seconds by scrolling a mouse wheel in the selected slot monitor.

The color-graded bar and the percentage value on the left side of the monitor indicate the workload of the slot.

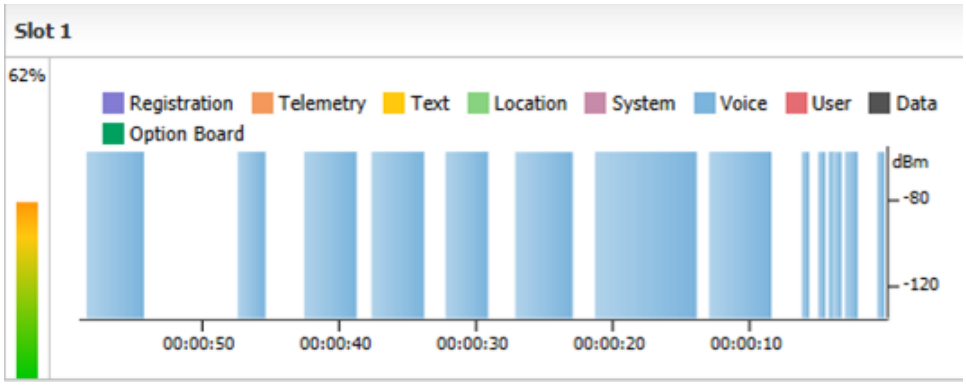


Figure 15: The real-time monitor

The received calls appear in the monitor as columns of different color, height, and width.

- The column height indicates the RSSI level (in dBm) of the received signal relative to the Y-axis.
- The column width corresponds to the duration of the signal (in milliseconds) relative to the X-axis.
- The column color indicates the protocol of transmitted information.

If the **Legend** button is pressed, you can see the legend with the description of each colored bar:

- Registration: ARS data
- Telemetry: Telemetry data
- Text: Text message
- Location: Location data
- System: System data
- Voice: Voice call
- User: Non-parsed data
- Data: Non-voice call in LCP systems
- Option Board: Option board call

Note: In IP Site Connect systems, all transmissions whose category cannot be detected appear as System. In LCP systems, only voice calls can be recognized. If the call is not Voice, it is categorized as Data.

The grid below the monitor updates in real time to display all traffic transmitted in the slot. It contains the detailed information about each entry, including the protocol (**Session Type** field) , the type of data (**Session Subtype** field), the time and duration of the transmission, the radio IDs of the call sender and recipient, the peer and slot that transmitted the call, and the signal strength measured by the repeater.

The grid toolbar includes the following buttons:

Table 16: 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 grid stop updating the content.
Clear	Click the **Clear** button to purge the grid.
Reload	Click the **Reload** button to undo the **Clear** command.
Group	Toggle the **Group** button to enter the grouping mode. To group the grid entries by any column, drag the column header to the grouping area above the grid header.

Button	Description
Filter	Toggle the **Filter** button to enter the filtering mode. To filter the grid, 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 above the column header. All entries not including the specified value in the column will be hidden.
Restore Defaults	Click the **Restore Defaults** button to undo grouping and filtering.
Legend	Toggle/release the **Legend** button to show/hide the legend in the monitor pane.
RCM	Toggle/release the **RCM** button to hide/display RCM messages in the grid among other entries. For the description of RCM messages, refer to Appendix C: RCM Messages.
Play	Click to display the voice player in a popup window and listen to the voice call selected in the table. Use the voice player controls as described in Voice Recording. **Note**: This button is grayed out for non-voice calls. It becomes available if you select a voice call in the grid.
Save to Folder	Click the **Save to Folder** button to save the selected voice call to the folder as the WAV file. The format of the file name is configured as described in Setting the Audio Output File Name Format. **Note**: This button is grayed out for non-voice calls. It becomes available if you select a voice call in the grid.

When you close the TRBOnet Watch console, the grid is cleared. If you launch the console again, the grid starts collecting data for the current work session. To display the data collected during the earlier work sessions, use reports as described in Reports and Analytics.

5.2.2.2. Viewing System Channels

The **Channels** tab allows you to monitor traffic in all channels of a MOTOTRBO system currently selected in the left pane of **Live Monitor**.

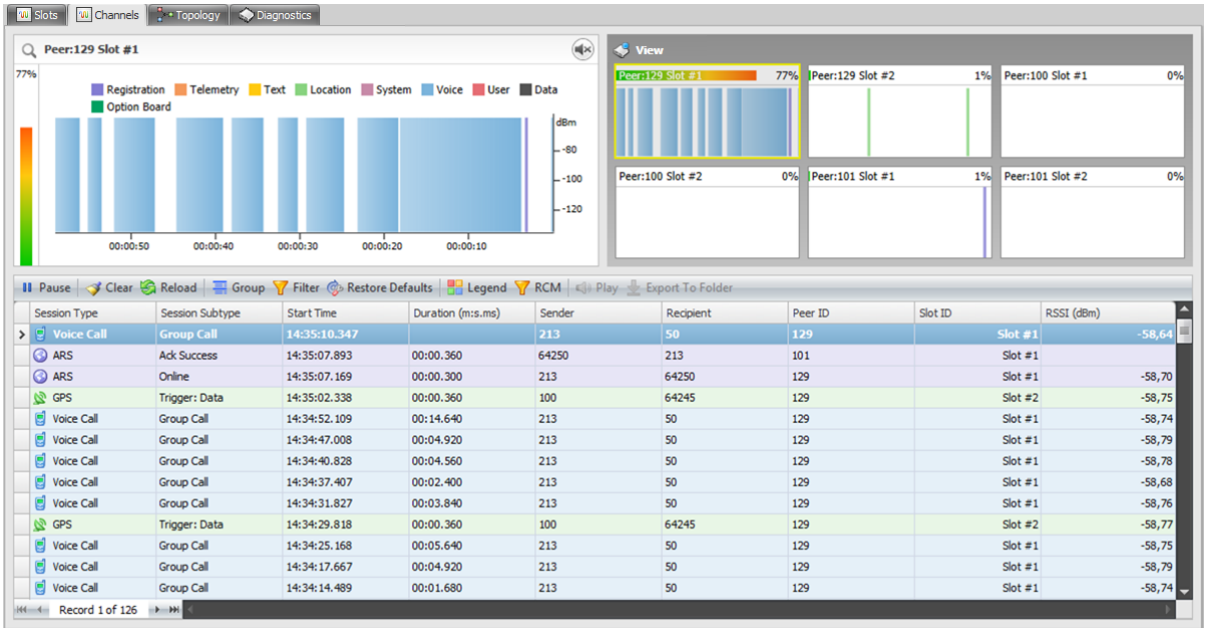


Figure 16: Channels tab

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

Note: You can see and edit the list of system peers in the TRBOnet Watch server configuration. For details, refer to topic Adding Peers.

Each peer in the system is presented by a pair of small traffic monitors that display activity of the peer in real time. Disconnected peers show the **Feed Offline** message over the pink shading.

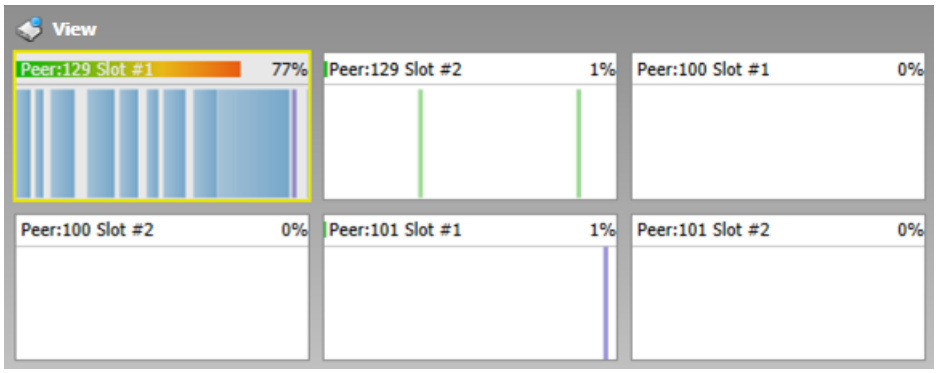


Figure 17: The view of all system peers

Click a slot in the **View** pane. The selected slot now shows its traffic in the left pane – real-time monitor. The behavior and features of the monitor are described in Viewing the IPSC System Slots.

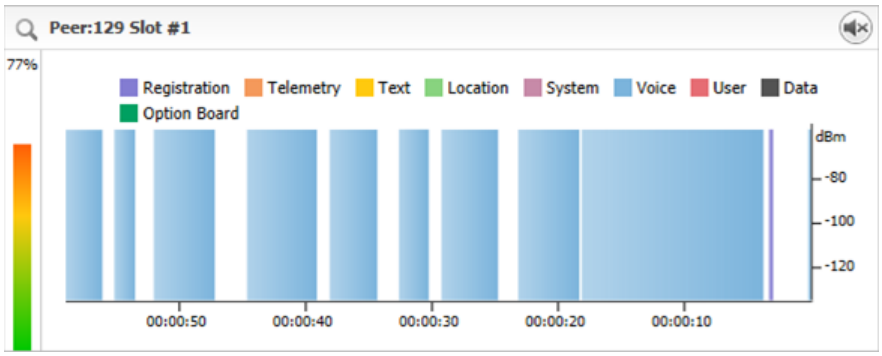


Figure 18: The real-time monitor displays traffic in the slot selected in the View pane

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

Note: The **Mute/Unmute** button is not available for Linked Capacity Plus systems.

The grid shows all calls transmitted in all system slots that are currently displayed in the **View** pane. The grid content is collected during one work session in the TRBOnet Watch console. The header columns and the toolbar are described in detail in Viewing the IPSC System Slots.

5.2.2.3. Viewing Diagnostics

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

Additionally, use the **Diagnostics** tab to modify certain repeater configuration settings remotely. To learn more about this option, refer to Controlling Repeaters Remotely.

To diagnose a MOTOTRBO system:

1. Launch the TRBOnet Watch console.
1. In the left pane, select **Live Monitor**, then select a MOTOTRBO system.
2. In the right pane, select the **Diagnostics** tab.

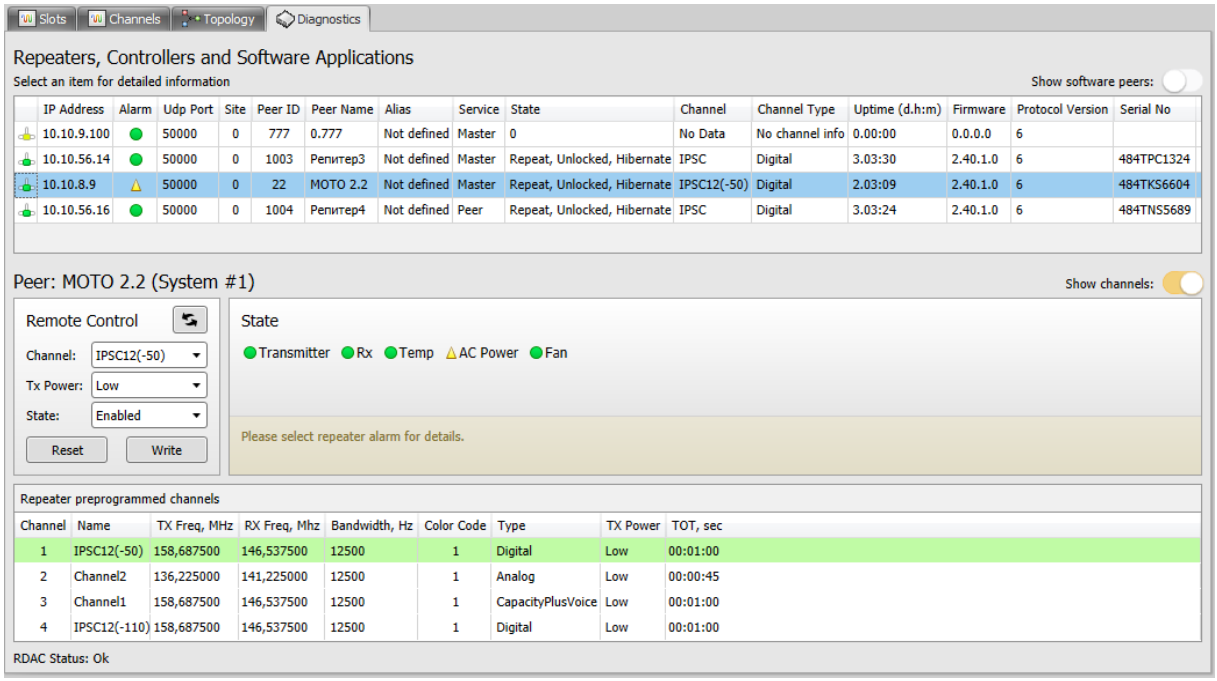


Figure 19: The Diagnostics tab

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

Table 17: Repeaters, Controllers and Software Applications grid - parameters

Parameter	Description
Icon	The connection status of the peer. ▪  : Green icon indicates normal IP connection and RDAC support for repeaters. ▪  : Yellow icon indicates normal IP connection and no RDAC support for repeaters. Software peers and XRC controllers always display this icon. ▪  : Blue circle icon indicates no IP connection. Note: Point the icon with the mouse cursor to see the tooltip with the description of the state.
IP Address	The IP address of the peer.

Parameter	Description
Alarm	The alarm status of the repeater. The severity is indicated by the icon as follows: ▪ 🟢: Green 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. 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: Alarms icons make sense for repeaters only. Other peers always display the 🟢 (no alarm) icon.
Udp Port	The UDP port of the peer.
Site	The ID of the site to which the peer is connected. Applies to Linked Capacity Plus systems only. Otherwise, set to 0.
Peer ID	The ID of the peer.
Peer Name	The peer name of the repeater as specified in the repeater’s configuration. Peers other than the master repeater show the peer ID.
Alias	The peer alias (if defined). To learn more about adding aliases, refer to Managing Aliases.
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).

Parameter	Description
Channel	The name of the repeater preprogrammed channel that is currently in use. Not applicable to software peers (displays **No Data**).
Channel Type	The type of the preprogrammed channel. 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**).
Uptime (d.h:m)	The total time the repeater is up and running.
Firmware	The firmware version of the repeater. Not applicable to software peers (displays 0.0.0.0.).
Protocol Version	The version of the radio communication protocol.
Serial No	The serial number of the hardware.

For the peer selected in the **Repeaters, Controllers and Software Applications** grid, other panels on the **Diagnostics** tab are updated to show the following information:

- The peer's identification in the format **Peer: *<peer ID or repeater programmed name\| peer alias>* (*<system name>*)**
- **Remote Control** panel: Displays the repeater parameters that you can set remotely. Disabled for software peers. For details, refer to Controlling Repeaters Remotely.
- **State** panel: Displays alarms and their status for the repeater selected in the **Repeaters, Controllers and Software Applications** grid. The icons indicate the alarm statuses as described above.

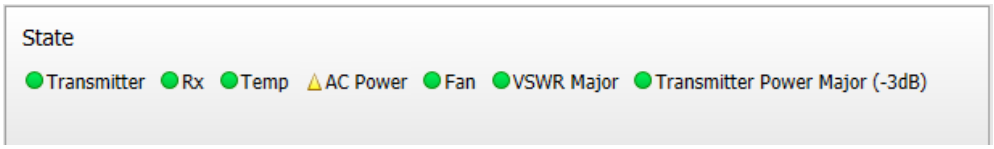


Figure 20: The State panel displays the AC Power alarm with the minor severity level

The displayed alarms are specific for the model of repeater. Hover over a particular alarm to get more information.

- **Repeater preprogrammed channels** grid: Displays the repeater channels and their parameters. Disabled for software peers. For details, refer to Controlling Repeaters Remotely.

5.2.2.4. Controlling Repeaters Remotely

Live Monitor allows you to manage certain parameters of a master MOTOTRBO repeater remotely. Select a MOTOTRBO system in the **Live Monitor** pane and open the **Diagnostics** tab.

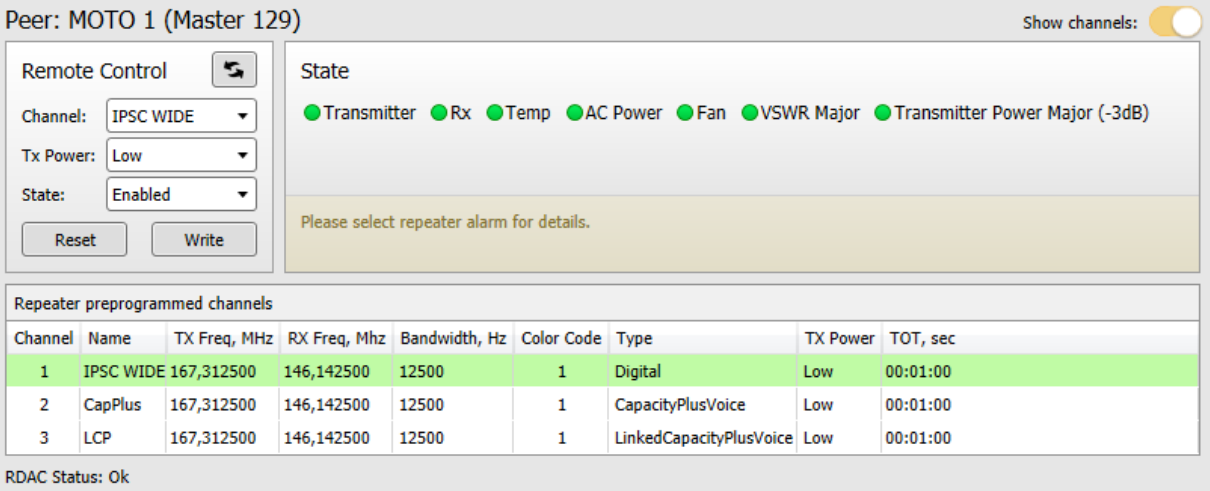


Figure 21: Remote Control

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

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

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

Note: You can hide and show the **Repeater preprogrammed channels** grid using the **Show channels** switcher.

The information in the grid is read-only. The programmed channel parameters are as follows:

- **Channel**: The ordinal number of the channel programmed in the repeater configuration.
- **Name**: The channel name specified 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, in Hz.
- **Color Code**: The color code of the channel.
- **Type**: The type of channel specified 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 specified in the repeater configuration.
- **TOT, sec**: The timeout during which the radio can continuously transmit before transmission terminates automatically.

The following remote operations on repeaters are allowed:

Table 18: Remote operations on repeaters

To do this:	Perform these steps:
Configure the repeater to use a different channel	**To configure the repeater to use a different channel:** 1. Select the repeater in the **Repeaters, Controllers and Software Applications** grid. 2. In the **Remote Control** panel, expand the **Channel** drop-down list and select a different channel programmed in the repeater. 3. Click the **Write** button. Updating the repeater configuration may take more than a minute. 4. If the type of the channel has changed after the update, launch the TRBOnet Watch server and specify the **System Type** parameter accordingly, as described in Registering MOTOTRBO IP Site Connect, Capacity Plus, and LCP. Note: The type of channel is included in the **Type** parameter in the **Repeater preprogrammed channels** grid.
Configure the transmission power of the repeater	High transmission power is required for a stronger signal needed to extend transmission distances. Low transmission power is preferred for communication in close proximity; it is also used to prevent transmissions into other geographical groups. **To configure the transmission poser of the repeater:** 1. Select the repeater in the **Repeaters, Controllers and Software Applications** grid.

To do this:	Perform these steps:
	2. In the **Remote Control** panel, expand the **Tx Power** drop-down list and select 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 to alarms and diagnostics. **To enable or disable the repeater:** 1. Select the repeater in the **Repeaters, Controllers and Software Applications** grid. 2. In the **Remote Control** panel, expand the **State** drop-down list and select a different option: **Enabled** or **Disabled**. 3. Click the **Write** button.
Reboot the repeater remotely	**To reboot the repeater:** 1. Select the repeater in the **Repeaters, Controllers and Software Applications** grid. 2. Click the **Reset** button in the **Remote Control** panel.
Reload the configuration settings	**To reload the repeater configuration:** 1. Select the repeater in the **Repeaters, Controllers and Software Applications** grid. 2. Click  in the **Remote Control** panel. The latest configuration settings of the repeater appear in the **Remote Control** panel and the **Repeater Preprogrammed Channels** grid.

5.2.3. Viewing System Topology

The **Topology** tab allows you to inspect the topology and connection states of all MOTOTRBO system peers and RoIP gateways registered in TRBOnet Watch for monitoring.

To view the topology of a particular system, open it in Live Monitor and select the **Topology** tab in the right pane.

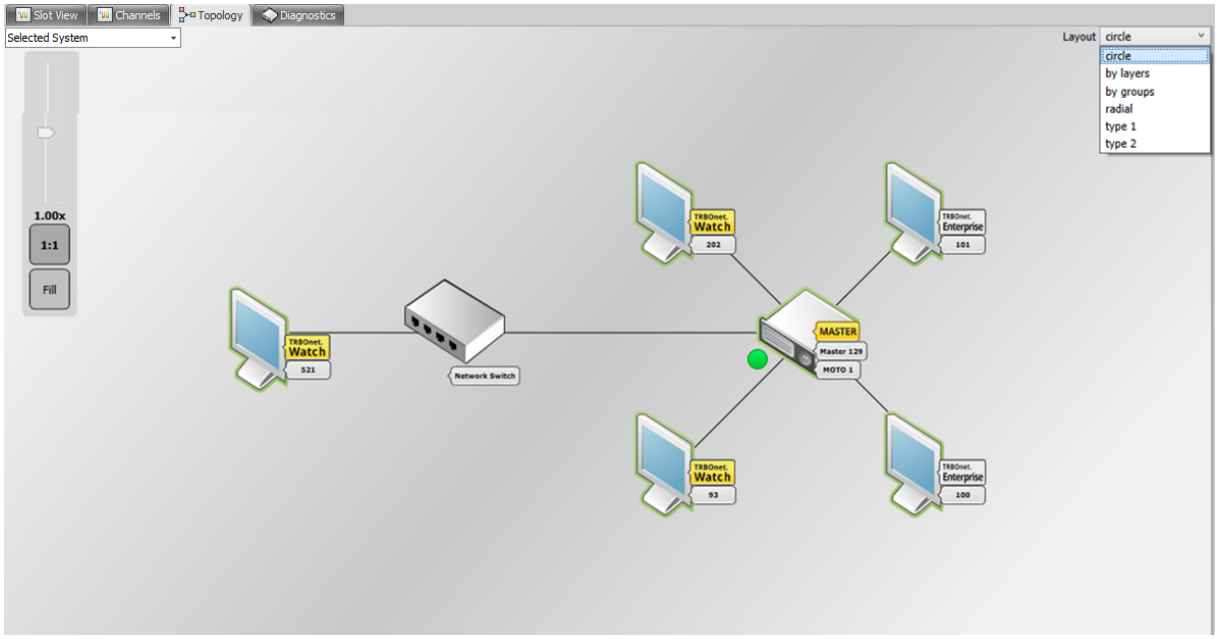


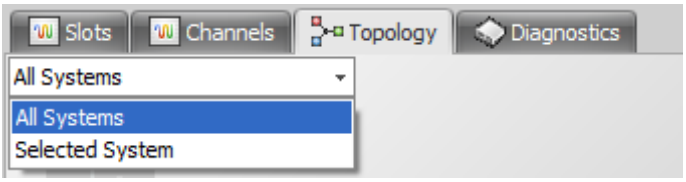
Figure 22: Topology of a MOTOTRBO IP Site Connect system

The topics in this section describe how to adjust the view of the topology map 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 map as described in this topic.

Table 19: Adjusting Topology

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 list on top of the topology map and select the required option.  **Figure 23: Selecting the scope of displayed MOTOTRBO systems** If a MOTOTRBO system is selected in Live Monitor, the following options are available:

Operation	Description
	▪ **All Systems**: The topology displays all monitored MOTOTRBO systems. ▪ **Selected System**: The topology displays the selected MOTOTRBO system only. If RoIP gateways are selected in Live Monitor, the following options are available: ▪ **All Systems**: Select this option to see all RoIP gateways and all MOTOTRBO systems monitored by your TRBOnet Watch. ▪ **RoIP Gateways**: Select this option to hide MOTOTRBO systems and see all RoIP gateways only.
Adjust the layout	You can choose a different layout of elements from the **Layout** drop-down box.
Rescale the map	You can zoom the topology map 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 rim) that are not relevant to your system, such as software applications connected to the given master repeater over IP. ▪ To remove a particular peer, right-click it and select **Remove Peer From Map** from the context menu. ▪ To remove all disconnected peers, right-click any peer and select **Remove All Disconnected Peers.** Note: If a disconnected peer connects to the repeater after the removal, it appears on the topology map automatically next time you launch the TRBOnet Watch console.

5.2.3.2. Graphics for MOTOTRBO Systems

MOTOTRBO system elements are presented on the topology map by graphical images connected over IP.

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

If hover over the element, the tooltip shows the information about the peer (ID and alias), the IP connection parameters, and system parameters.

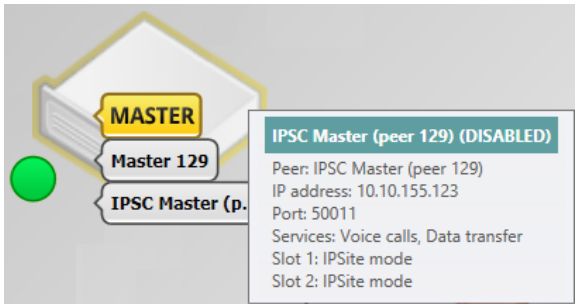
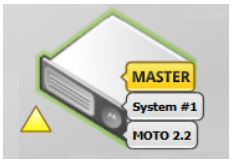
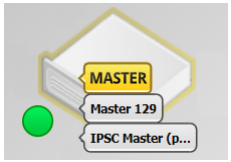


Figure 24: A cursor pointed at the image shows the tooltip with details

The following examples explain how to read information on the topology map.

 **Figure 25: 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 rim: Repeater enabled, normal IP connection
 **Figure 26: Master repeater (reloading)**	Image: Repeater Green rim: Normal IP connection Icon: No RDAC connection

 **Figure 27: Master repeater (alarm)**	Image: Repeater Green rim: Normal IP connection Icon: RDAC issue, minor severity level (“attention”)
 **Figure 28: Master repeater (disabled)**	Image: Repeater Yellow rim: Repeater disabled Icon: Normal condition, no RDAC issues
 **Figure 29: Unknown element**	Image: Unknown (not registered) element Labels: ▪ **85**: Peer ID Red rim: No IP connection with TRBOnet Watch Icon: No XNL connection
 **Figure 30: Software peer (normal state)**	Image: Software peer Labels: ▪ **TRBOnet.Watch**: TRBOnet Watch applicaiton ▪ **93**: Peer ID Green rim: Normal IP connection
 **Figure 31: Software peer (disconnected)**	Image: Software peer Red rim: No IP connection. The reason may be the IP address or port specified incorrectly. Icon: No XNL connection

5.2.3.3. Graphics for RoIP Gateway

The topology map represents the RoIP gateways as graphical images connected to your TRBOnet Watch over IP.

- The shape of the image indicates a radio (not) connected to the gateway: a box stands for no radio connection, a station indicates a connected radio.
- The label indicates the radio Id.

- Color rims serve to indicate the IP connection to the TRBOnet Watch.
- Icons serve to indicate the radio mode (digital, analog) and XCMP/XNL connection.

Hover over the element to see the tooltip with details about the hardware and the connected radio.

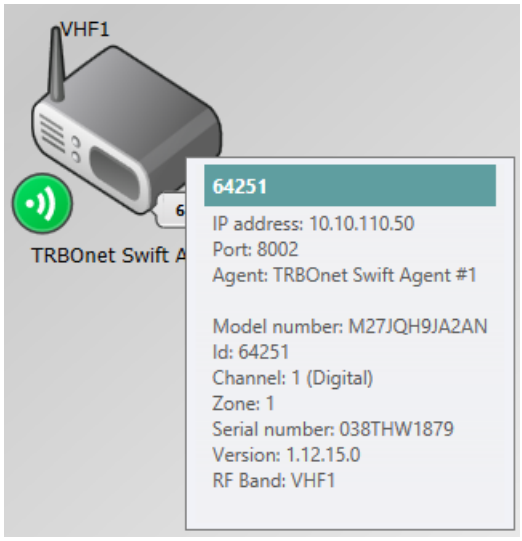
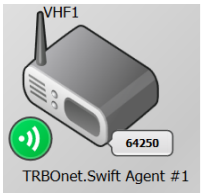


Figure 32: A cursor pointed at the image shows the tooltip with details

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

 **Figure 33: IP connection, no radio**	Image: Radio not connected Text: System name of the RoIP gateway Green rim: Normal IP connection
 **Figure 34: No IP connection, no radio**	Image: Radio not connected Text: System name of the RoIP gateway Red rim: No IP connection with TRBOnet Watch Icon: No XNL connection

 **Figure 35: 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 36: Radio connected, analog mode**	Image: Radio connected Text: System name of the RoIP gateway Icons: ▪ Analog mode, GPIO wired connection ▪ Radio is powered on, the connection status is unknown (always unknown when in analog mode)

5.3. Reports and Analytics

The predefined reports and analytical charts help you instantly retrieve and visualize the database information on any aspect of system monitoring. By setting specific filtering criteria, you can adjust your reports and charts to include only required channels, traffic parameters, and timeframes.

Note: Reports and charts include information about radio systems that have been registered and enabled for monitoring in the TRBOnet Watch server configuration. Find the details in **Registering Radio Systems**. Rules created for a MOTOTRBO system may additionally restrict the information about that system. For details, refer to **Configuring Data Storage**.

This section describes how to build reports and adjust them to include the required scope, and what additional features and settings can be utilized when working with charts.

For a detailed description of each report and chart, refer to Appendix A: Analytics and Reports.

5.3.1. Building Reports

To create reports, select **Reports** in the left pane of the TRBOnet console. To open reports in a separate window, right-click the **Reports** pane header and select **Open in New Window**.

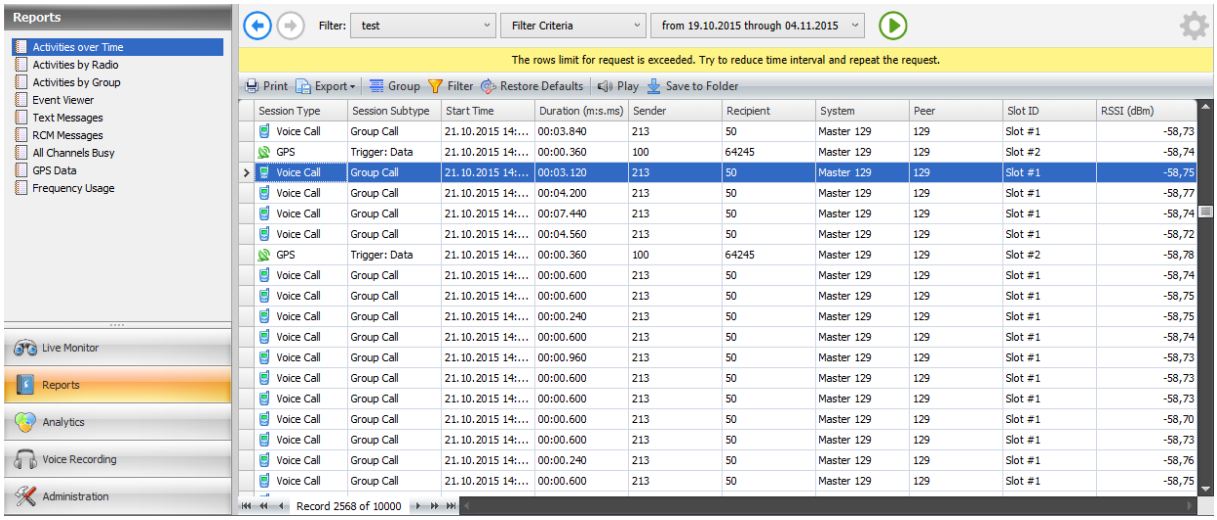


Figure 37: Reports tab

The left pane displays the list of predefined reports. You cannot add custom reports or delete any report from this list. For the detailed description of each report, refer to Reports (Appendix A).

The Filter toolbar provides controls for managing filters and for building charts and reports. Find more details in Using Filters.

The grid displays the entries of a generated report. You can manage the grid entries using the grid toolbar controls as described below. The message area (yellow tap) appears to display a warning about the generated report.

You can perform the following operations in reports:

Table 20: Operations in reports

Operation	Description
Build a report	**To build a report:** 1. Select a predefined report in the **Reports** pane. 2. Expand the **Filter** drop-down list and select the filter. To view all filtering parameters specific for this report, expand the **Filter Criteria** panel and the **Date and Time** panel. Find the description of all parameters in Using Filters.

Operation	Description
	Note: Adjust the filtering parameters to fit into the maximum allowed number of 10,000 entries that can be displayed. 3. Click the **Start** button. The generated report appears in the grid.
Switch between different versions of your report	If you generate a report more than once, for instance, using different filtering parameters, you can switch between these versions using the **Previous** and **Next** buttons. The filtering parameters in panels **Filter Criteria** and **Date and Time** change for each version accordingly.
Print and/or export reports	A report can be printed and exported to a number of file formats to a specified disk folder or network location. Use buttons **Print** and **Export**, respectively. The supported file formats include CSV, HTML, PDF, PNG, RTF, TXT, XLS, and XLSX.
Rearrange the grid	Improve the layout of the grid using these supported techniques: ▪ Sorting: Sort the grid by any column by clicking the respective column tab in the header. ▪ Filtering: Click **Filter** and select or enter the filter (value) in the white area below the column tab. ▪ Grouping: Click **Group** and drag the column tab to the area above the grid. You can print the modified report or export it to a file. To return to the original layout, click **Restore Defaults**. The modified layout is canceled if you switch to a different version of the report.
Playback voice calls	This option is available in the Activities over Time report only. **To playback a call:** 1. Select the **Voice Call** entry in the grid. 2. Click the **Play** button on the grid toolbar.

Operation	Description
	The call is played back in a voice player in a popup window. Find the details about the voice player controls in Voice Recording.
Export voice calls	This option is available in the Activities over Time report only. **To export a call:** 1. Select the **Voice Call** entry in the grid. 2. Click the **Save to Folder** button on the grid toolbar. 3. Point the target folder in the dialog box and click OK. The selected voice call is saved to the specified direction as a WAV file. The format of the WAV file name is preconfigured as described in Setting the Audio Output File Name Format.

5.3.2. Building Charts

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

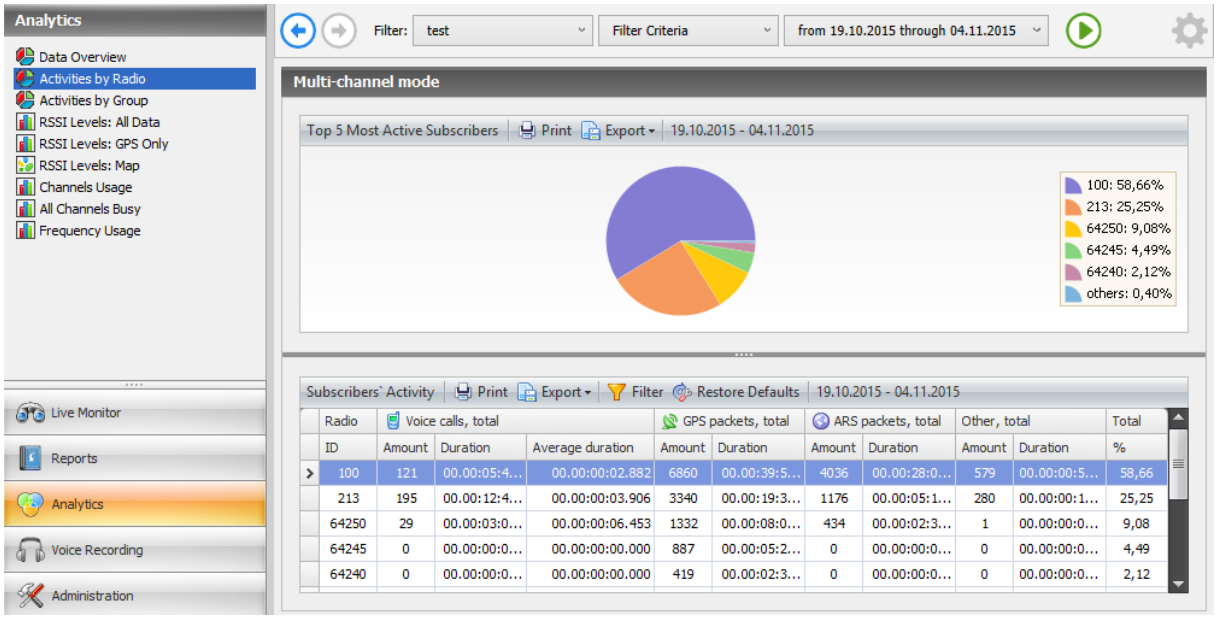


Figure 38: Generating analytical charts

The left pane of the **Analytics** tab displays the list of predefined charts. You cannot add custom analytical charts or delete any predefined chart from this list. For the detailed description of each chart, refer to Analytics (Appendix A).

The Filter toolbar provides controls for managing filters and for building charts and reports. Find more details in Using Filters.

The generated charts appear each in a separate pane with the toolbar. The title of the chart appears on top of the pane. You can also see the date and time range of the chart, and the time interval in braces (**Day**, **Hour**, **Minute**).

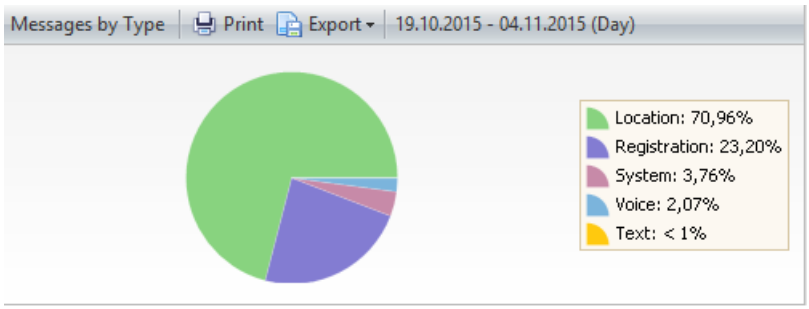


Figure 39: Chart pane

The bar above all charts indicates the channel mode:

- **Multi-channel mode**: The charts are generated for multiple selected systems or for a single system of type other than IPSC.
- **Slot #<*1*|*2*>**: The charts are generated for a single selected system of type IPSC. The layout shows the double set of charts, each related to a certain slot.

You can perform the following operations in the charts:

Table 21: Managing charts

Operation	Description
Build a chart	**To build a chart:** 1. Select the chart in the **Analytics** pane. 2. Select the filter from the **Filter** list. 3. Verify the filtering parameters in panels **Filter Criteria** and **Date and Time**. Find the description of all parameters in Using Filters. 4. If applicable, adjust the chart settings: • For an RSSI Levels chart, specify the RSSI settings as described in Configuring RSSI Settings.

Operation	Description
	• For RSSI Levels: Map, configure the map settings as described in Configuring Map Usage. 5. Click the **Start** button. The generated analytics appears in the right pane.
Compare versions of your chart	If you generate a chart more than once, for instance, using different filtering parameters, you can switch between the generated versions of the chart by clicking **Previous** and **Next**. The filtering parameters in panels **Filter Criteria** and **Date and Time** are updated to match the current version of the chart.
Print and/or export a chart	Each chart can be printed and exported in a number of file formats to a specified disk folder or network location. Use tollbar buttons **Print** and **Export**, respectively. The supported file formats include PDF, PNG, XLS, and XLSX.
Drill down to a more detailed chart	Most of the charts allow you to drill down to a more detailed summary or to a chart with smaller time intervals. When drilling down into a smaller time interval, the same chart is rescaled to show the selected day divided into hours, or the selected hour divided into minutes. Drill-down into one-minute intervals is not supported. ▪ To drill down, you need to click a slice in the pie chart or a line within the required time interval in the graph. ▪ To go back to the level from which you drilled down, click the Previous button on the management toolbar

5.3.2.1. Configuring RSSI Settings

RSSI Levels charts display the RSSI data evaluated to a particular level and colored accordingly. You can define the RSSI threshold levels and assign the color for each. All RSSI data above the given threshold level will appear in the chart in respective color.

To configure RSSI levels:

1. Go to **Analytics** and select **RSSI Levels: All Data** or **RSSI Levels: GPS Only** in the **Analytics** pane.
2. Click the **Settings** button on the navigation toolbar.
3. In the **Rssi Levels** dialog box, modify the list of RSSI threshold values according to your needs. The following operations are allowed:

Table 22: Configuring RSSI levels

Operation	Instructions
Add a threshold	Click the **Add** button to insert a threshold with default parameters to the list.
Adjust the threshold parameters	To edit the value or description, drop the cursor in the field and type the desired value. The **Value (dbm)** field does not accept fractions. To edit the color, click in the Color field and select the color from the drop-down panel.
Remove a threshold	Select the threshold and click the **Remove** button.
Set all threshold settings to defaults	Click the **Defaults** button to reset all changes and get back to the installed threshold settings.

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

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

5.3.3. Using Filters

Reports and charts use *filters* to fetch the required information from the database. Before generating output on the **Reports** tab or on the **Analytics** tab, you need to select a particular filter and adjust the filtering parameters on the filter toolbar.

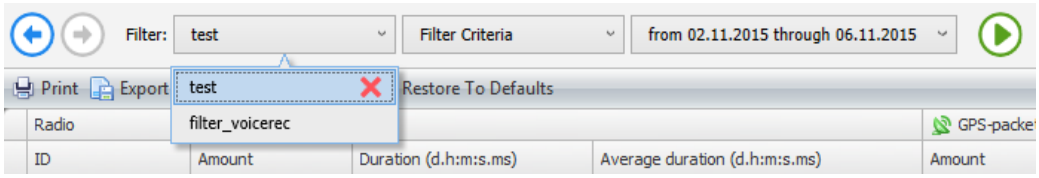


Figure 40: Filter toolbar

The filter toolbar includes the following controls:

Table 23: Filter toolbar - controls

Control	Description
	**Previous** and **Next** buttons serve to switch between the generated versions of a report or a chart, for instance, after adjusting filtering parameters.
Filter	The list of filters available for use. You can add more filters and remove unnecessary filters. Find the details in Managing Filters.
Filter Criteria	The panel with filtering parameters arranged into tabs. For each report and analytics, only applicable tabs appear. You can modify these parameters as described in Setting Filter Criteria.
Date and Time	The panel with filtering parameters that define the date and time range. Reports and charts will include data with timestamps that fall into the specified range. Find the details in Setting Date and Time Range.
	Start button generates the selected report or analytics using the selected filter.
	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

You can reuse the existing filters by changing their parameters as necessary, or you may need to have a special filter for each analytical case.

Table 24: Managing filters

Operation	Description
Reuse the current filter	You can make all necessary changes in the filter currently displayed in the **Filter** box, and generate output immediately. **To reuse the current filter:** 1. Select the report or chart in the left panel.

Operation	Description
	2. Expand the **Filter Criteria** panel and update the filtering parameters as described in Setting Filter Criteria. Click **Apply** on each tab that you update. 3. If necessary, expand the **Date and Time** panel and specify the date and time range as described in Setting Date and Time Range. Click **Apply** on the tab that you update. 4. Click **Start** to generate the selected report or chart using the current filter.
Reuse the filtering parameters of a particular report/chart version	You can generate multiple versions of a report or a chart, each time modifying the filtering parameters. When you switch between these versions by clicking **Previous** and **Next**, each time panels **Filter Criteria** and **Date and Time** update their filtering parameters to match the currently selected version of the output. To reuse these parameters, select a different report or analytics in the left pane and click **Start**.
Add a new filter to the **Filter** list	You may find it useful to create a special filter for each business case. **To create a new filter:** 1. Expand the **Filter** dropdown box and select any filter. 2. Expand the **Filter Criteria** panel or the **Date and Time** panel and select any tab. Click **Save As**. 3. Enter the unique name of the filter and click **OK**. The filter with the specified name appears in the **Filter** dropdown box. 4. Select the required report or chart. Modify the filtering parameters in the **Filter Criteria** panel and in the **Date and Time** panel. Find the details in Setting Filter Criteria and Setting Date and Time Range, respectively.
Remove a filter from the **Filter** list	To remove a filter from the **Filter** list, point it with the mouse cursor and click the “cross” icon. The removed filter cannot be restored with the Undo command.

5.3.3.2. Setting Filter Criteria

Parameters in the **Filter Criteria** panel restrict the amount of data to be included in reports and charts. All parameters are arranged in tabs. Depending on the selected report or analytics, some tabs may not appear in the panel. The selected report or analytics can use only the displayed parameters. Hidden tabs include parameters that are not relevant to the subject.

You cannot generate a report or chart until all of its required parameter are set properly. If any required parameter is not specified, the **Filter Criteria** box displays the exclamation icon. If you hover over the panel box, the tooltip displays the message indicating the problem.

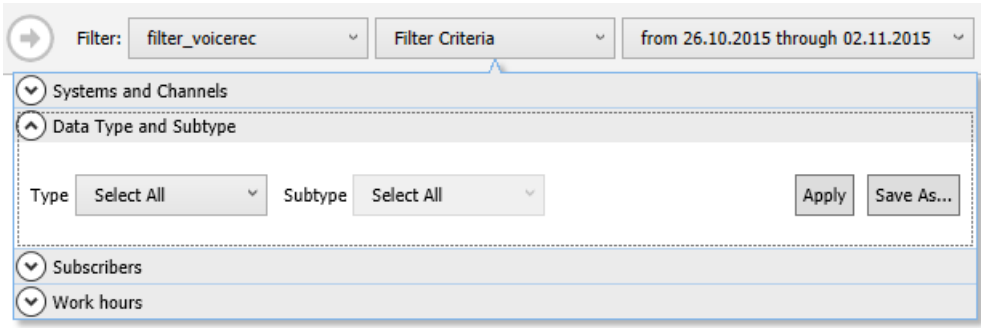


Figure 41: Filter Criteria panel

To set the filtering parameters:

1. Select a report or a chart.
2. Expand the **Filter** dropdown box and select a filter.
3. Expand the **Filter Criteria** panel on the management toolbar.
4. Expand the displayed tabs one after another and set all required filtering parameters as described in the table below. To save the settings, click **Apply** in each tab.

Table 25: Filter Criteria panel – filtering parameters

Tab	Description	Usage
Systems and Channels (**Systems** for the Event Viewer report;	Select the systems to be included in reports and analytics. For MOTOTRBO systems, select the whole system (master repeater slots and all peer slots) or particular slots. **To select a system:** ▪ In the **Available Items** list, click the system name and click the **Select** button, or click the “arrow” icon near the system name.	All reports and charts

Tab	Description	Usage
Peers and Stations for the Frequency Usage report and chart)	▪ To select particular slots in MOTOTRBO systems, expand the system in the **Available Items** list and click the “arrow” icon or the **Select** button for each slot. ▪ Click the **Select All** button to select all systems. Note: The **Available Items** list displays system slots that are added for monitoring in the TRBOnet Watch server settings. For details, refer to section Adding Peers. The selected systems and slots appear in the **Selected Items** list. To remove selected systems or slots, click the “cross” icon or the **Remove** button for each selected item. Or, click **Remove All** to clear the **Selected Items** list. The removed items return to the **Available Items** list. Note: Use the **<Removed>** item for your reports and charts to include all systems that have ever been registered and whose data has been stored in the database. This includes systems that were unregistered, and whose data became irretrievable for reporting and analytics after that. You cannot retrieve data for an unregistered system other way than using <Removed>.	
Data Type and Subtype	Select the type of traffic to be included in reports and analytics. ▪ **Type**: The type of traffic. Values: Registration, Telemetry, Text, Location, System, Voice, User, Data, Option Board. ▪ **Subtype**: The type of call or message. For **Type** set to **Option Board**, select the hardware model. Default: Select All.	Reports only: Activities Over Time, Activities by Radio, Activities by Group

Tab	Description	Usage
Subscribers	Select the option to indicate subscribers whose outgoing traffic will be included in the report or chart. Options: ▪ **Allow all subscribers**: Ignores subscriber number as a filtering parameter. ▪ **Specified subscriber**: Retrieves outgoing traffic of a particular subscriber. Enter the subscriber number in the field. ▪ **Range of subscribers**: Retrieves outgoing traffic of all subscribers within the specified number range. Enter the first and last number in the range. ▪ **Subscribers by mask**: Retrieves outgoing traffic of all subscribers whose numbers match the specified mask. Enter the mask in the field using digits and wildcards: • % to replace any number of digits in the subscriber number • _ (undrescore) to replace one digit in the subscriber number For instance, enter the mask _12%34_678 to filter out subscriber numbers 0120003406 78, 9126347678, and others.	All reports except: Activities by Group, All Channels Busy, Frequency Usage, Event Viewer Charts: RSSI Levels family only
Message Type	Select the type of RCM messages to be included in reports. Select **Include All Types** to include all RCM messages.	Reports: RCM Messages
All Channels Busy Threshold	Specify the minimum length (in seconds) of the All Channels Busy occurrence to be included in reports and charts.	Reports: All Channels Busy Charts: All Channels Busy
Work hours	Specify the timeframe(s) during each reported day that will be included in reports and charts. Options: ▪ **24x7**: Ignores work hours as a filtering parameter.	All reports and charts

Tab	Description	Usage
	▪ **Are the same each day**: Defines similar work hours for all weekdays. ▪ **Vary by day**: Defines specific work hours for every weekday. Note: The **Date and Time** parameter specifies primary date and time filtering, after which the **Work hours** filtering applies to each day.	

5.3.3.3. Setting Date and Time Range

Before generating a report or a chart, verify the date and time range that will restrict the amount of the displayed data.

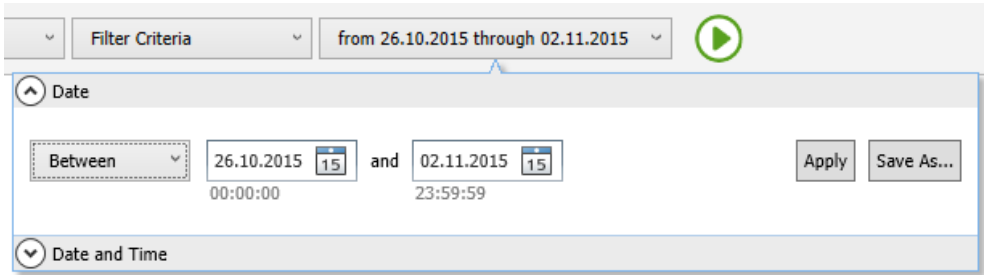


Figure 42: Date and Time panel

To set the date and time range:

1. Select the report or chart.
2. Expand the **Filter** list and select any filter.
3. Expand the **Date and Time** panel. Select the required tab and specify filtering parameters.

Table 26: Date and Time panel – filtering parameters

Tab	Description
Date tab	Select the operator (**Between**, **Before**, **Since**) and specify the start and/or end dates for reporting and charts.
Date and Time tab	Specify the start and end date and time for reporting and charts.

4. Click **Apply**. The applied filtering parameters are saved in the filter. Parameters on the other tab will be ignored.

Note: The date and time range affects the granularity of the time scale (days, hours, or minutes) in charts and in the Frequency Usage report. For details, refer to Appendix A: Analytics and Reports.

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 view on the map the RSSI levels measured in the selected system(s) during the predefined date and time range. All filtering parameters of **RSSI Levels: Map** are described in detail in RSSI Levels: Map (Appendix A).

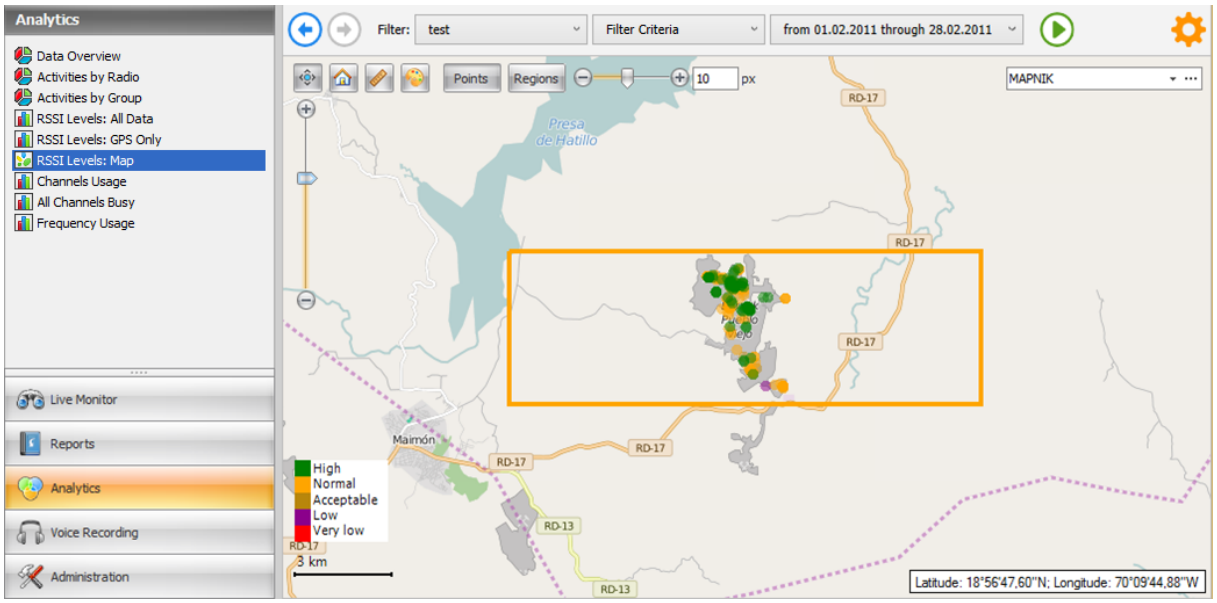


Figure 43: RSSI Levels Map

The coverage zone appears on the map in the form of colored symbols (points or regions) in a rectangular frame.

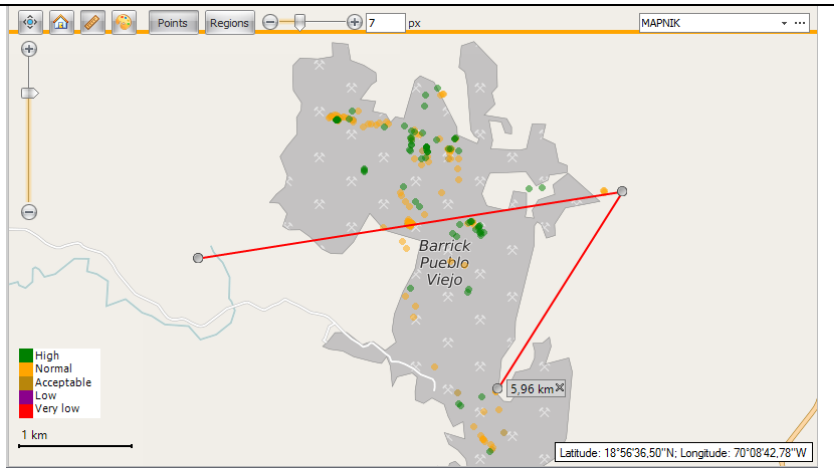
- A point indicates the exact location of the RSSI signal.
- A region has a fixed location on the map. A region appears on the map if any RSSI signals are detected in this area. If pointed with a mouse cursor, a region shows its square, the amount of RSSI signals, and the average RSSI level.

The color of the symbol informs you about the RSSI level. The colors of all RSSI level groups appears in the legend in the lower left corner. The threshold values that create RSSI groups are configured in the map settings as described in Configuring Map Usage.

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

Table 27: 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 left lower 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 with a smaller step. ▪ Draw a rectangle over the map, keeping the secondary mouse button pressed. The selected area extends to the map size. Note: If distance measure mode is enabled, you cannot rescale the map to the selected area.
Pan	You can move the map with the mouse, keeping the primary mouse button pressed. While in panning mode, the mouse cursor changes to show the pan icon. Release the primary mouse button to cancel panning mode.
Moving to the next RSSI site	You can automatically navigate between multiple RSSI sites - distant locations where RSSI level measurements 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 mode	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 distance. The tooltip shows the distance of 0.00 km. 3. Double-click every next point of the measured path and see the measured path and the tooltip showing the incremented distance.

Feature	Description
	 **Figure 44: Distance measuring** 4. To stop, cancel the distance measure mode by clicking the **Distance measure** button again, or by clicking the **Pan** button. The measured path disappears from the map. To start a new measurement, enable the distance measure mode again.
Fill mode	You can fade out the map to easily find the colored symbols of RSSI occurrences (points or regions). ▪ To fade out the map, click the **Fill mode** button and enable fill mode. ▪ To cancel fill mode, click the **Fill mode** button again. Note: The fill mode feature needs to be enabled and configured in **RSSI Levels: Map** settings. Refer to topic Configuring Map Usage for details.
Symbols	Select between **Points** and **Regions** to see the RSSI occurrences on the map displayed as dots or rectangular areas. Using points makes sense when you have little data or when you use large zoom. Otherwise, use regions. Note: The size of RSSI symbols can be configured in **RSSI Levels: Map** settings. Refer to topic Configuring Map Usage for details.
Replaceable maps	Expand the list of maps and select the preferred map. The selected map replaces the previous one automatically.

Feature	Description
	Note: The list of maps available in the list, and the order in which maps appear in the list can be configured in **RSSI Levels: Map** settings. Refer to topic Configuring Map Usage for details.
Cursor coordinates	When the mouse cursor hovers 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 in **RSSI Levels: Map** settings. Refer to topic Configuring Map Usage for details.

5.3.4.1. Configuring Map Usage

RSSI Levels: Map can display all kinds of geographical maps that you download and indicate for use. You can configure **RSSI Levels: Map** to automatically update the indicated online maps and enable features.

To configure map settings:

1. Go to **Analytics** and select **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 settings as follows:

Table 28: Configuring RSSI map settings

Control/operation	Description
RSSI Coverage tab *Configure RSSI thresholds and graphical indication of RSSI occurrences on the map.*	
Symbol	Configure the size of symbols used to indicate the location of the measured RSSI levels on the map. Options: ▪ **Points**: Select to display RSSI occurrences as points. Readjust the point size (in pixels) if necessary. ▪ **Regions**: Select to display RSSI occurrences in rectangular areas (regions). Readjust the rectangle size (in meters) if necessary. Note: When you open the map, the selected symbol applies by default. Then you can switch between points and regions on the map.

Control/operation	Description
Rssi thresholds	Configure RSSI thresholds and their parameters as described in Configuring RSSI Settings.
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 select **Add Online Map** from the context menu. 2. In the **Add Map** dialog box, specify the type of map: • **Predefined**: Select to restore an online map installed with the product and then removed. Expand the drop-down list and select the map to add. • **Custom**: Specify the URL of the preferred online map. 3. Click **OK** to close the dialog box. Note: To learn more about supported online maps, refer to Supported Maps (Appendix A).
Add a T-Map	1. Click **Add** and select **Add T-Map** from the context menu. 2. Navigate to the TMAP file stored in the local folder and click **Open**. Note: To learn more about supported offline maps, refer to Supported Maps (Appendix A).
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** exactly as ordered in the settings.

Control/operation	Description
Advanced tab *Configure automatic update for online maps, the use of fill mode, and the use of 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	Enable or disable the use of fill mode in **RSSI Levels: Map**. Expand the dropdown list and select **No fill** to disable the use of fill mode, or select **Fill all map** to enable it. To learn more about fill mode, refer to Using RSSI Levels Map.
Color	If fill mode is allowed, click to select the web color for the fill layer.
Transparency	If fill mode is allowed, adjust the transparency of the fill layer.
Show cursor coordinates	Select this option to show the coordinates of the cursor hovering 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. Voice Recording

The Voice Recording feature allows you to listen to any voice call stored in the database, and to export the call as a WAV file to a selected folder.

To open the **Voice Recording** tab, select **Voice Recording** in the TRBOnet Watch console.

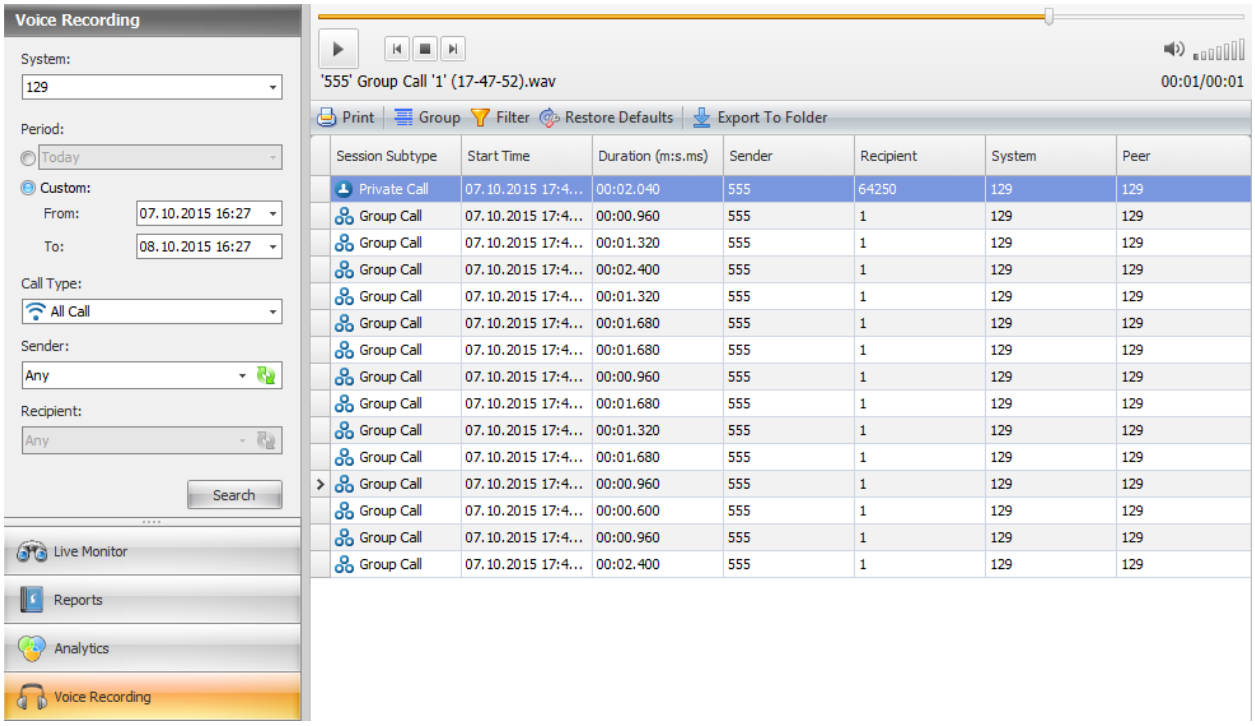


Figure 45: Voice Recording tab

The **Voice Recording** tab displays the following items:

- Search pane: Allows for voice call lookup based on the specified search criteria.
- Voice player: Displays controls for the call playback.
- Calls grid: Displays all calls that match the entered search criteria.

Table 29: Operations allowed in the Voice Recording tab

To do this:	Take these steps:
Find a stored call	**To find a stored call:** 1. Enter the call parameters in the search pane: • **System**: Select the system in which the call was initiated. • **Period**: Specify the time range within which the call was initiated. • **Call Type**: Specify the type of call such as Any (default), All Call, Group Call, or Private Call. • **Sender**: Specify the subscriber who initiated the call. • **Recipient**: Specify the subscriber or the group that received the call. Not applicable to All Call type. 2. Click **Search**.

To do this:	Take these steps:
	All matching calls appear in the grid. The fields specify all information about the call: its type, start time, duration, the call sender and recipient, the system, and the peer ID of the master repeater.
Listen to the call	Select the required call in the grid. The name of the audio file appears in the voice player. Note: The name format of the audio file is stored in the server configuration. This format can be changed as described in topic Setting the Audio Output File Name Format.  **Figure 46: Voice player** Use the voice player buttons as follows: ▪ **Play/Pause**: Click to play the selected call. Click again to make a pause. ▪ **Back**: Click to select the previous call in the grid. ▪ **Stop**: Click to stop the call playback. ▪ **Forward**: Click to select the next call in the grid. ▪ Adjust the volume by clicking the volume bars.
Print the list of calls	You can print the entire list of calls displayed in the grid. You cannot select calls for printing. **To print the list of calls:** 1. Click **Print** on the toolbar. 2. In the **Preview** system dialog box, select **Print** from the **File** menu.
Rearrange the grid of calls	Improve the layout of the grid using these supported techniques: ▪ Sorting: Sort the grid by any column by clicking the respective column tab in the header. ▪ Filtering: Click the **Filter** button and select or enter the filter (value) in the white area below the column tab. ▪ Grouping: Click **Group** and drag the column tab to the area above the grid. To return to the original layout, click **Restore Defaults**.

To do this:	Take these steps:
Export the WAV file to a folder	**To save the WAV file to a folder:** 1. Select the call and click **Export to Folder** on the toolbar. 2. In the dialog box, point the existing destination folder or create a new one and point it. 3. Click **OK**.

5.5. Administration

This section describes the operations to administer TRBOnet Watch.

5.5.1. Managing Aliases

Aliases are descriptive names that you can optionally assign to system peers, radios, and talk groups. An alias displayed near the object in Live Monitor, in reports, or in the **TRBOnet Watch Server** window helps you easier identify that object, compared when you only see a numeric identifier.

Note: Aliases that you assign in 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 master repeater, the repeater configuration is not affected.

To assign or edit aliases in the TRBOnet Watch console, select **Administration** and then **Aliases** in the left panel. The right panel includes tabs **Radios**, **Groups**, and **Peers** that have identical controls and require the same input.

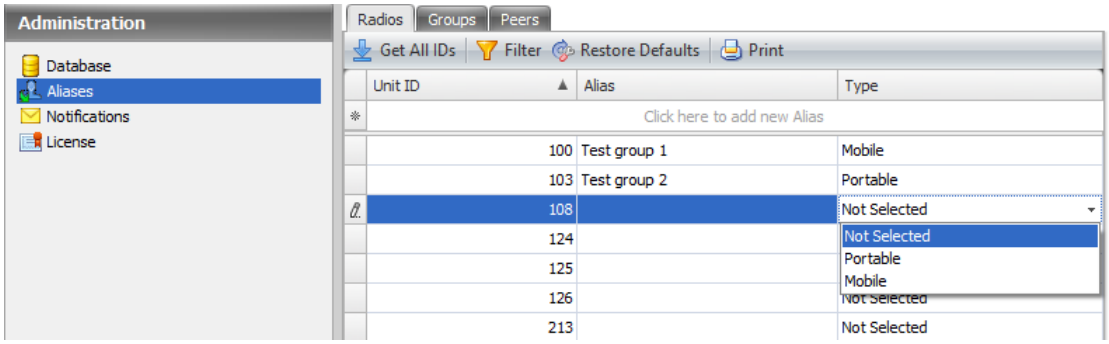


Figure 47: Managing aliases

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

- **Unit ID**: The identifier of the system object.
- **Alias**: The assigned alias or an empty string.

- **Type**: Appears on the **Radios** tab only. You can expand the **Type** list and specify the type of the radio – portable or mobile. All radios have their types set to **Not Selected** by default.

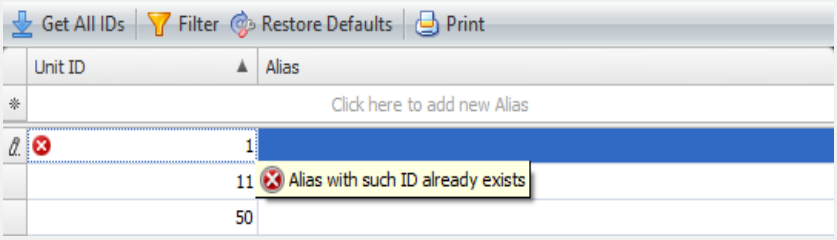
The first grid line shows text **Click here to add new Alias**. If clicked, it turns into an editable grid line where you can enter a new ID and alias.

To manage data in the grid, use the grid toolbar buttons as follows:

- **Get All IDs**: Click to reload all identifiers from the configuration.
- **Filter**: Toggle on/off to enable/disable the filtering mode.
- **Restore Defaults**: Click to disable filtering in the grid.
- **Print**: Click to open the **Preview** window in which you can set up page parameters, select the printer, print out the grid, export it to a file of the selected type, and email the grid in the attached file.

You can perform the following operations in the grid.

Table 30: Operations on aliases

Operation	Description
Type an alias	Select the row and start typing, or click the **Alias** field and type the alias. To leave the edit mode, press ENTER, or move to another row, or click any other field. Note: If you have dropped the cursor to the **Unit ID** field, the field is cleared. You must enter a unique ID. An attempt to enter the cleared or existing ID or leave the field without editing will result in the error message **Wrong ID** or **Alias with such ID already exists**.  To resolve this error, press ALT or click the **Get All IDs** toolbar button.
Add a grid row	1. Click the text **Click here to add new Alias** in the first grid line. 2. Enter the unique values.

Operation	Description
	3. Press ENTER or click any other row. The grid is resorted by field **Unit ID** in the ascending order. The new grid row is inserted to the position according to the entered Id.
Delete a grid row	1. Select the grid row(s). 2. Press DEL. 3. 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.
Filter aliases	Toggle the **Filter** button to enter the filtering mode. To filter the grid, 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 above the column header. All entries not including the specified value in the column are hidden. To disable filtering, toggle off the **Filter** button or click the **Restore Defaults** button.
Print and/or export aliases	Use the **Print** toolbar button to print aliases on the opened tab or export them to any supported file format, including CSV, HTML, PDF, PNG, RTF, TXT, XLS, and XLSX.

5.5.2. Managing Notifications

TRBOnet Watch can optionally generate a sound and/or email notification if a particular alarm is raised in the system. Sound notifications are played to the TRBOnet Watch console operator. A popup box is displayed to the operator to let them stop the sound alert. Email notifications are sent to the preconfigured email address(es).

The list of notifications is predefined. By default, sending all kinds of notifications is turned off. You can enable this feature and indicate particular sound and email notifications to be generated.

This section describes how to configure sending notifications and how to monitor all notifications generated in the registered systems.

5.5.2.1. Configuring Notifications

To configure sending notifications, launch the TRBOnet Watch console and select **Administration** and then **Notifications** in the left pane.

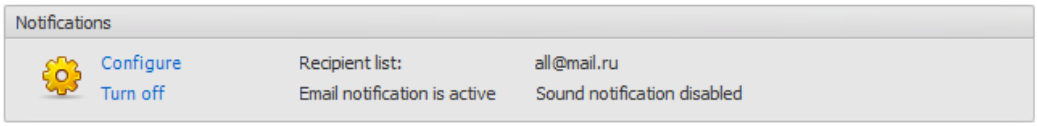


Figure 48: The status of the notification feature

The **Notifications** panel displays the status of the notification feature.

Table 31: Notification panel controls (indicators of the notification status)

Status	Description	Instructions
Turn on (**Turn off**)	Indicates the status of the feature: ▪ **Turn on**: Notification is turned off, notifications are not generated. The **Notifications** panel shows email notification inactive and sound notification disabled. ▪ **Turn off**: Notification is turned on.	**To turn on the notification feature:** 1. Enable at least one sound notification in the list. Or, configure email settings as described in Configuring Email Settings. Then enable at least one email notification in the list as described in Enabling Notifications. 2. Click **Turn on**. To turn off the notification feature, click **Turn off**.
Recipient list	The list of email notification recipients. Shows **Empty** if recipients are not specified. If empty, email notification cannot be activated.	To add email recipients, refer to Configuring Email Settings.

Status	Description	Instructions
Email notification is active (**inactive**)	If active, email notification is configured and at least one email notification is enabled. If inactive, email settings are not complete and/or all email notifications are disabled, or the notification feature is turned off.	**To activate email notification:** 1. Configure email settings. Find the details in topic Configuring Email Settings. 2. Enable at least one email notification in the list. Find the details in Enabling Notifications. 3. Turn on the notification feature.
Sound notification enabled (disabled)	If enabled, at least one sound notification is enabled. If disabled, all sound notifications are disabled, or the notification feature is turned off.	**To activate sound notification:** 1. Enable at least one sound notification in the list. Find the details in Enabling Notifications. 2. Turn on the notification feature.

5.5.2.1.1. Configuring Email Settings

To use email notifications, you need to complete the list of email settings.

To configure email settings:

1. In the TRBOnet Watch console, select **Administration** and then **Notifications** in the left pane.
2. Click **Configure** in the **Notifications** panel.
3. In the **Notification Settings** dialog box, select the **Email** tab and specify the following settings.

Table 32: Email notification settings

Parameter	Description
SMTP server host or IP	The host name of IP address of the SMTP server.
SMTP server port	The port of the SMTP server. Default: port 25 for non-SSL communication, port 465 for SSL.

Parameter	Description
Use SSL	Select to enable the use of SSL protocol; leave empty otherwise.
Authentication type	The type of authentication on the SNMP server side. Expand the list and select the option: ▪ **Anonymous access**: Use anonymous access to the SNMP server. ▪ **Windows authentication**: Use Windows credentials for access to the SNMP server. ▪ **SNMP user name and password**: Use SNMP credentials for access to the SNMP server. Specify the user name and password in the fields below.
User name	The name of the SNMP user.
Password	The password of the SNMP user.
Sender	The email address to be shown in the From field of each email notification.
Recipients	The list of email recipients. ▪ To add a recipient, click the **Add** button and enter the email address of the notification in the popup dialog box. Click **OK**. ▪ To remove a recipient, select it in the list and click the **Delete** button.

4. Click the **Send Test Message** button to test the specified SMTP connection.
5. Click **OK** to save the settings and exit the dialog box.

5.5.2.1.2. Enabling Notifications

To use email or sound notification, you need to enable at least one email or sound notification in the list, respectively.

To enable notifications:

1. In the TRBOnet Watch console, select **Administration** and then **Notifications** in the left pane.
2. Click **Configure** in the **Notifications** panel.

3. In the **Notification Settings** dialog box, select the **Email Notifications** tab for enabling email notifications, or **Sound Alerts** tab for enabling sound notifications. These tabs display identical controls and notifications and require similar input.
4. Expand the **Default Notifications** list. Do any of the following:

   - Enable each required notification by clicking the **False** value and selecting **True** from the drop-down list. The description of the selected notification appears below the scrollable pane.

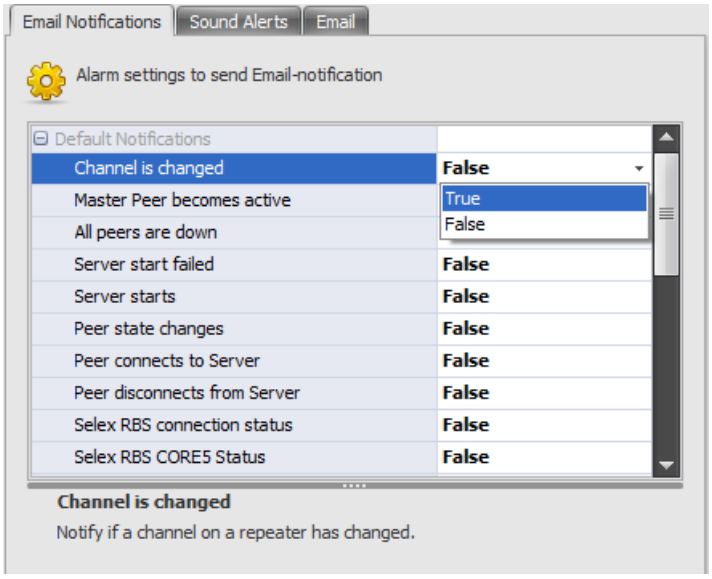


Figure 49: Enabling particular notifications

   - Configure multiple or all notifications by clicking the **Select Preset** button and selecting the option:

     - **None**: Disable all notifications in the expanded list.
     - **Critical**: Enable only critical severity notifications in the expanded list.
     - **Medium**: Enable critical and medium severity notifications in the expanded list.
     - **All**: Enable all notifications in the expanded list.

5. Collapse the **Default notifications** list and expand the **RDAC Notifications** list. Do any of the following:

   - Enable each required notification by clicking the **None** value and selecting the required value from the drop-down list:

     - **Detected**: Enable sending the notification when the issue that caused the alarm is detected.
     - **Released**: Enable sending the notification when the issue that caused the alarm is released.

- **Both**: Enable sending the notification in both above cases.

- Configure multiple or all notifications by clicking the **Select Preset** button and selecting the required option - **None**, **Critical**, **Medium**, or **All**.

> Note: When you enable multiple notifications, they are set to the **Both** value by default.

6. Click **OK** to save the changes and exit the dialog box.

5.5.2.2. Viewing Notifications

To view notifications generated in the TRBOnet Watch console, select **Administration** and then **Notifications** in the left pane.

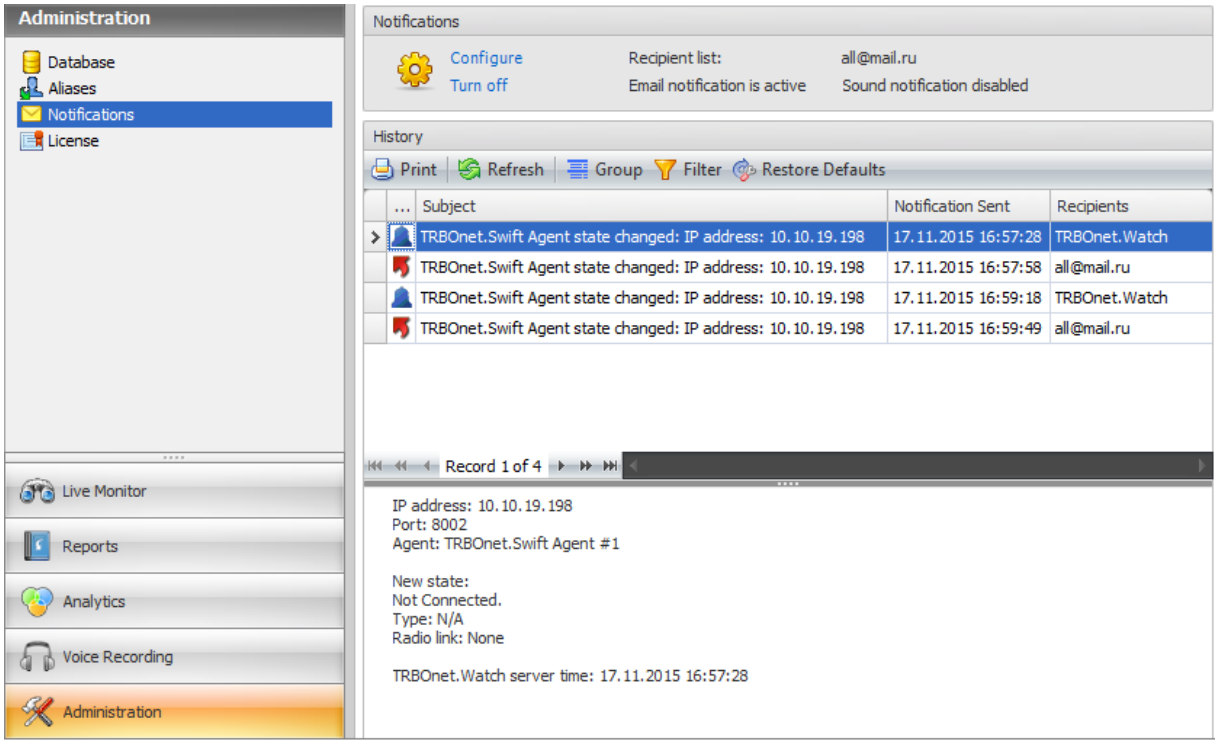


Figure 50: Viewing generated notifications

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” stands for an email notification not sent. The other grid columns 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 grid.

The toolbar displays controls for managing data in the grid. Use buttons **Print**, **Group**, and **Filter** to print all notifications, group them by a selected field, and filter them by value, respectively. To undo grouping and filtering, click **Restore Defaults**. To reload the grid, click **Refresh**.

5.5.3. Viewing the License Information

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

To learn more about getting a license, refer to Managing the Software License.

5.5.4. Viewing the Database Information

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

The **Database** pane displays the information about the installed SQL Server application, the database and transaction log volumes, and the date of the last backup. Having these figures, you can decide about the next date of maintenance or re-adjust the existing maintenance schedule.

To learn more about maintenance of the TRBOnet Watch database, refer to Configuring Database Maintenance.

Note: The information in the **Data size**, **Log size**, and **Backup date** fields is actual at the time the **Database** pane is opened. This data is not updated until you reopen the pane.

Appendix A: Analytics and Reports

A.1. Analytics

This section includes the description of all predefined charts that can be generated in the TRBOnet Watch console. For each chart, the section states its goal, the list of required filtering parameters, the meaning of each chart parameter, and the features supported by the chart.

To learn more about filtering parameters, refer to Using Filters.

A.1.1. Data Overview

The **Data Overview** charts summarize the workload of the specified channel(s) and shows their traffic sorted by type. This group of charts includes **Messages by Type** (pie chart) and **Loading Level of the Channels** (line chart).

Table 33: Data Overview charts – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the charts.
Work hours	The timeframe within the specified date and time range to be included in the charts.
Date and Time	The date and time range included in the charts. Also, defines the granularity of the time scale in the **Loading Level of the Channels** chart. ▪ One-day intervals are used for different start and end dates. ▪ One-hour intervals are used if you set equal start and end dates and different start and end hours. ▪ One-minute intervals are used if you set equal start and end dates and hours and different start and end minutes.

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 specified date and time range. The whole traffic in all monitored channels makes 100%.

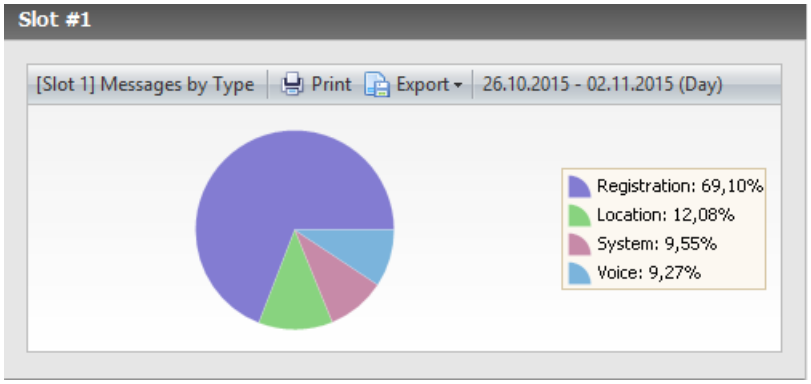


Figure 51: Messages by Type chart

- The date and time range is displayed on top of the chart. This value is specified by the **Date and Time** filtering parameter.
- The colored slices indicate the amount of each type of traffic transmitted in the selected systems during the specified date and time range.
- The legend shows the color, the type of traffic, and the percentage of this type of traffic in the pie chart.

Note: Drill-down into a more detailed summary is not supported.

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) within the specified the date and time range.

The channels are selected for analysis in the **Systems and Channels** filtering parameter. This parameter also affects the layout of the chart:

- If a single MOTOTRBO IPSC system is selected, two charts (**Slot 1** and **Slot 2**) each display the load of the respective slot.
- If a single IP gateway or multiple systems are selected, the chart calculates and displays the average workload of all channels.

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

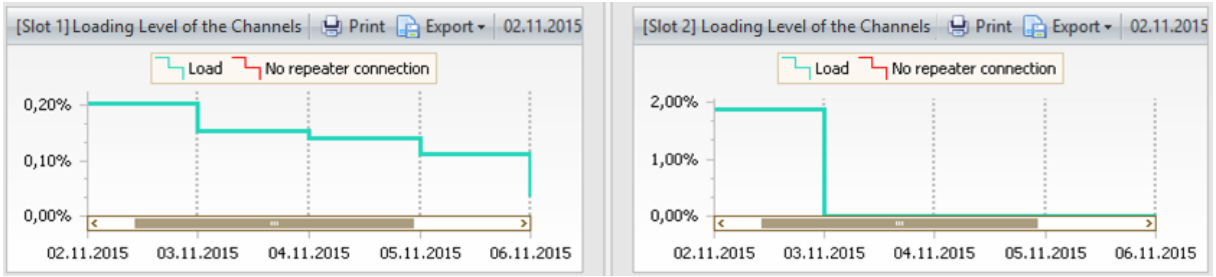


Figure 52: The loading level in the time slots of a MOTOTRBO IPSC system

- The X-axis shows the time scale divided into minimum time intervals. The length of the time scale and its granularity (one day, or one hour, or one minute) are defined by the **Date and Time** filtering parameter. To learn more, refer to Data Overview.
- The Y-axis shows the workload (%) of the selected channel(s). The workload is calculated in each time interval as the total time when the channels were loaded, divided by the total time when they were connected.
- The legend shows the colors that indicate the connection status of the channel(s). The red line indicates that all repeaters are not connected to the TRBOnet Watch server and all IP gateways are not connected to the radio. Connection in the future time is always a red line.
- The date and time range and the length of the minimum time interval are shown on top of the chart.

Table 34: Loading Level of the Channels chart - features

Feature	Description
Drill-down	To drill down into a chart with smaller time intervals, click the blue line in the desired time interval. ▪ If the X-axis is divided into one-day intervals, drill-down to a particular day is allowed. ▪ Similarly, if the X-axis shows one-hour intervals, you can drill down into a particular hour to analyze the loading level of the channel(s) on a per-minute basis.

A.1.2. Activities by Radio

The **Activities by Radio** charts visualize traffic of the most active radios in the specified channels during the selected date and time range. The summary is presented by charts **Top 5 Most Active Radios** (pie chart), **Voice Activity for Radio** (column chart), **Data Activity for Radio** (column chart), and by the **Activity by Radio** grid.

Table 35: Activities by Radio charts – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the charts.

Parameter	Description
Work hours	The timeframe within the specified date and time range to be included in the charts.
Date and Time	The date and time range included in the charts. Also, defines the granularity of the time scale (X-axis) for charts **Voice Activity for Radio** and **Data Activity for Radio**: ▪ For one-day intervals, set different start and end dates. ▪ For one-hour intervals, set equal start and end dates and different start and end hours. Note: One-minute intervals are not supported. If you specify a range of less than one hour on the **Date and Time** tab, the time interval is set to one hour.

A.1.2.1. *Top 5 Most Active Radios*

The **Top 5 Most Active Radios** pie chart shows the percentage of traffic generated by each active radio in the monitored channel(s) within the specified date and time range. Traffic generated by all radios makes 100%.

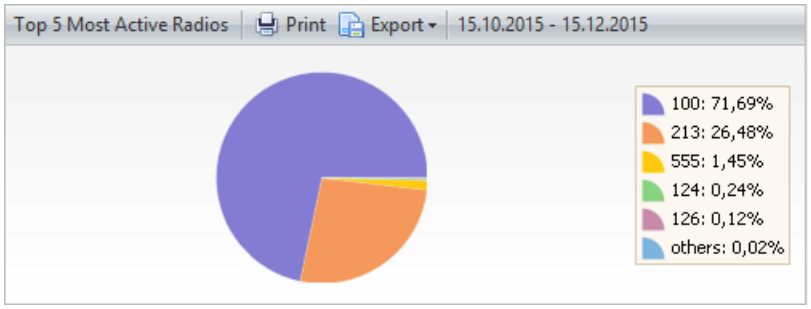


Figure 53: The percentage of traffic used by 5 most active radios

- Each radio is presented by a slice of a different color.
- The legend indicates the color and Id of the radio, and the percentage of traffic generated by this radio.
- The date and time range is displayed on top of the chart. This value is specified by the **Date and Time** filtering parameter. For details, refer to Activities by Radio.

Table 36: Top 5 Most Active Radios chart - features

Feature	Description
Drill-down	To drill down into the traffic details of a particular radio, click the respective slice in the chart. The traffic details are presented by column charts **Voice Activity for Radio** and **Data Activity for Radio**.

A.1.2.2. Activity by Radio

The **Activity by Radio** grid shows the amounts of traffic (voice, GPS, ARS, and other) transmitted by each of the most active radios during the selected date and time range, and the amount of time spent for each type of traffic. The grid also summarizes all types of traffic initiated by each radio and shows the input (%) of that radio in the common traffic of the five most active radios.

Table 37: Activity by Radio grid - fields

Field (level1)	Field (level 2)	Description
Radio	**ID**	The ID of the radio whose outgoing traffic is summarized.
Voice calls, total	**Amount**	The amount of voice calls initiated by the radio during the specified date and time range.
	Duration (d.h:m:s.ms)	The total duration of voice calls initiated by the radio during the specified date and time range.
	Average duration (d.h:m:s.ms)	The average duration of a voice call initiated by the radio.
GPS packets, total	**Amount**	The amount of GPS messages sent by the radio during the specified date and time range.
	Duration (d.h:m:s.ms)	The total duration of GPS traffic initiated by the radio within the specified date and time range.
	Amount	The amount of ARS messages sent by the radio during the specified date and time range.

Field (level1)	Field (level 2)	Description
ARS packets, total	**Duration (d.h:m:s.ms)**	The total duration of ARS traffic initiated by the radio within the specified date and time range.
Other, total	**Amount**	The amount of other traffic sent by the radio during the specified date and time range.
	Duration (d.h:m:s.ms)	The total duration of other traffic initiated by the radio within the specified date and time range.
Total	**%**	The total amount of all traffic (%) generated by the radio in the selected channel(s) during the specified date and time range. Traffic generated by all most active radios makes 100%.

Table 38: Activity by Radio grid - features

Feature	Description
Drill-down	To drill down into the traffic details of a particular radio, click the grid row representing the radio. The traffic details appear in column charts **Voice Activity for Radio** and **Data Activity for Radio**.
Filtering	Click the **Filter** button on the grid toolbar to enter the filtering mode. Enter the value in the filter box below the column header to filter the grid entries by this value. Click **Restore Defaults** to exit the filtering mode.

A.1.2.3. Voice Activity for Radio

In each time interval of the X-axis, the **Voice Activity for Radio** chart shows the amount of group calls, private calls, and All Calls initiated by the radio.

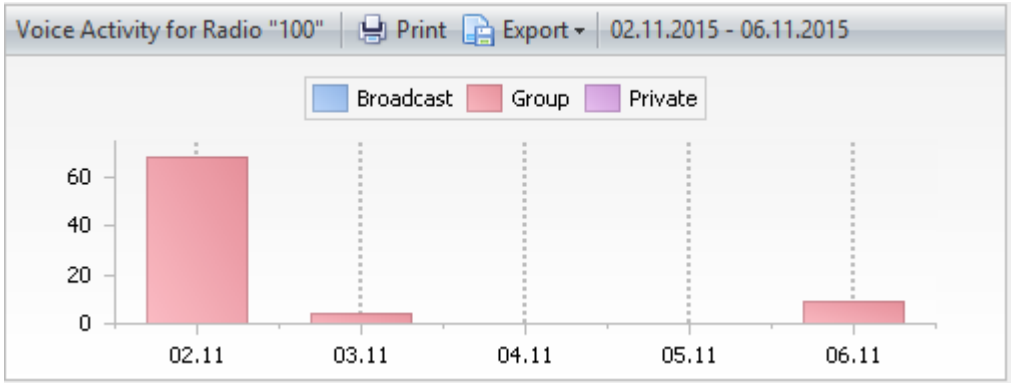


Figure 54: Voice activity of radio "100" evaluated by call types

- The legend indicates the color for each type of call.
- The X-axis shows the date and time range divided into time intervals (days or hours). The length and granularity of the time scale are defined by the **Date and Time** filtering parameter. For details, refer to Activities by Radio.
- The Y-axis shows the number of calls.
- The height of each column indicates the total number of calls made in the time interval. The column may include sections of different colors, indicating amounts of different types of calls initiated by the radio.
- The cursor pointed at the column shows the tip that reveals the call details (type of call, total amount, and duration).

Table 39: Voice Activity for Radio chart - features

Feature	Description
Drill-down	If the X-axis is divided into one-day intervals, drill-down into a particular day is allowed. ▪ To drill down into a particular day, click the column in the desired time interval. ▪ Both the **Voice Activity for Radio** and **Data Activity for Radio** charts display the traffic of the radio transmitted in one-hour intervals of the selected day. The selected date and work hours are displayed on top of both charts.

A.1.2.4. Data Activity for Radio

In each time interval of the X-axis, the **Data Activity for Radio** chart shows the amount of non-voice traffic generated by the radio.

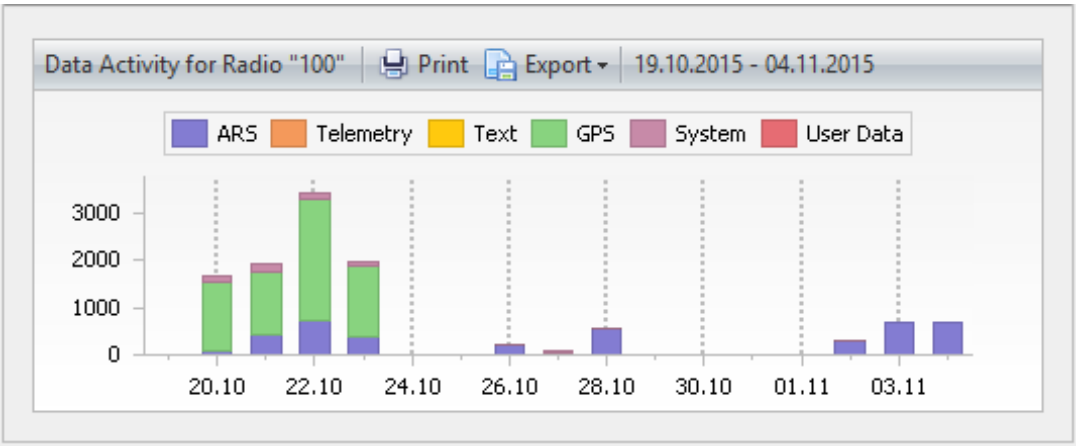


Figure 55: Data activity of radio "100" evaluated by traffic types

- The legend indicates the color for each type of non-voice traffic.
- The X-axis shows the date and time range divided into time intervals (days or hours). The length and granularity of the time scale are defined by the **Date and Time** filtering parameter. For details, refer to Activities by Radio.
- The Y-axis shows the number of messages.
- The height of each column indicates the total number of non-voice messages generated in the time interval (day or hour). The column may include sections of different colors, indicating amounts of different types of messages initiated by the radio.
- The cursor pointed at the column shows the tip with the traffic details (type of message, total amount, and duration).

Table 40: S Data Activity for Radio chart - features

Feature	Description
Drill-down	If the X-axis is divided into one-day intervals, drill-down into a particular day is allowed. To drill down into a particular day, click the column in the desired time interval. ▪ Both the **Voice Activity for Radio** and **Data Activity for Radio** charts display the messages transmitted in one-hour intervals of the selected day. ▪ The selected date and work hours are displayed on top of both charts.

A.1.3. Activities by Group

The **Activities by Group** charts visualize the traffic of the most active talk groups in the selected channels during the specified date and time range. The summary is presented by charts **Top 5 Most Active Groups** (pie chart) and **Group's Activity** (grid).

Table 41: Activities by Group chart – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the charts.
Work Hours	The timeframe within the specified date and time range to be included in the charts.
Date and Time	The date and time range included in the charts.

A.1.3.1. Top 5 Most Active Groups

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

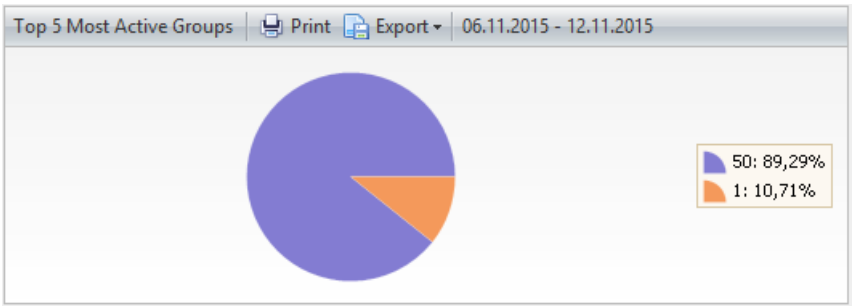


Figure 56: The percentage of traffic generated by group 50 and group 1

- Each active talk group is presented by a slice of a different color.
- The legend indicates the color of the group, the group number, and the percentage of traffic generated by the group members.
- The date and time range is displayed on top of the chart. This value is specified by the **Date and Time** filtering parameter.

Note: Drill-down into a more detailed summary is not supported.

A.1.3.2. Group's Activity

The **Group's Activity** grid shows the amount and duration of group calls in each of the five most active talk groups during the selected date and time range. The grid also shows the input (%) of each group in the common voice traffic generated by all most active groups.

Table 42: Group's Activity grid - fields

Field (level1)	Field (level 2)	Description
Group	**ID**	The number of the group whose voice traffic is summarized.
Voice calls	**Amount**	The amount of voice calls initiated by the group members within the specified date and time range.
	Duration (d.h:m:s.ms)	The total duration of voice calls initiated in the group during the specified date and time range.
	Average duration (d.h:m:s.ms)	The average duration of a voice call initiated in the group.
Total	**%**	The total amount of voice traffic (%) initiated in the group during the specified date and time range. Traffic generated by all five most active groups makes 100%.

Table 43: Group's Activity grid - features

Feature	Description
Filtering	Click **Filter** on the grid toolbar to enter the filtering mode. Enter the value in the filter box above the column to filter the grid entries by this value. Click **Restore Defaults** to exit the filtering mode.
Drill-down	Drill-down into a more detailed summary is not supported.

A.1.4. RSSI Levels: All Data

The **RSSI Levels: All Data** charts show the traffic in the selected MOTOTRBO system(s) grouped by RSSI levels. The evaluation of signal strength is based on the RSSI level thresholds that can be configured as described in Configuring RSSI Settings.

Table 44: RSSI Levels: All Data chart – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the charts.
Subscribers	The subscriber numbers (radio IDs) whose generated traffic is included in the charts.
Work hours	The timeframe within the specified date and time range included in the charts.
Date and Time	The date and time range included in the charts.

A.1.4.1. RSSI by Thresholds

The **RSSI by Thresholds** pie chart groups by RSSI level all voice and data calls received by the selected channels during the specified date and time range. Grouping is based on the preconfigured RSSI levels.

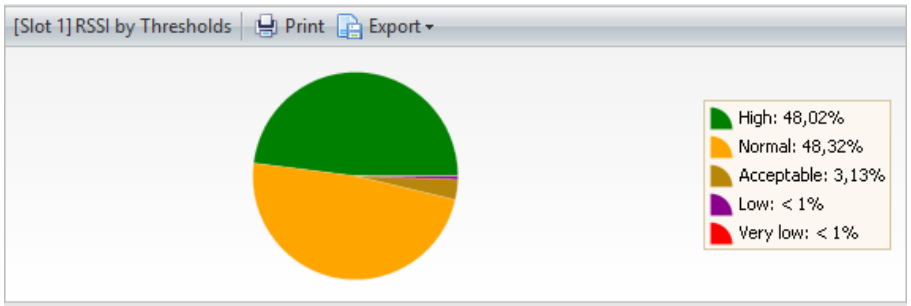


Figure 57: The amount of traffic per RSSI level band

- Each group of traffic is presented by a slice of a different color.
- The legend indicates the color and the brief description of the RSSI level, and the percentage of incoming voice and data calls with this RSSI level.

Table 45: RSSI by Thresholds chart - features

Feature	Description
Settings	The color of each slice in the pie chart, the number of possible slices, and the boundaries of each RSSI level can be configured in the **Rssi Levels** dialog box. For details, refer to Configuring RSSI Settings.
Drill-down	Drill-down into a more detailed summary is not supported.

A.1.4.2. Relative Rssi Frequency by Thresholds

The **Relative Rssi Frequency by Thresholds** area chart shows the distribution of incoming voice and data calls by RSSI levels in the selected channels(s) during the specified date and time range.

Figure 58: 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 voice and data calls with the given RSSI level. The value of 100% means all calls whose RSSI were detected in the selected channel(s) during the specified date and time range.

  Note: This chart requires at least 10 calls with RSSI levels.

- The color indicates a particular RSSI level. The boundaries of each level are the preconfigured RSSI level thresholds. The legend indicates the colors of all RSSI levels.

  Note: To see all RSSI level thresholds, click the **Settings** icon on the filter toolbar.

Table 46: Relative Rssi Frequency by Thresholds chart - features

Feature	Description
Settings	The number of RSSI levels, their boundaries (thresholds), and colors can be configured in the **Rssi Levels** dialog box. For details, refer to Configuring RSSI Settings.
Drill-down	Drill-down into a more detailed summary is not supported.

A.1.5. RSSI Levels: GPS Only

The **RSSI Levels: GPS Only** charts show the GPS traffic generated in the selected MOTOTRBO IP Site Connect, Capacity Plus, and Connect Plus systems and grouped by RSSI levels. The evaluation of signal strength is based on RSSI level thresholds that can be configured as described in Configuring RSSI Settings.

The included charts are **RSSI by Thresholds** (pie chart) and **Relative Rssi Frequency by Thresholds** (area chart). For the description of these charts and their features and filtering parameters, refer to section RSSI Levels: All Data. The charts described in this section are identical to **RSSI Levels: GPS Only**, except they describe all types of traffic rather than GPS only.

A.1.6. RSSI Levels: Map

RSSI Levels: Map loads the geographical map to visualize the location of calls with different RSSI levels transmitted in the selected system(s) during the specified date and time range. **RSSI Levels: Map** is available for MOTOTRBO IP Site Connect, Capacity Plus, and Connect Plus system types.

Table 47: RSSI Levels: Map – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the charts.
Subscribers	The subscriber numbers (radio IDs) whose generated traffic is included in the charts.
Work hours	The timeframe within the specified date and time range included in the charts.
Date and Time	The date and time range included in the charts.

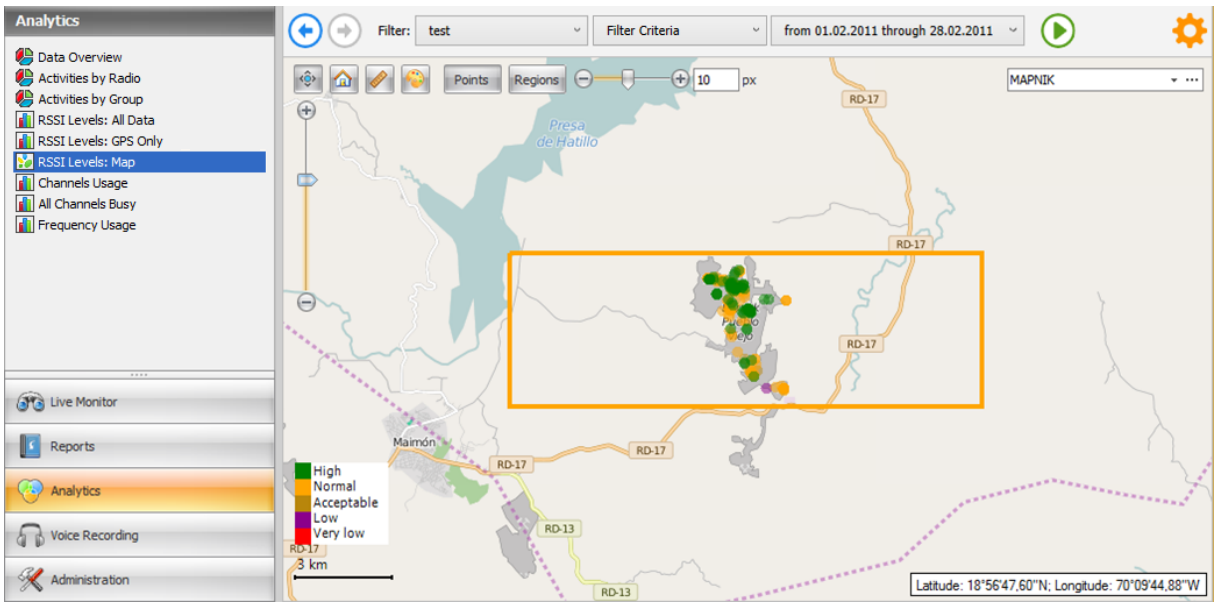


Figure 59: RSSI Levels: Map

Table 48: RSSI Levels: Map – features

Feature	Description
Settings	**RSSI Levels: Map** settings can be configured in a separate dialog box. For details, refer to Configuring Map Usage.
Map features	**RSSI Levels: Map** supports zooming, pan mode, shows the coordinates of the mouse cursor (option), shows all measured RSSI as symbols with configurable shape, size, color). Maps are replaceable. **RSSI Levels: Map** displays all maps available for choice in a drill-down list. For details, refer to Using RSSI Levels Map.
Move to the next RSSI site	**RSSI Levels: Map** can analyze the distance between RSSI occurrences, show all RSSI occurrences belonging to one site, and navigate you between RSSI sites. For details, refer to Using RSSI Levels Map.
Distance measure	In the distance measure mode, a double click on the map sets a point. A series of points is connected with a red line, and the total distance between the first and last point is calculated and visualized. For details, refer to Using RSSI Levels Map.

Feature	Description
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 occurrences on the map. The color and transparency of the additional layer can be configured in the **RSSI Levels: Map** settings. For details, refer to Using RSSI Levels Map.

A.1.7. Channels Usage

The **Channels Usage** charts show the average loading level and individual levels for all selected channels within the specified date and time range.

Table 49: Channels Usage charts – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose loading level is included in the charts.
Work hours	The timeframe within the specified date and time range to be included in the charts.
Date and Time	The date and time range included in the charts. Also, defines the granularity of the time scale (X-axis): ▪ One-day intervals are used for different start and end dates. ▪ One-hour intervals are used if you set equal start and end dates and different start and end hours. ▪ One-minute intervals are used if you set equal start and end dates and hours and different start and end minutes.

A.1.7.1. 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 date and time range. The individual loading levels of all channels is displayed below as line charts.

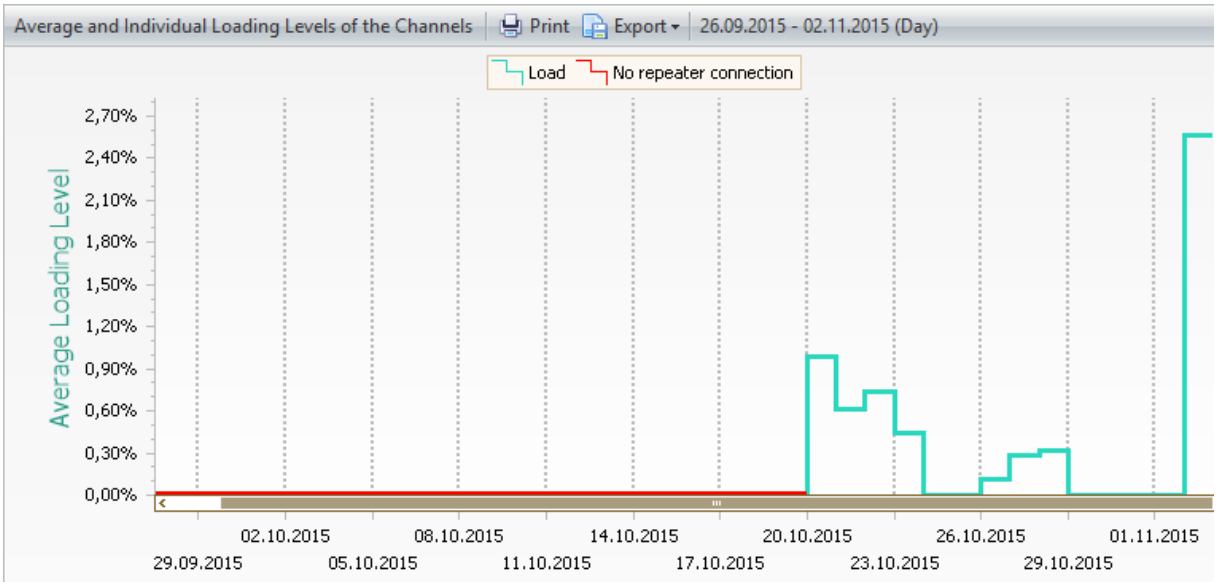


Figure 60: Average and Individual Loading Levels of the Channels chart

- The X-axis shows the time scale divided into time intervals. The length of the time scale and its granularity (one day, or one hour, or one minute) are defined by the **Date and Time** filtering parameter. To learn more, refer to Channels Usage.
- The Y-axis shows the average workload (%) of all channels specified in the **Systems and Channels** filtering parameter. The workload is calculated in each time interval as the total time when the channels were used, divided by the total time when they were connected.
- The legend shows the colors that indicate the connection status of the channel(s). The red line indicates that all repeaters are not connected to the TRBOnet Watch server and all IP gateways are not connected to a radio. Connection is the future time is always a red line.
- The date and time range and the length of the minimum time interval are displayed on top of the chart.

Table 50: Average and Individual Loading Levels of the Channels chart - features

Feature	Description
Drill-down	To drill down into a chart with smaller time intervals, click the turquoise line in the desired time interval. ▪ If the X-axis is divided into one-day intervals, drill-down into a particular day is allowed. ▪ Similarly, if the X-axis shows one-hour intervals, you can drill down into a particular hour to analyze the loading level of the channel(s) on a per-minute basis.

A.1.8. All Channels Busy

The **All Channels Busy** charts show all cases within the specified date and time range when all selected channels were busy (unavailable for radio users) longer than the specified threshold value.

The included charts, **Amount and Total Time of All Channels Busy by Period** and **Maximal Number of Active Channels by Period**, help you figure out how the number of active channels affects the frequency and duration of All Channels Busy situations, and investigate the cause of any such case.

Table 51: All Channels Busy charts – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots to be included in the charts. You need to indicate at least two channels for this type of analysis.
All Channels Busy Threshold	The minimum considered time (in seconds) when the selected channels were busy. If set to 0, the charts will display any periods of time when the channels were busy.
Work hours	The timeframe within the specified date and time range to be included in the charts.
Date and Time	The date and time range included in the charts. Also, defines the granularity of the time scale in the included charts. ▪ One-day intervals are used for different start and end dates. ▪ One-hour intervals are used if you set equal start and end dates and different start and end hours. ▪ One-minute intervals are used if you set equal start and end dates and hours and different start and end minutes.

A.1.8.1. Amount and Total Time of All Channels Busy by Period

The **Amount and Total Time of All Channels Busy by Period** chart shows the frequency and duration of All Channels Busy occurrences during the specified date and time range.

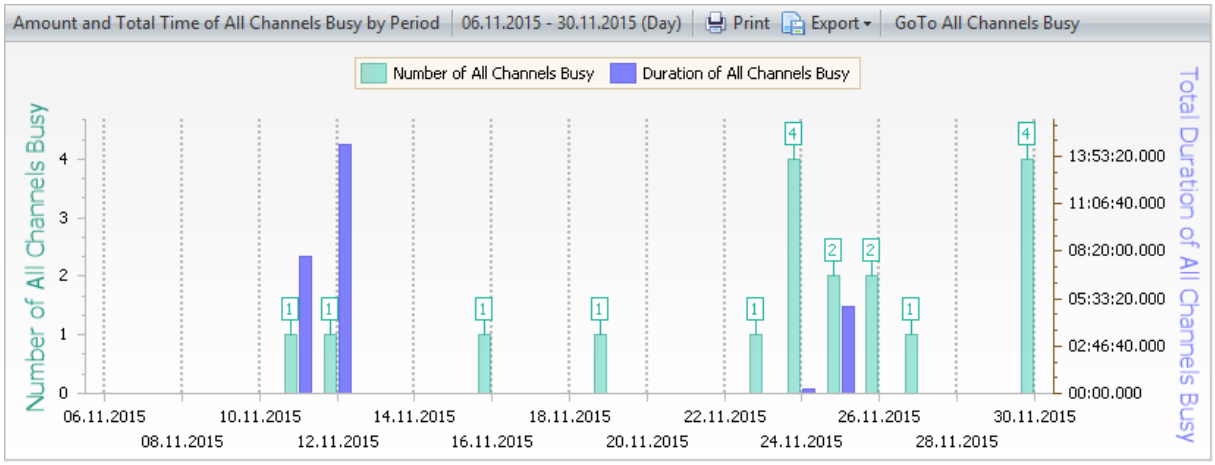


Figure 61: Amount and Total Time of All Channels Busy by Period chart

- The chart heading shows the number of selected channels and the minimum required duration of an All Channels Busy occurrence. These values are specified in the filtering parameters as described in All Channels Busy.
- The X-axis shows the time scale divided into time intervals. The length of the time scale and its granularity (one day, or one hour, or one minute) are defined by the **Date and Time** filtering parameter. To learn more, refer to All Channels Busy.
- The left scale of the Y-axis shows the number of occurrences when all selected channels were busy. The right scale shows the duration of each such occurrence.
- The turquoise bar shows the occurrence of at least one All Channel Busy case in the time interval. The height of the bar and the digit in the turquoise frame indicate the count of such occurrences.
- The height of the iris bar indicates the duration of All Channels Busy occurrences in the time interval.
- The legend indicates the use of colors in the chart.

Table 52: Amount and Total Time of All Channels Busy by Period chart - features

Feature	Description
Related report	Click the **Go To All Channels Busy** button to open the All Channels Busy report for this chart in a separate window. Find the description of all report fields in All Channels Busy.
Drill-down	To drill down into a chart with smaller time intervals, click any bar in the desired time interval. ▪ If the X-axis is divided into one-day intervals, drill-down to a particular day is allowed.

Feature	Description
	▪ Similarly, if the X-axis shows one-hour intervals, you can drill down into a particular hour to analyze the All Channels Busy cases on a per-minute basis. When you drill down, the **Maximal Number of Active Channels by Period** chart updates accordingly.

A.1.8.2. Maximal Number of Active Channels by Period

The **Maximal Number of Active Channels by Period** chart shows the number of active and disconnected channels in each time interval of the specified date and time range.

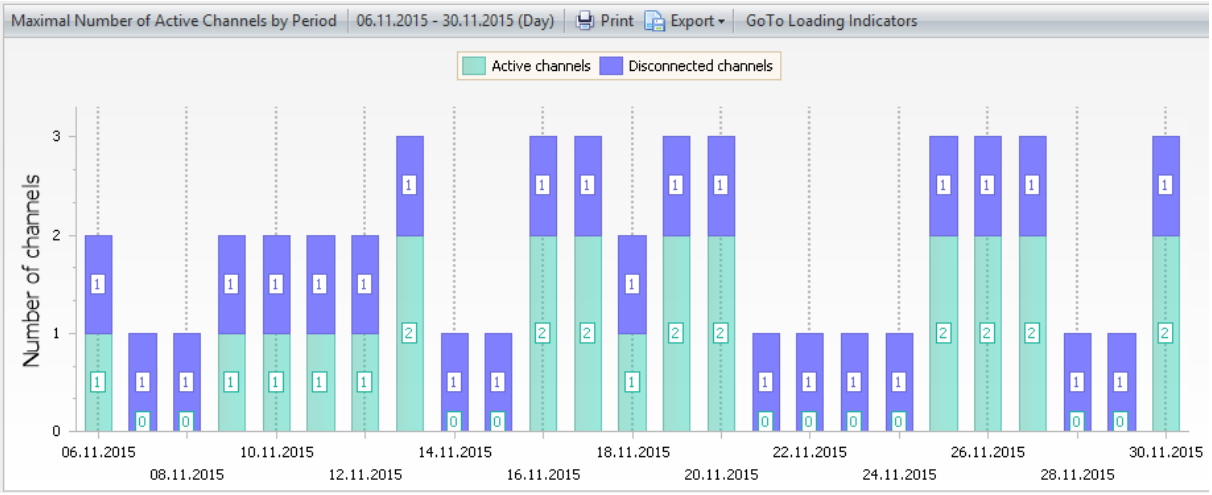


Figure 62: Maximal Number of Active Channels by Period chart

- The X-axis shows the time scale divided into time intervals. The length of the time scale and its granularity (one day, or one hour, or one minute) are defined by the **Date and Time** filtering parameter. To learn more, refer to All Channels Busy.

  Note: The range and granularity of the time scale are the same as in the **Amount and Total Time of All Channels Busy by Period** chart displayed above.

- The Y-axis shows the number of channels.
- The turquoise bar indicates the presence of active channel(s) in the given time interval. The height of the bar and the digit in the turquoise frame indicate the number of active channels.
- Similarly, the iris bar and the digit in the iris frame show the number of disconnected channels in the given time interval.

- The legend shows the colors for active and disconnected channels. Channels connected but not active do not appear in the chart.

Table 53: Maximal Number of Active Channels by Period chart - features

Feature	Description
Related chart	Click the **Go To Loading Indicators** button to open the **Channels Usage** chart using the current filtering parameters in a separate window. Find the description of the chart in Channels Usage.
Drill-down	To drill down into a chart with smaller time intervals, click any bar in the desired time interval. ▪ If the X-axis is divided into one-day intervals, drill-down to a particular day is allowed. ▪ Similarly, if the X-axis shows one-hour intervals, you can drill down into a particular hour to analyze the connection states of the selected channels on a per-minute basis. When you drill down, the **Amount and Total Time of All Channels Busy by Period** chart updates accordingly.

A.1.9. Frequency Usage

The **Frequency Usage** chart shows the use of frequencies in the selected channel(s) over each time interval of the specified date and time range. The frequency used by each repeater and radio station is specific for your radio network.

Table 54: Frequency Usage chart – filtering parameters

Parameter	Description
Peers and Stations	Peers and RoIP gateways included in the chart.
Work hours	The timeframe(s) within the specified date and time range to be included in the chart.
Date and Time	The date and time range included in the chart. Also, defines the granularity of the time scale in the chart. ▪ One-day intervals are used for different start and end dates. ▪ One-hour intervals are used if you set equal start and end dates and different start and end hours.

Parameter	Description
	▪ One-minute intervals are used if you set equal start and end dates and hours and different start and end minutes. For one-minute intervals, select the **Date and Time** tab, set equal start and end dates and hours and different start and end minutes.

Each selected peer and gateway is displayed in the separate line chart. The name of the system peer or RoIP gateway appears near the Y-axis in each chart.

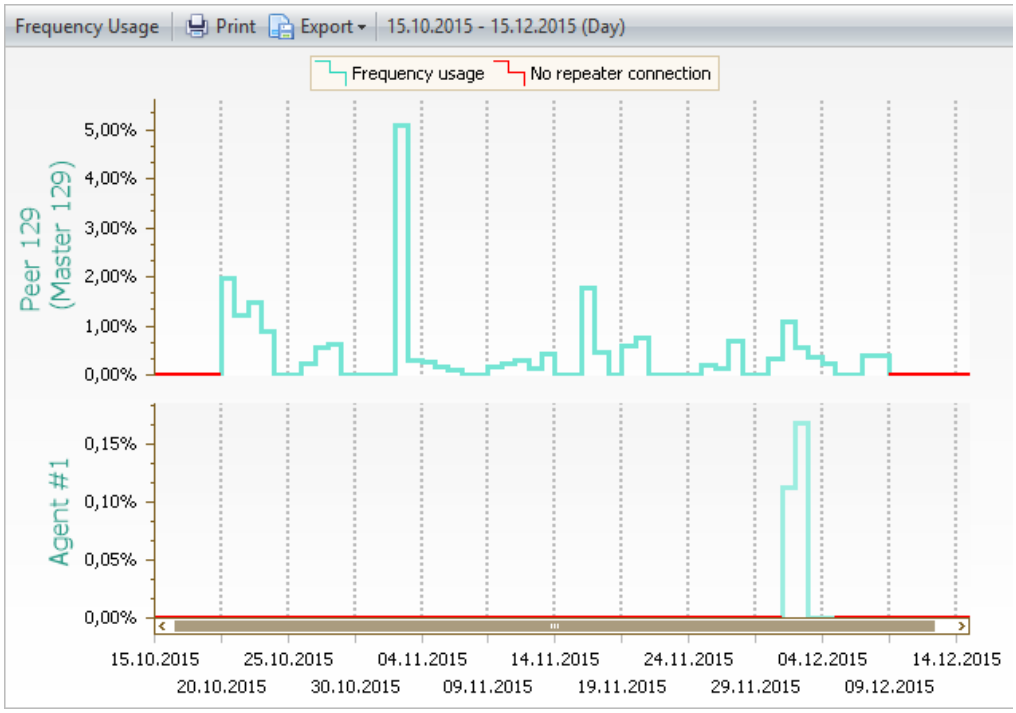


Figure 63: Frequency usage in two systems

- The X-axis shows the time scale divided into time intervals. The **Date and Time** filtering parameter defines the length and granularity (one day, one hour, or one minute) of the time scale.
- The Y-axis shows the usage of the frequency. The percentage value is calculated in each time interval as the duration of the frequency usage divided by the duration of the channel being connected.
- The legend shows the line colors of connection states. The turquoise line stands for the connected state. The red line indicates that the repeater is not connected to the TRBOnet Watch server, or that the RoIP gateway is not connected to a radio. Connection in the future time is always a red line.
- The height of the turquoise line shows the loading level of the frequency, that is, the usage time divided by the uptime per time interval.

Table 55: Frequency Usage chart - features

Feature	Description
Drill-down	To drill down into a chart with smaller time intervals, click the turquoise line in the desired time interval. ▪ If the X-axis is divided into one-day intervals, drill-down to a particular day is allowed. ▪ Similarly, if the X-axis shows one-hour intervals, you can drill down into a particular hour to analyze the usage of the selected channels on a per-minute basis. The date and time range and the length of the minimum time interval are displayed on top of the chart(s).

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 states its goal, filtering parameters, and the meaning of each field in the report.

To learn more about filtering parameters, refer to Using Filters.

A.2.1. Activities over Time

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

Table 56: Activities over Time report – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the report.
Data Type and Subtype	The protocol and, optionally, the type of call or message to be included in the report.

Parameter	Description
	Note: The **System** protocol allows you to select all types of messages, except RCM. To get information about RCM messages generated in the given MOTOTRBO system, build the RCM Messages report.
Subscribers	The subscriber numbers (radio IDs) whose traffic is included in the report.
Work hours	The timeframe within the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 57: Activities over Time report – fields

Field	Description
Session Type	The type of traffic (protocol).
Session Subtype	The type of data.
Start Time	The start time of call transmission.
Duration (m:s.ms)	The duration of the call (including hand time).
Sender	The subscriber number (radio ID) of the sender.
Recipient	The subscriber number 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 used by the call.
RSSI (dBm)	The incoming signal strength measured in the MOTOTRBO repeater slot. Is set to N/A if not applicable.

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 for each type of traffic during the reported period of time. The report also summarizes all types of traffic initiated by each radio and shows the input (%) of that radio in the overall system traffic.

Table 58: Activities by Radio report – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the report.
Data Type and Subtype	The type of traffic and, optionally, type(s) of calls and messages included in the report.
Subscribers	The subscriber numbers (radio IDs) whose traffic is included in the report.
Work hours	The timeframe within the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 59: Activities by Radio report – fields

Field (level1)	Field (level 2)	Description
Radio	**ID**	The radio whose outgoing traffic is summarized.
Voice calls	**Amount**	The amount of voice calls initiated by the radio during the reported period.
	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.

Field (level1)	Field (level 2)	Description
GPS packets	**Amount**	The amount of GPS messages sent by the radio during the reported period.
	Duration (d.h:m:s.ms)	The total duration of GPS traffic initiated by the radio.
ARS packets	**Amount**	The amount of ARS messages sent by the radio during the reported period.
	Duration (d.h:m:s.ms)	The total duration of ARS traffic initiated by the radio.
Total	**%**	The total amount of traffic (%) generated by the radio in the system during the reported period. The total value is calculated for all kinds of traffic, including traffic types not shown in the report.

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 period of time. Also, the report calculates the input (%) of each talk group into the overall voice traffic in the system.

Table 60: Activities by Groups report – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the report.
Data Type and Subtype	The type of traffic and, optionally, type(s) of calls and messages included in the report.
Work hours	The timeframe within the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 61: Activities by Groups report – fields

Field (level1)	Field (level 2)	Description
Group	**ID**	The talk group whose outgoing voice call traffic is summarized.
Voice calls	**Amount**	The amount of voice calls initiated by the radio during the reported period.
	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 total amount of voice traffic (%) generated by the talk group members in the system during the reported period.

A.2.4. Event Viewer

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

Table 62: Event Viewer report – filtering parameters

Parameter	Description
Systems	The list of system names. Peers are not included.
Work hours	The timeframe within the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 63: Event Viewer report – fields

Field	Description
System	The name of the system where the event occurred.

Field	Description
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 textual description of the event.

A.2.5. Text Messages

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

Table 64: Text Messages report – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the report.
Subscribers	The subscriber numbers (radio IDs) whose traffic is included in the report.
Work hours	The timeframe within the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 65: Text Messages report – fields

Field	Description
Sender	The subscriber number (radio ID) of the sender.

Field	Description
Recipient	The subscriber number 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 time slot that transmitted the message.
Text	The text of the message.

A.2.6. RCM Messages

The **RCM Messages** report shows Repeater Control Messages (RCM) transmitted in the selected system(s) during the specified period of time.

Note: MOTOTRBO systems included in the Repeater Call Monitoring report must have their Store Repeater Control Messages (RCM) option enabled in the server configuration settings. To learn more, refer to Configuring Data Storage.

Table 66: RCM Messages report – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots whose traffic is included in the report.
Subscribers	The subscriber numbers (radio IDs) whose traffic is included in the report.
Message Type	The type of RCM to be included in the report.
Work hours	The timeframe within the specified period of time to be included in the report.
Date and Time	The date and time range of the report.

Table 67: 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.
Start Time	The time when the RCM message was sent.
Duration (m:s.ms)	The duration of the message transmission.
System	The name of the MOTOTRBO system whose repeater generated the RCM.
Peer	The peer ID of the repeater that generated the RCM.
Slot ID	The time slot in which the RCM was transmitted.

A.2.7. All Channels Busy

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

Table 68: All Channels Busy report – filtering parameters

Parameter	Description
Systems and Channels	The system names and slots to be included in the report. You need to indicate at least two channels for this report.
All Channels Busy Threshold	The minimum duration (in seconds) of an All Channels Busy occurrence to be included in the report. If set to 0, any duration is included.
Work hours	The timeframe in the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 69: 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**: The channels were busy with traffic not generated by subscribers. ▪ **Collapse**: The expanded grid 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 subscriber number of the sender. • **Recipient**: The subscriber number of the recipient. • **System**: The system in whose channels were busy. • **Site**: For Linked Capacity Plus systems, the site where the transmission occurred. Not relevant to other system types (set to 0). • **Peer**: The peer ID of the repeater that transmitted the call or message. • **Slot**: The time slot that was busy.
Start Time	The date and time when all selected channels became busy.
End Time	The date and time when any selected channel became available after all of them were busy.
Duration	The total time during which the selected channels were busy. Format: DD.HH:MM:SS

A.2.8. GPS Data

The **GPS Data** report shows all GPS messages transmitted in the selected system(s) and slot(s) during the reported period.

Table 70: GPS Data report – filtering parameters

Parameter	Description
Systems and Channels	The systems and slots included in the report.
Subscribers	The subscriber numbers (radio IDs) whose GPS traffic is included in the report.
Work hours	The timeframe in the specified date and time range to be included in the report.
Date and Time	The date and time range of the report.

Table 71: GPS Data report – fields

Field	Description
Session Type	The GPS session.
Session Subtype	The type of a GPS message.
Start Time	The start time of the GPS transmission.
Duration	The total time during which the repeater used the channel to transmit the GPS message. Hang time is included.
Sender	The subscriber number that initiated the GPS message.
Recipient	The subscriber number 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 in the slot.
Longitude	The GPS longitude of the sender.

Field	Description
Latitude	The GPS latitude of the sender.
Radius, m	The tracking inaccuracy (in meters) of the GPS coordinates. This report shows all records where the tracking inaccuracy does not exceed 15 meters; records with the greater inaccuracy are not included in the report.

A.2.9. Frequency Usage

The **Frequency Usage** report shows for all selected systems:

- The total time during which every peer or RoIP gateway was connected to the network, and the duration (%) of the connected state.
- The total time during which every peer or RoIP gateway was active, and the duration (%) of being in active state relative to being connected.

The values are shown per day (or hour, or minute) of the reported period of time. The granularity of the time scale depends on the date and time range specified as a parameter.

Table 72: Frequency Usage report – filtering parameters

Parameter	Description
Peers and Stations	System peers and IP gateways included in the report.
Work hours	The timeframe(s) within the specified date and time range to be included in the report.
Date and Time	The date and time range of the report. Also, defines the granularity of the time scale - days, hours, or minutes. ▪ One-day intervals are used for different start and end dates. ▪ One-hour intervals are used if you set equal start and end dates and different start and end hours. ▪ One-minute intervals are used if you set equal start and end dates and hours and different start and end minutes.

Table 73: Frequency Usage report – fields

Field (level1)	Field (level 2)	Description
Days (or **Hours**, or **Minutes**)		The time interval on which the report shows the duration of the Activity and Connection states per peer or RoIP gateway.
State		The operational state of the peer or RoIP gateway: ▪ **Activity**: The peer or RoIP gateway transmits traffic. Note: If the peer or RoIP gateway had no activity during the reported time interval, the Activity state is not displayed. ▪ **Connection**: The peer is connected to the TRBOnet Watch server over IP, or the RoIP gateway is connected to a radio.
Peer <*ID*> (<*system name*>)	**Duration, h:m:s.ms**	The total time the peer or RoIP gateway was in the Activity or Connection state during the time interval.
	Duration, %	The meaning depends on the operational state: ▪ **Connection**: The percentage of time interval when the peer or IP gateway was in the connected state. ▪ **Activity**: The percentage of the Connection time when the peer or RoIP gateway was in the Activity state.

A.3. Supported Maps

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

Table 74: 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

Resource	Description
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 75: 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 Neocom Software, Ltd support.

Appendix B: SNMP Support

B.1 MIB Files

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

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

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

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

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

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

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

entPhysicalTable describes each physical component (entity) in the system. The table contains an entry for the top-level entity (master repeater) and for each entity connected to the master (hardware peers, applications, etc.). 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 76: 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

Object Name	Object ID	Description	MIB file
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 Configuring SNMP Communication.			
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 obtain information about system alarms from the CISCO-ENTITY-ALARM-MIB:

1. To determine if any alarms are currently being asserted, read the values of the objects in ceAlarmTable.
   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.
2. To obtain information about individual alarms, read the values of the ceAlarmDescrSeverity and ceAlarmDescrText objects.

TRBOnet Watch Alarm Codes

Table 77: 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

Alarm	Decimal code
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 78: Examples of configuring an NMS for SNMP communication with TRBOnet Watch

To do this:	Perform 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**.

To do this:	Perform these steps:
	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, select 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 Passwd**: Show the values specified in TRBOnet Watch configuration. Note: For the description of TRBOnet Watch SNMP configuration settings, refer to topic Configuring SNMP Communication. 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 contains 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:	Perform 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 the 107 code in the table of alarms presented in Alarms. This code indicates the PeerDisconnected alarm.

Appendix C: RCM Messages

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

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

Table 79: RCM messages

RCM Message (Reason Code)	Failure Scenario
CALL TRANSMISSION STATUSES	
Race Condition Failure	The Call Setup request is rejected during Arbitration.
Invalid/Prohibited Call Failure	Incorrect or forbidden format.
Destination Slot Busy Failure	The destination channel is busy.
Destination Group Busy Failure	The Call Setup request is declined because the destination Group is busy on another channel. This scenario applies to setting up a new call in the rest channel in Capacity Plus/LCP systems only.
All Channels Busy Failure	The Call Setup request is declined because all the channels at the site are busy. The rest channel is busy. This scenario applies to setting up a new call in the rest channel in Capacity Plus /LCP systems only.
OTA Repeat Disabled Failure	The Call Setup request is declined because the repeater where the request is sent is momentarily disabled by a system monitoring application.

RCM Message (Reason Code)	Failure Scenario
Signal Interference Failure	The Call Setup request is declined because the repeater where the request is sent is suffering FCC type I or II interference. In Capacity Plus /LCP systems, this scenario applies to setting up a new call in the rest channel only.
CWID In Progress Failure	The Call Setup request is declined because the repeater where the request is sent is transmitting CWID. In Capacity Plus /LCP systems, this scenario applies to setting up a new call in the rest channel only.
TOT Expiry Premature Call End Failure	The call sending is ended because of the TOT timer expiry.
Transmit Interrupted Call Failure	The Call Setup request w/interrupt access failed to interrupt the ongoing OTA interrupt voice call.
Higher Priority Call Takeover Failure	The call is preempted by another call with higher priority such as Emergency call.
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 in 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 in the rest channel in Capacity Plus /LCP systems only.

RCM Message (Reason Code)	Failure Scenario
Long Under Run Condition	The repeater ends the call due to jitter buffer under-runs continuously for over 720 ms. This may be due to the 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 in 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 begins to block repeat (FCC Type I).
End of Signal Interference (FCC Type I)	Signal interference is weak enough and the repeater resumes over-the-air repeat (FCC Type I).
Start of Signal Interference (FCC Type II)	Signal interference is strong enough and begins to block repeat (FCC Type II).
End of Signal Interference (FCC Type II)	Signal interference is weak enough and the repeater resumes over-the-air repeat (FCC Type II).
Start of CWID/BSI Repeat	The repeater has to transmit CWID/BSI and begins to block repeat.
End of CWID/BSI Repeat	Broadcast of the calls into the air is intermitted.
Signal Interference Failure	The repeater finishes CWID/BSI transmission and resumes over-the-air repeat.