

# **TRBO***net*

## **TRBO***net* PLUS

### Deployment Guide

*For MOTOTRBO Capacity MAX*

Version 5.1

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Last revised on 28 October 2016.

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# 1. Introduction

## 1.1 About This Document

The information in this guide is intended for administrators setting up evaluation and proof-of-concept deployments of MOTOTRBO Dispatch over IP solutions. The document describes the installation of Neocom TRBOnet PLUS and the minimum steps required to configure communication with a MOTOTRBO Capacity MAX system.

For more comprehensive information on the Neocom TRBOnet family of radio network software tools, refer to the [Documentation section](#) of our web site.

## 1.2 About TRBOnet

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

## 1.3 Contacts

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APAC	+61 28 6078325	<a href="http://kb.trbonet.com">http://kb.trbonet.com</a> — online knowledge base

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## 2. System Components

TRBOnet software consists of several modules, a combination of which enables you to build enterprise dispatch solutions of different levels of complexity and redundancy. The first step in implementing the best solution is determining the topology for the customer's system and identifying the modules required for the implementation of the customer's objectives.

### 2.1. TRBOnet Agent

TRBOnet Agent is a Windows software application that establishes a direct connection to MOTOTRBO equipment and works as a gateway routing audio and data packets between an IP network and a radio network. After setup in the integrated configuration tool, TRBOnet Agent runs as a Windows service and does not require operator attendance.

TRBOnet Agent can provide a connection to any MOTOTRBO system, irrespective the radio network topology.

The main benefit of using TRBOnet Agent is the ability to receive data from a radio network and transmit it to multiple connected servers simultaneously. With TRBOnet Agent used as an entry point, the number of MOTOTRBO connections in a system is not growing, which eliminates some restrictions in building dispatch solutions.

Depending on the network complexity, TRBOnet Agent can be installed on a dedicated host or enabled on a TRBOnet Server as a feature. A dedicated TRBOnet Agent is an optional component on a dispatch network. It is required on high-complexity networks with multiple independent servers and/or servers running in the redundancy mode. If a system includes a single server, we recommend that you activate the built-in TRBOnet Agent when configuring TRBOnet Server.

TRBOnet Agent can operate in the normal mode or in the hot-standby mode to provide N+1 redundancy for one or several top-level TRBOnet Agents, which allows you to build dispatch networks of the required availability level. If the main TRBOnet Agent fails, all connected clients switch to the next active TRBOnet Agent in the bundle.

### 2.2. TRBOnet Server

TRBOnet Server is a Windows software application that connects to TRBOnet Agent (built-in or remote) as a client to receive information from the radio network and to execute required operations. TRBOnet Server handles data streams coming from MOTOTRBO equipment, controls the behavior of the system, stores the statuses of subscriber units to the MS SQL database, and provides the actual information to the connected TRBOnet Dispatch Consoles.

After setup in the integrated configuration tool, TRBOnet Server runs as a Windows service and does not require operator attendance.

TRBOnet Server is a mandatory component on a dispatch network. A distributed dispatch network can include multiple TRBOnet Servers working independently.

TRBOnet Server can run in the normal mode or as a redundant server for one or several top-level servers, providing the required availability to a dispatch network. If a master TRBOnet Server fails, all connected clients switch to the redundant TRBOnet Server that goes next in the prioritized list.

### **2.3. TRBOnet Dispatch Console**

TRBOnet Dispatch Console is a Windows software application that connects to TRBOnet Server and provides the operator interface for interaction with the radio network subscribers and groups of subscribers.

Each TRBOnet Dispatch Console is typically connected to one TRBOnet Server. If TRBOnet Server fails, TRBOnet Dispatch Console automatically switches to the redundant server that goes next in the prioritized list.

### 3. Dispatch Network Planning

When planning a dispatch network, a good approach is creating a single document that would describe the fleets of field radios and dispatcher positions and communication between the system users (radio users, dispatchers, mobile clients, and other). We recommend that you create a system network diagram based on the real customer backbone IP network. To select the best topology, answer the following questions:

- Do you have one server room or several?
- Do you have one CMSS with one Trunked Controller or several?
- If you have several CMSS with several Trunked Controllers, are they located in the same server room or not?
- If you have several CMSS and they are located in different server rooms, should dispatchers continue work in case of the backbone network failure between CMSS?
- Should dispatchers continue work in case of the main TRBOnet Server failure?

Answers to these questions will help you identify the most suitable topology described below and customize it according to the customer’s requirements.

#### 3.1. Single Server Topology

The minimum system configuration that allows the use of all Capacity MAX and TRBOnet features includes one CMSS with Trunked Controller, one or more MNIS VRC Gateways, one MNIS Data Gateway, an RF site, one TRBOnet Server with the built-in TRBOnet Agent, and one or more TRBOnet Dispatch Consoles.

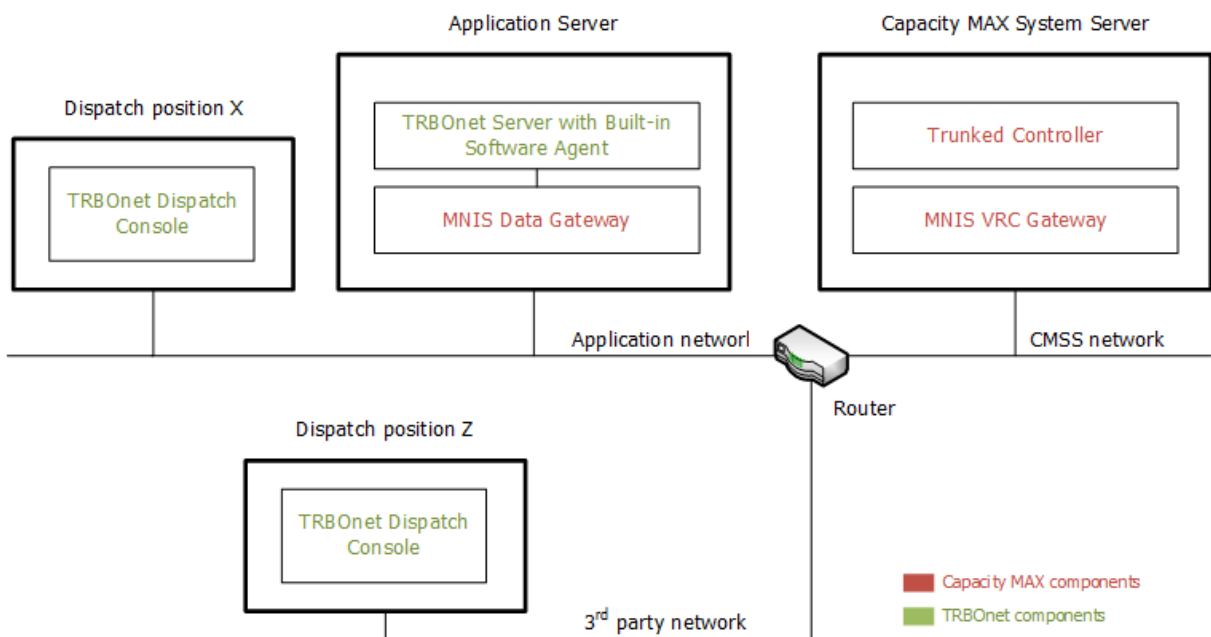


Figure 1: Single server topology



This topology should be selected if all of the following is true:

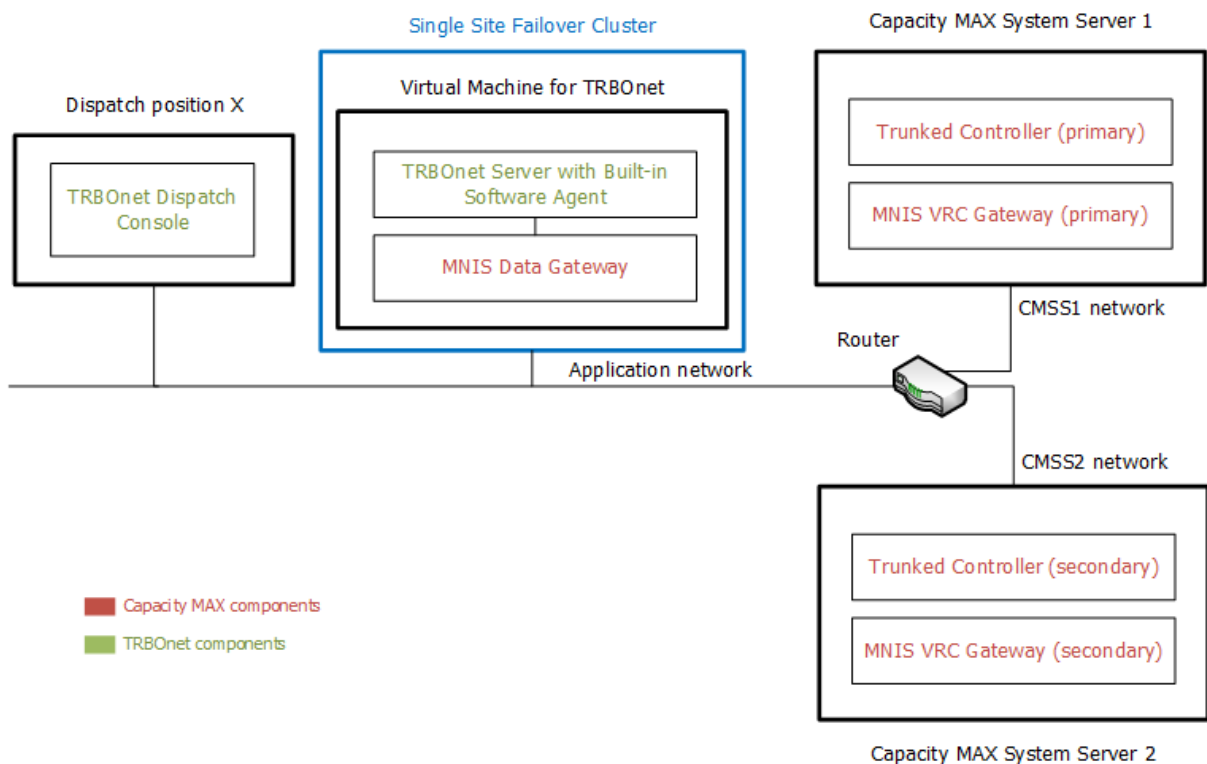
- A customer has one central server room and one main dispatch center
- Only one CMSS with Trunked Controller is available
- In case of CMSS hardware failure or TRBOnet Server hardware failure or backend network failure, dispatcher operations in TRBOnet Dispatch Console are not required

Also, select this topology if the system is intended for laboratory testing.

### 3.2. Single Server on a VM Located in a Failover Cluster

TRBOnet Server with MNIS Data Gateway can be installed on a virtual machine (VM) deployed in a failover cluster. This solution was tested on clusters based on the Microsoft Hyper-V and VMware vSphere platforms. The maximum fault tolerance is achieved on the following set of system components:

- 2 x CMSS with Trunked Controller (Primary + Secondary)
- 2 x MNIS VRC Gateway (Primary + Secondary)
- 1 x TRBOnet Server with built-in TRBOnet Agent
- 1 x MNIS Data Gateway



**Figure 2: Single server on a VM located in a failover cluster**

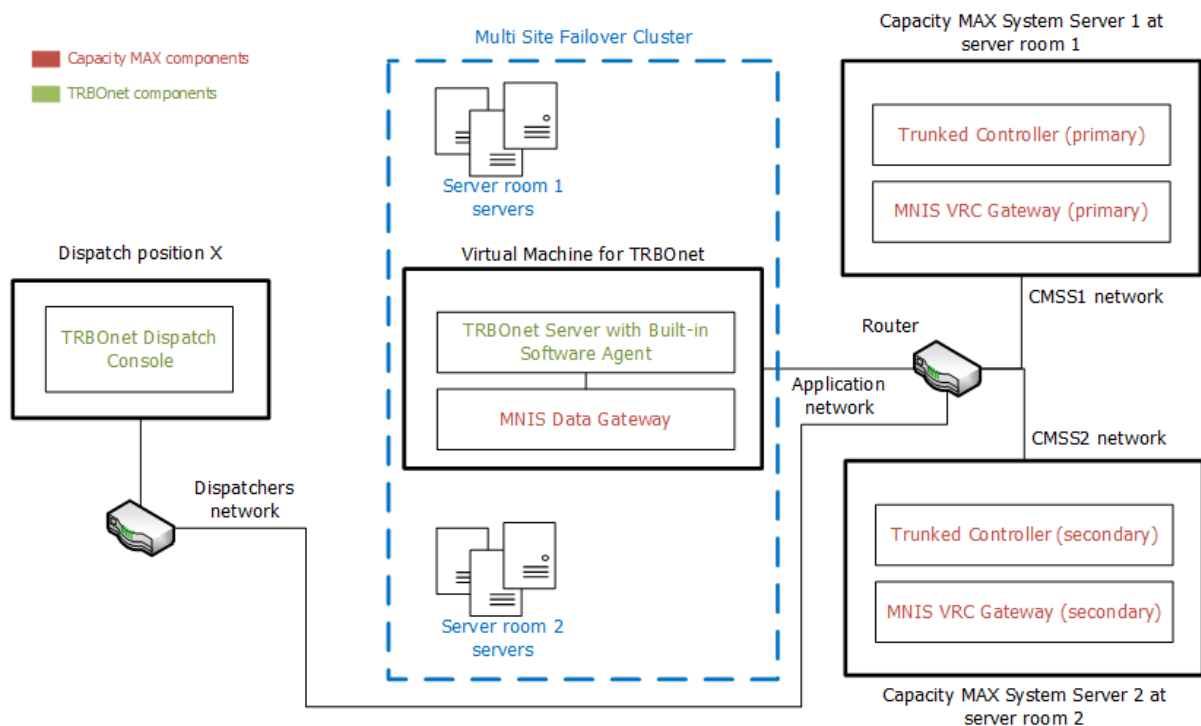
This topology should be selected if all of the following is true:

- A customer has one central server room and one main dispatch center

- The customer’s IT department personnel already use a failover cluster or have enough expertise to build a failover cluster and support the high-availability infrastructure
- In case of the backend network failure, dispatcher operations in TRBOnet Dispatch Console are not required

A system built on this topology provides the high-level availability if the server rooms are built and equipment deployed according to all rules. External IP channels and network components should be reserved for communication with RF sites and for connection with TRBOnet Dispatch Consoles. Each CMSS and each failover cluster node should be mounted to a separate 19-inch rack with its own backup power system.

If external IP communication channels cannot be reserved and the customer already uses a multi-site failover cluster for other services, and equipment for building a Capacity MAX system can be placed in multiple server rooms, the topology can be adapted according to Figure 3.



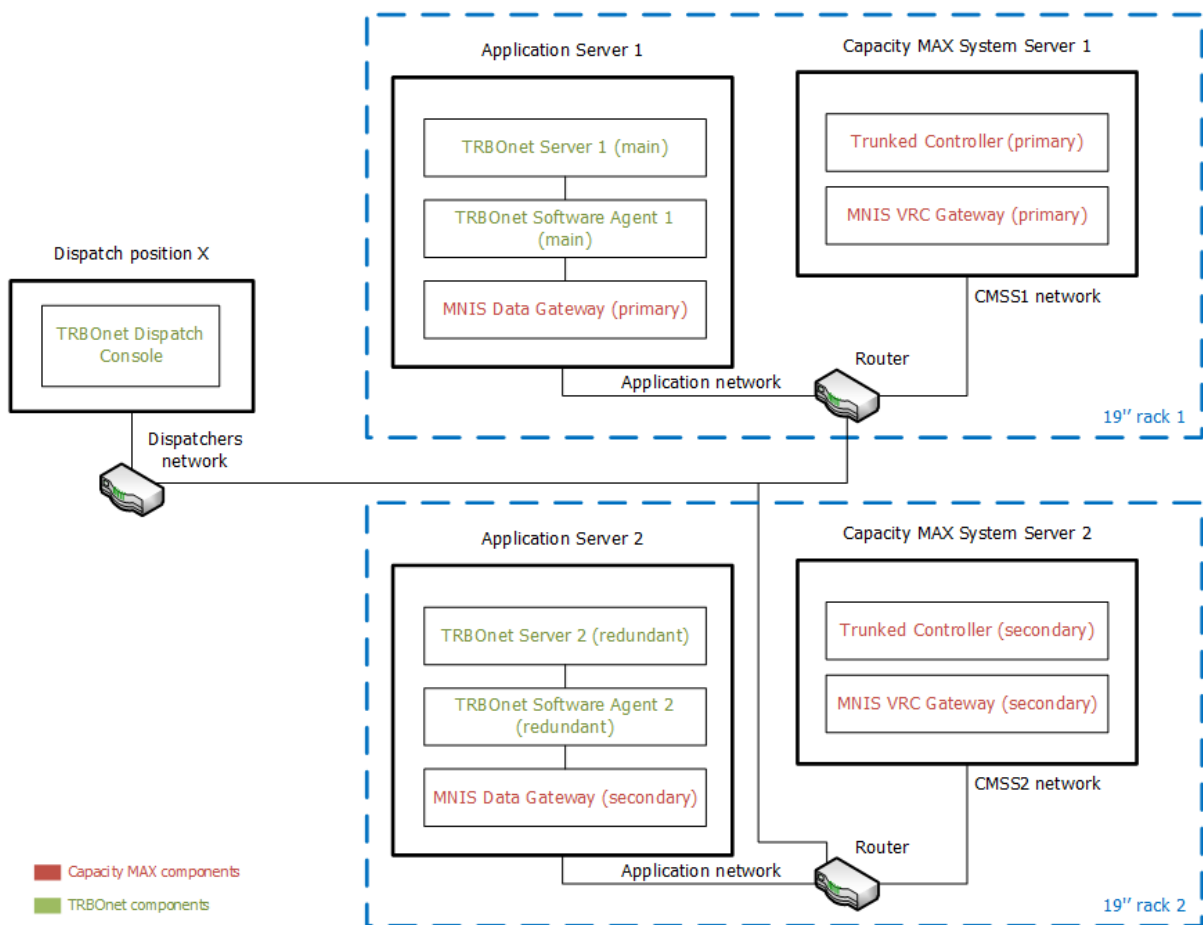
**Figure 3: A single server on a VM located in a multi-site failover cluster**

The system presented on this diagram provides outstanding reliability for further operation in case of the Server Room 1 WAN network failure. The failover cluster automatically restarts the virtual machine with TRBOnet Server and MNIS Data Gateway at Server Room 2 with minimum data loss. The secondary Trunked Controller and the MNIS VRC Gateway become active and ready to provide communication with RF sites.

### 3.3. Redundant Server Topology (N+1 Redundancy)

To ensure fail-safe operation of Capacity MAX with TRBOnet, consider designing a system with N+1 redundancy. In this topology, each component (N) has at least one independent backup (1). For the maximal fault tolerance, we recommend the following set of system components:

- 2 x CMSS with Trunked Controller (Primary + Secondary)
- 2 x MNIS VRC Gateway (Primary + Secondary)
- 2 x TRBOnet Server
- 2 x TRBOnet Agent
- 2 x MNIS Data Gateway



**Figure 4: Redundant server topology (N+1 redundancy)**

This topology should be selected if all of the following is true:

- A customer has one central server room with a redundant IP network or several independent server rooms
- The dispatch solution should work in the 365/7/24 operation mode

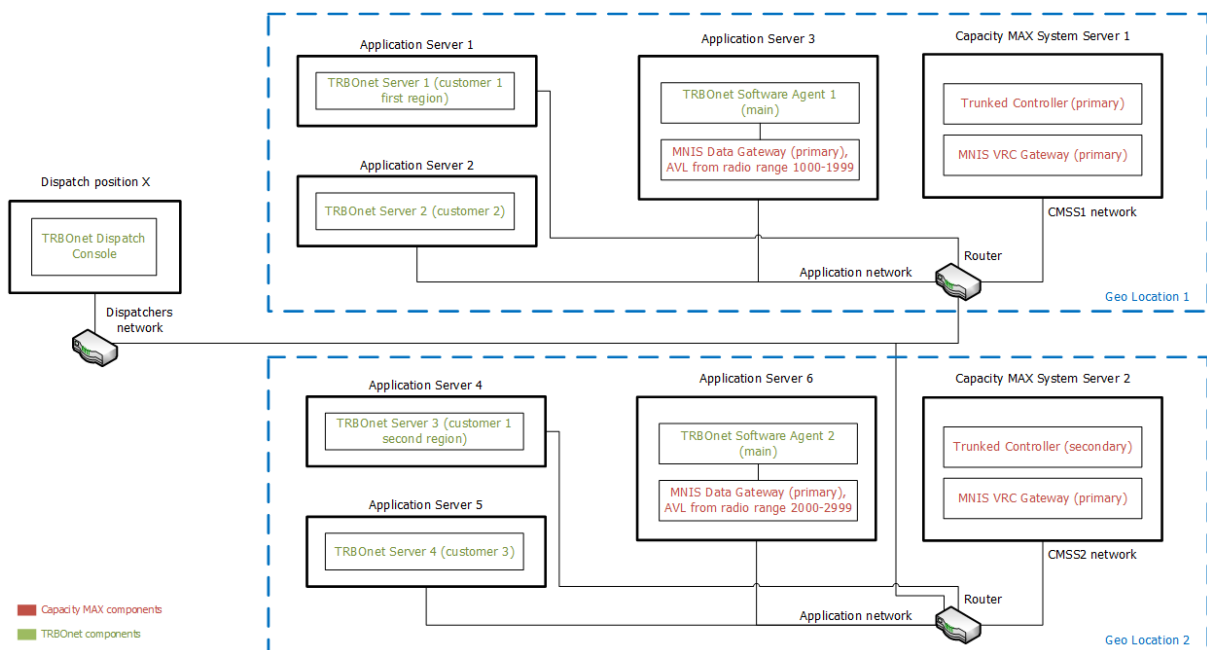
The diagram (Figure 4 on page 7) can be modified for a particular system, depending on the additional system elements such as PBX, analog radio networks, actual IP network addresses and end-user requirements.

### 3.4. Multi-Server Topology

When designing a distributed dispatch system with big spatial scope (such as a region-wide or a country-wide system) or a system with special customer requirements to the equipment location, fault tolerance may require use of a network topology with multiple independent servers. Each server in such a system can receive and handle information from subscribers of a particular radio network, sharing the common infrastructure and not affecting other servers.

When using multiple TRBOnet Servers in Capacity MAX, it is important to plan the proper placement of TRBOnet Agents with MNIS Data Gateways on the IP network in order to minimize the RF channels usage.

- several CMSS with Trunked Controller
- several MNIS VRC Gateways
- several TRBOnet Servers
- several TRBOnet Agents
- several MNIS Data Gateways



**Figure 5: Multi-server topology**

This topology should be selected if all of the following is true:

- The system has several independent regions and each region should continue work in case of the network failure between that region and other regions
- Several customers share the same Capacity MAX radio network

To ensure fail-safe operation of a separate component in a system with the multi-server topology, any component can be reserved using N+1 redundancy or virtualization.

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## 4. Installation

Before installing TRBOnet PLUS, make sure that your computer meets the software requirements described out the website at

<http://kb.trbonet.com/public.pl?Action=PublicFAQZoom;ItemID=32>

### *Install Windows Service Packs*

For all platforms, we recommend that before installing TRBOnet PLUS you update your operating system to the latest Service Pack and install critical updates available from Windows Update.

To prevent random Windows restarts, disable the automatic upgrade on the server-side hardware.

### *Install Microsoft SQL Server*

Before installing TRBOnet Server, download and install the Microsoft SQL Server software. The selected edition depends on the size of the system and data storage. To test the system, install MS SQL Server Express edition. Select the 32-bit or 64-bit version depending on the underlying operating system. Accept the defaults during the installation.

### *Install .NET Components*

TRBOnet installer can install .NET Framework automatically if you have internet connection at your servers and dispatch computers. Otherwise you can install it manually:

.NET Framework redistributables are available from Microsoft at

<https://www.microsoft.com/en-us/download/search.aspx?q=.net%20framework>

Select the .NET Framework 4.6.1 version to install.

### *Install TRBOnet PLUS*

Download the latest version of TRBOnet PLUS. Unzip and run the installation file as a local administrator. Follow the prompts to install TRBOnet PLUS 5.1. Click to install Server and Dispatch Console.

If the selected topology requires TRBOnet Agents installed on dedicated computers, run the TRBOnet PLUS installation file on each dedicated host as a local administrator. Follow the prompts to install TRBOnet PLUS 5.1. On the **Choose Setup Type** step, select **Custom** and click to install TRBOnet Agent.

After the installation is finished, configure the installed TRBOnet components as described in the respective section of this document.

## 5. TRBOnet Agent Configuration

This section describes how to configure TRBOnet Agent for communication with a Capacity MAX system. TRBOnet Agent can work as a part of the TRBOnet Server process or as a standalone application. The steps to configure a connection to the MOTOTRBO equipment are the same for a built-in and remote TRBOnet Agent.

**Table 1: High-level steps for configuring TRBOnet Agent**

#	High-level steps	Refer to:
1	<p>Launch the configuration tool.</p> <p><b>Remote TRBOnet Agent:</b></p> <p>Double-click the <b>TRBOnet Agent</b> icon on the desktop. Or, select <b>All Programs</b> and then <b>Neocom Software</b> and <b>TRBOnet Agent</b> from the <b>Start</b> menu.</p> <p><b>Built-in TRBOnet Agent:</b></p> <p>Double-click the <b>TRBOnet Server</b> icon on the desktop, or select <b>All Programs</b> and then <b>Neocom Software</b> and <b>TRBOnet Server</b> from the <b>Start</b> menu.</p> <p>In the TRBOnet Server configuration window, click <b>Local Agent</b> in the navigation pane and make sure that the <b>Enable Local Agent</b> option is selected.</p>	
2	Apply a license with Capacity MAX support (optional).	5.1. Applying a License with Capacity MAX Support (page 12)
3	Register a Capacity MAX system.	5.2. Registering a Capacity MAX System (page 12)
4	Configure N+1 redundancy for TRBOnet Agent (optional).	5.3. Configuring N+1 Redundancy for TRBOnet Agent (page 27)
5	Run TRBOnet Agent as a Windows service.	5.4. Running TRBOnet Agent as a Windows Service (page 28)

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## 5.1. Applying a License with Capacity MAX Support

The downloadable installation package of TRBOnet PLUS comes with a free 60-day evaluation license that allows two Capacity MAX connections. To connect more Capacity MAX systems to TRBOnet, contact Neocom Software, Ltd for a new license with additional Capacity MAX connections included.

### To apply a new license:

1. Copy the new license file to a local folder. If this folder contains other license files, delete them.
2. Launch the configuration tool. In the configuration window, click **License** in the left pane.
3. Click the **License Manager** link in the right pane.
4. In the **License Manager** window, follow the instructions and select the new license file from the local folder.

## 5.2. Registering a Capacity MAX System

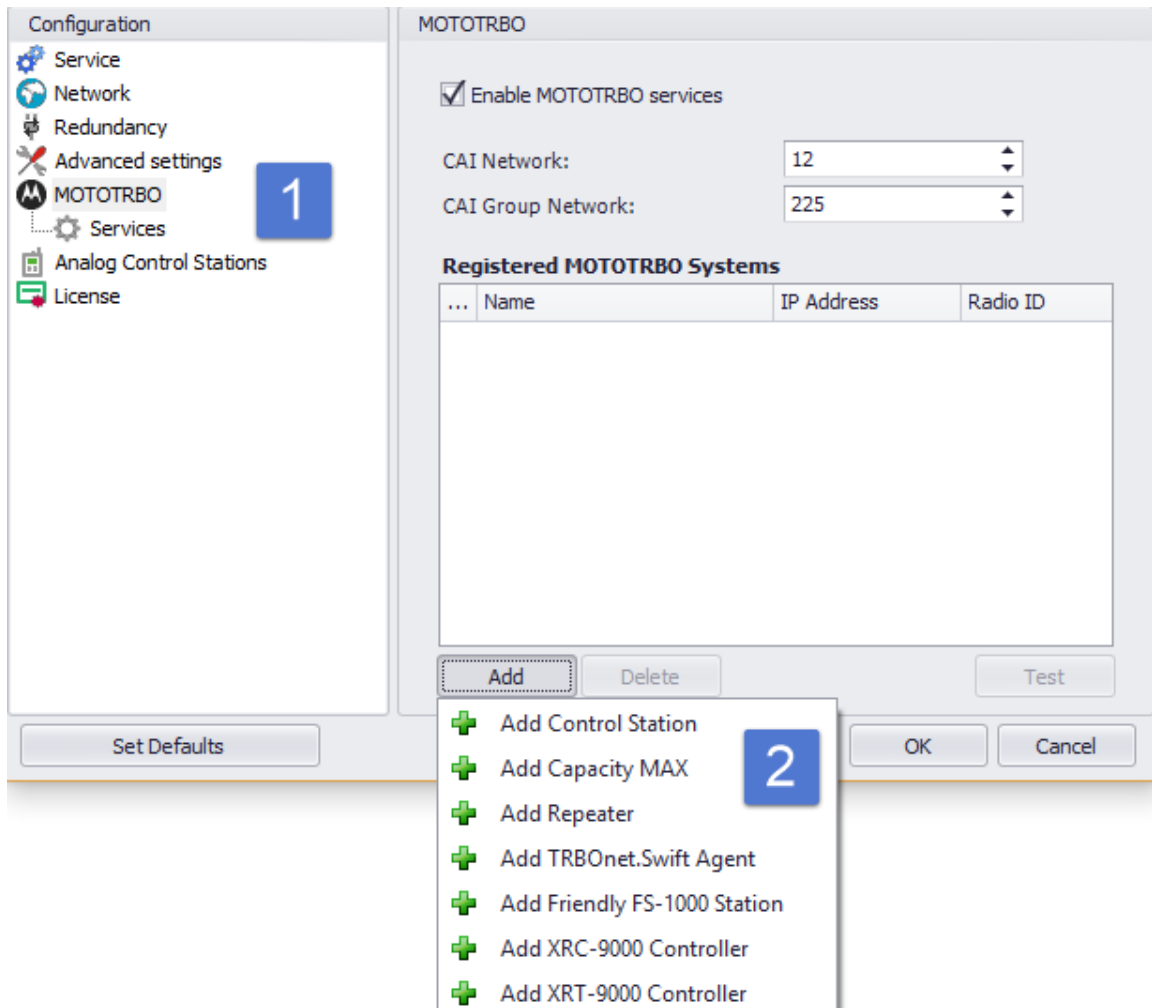
TRBOnet Agent is a system component responsible for connecting TRBOnet Server and MOTOTRBO equipment. In most cases, you connect a radio system to the built-in TRBOnet Agent activated in the TRBOnet Server options. In complex setup cases, you can connect a system to a remote TRBOnet Agent installed on a dedicated computer.

By default, the TRBOnet Agent configuration does not define connections to radio systems. You can add as many connections to MOTOTRBO Capacity MAX systems as your license allows.

### To add a MOTOTRBO Capacity MAX system:

1. Launch the configuration tool. In the left pane, click **MOTOTRBO**.
2. In the right pane, click the **Add** button and select **Add Capacity MAX** from the drop-down menu.





**Figure 6: Adding a MOTOTRBO Capacity MAX system**

The new Capacity MAX system appears in the left pane under **MOTOTRBO**.

3. In the right pane, specify the system settings (Table 2).

Note: Some of these settings must match the Capacity MAX system configuration settings specified in the Radio Management software. The table indicates the matching Radio Management settings where applicable.

**Table 2: Capacity MAX system settings in TRBOnet**

TRBOnet setting	RM setting	Description
<b>System Name</b>	NA	Specify a user-friendly name of the system.
<b>Radio ID</b>	Console Radio ID	TRBOnet operates like a virtual radio in Capacity MAX systems.

TRBOnet setting	RM setting	Description
		Specify the radio ID to be used by the TRBOnet Server by default for making private calls, group calls, site-all-calls, and system-all-calls.  Note: This radio ID shall be registered in the Radio Management software tool as a Console Radio.
<b>System Type</b>	NA	Select <b>Capacity MAX</b> .
<b>System Identifier</b>	NA	The Capacity MAX system identifier to be used by TRBOnet.  Leave this field empty if you have one Capacity MAX system. Otherwise, enter a unique value for each independent Capacity MAX system. Use same System Identifier for all TRBOnet modules assigned for single Capacity MAX system.
<b>Network ID</b>	Network ID	Specify the Network ID assigned to your Capacity MAX system in the Radio Management software.

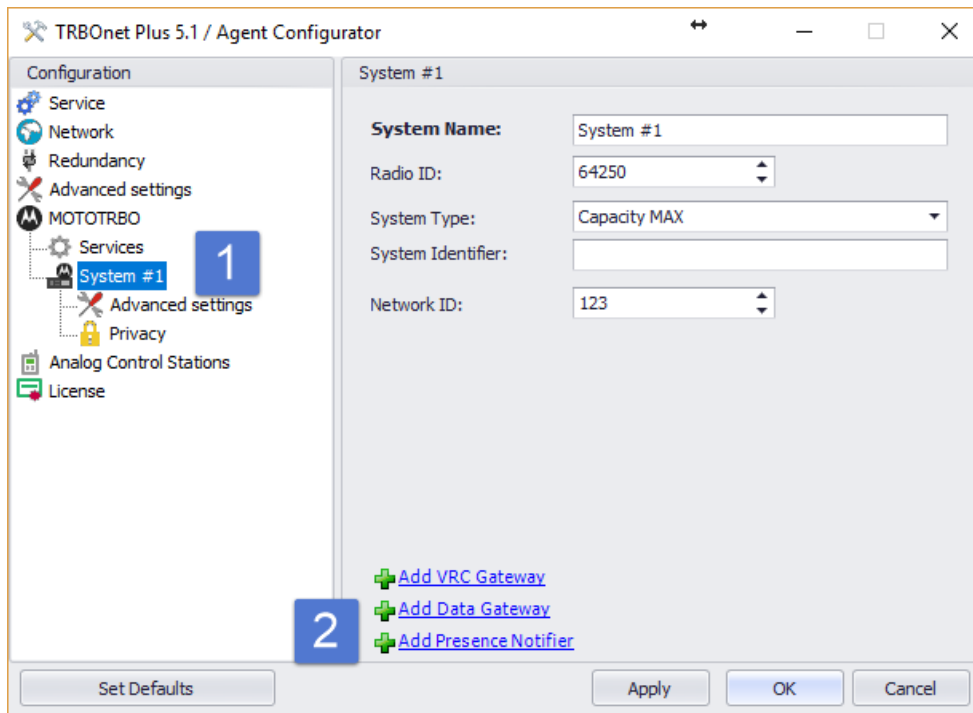
4. In the left pane, click **Privacy** under the Capacity MAX system name. Specify the type of privacy and privacy keys as configured in the system.

### 5.2.1. Configuring Connection to Presence Notifier

Presence Notifier is the Trunked Controller module responsible for notifying 3<sup>rd</sup> party applications about the actual presence statuses of the radios. Presence Notifier is a service that TRBOnet uses to obtain the presence statuses of subscriber radios in a Capacity MAX system.

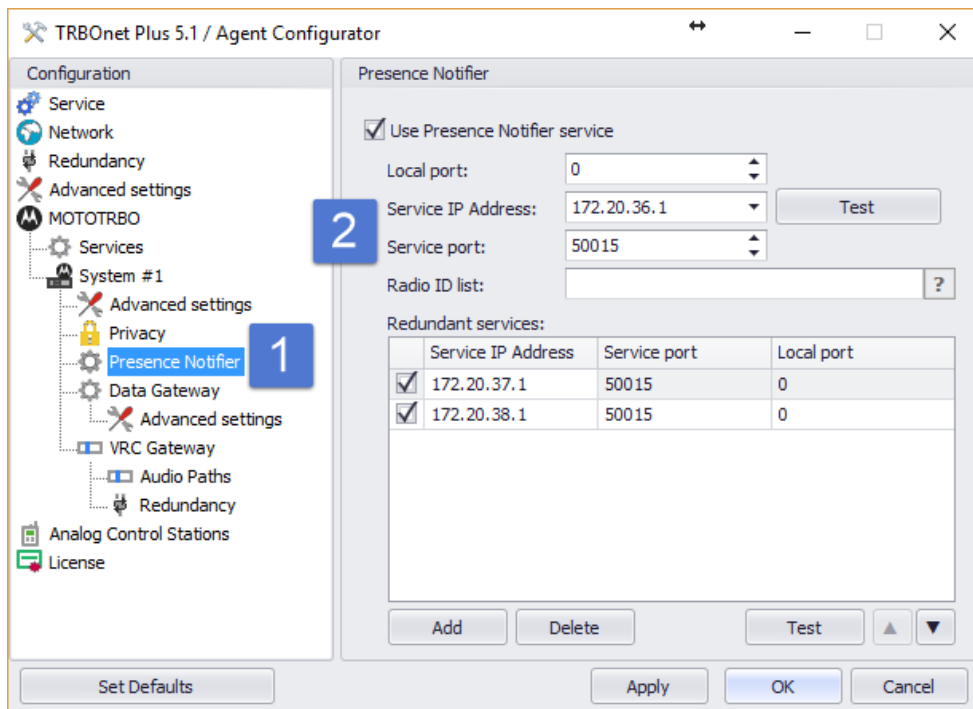
#### To configure connection to Presence Notifier:

1. In the left pane of the configuration tool, click your Capacity MAX system under **MOTOTRBO**.
2. In the right pane, click **Add Presence Notifier**.



**Figure 7: Adding Presence Notifier**

3. In the left pane, click **Presence Notifier** under your system.



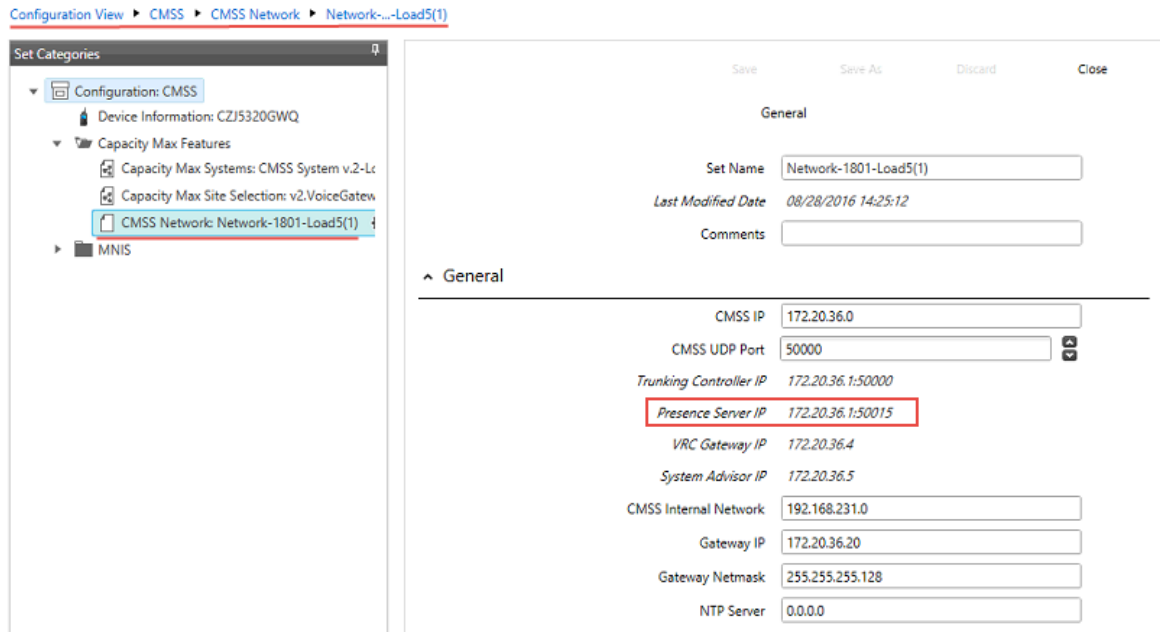
**Figure 8: Configuring connection to Presence Notifier**

4. In the right pane, specify the Presence Notifier connection properties (Table 3).

Note: Some properties match the Capacity MAX configuration settings specified in the Radio Management software. Table 3 indicates such matches where applicable.

**Table 3: Presence Notifier connection properties**

<b>TRBOnet property</b>	<b>Matching CMSS setting</b>	<b>Description</b>
<b>Use Presence Notifier service</b>	NA	Select to enable Presence Notifier in TRBOnet.
<b>Local port</b>	NA	Specify any non-used local IP port for communication with Presence Notifier. Keep "0" to enable TRBOnet to select the local port automatically.
<b>Service IP Address</b>	Presence Server IP	Specify the IP address of Trunked Controller.
<b>Service port</b>	CMSS Network > Presence Server Port	Specify the IP port of Trunked Controller allocated for communication with Presence Notifier.  Default: 50015  Click <b>Test</b> . You should receive the "Service Available" message if all properties are configured correctly and Trunked Controller is up and running.  If the test fails, contact the CMSS team to receive the correct IP port.
<b>Radio ID list</b>	NA	Specify the subscriber radio IDs for which TRBOnet shall receive presence information (PRESENCE and ABSENCE notifications) from Trunked Controller.  By default, TRBOnet subscribes for presence information about all radios registered in the system.  To minimize the traffic, you can define particular radio IDs and ranges.  For example: 1, 5, 15-20



**Figure 9: Presence Notifier settings in the Radio Management tool**

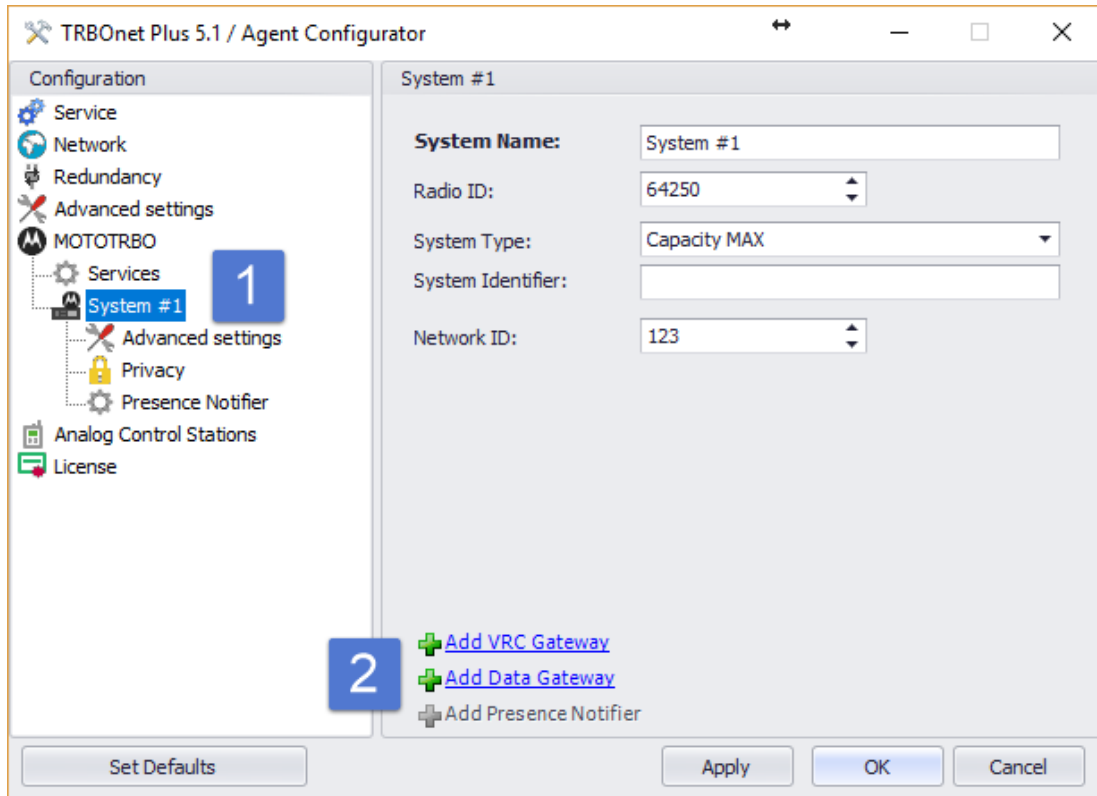
5. If your Capacity Max system includes multiple Trunked Controllers with Presence Notifier, you can fill the list of redundant Presence Notifier services. In the event of the main Presence Notifier failure, TRBOnet automatically switches to the next active Presence Notifier specified in the list.
6. Click **Test** to test the Presence Notifier connection. If the test fails, check the IP network connection between the TRBOnet host machine and Trunked Controller using the ICMP ping and contact technical support.

### 5.2.2. Configuring Connection to Data Gateway

The Data Gateway service is used by TRBOnet to transmit data between the 3<sup>rd</sup> party software and subscriber radios in a Capacity MAX system. MNIS Data Gateway can be deployed on the same computer with TRBOnet Agent (the simplest option) or on a separate computer. Deploying Data Gateway on the TRBOnet Agent host is recommended as it minimizes the configuration effort.

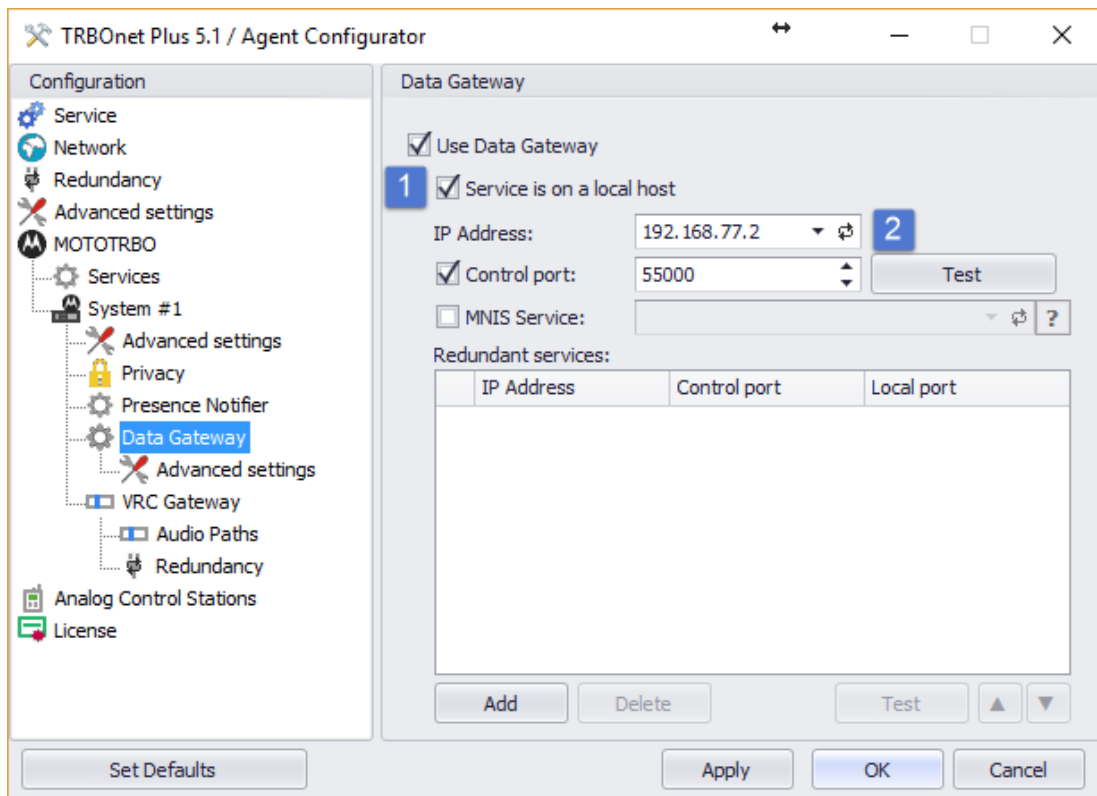
#### To configure connection to Data Gateway installed on the TRBOnet Agent host:

1. In the left pane of the configuration tool, click your Capacity MAX system under **MOTOTRBO**. In the right pane, click **Add Data Gateway**.



**Figure 10: Adding a Data Gateway connection**

2. In the left pane, click **Data Gateway** under your Capacity MAX system.



**Figure 11: Configuring connection to Data Gateway deployed on the TRBOnet Agent host**

- In the right pane, specify the following Data Gateway connection properties (Table 4).

**Table 4: Connection properties for Data Gateway installed on the TRBOnet Agent host**

TRBOnet property	Description
<b>Use Data Gateway</b>	Select this option to enable Data Gateway in TRBOnet.
<b>Service is on a local host</b>	Select this option if MNIS Data Gateway is installed on the same computer with TRBOnet Agent.
<b>IP Address</b>	Press the <b>Refresh</b> button and click the MNIS tunnel from the drop-down menu. MNIS Data Gateway should be started.
<b>Control Port</b>	Select this option and specify the correct value to receive RSSI information in GPS messages and to control the Data Gateway status.  Default: 55000
<b>Other properties</b>	Use default values.

- Click **Test** to test the Data Gateway connection. If the test fails, check the network and the MNIS Data Gateway logs or contact technical support.
- If your system includes multiple Data Gateways and the MNIS is installed on the TRBOnet Agent host, keep the **Redundant services** list for MNIS Data Gateway empty. In this case, MNIS Data Gateway and TRBOnet Agent redundancy shall be managed on the TRBOnet Server level.

**To configure connection to Data Gateway installed on a different computer:**

- In the left pane of the configuration tool, click your Capacity MAX system under **MOTOTRBO**. In the right pane, click **Add Data Gateway**.
- In the left pane, click **Data Gateway** under your Capacity MAX system.
- In the right pane, specify the following Data Gateway connection properties (Table 5).

**Table 5: Connection properties for Data Gateway installed on a different computer**

TRBOnet property	Description
<b>Use Data Gateway</b>	Select this option to enable Data Gateway in TRBOnet.
<b>Service is on a local host</b>	Keep not selected.

TRBOnet property	Description
<b>IP Address</b>	Specify the IP address of the computer where MNIS Data Gateway is installed.
<b>Control Port</b>	Select this option and specify the correct value to receive RSSI information in GPS messages and to control the Data Gateway status.  Default: 55000
<b>Other properties</b>	Use default values.

- In the left pane, click **Advanced settings** under **Data Gateway**. In the right pane, specify the additional Data Gateway connection properties (Table 6).

**Table 6: Advanced properties for Data Gateway installed on a different computer**

TRBOnet property	Description
<b>Register network routes</b>	Enable this option to allow TRBOnet Agent to update the Windows route table. If multiple TRBOnet Agents are installed on the same computer, only one TRBOnet Agent must have this option enabled to prevent collisions.
<b>Register port forwarding rules on gateway</b>	Enable this option.
<b>Send data to group over control port</b>	Enable this option.
<b>Other properties</b>	Use default values.

- Click **Test** to test the Data Gateway connection.
- If your system includes multiple MNIS Data Gateways and the remote TRBOnet Agent is installed on a dedicated computer, you can fill the **Redundant services** list for MNIS Data Gateway. If the main MNIS Data Gateway fails, TRBOnet automatically connects to the next active redundant Data Gateway and changes the Windows route table on the TRBOnet Agent host accordingly.



### 5.2.3. Configuring Connection to MNIS VRC Gateway

MNIS VRC Gateway is a service used by TRBOnet to initiate and receive voice calls from a Capacity MAX system. TRBOnet requires at least one VRC Gateway connection to be able to initiate, receive, and record voice calls.

TRBOnet operates as a virtual software radio in a Capacity MAX system. TRBOnet can emulate one or several radios. Each virtual radio can initiate and receive private, group, and site calls. To be able to initiate and receive voice calls, do the following:

- In the Radio Management software, register all required virtual radios, groups, and All Call entities. Virtual radios must be registered as **Console** radios.
- In the TRBOnet Agent configuration, create a connection for each MNIS VRC Gateway available in the Capacity MAX system. Then add voice paths for all registered virtual radios, groups, and All Call entities to the MNIS VRC Gateway connections. Each virtual radio shall be added to one MNIS VRC Gateway connection to avoid collisions at runtime.

When TRBOnet Agent starts, it registers all specified voice paths to a respective VRC Gateway.

#### To configure connection to MNIS VRC Gateway:

1. In the left pane of the configuration tool, select your Capacity MAX system. In the right pane, click **Add VRC Gateway**.

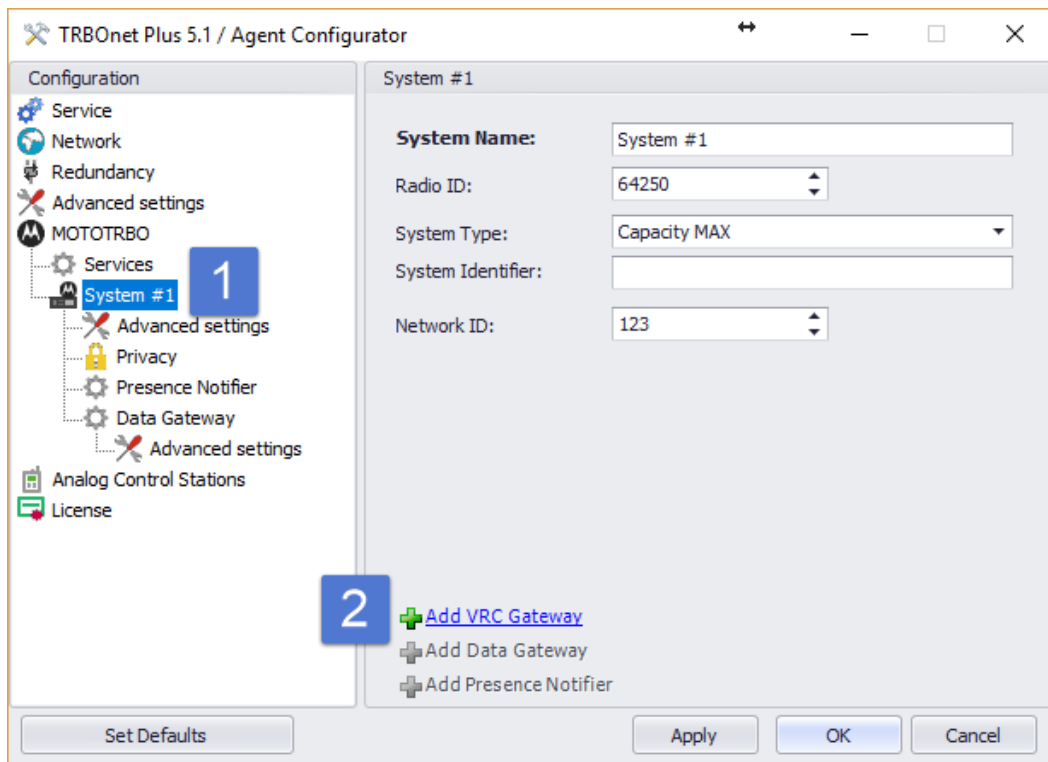
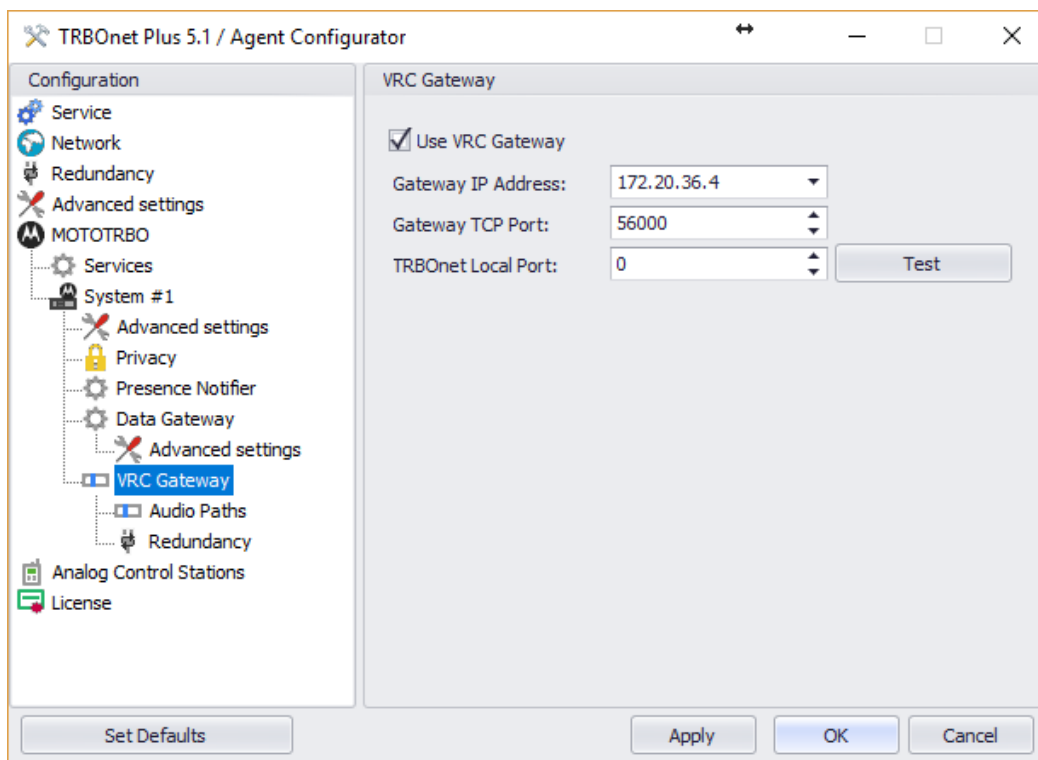


Figure 12: Adding a VRC Gateway connection

2. In the left pane, select **VRC Gateway** under your system.



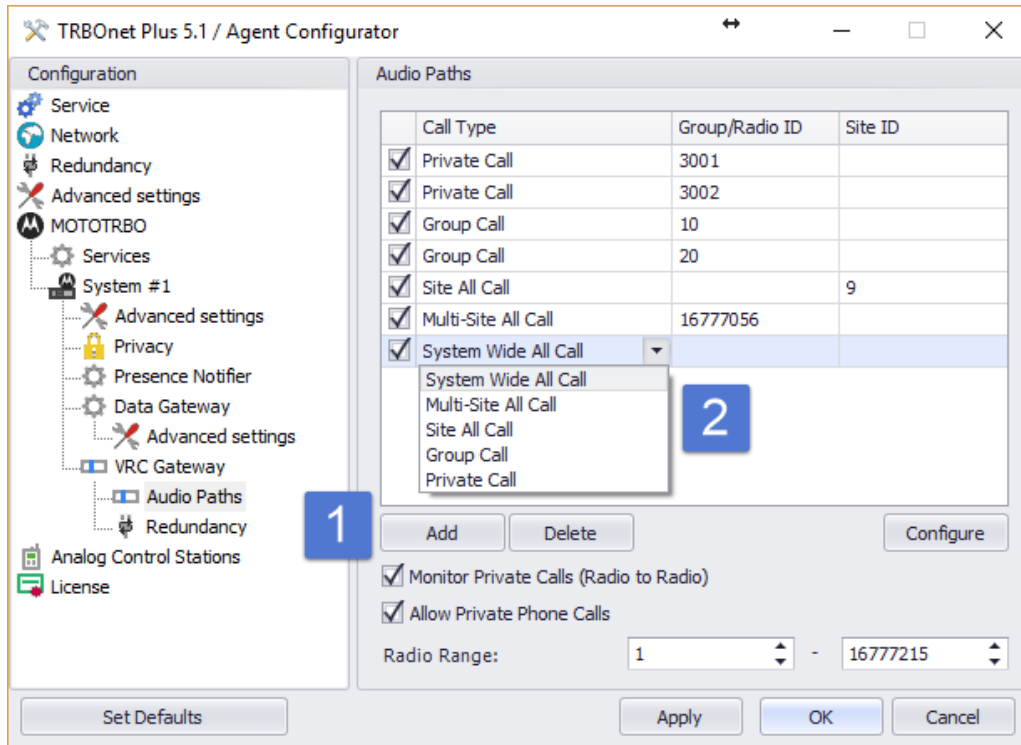
**Figure 13: Configuring connection to VRC Gateway**

3. Specify the VRC Gateway connection properties in the right pane.

**Table 7: Voice Gateway connection properties**

TRBOnet property	Description
<b>Use VRC Gateway</b>	Select this option to enable VRC Gateway in TRBOnet.
<b>Gateway IP Address</b>	Specify the IP address of VRC Gateway.
<b>Gateway TCP Port</b>	Specify the TCP port of VRC Gateway. Specify the value as in the VRC Gateway configuration file (Figure 9 on page 17). Default: 56000
<b>TRBOnet Local Port</b>	The local IP port allocated for VRC Gateway communication. Specify any non-used port, or keep "0" for TRBOnet to select the port automatically.

4. Press **Test** to ensure that the connection settings are valid. A successful test shows the "System State: Active" message.
5. To add a voice path, click **Audio Paths** under **VRC Gateway** in the left pane, then click **Add**. Expand the **Call Type** menu and click the type of a voice path:

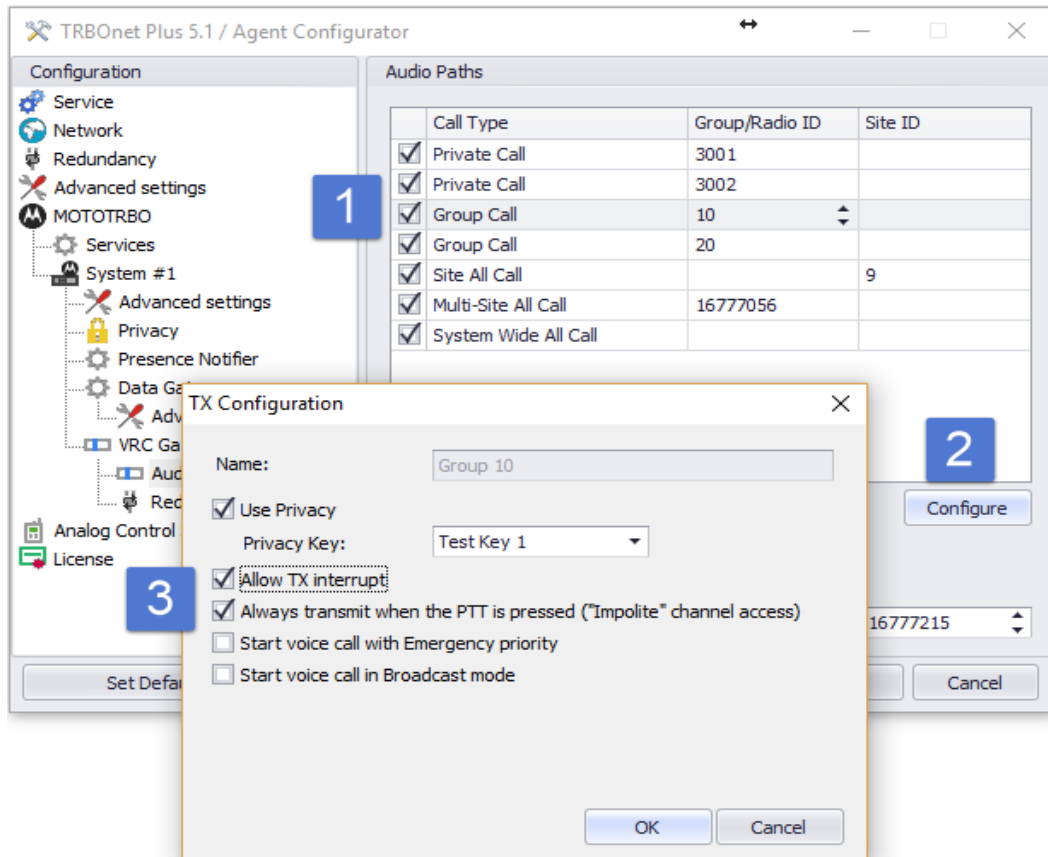


**Figure 14: Adding voice paths to a VRC Gateway connection**

- **Private Call:** Select to add a private voice path for a virtual radio. Specify the radio ID in the **Group/Radio ID** field.
- **Group Call:** Select to add a group voice path for a talk group. Specify the group number in the **Group/Radio ID** field.
- **Site All Call:** Select to add a Site All Calls voice path. Specify the RF Site ID in the **Site ID** field. You can add one Site All Call voice path per site.
- **Multi-Site All Call:** Select to add a Multi-Site All Calls voice path. You can add multiple Multi-Site All Call voice paths.
- **System Wide All Call:** Select to add a System Wide All Calls voice path. You can add one System Wide All Call per MNIS VRC.

Note: Add private voice paths for all virtual radios on which you need to initiate and receive voice calls. As a must, register the default radio ID specified in the Capacity MAX system properties (Table 2 on page 13, property **Radio ID**).

6. If necessary, specify additional properties for the configured voice call path. To do this, select the added voice call path and click **Configure**.



**Figure 15: Configuring additional properties for voice paths**

7. In the popup window, specify the additional voice call properties (Table 8).

**Table 8: Additional voice path properties**

TRBOnet property	Description
<b>Name</b>	Type the default caption for the PTT box to be displayed in TRBOnet Dispatch Console.
<b>Use Privacy</b>	Enable this option to enable Privacy for the selected voice call path. Outgoing calls from the dispatcher will be encrypted.
<b>Privacy Key</b>	Select the encryption key to protect outgoing calls from dispatchers.
<b>Allow TX interrupt</b>	Enable this option to allow subscriber units (SU) to interrupt dispatcher transmission on the selected voice call path.

TRBOnet property	Description
	<p>Note: In the Radio Management software, configure <b>In-Call Criteria: TX interrupt</b> for each SU provided with this option.</p>
<p><b>Always transmit when the PTT is pressed (“Impolite” channel access)</b></p>	<p>Enable this option to allow dispatchers to interrupt subscriber units.</p> <p>Note: In the Radio Management software (RM configuration &gt; Personality), enable option <b>Allow Interruption</b> for subscriber units (SU) on the selected voice call path.</p>
<p><b>Start voice call with Emergency priority</b></p>	<p>Enable this option to allow dispatchers to use the selected group call path for Emergency notifications. A group call will pass through VRC Gateway with the Emergency priority. The PTT box will have a special emergency indication during the call. Subscriber units will indicate the call as Emergency.</p>
<p><b>Start voice call in Broadcast mode</b></p>	<p>Enable this option to allow dispatchers to use the selected group call path for notifications. Voice calls will start with the Broadcast attribute and subscriber units will be not able to answer to this call during hangtime.</p>

8. TRBOnet can operate multiple VRC Gateways at a time. To add more VRC Gateways, select the system name in the left pane of the configuration window and click **Add VRC Gateway** in the right pane.
9. If you have multiple MNIS VRC Gateways in a system for redundancy purposes, you can fill the list of redundant gateways for each VRC Gateway. In the left pane, click **Redundancy** under your system name and under **VRC Gateway**. In the right pane, click **Add** to add a redundant gateway and specify the connection properties.

If the main VRC Gateway fails, TRBOnet automatically connects to the next active redundant VRC Gateway and re-registers all voice call paths of the failed VRC Gateway to the current one. When the main VRC Gateway recovers, TRBOnet switches back to it.

### 5.2.4. Configuring Phone Interconnect Connection and Voice Recording

In Capacity MAX systems, a radio can initiate and receive phone calls to/from PSTN users. Also, TRBOnet can record private radio-to-radio calls. To be able to use this functionality, do the following:

- In the Radio Management software, go to the Subscriber Access Control table and configure the radios. For each radio, define the VRC Gateway for phone calls and voice recording. The indicated VRC Gateway should be used by TRBOnet.

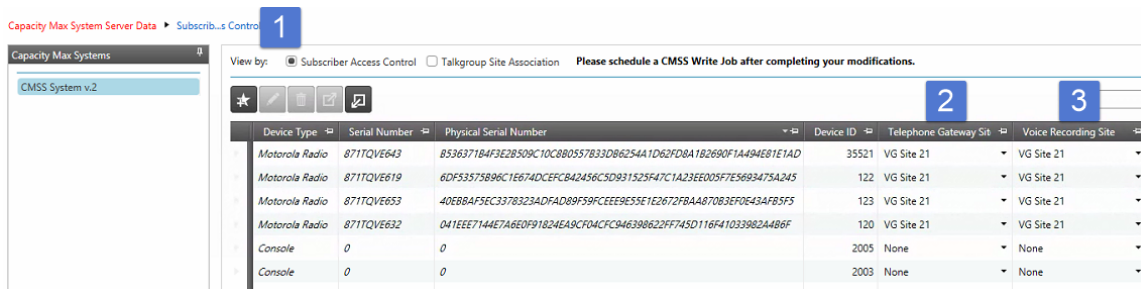


Figure 16: Configuring a radio for communication with PSTN users in the Radio Management tool

- In the TRBOnet Agent configuration, open the respective VRC Gateway page and enable the **Allow Private Phone Calls** and **Monitor Private Calls** options. The **Radio Range** property specifies the range of radio IDs for which phone calls and voice recording are allowed.

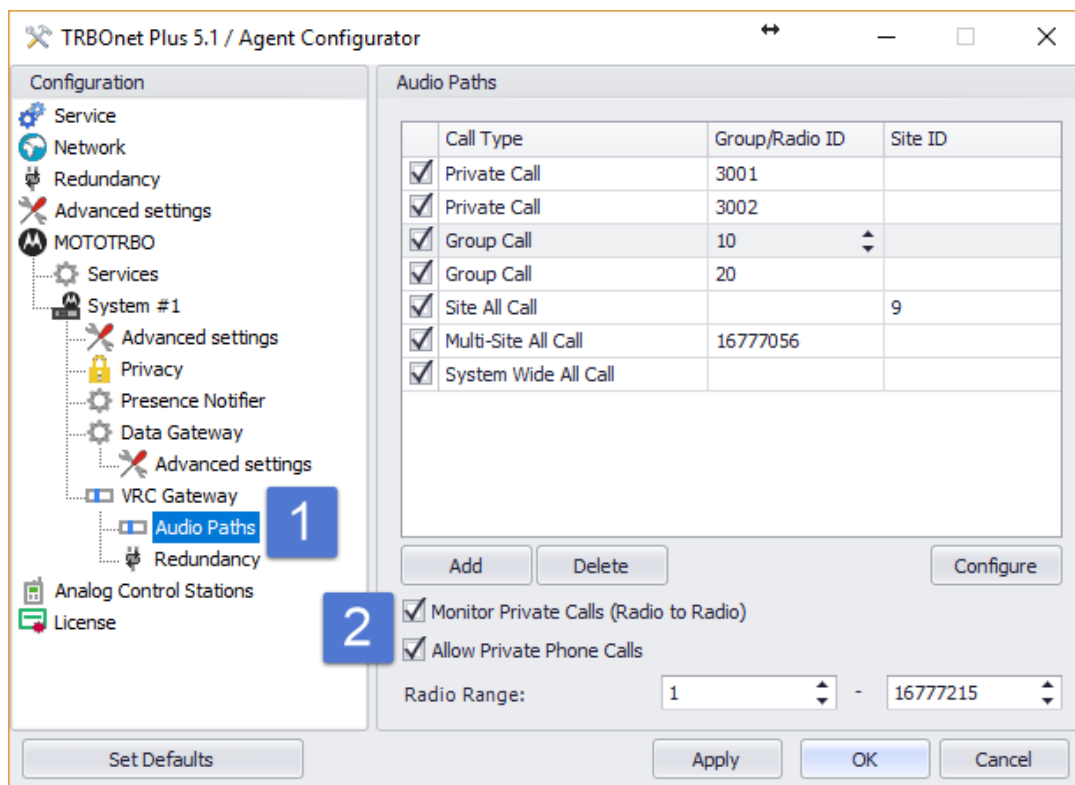


Figure 17: Configuring TRBOnet Agent for work with Phone Interconnect and Voice Recording

VRC Gateway will forward Phone Interconnect requests to TRBOnet Agent. TRBOnet Server used at this configuration will process phone call requests, establish and manage sessions. Refer to section 6.4. Configuring Phone Interconnect Server (page 33) for additional configuration steps required by the Phone Interconnect functionality.

### 5.3. Configuring N+1 Redundancy for TRBOnet Agent

To ensure fail-safe operation of TRBOnet Agent in a system, it is possible to use the failover configuration based on N+1 redundancy. In this configuration, TRBOnet Agent can be configured for work in the hot-standby mode. In this mode, TRBOnet Agent controls the statuses of the top-level TRBOnet Agents and does not process any traffic as long as all top-level TRBOnet Agents have are available and in the Active status.

#### To configure Software Agent to work in hot-standby mode:

1. Launch TRBOnet Agent. In the left pane of the configuration window, select **Redundancy**.
2. In the right pane, select the **Redundant agent mode** option. Select the **Passive** redundancy mode.
3. In the **Main agents** list, add connections to the top-level TRBOnet Agents in the redundancy bundle.

Your redundant TRBOnet Agent will be activated only if all TRBOnet Agents in the **Main agents** list have become unavailable and/or inactive. TRBOnet Agent becomes inactive if it has lost connection to all MOTOTRBO services, or if all MOTOTRBO services are not active.

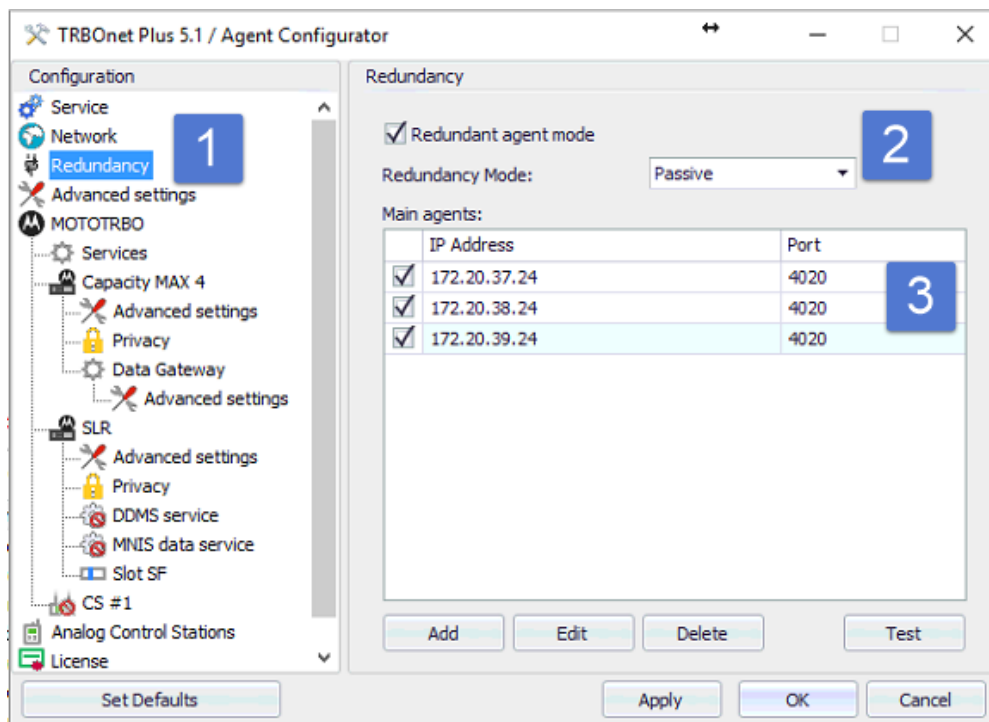


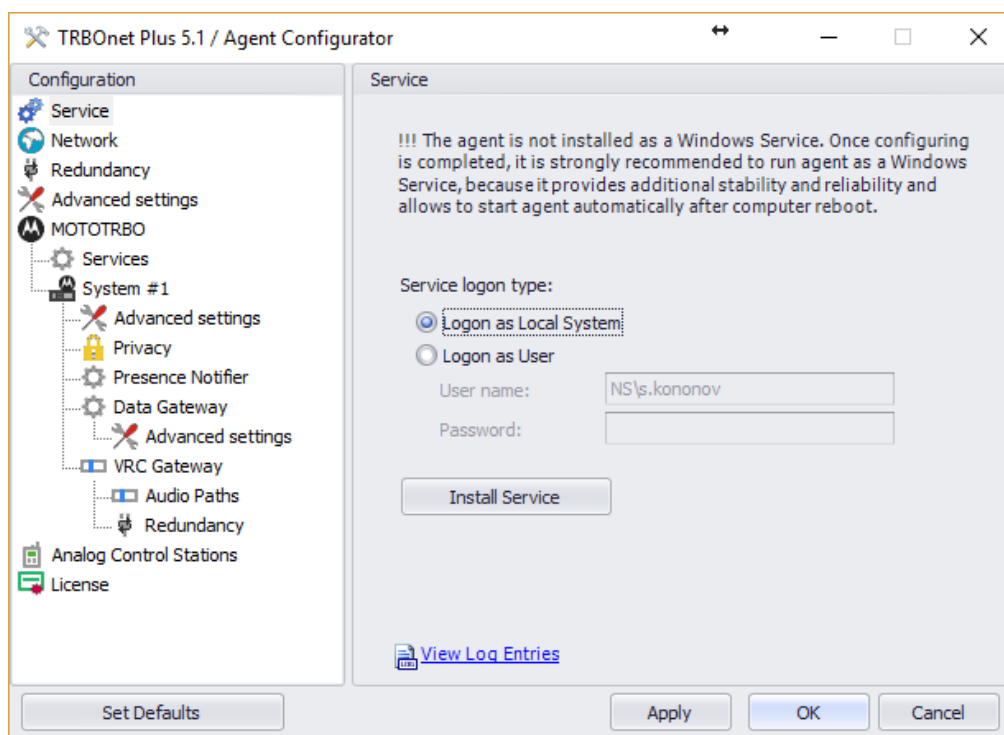
Figure 18: Configuring N+1 redundancy for TRBOnet Agent

## 5.4. Running TRBOnet Agent as a Windows Service

Running TRBOnet Agent as a Windows service is a mandatory configuration step. When it runs as a service, TRBOnet Agent gains more stability and starts automatically after computer reboot.

**To run TRBOnet Agent as a Windows service:**

1. Launch the TRBOnet Agent application. In the left pane of the configuration window, click **Service**.



**Figure 19: Running TRBOnet Agent as a Windows service**

2. Select the account under which the service will be running:
  - **Logon as Local System (Recommended):** Select the Local System account.
  - **Logon as User:** Select your current Windows User account.
3. Click **Install Service**. The Windows service is installed and stopped.
4. Click **Save changes and restart service**.

To learn the TRBOnet Agent status, click **View Log Entries** in the right pane. In the **View Log Entries** window, check the latest TRBOnet Agent log on the **Application** page. An empty log indicates the normal operational status.



## 6. TRBOnet Server Configuration

This section describes how to configure TRBOnet Server for communication with a Capacity MAX system.

**Table 9: High-level steps for configuring TRBOnet Server**

#	High-level steps	Refer to:
1	<p>Launch the TRBOnet Server application by double-clicking the TRBOnet Server icon on the desktop or by selecting <b>All Programs</b> and then <b>Neocom Software</b> and <b>TRBOnet Server</b> from the <b>Start</b> menu.</p> <p>When TRBOnet Server is launched, the main configuration window appears.</p>	
2	Apply a license with Capacity MAX support (optional).	6.1. Applying a License with Capacity MAX Support (page 29)
3	Specify a connection to the TRBOnet database.	6.2. Adding a TRBOnet Database Connection (page 30)
4	Specify a connection to a MOTOTRBO radio network via TRBOnet Agent.	6.3. Adding a MOTOTRBO Connection via TRBOnet Agent (page 31)
5	Configure Phone Interconnect Server.	6.4. Configuring Phone Interconnect Server (page 33)
6	Configure N+1 redundancy for TRBOnet Server (optional).	6.5. Configuring N+1 Redundancy for TRBOnet Server (page 34)
7	Configure TRBOnet Server to work as a Windows service.	6.6. Running TRBOnet Server as a Windows Service (page 35)

### 6.1. Applying a License with Capacity MAX Support

The downloadable installation package of TRBOnet PLUS comes with a free 60-day evaluation license that allows two Capacity MAX connections. If you need to connect more Capacity MAX systems to the same TRBOnet Server or TRBOnet Agent, contact Neocom Software, Ltd for a new license with more connections included.

### To apply a new license:

1. Copy the new license file to a local folder. If this folder contains other license files, delete them.
2. Launch TRBOnet Server. In the configuration window, select **License** in the left pane.
3. Click **License Manager** in the right pane.
4. In the **License Manager** window, follow the instructions and select the new license file from the local folder.

## 6.2. Adding a TRBOnet Database Connection

TRBOnet PLUS stores all collected data in the MS SQL database. You need to create a TRBOnet database and specify the database connection in the TRBOnet Server configuration.

### To create a TRBOnet database connection:

1. Launch TRBOnet Server. In the configuration window, select **Database** in the left pane.
2. In the right pane, specify the following connection properties:

**Table 10: TRBOnet database connection properties**

Property	Description
<b>SQL Server</b>	Select the SQL Server from the drop-down menu or enter it manually.
<b>Database</b>	Specify the preferred name of the database.
<b>Authentication</b>	<p>Select the authentication method through which TRBOnet Server will connect to the database:</p> <ul style="list-style-type: none"> <li>▪ <b>SQL Server:</b> TRBOnet Server will use the SQL Server user credentials to connect to the database.</li> <li>▪ <b>Windows:</b> TRBOnet Server will use your Windows user credentials to connect to the database (recommended).</li> </ul> <p><b>Note:</b> The selected account must be granted rights to connect to SQL Server, create the database, and update the existing database.</p>
<b>Login</b>	If <b>SQL Server</b> authentication is selected, specify a valid SQL Server user name.
<b>Password</b>	If <b>SQL Server</b> authentication is selected, specify a valid SQL Server user password.

3. Click **Create Database**. The database with the specified name is created.
4. Click **Test Connection**.

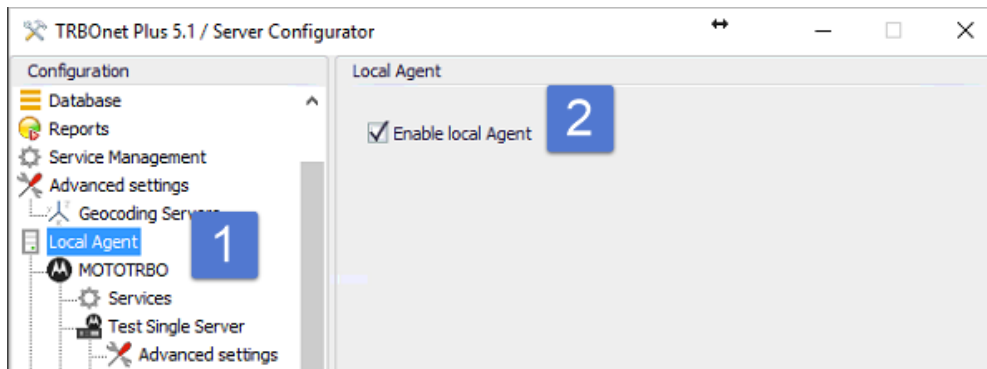
### 6.3. Adding a MOTOTRBO Connection via TRBOnet Agent

Depending on the selected topology, TRBOnet Server can be connected to a MOTOTRBO network via the built-in TRBOnet Agent or a remote TRBOnet Agent installed on a different computer. In complex configurations, TRBOnet Server can use one built-in TRBOnet Agent and multiple remote TRBOnet Agents at the same time.

#### 6.3.1. Enabling the Built-In TRBOnet Agent

**To enable the built-in TRBOnet Agent on TRBOnet Server:**

1. Launch TRBOnet Server. In the configuration window, click **Local Agent** in the left pane and make sure that the **Enable Local Agent** option is selected.



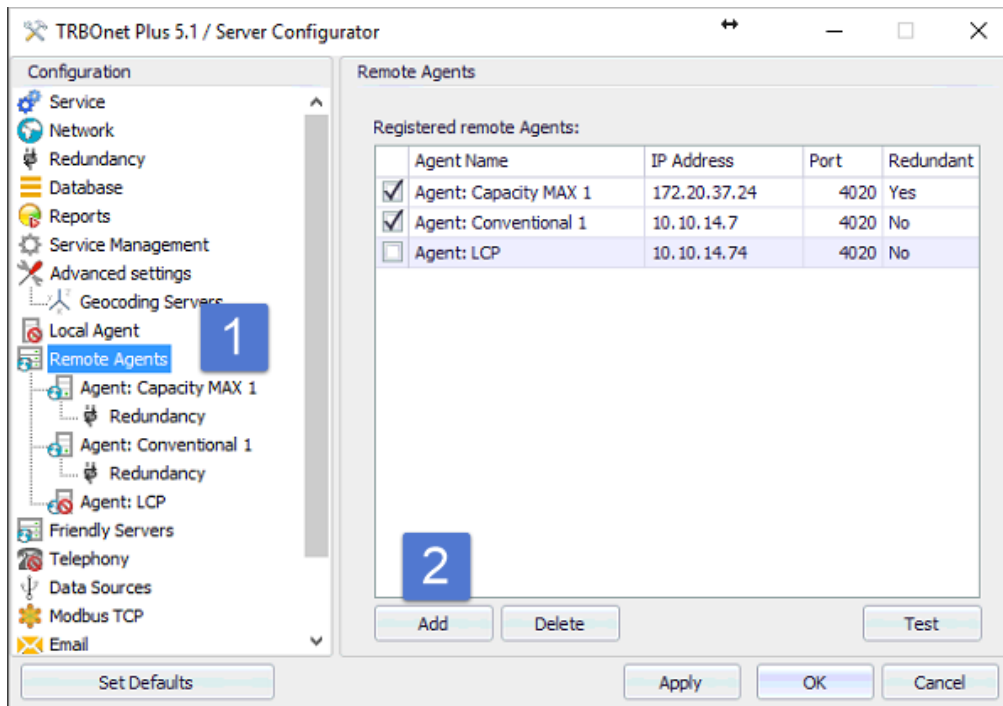
**Figure 20: Enabling the built-in TRBOnet Agent**

2. Configure a connection to Capacity MAX as described in section 5. TRBOnet Agent Configuration (page 11).

#### 6.3.2. Adding a Connection to a Remote TRBOnet Agent

**To add a connection to a remote TRBOnet Agent:**

1. Launch TRBOnet Server. In the configuration window, click **Remote Agents** in the left pane, then click the **Add** button in the right pane.



**Figure 21: Adding a connection to a remote TRBONet Agent**

2. In the left pane, specify the TRBONet Agent connection properties:

**Table 11: Remote TRBONet Agent connection properties**

Property	Description
<b>Agent Name</b>	A user-friendly name of the remote TRBONet Agent.
<b>IP Addresses</b>	The IP address or the host name of the computer where the selected TRBONet Agent is located.
<b>Port</b>	The command port allocated for communication with TRBONet Agent on the host computer. Default: 4020

3. Click **Test** to test the created TRBONet Agent connection. If the test is successful, the list of systems configured on the TRBONet Agent appears in the popup window.
4. If the just added TRBONet Agent has one or several redundant TRBONet Agents in the system, click **Redundancy** under your TRBONet Agent in the left pane. To add a redundant TRBONet Agent to the list, click **Add** in the right pane and specify the TRBONet Agent connection properties (Table 11).

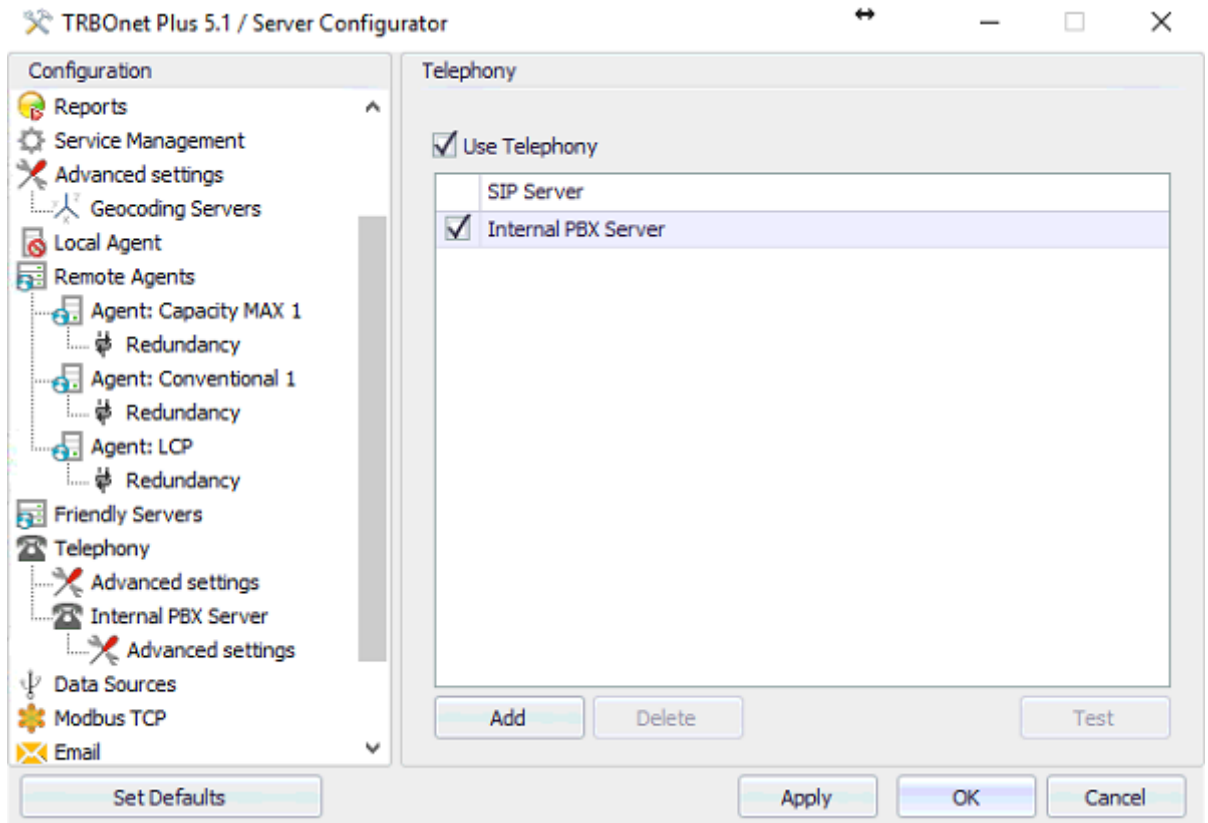
If the main TRBONet Agent fails or loses connection to all configured MOTOTRBO networks, TRBONet Server automatically switches to the next active TRBONet Agent in the list. When the main TRBONet Agent becomes available again, TRBONet switches back to it.

## 6.4. Configuring Phone Interconnect Server

TRBOnet can work as a SIP PBX. For testing and for small systems, it is recommended to use the internal TRBOnet PBX service.

### To enable the internal SIP PBX:

1. Launch TRBOnet Server. In the configuration window, select **Telephony**.
2. Select options **Use Telephony** and **Internal PBX Server**.



**Figure 22: Activating the internal PBX Server**

3. In the left pane, select **Internal PBX Server** under **Telephony**. In the right pane, specify the Internal PBX Server properties (Table 12).

**Table 12: Internal PBX Server properties**

TRBOnet Property	Description
<b>Use Internal PBX Server</b>	Select to enable the internal PBX Server.

TRBOnet Property	Description
<b>Local IP</b>	Select the LAN interface of the internal SIP PBX from the drop-down menu.  Note: The SIP phones must be on the same network with this LAN. The SIP phone configuration must specify the same IP address for the SIP Proxy/Registrar.
<b>Port</b>	Specify any non-used local port for the internal SIP PBX.  Default: 5060  Note: The SIP phone configuration must specify the same UDP port for the SIP Proxy/Registrar.
<b>SIP ID</b>	Specify the SIP number for the Dispatch Center. The user can dial this number on a SIP phone to reach the TRBOnet voice menu (IVR).
<b>SIP User</b>	Specify the SIP user name for the Dispatch Center. Outgoing calls from the TRBOnet Dispatch Center to SIP phones will show this calling user name.

- The default values in **Advanced Settings** under **Telephony** should not be modified, unless the phones require different settings. The recommended packet time is 60 milliseconds.

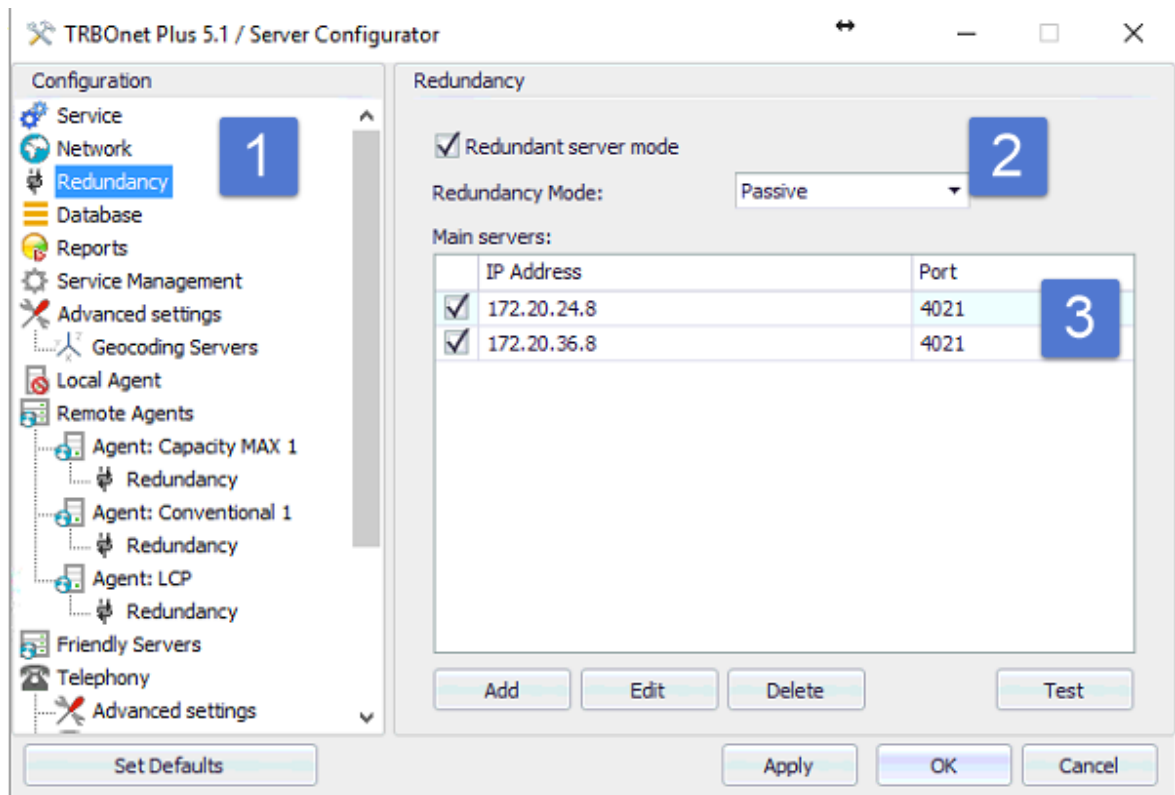
## 6.5. Configuring N+1 Redundancy for TRBOnet Server

To ensure fail-safe operation of TRBOnet Server in a system, it is possible to use the failover configuration based on N+1 redundancy. A redundant TRBOnet Server runs in the hot-standby mode. In this mode, TRBOnet Server controls the statuses of the top-level servers in the redundancy bundle and does not process any traffic as long as the top-level servers are available and active. TRBOnet Dispatch Console users with non-Administrator accounts cannot connect to TRBOnet Server running in the hot-standby mode.

### To configure TRBOnet Server for work in the hot-standby mode:

- Launch TRBOnet Server. In the left pane of the configuration window, select **Redundancy**. In the right pane, select the **Redundant server mode** option. Use the **Passive** redundancy mode for Capacity MAX.

- In the right pane, click **Add** to add all higher-level TRBOnet Servers to the **Main servers** list. Add the main TRBOnet Server on the top position, then add the redundant TRBOnet Server for the main one, and so on.



**Figure 23: Configuring N+1 redundancy for TRBOnet Server**

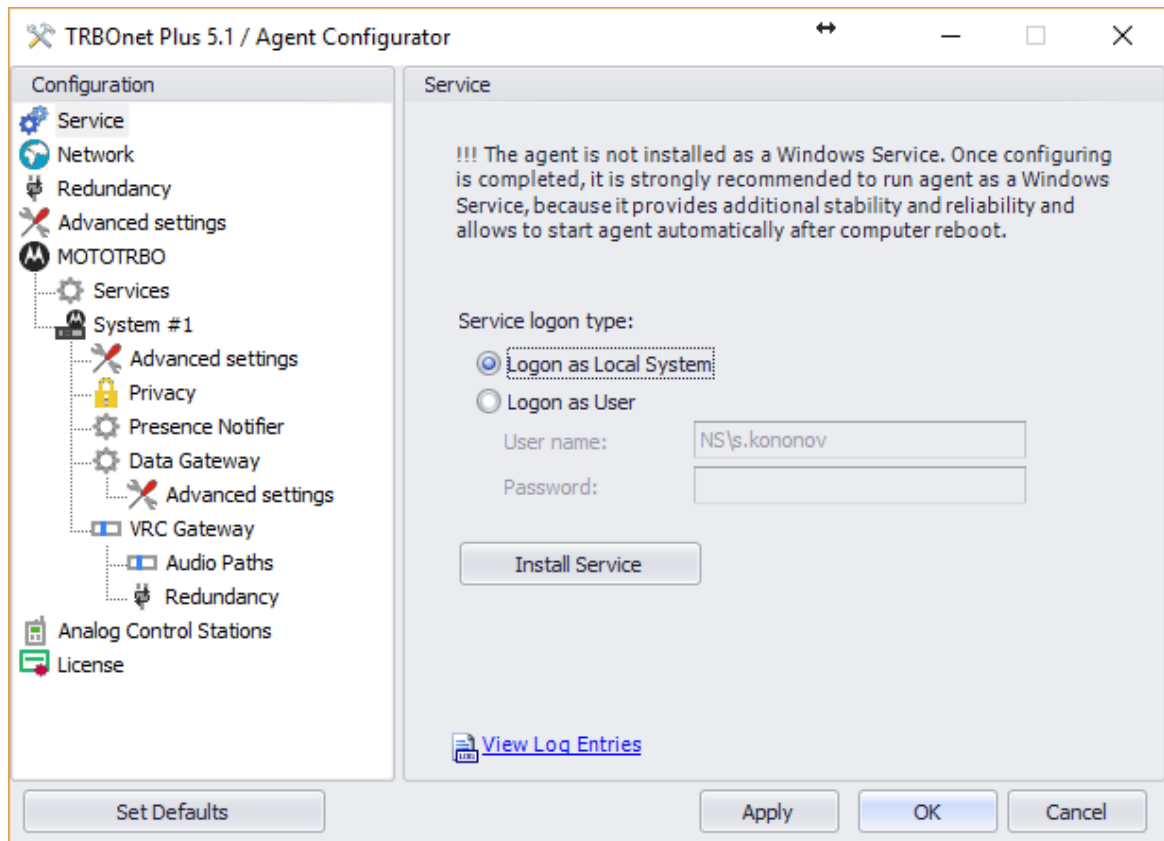
The current TRBOnet Server (Figure 23) is located on level 3 in the bundle, with two top-level servers placed on the above positions in the list. The current TRBOnet Server will be activated if all servers in the **Main servers** list have become unavailable and/or inactive. TRBOnet Server becomes inactive when connections to all services (MOTOTRBO, SIP, other) are lost.

## 6.6. Running TRBOnet Server as a Windows Service

Running TRBOnet Server as a Windows service is a mandatory configuration step. When it runs as a service, TRBOnet Server gains more stability and starts automatically after computer reboot.

### To run TRBOnet Server as a Windows service:

- Launch TRBOnet Server. In the left pane, select **Service**.



**Figure 24: Creating a Windows service**

2. Select the account under which the service will be running:
  - **Logon as Local System (Recommended):** Select the Local System account.
  - **Logon as User:** Select your current Windows User account.
3. Click **Install Service**. The Windows service is installed and stopped.
4. Click **Save changes and restart service**.

To learn the TRBOnet Server status, click **View Log Entries** in the right pane. In the **View Log Entries** window, check the latest TRBOnet Server log on the **Application** page. An empty log indicates the normal operational status.



## 7. Dispatch Console Configuration

The TRBOnet Dispatch Console is a client application intended for dispatchers operating the radio systems. This section describes how to finalize the TRBOnet PLUS configuration in the Dispatch Console and enable dispatchers to operate all types of calls in a Capacity MAX system.

**Table 13: High-level steps for configuring the TRBOnet Dispatch Console**

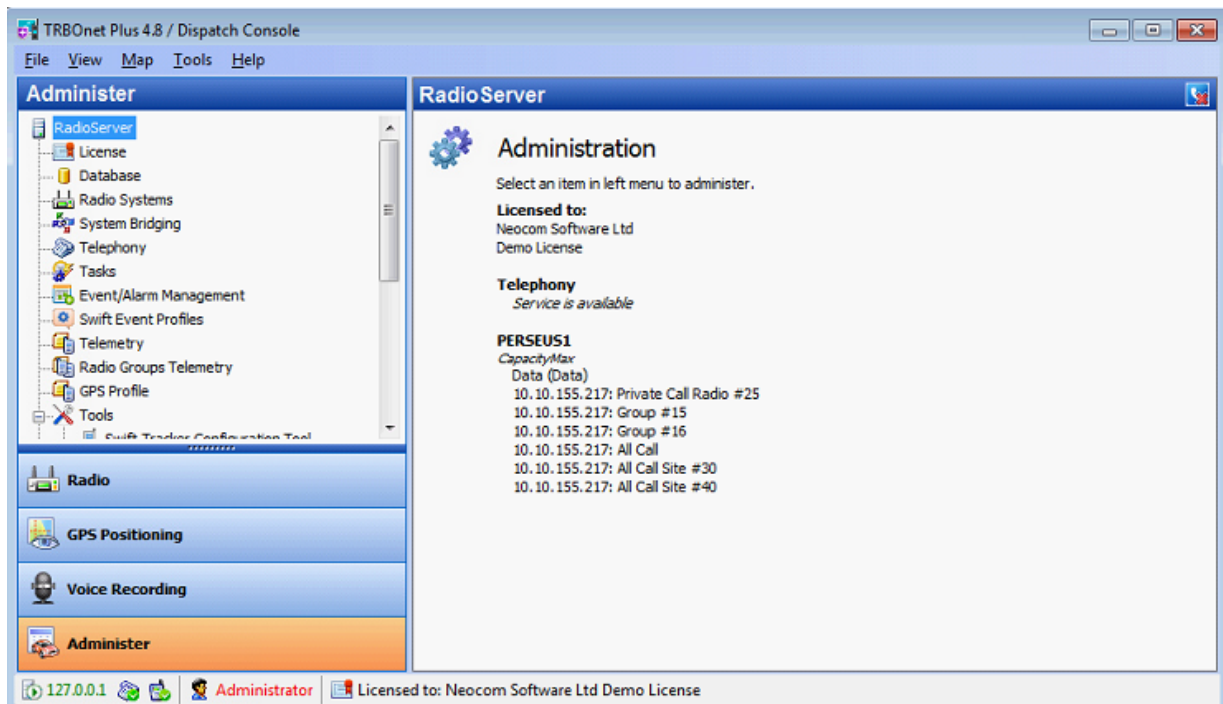
#	High-level steps	Refer to:
1	<p>Launch the Dispatch Console by clicking the shortcut on the Windows desktop. The Dispatch Console displays the window asking you to enter the TRBOnet Server IP address, user name, and password. Log in with the following credentials:</p> <ul style="list-style-type: none"> <li>▪ Default User Name: <b>admin</b></li> <li>▪ Default Password: <b>admin</b></li> </ul>	
2	Check the real-time system status	7.1. Checking the Real-time System Status (page 37)
3	Register talk groups	7.2. Registering Talk Groups (page 38)
4	Register subscriber radios	7.3. Registering Radios (page 39)
5	Register phone extensions	7.4. Registering Phone Extensions (page 40)

### 7.1. Checking the Real-time System Status

The administrative TRBOnet account enables you to check the system status in the Dispatch Console.

**To check the system status:**

1. In the main window of Dispatch Console, click the **Administration** tab in the left pane.
2. In the **Administration** (left) pane, select **RadioServer** from the tree.



**Figure 25: Checking the real-time status of a Capacity MAX system**

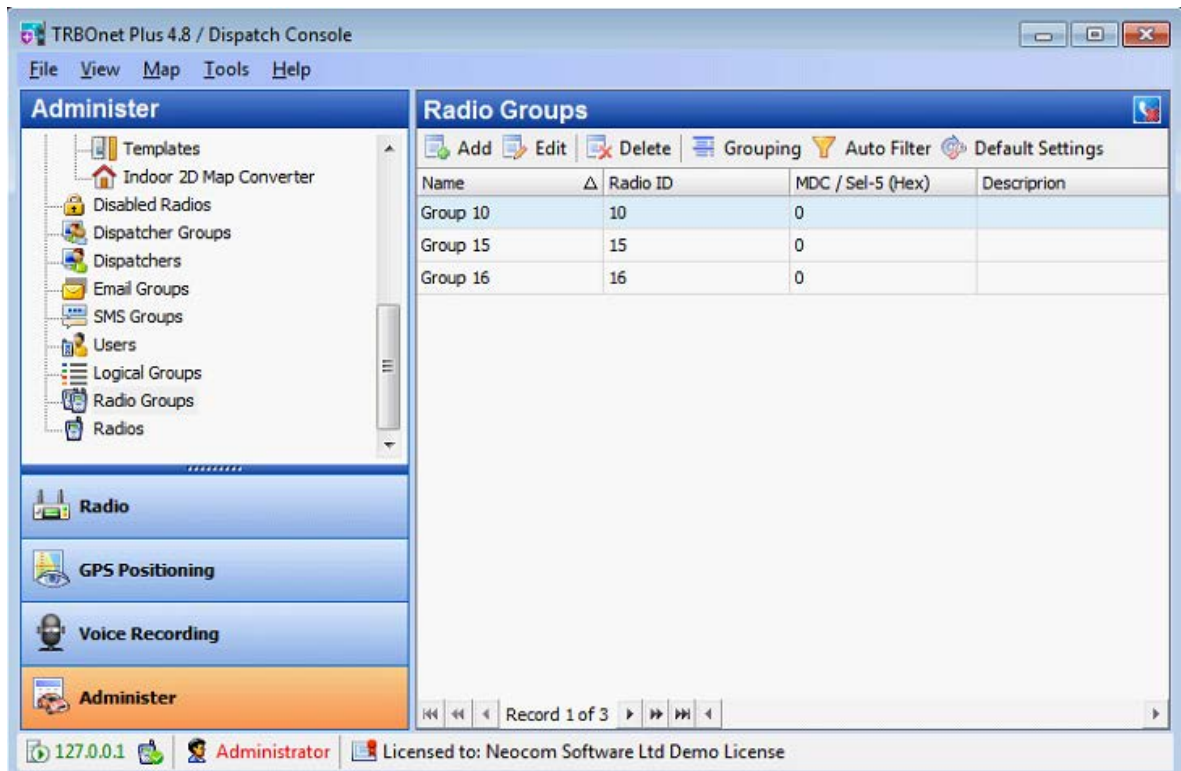
The right pane displays the status of your Capacity MAX system. If you do not see any messages in red text, the system is configured correctly. Otherwise, you need to analyze the error messages and make the required changes in the TRBOnet Server configuration.

## 7.2. Registering Talk Groups

By default, TRBOnet can only receive group calls. To be able to initiate group calls from the Dispatch Console in a Capacity MAX system, you need to register talk groups in the system.

### To register radio groups:

1. In the main window of Dispatch Console, click the **Administration** tab in the left pane.
2. In the **Administration** (left) pane, select **Radio Groups** from the tree.
3. Add all groups that should be accessed by dispatchers. To add a group, click **Add** in the right pane, specify the group properties, and click **OK**.



**Figure 26: Registering radio groups**

The following properties are mandatory:

- **Name:** A descriptive name of the group.
- **Group ID:** The group ID added in the TRBOnet Server configuration as a group voice path.

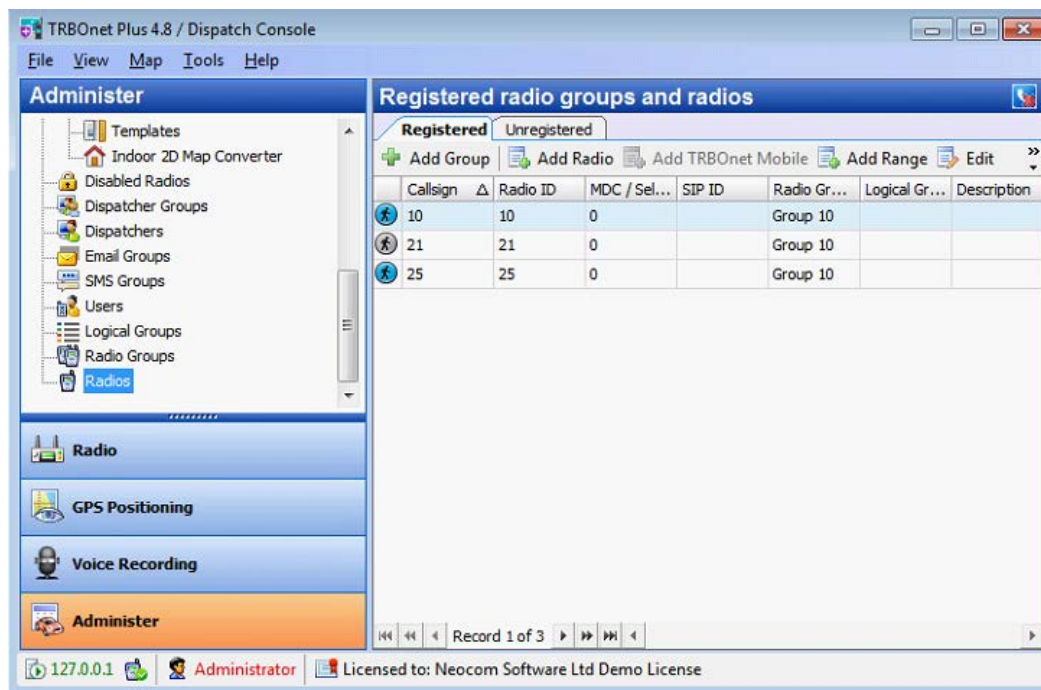
Later, you will be able to assign groups to particular dispatcher accounts. The administrative account can access all registered groups.

### 7.3. Registering Radios

TRBOnet can control the statuses of subscriber radios and receive and initiate private, data, and CSBK calls on subscriber radios. To be able to control a radio from TRBOnet, you need to register that radio in Dispatch Console. TRBOnet ignores voice, data, and CSBK calls from non-registered radios and does not store ignored calls in the TRBOnet database.

#### To register subscriber radios:

1. In the main window of Dispatch Console, click the **Administration** tab in the left pane.
2. In the **Administration** (left) pane, select **Radios** from the tree.
3. Add all required subscriber radios. To add a radio, click **Add Radio** in the right pane, specify the radio properties, and click **OK**.



**Figure 27: Registering subscriber radios**

The following properties are mandatory:

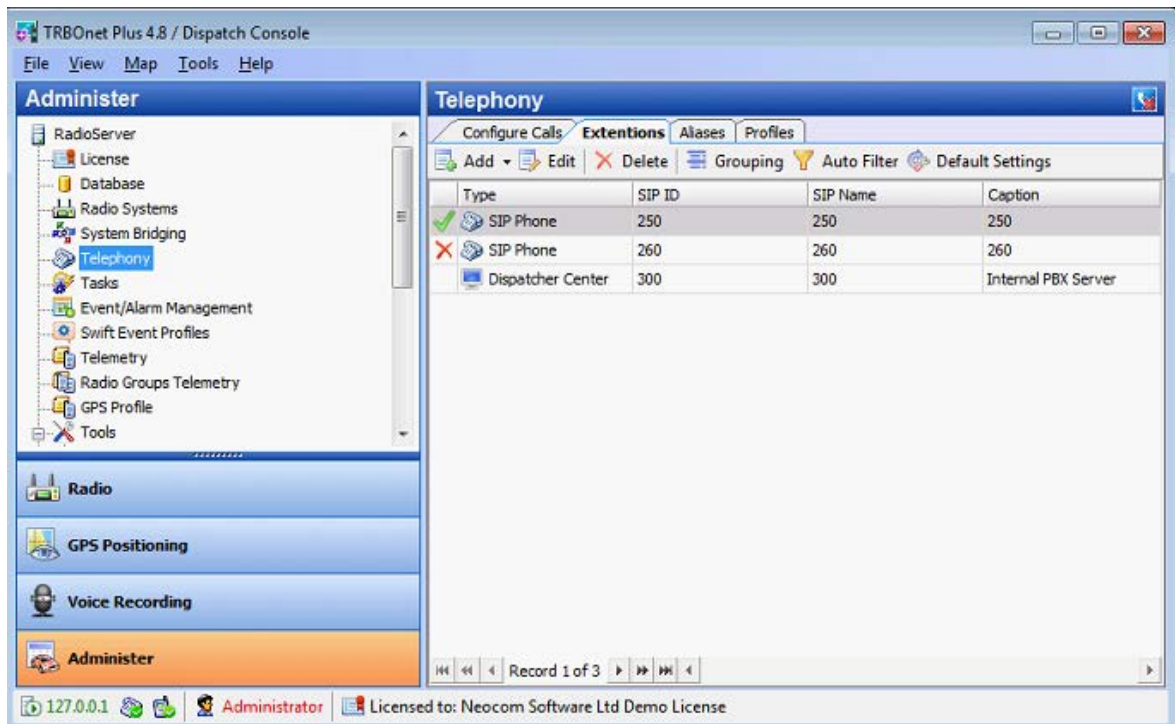
- **Callsign:** A descriptive name of a subscriber radio displayed to the dispatcher.
- **Radio ID:** The subscriber radio ID existing in a Capacity MAX system
- **Radio Groups:** The radio groups to which the radio belongs.

## 7.4. Registering Phone Extensions

To be able to use SIP phones (handsets or softphones) with the TRBOnet SIP PBX, you need to add SIP extensions to the system and configure your SIP devices.

### To register SIP Extensions:

1. In the main window of Dispatch Console, click the **Administration** tab in the left pane.
2. In the **Administration** (left) pane, select **Telephony** from the tree.
3. In the right pane, select the **Extensions** tab and add the required extensions. To add an extension, click **Add** in the right pane, then specify the extension properties and click **OK**.



**Figure 28: Registering SIP extensions**

Configure your SIP devices to connect to TRBONet PBX and use extensions created on the **Extensions** tab. If the SIP device is properly connected to the TRBONet Server, you can check the status of that device on the **Extensions** tab.

Note: Due to the SIP protocol specification, you need to wait after the TRBONet Server restarts until the registration interval expires and then all SIP devices are re-registered, or you can force reboot on your SIP devices.

By default, TRBONet enables you to make a call from a SIP phone to a different SIP phone, to a radio ID, or to the Dispatch Center number (Table 12 on page 33, **SIP ID** property), and from a radio to any SIP phone registered in the system.

To be able to make a call from a SIP phone to a radio group, you need to adjust the **Telephony** settings and define additional rules. Rules are needed because a radio group cannot be assigned to a registered extension.

#### **To enable calls from a SIP phone to a radio group:**

1. In the main window of Dispatch Console, click the **Administration** tab in the left pane.
2. In the **Administration** (left) pane, select **Telephony** from the tree.
3. In the right pane, select the **Configure Calls** tab and click **Configure** under **Incoming calls configuration**.
4. In the **Incoming calls configuration** window, specify the following recommended settings:

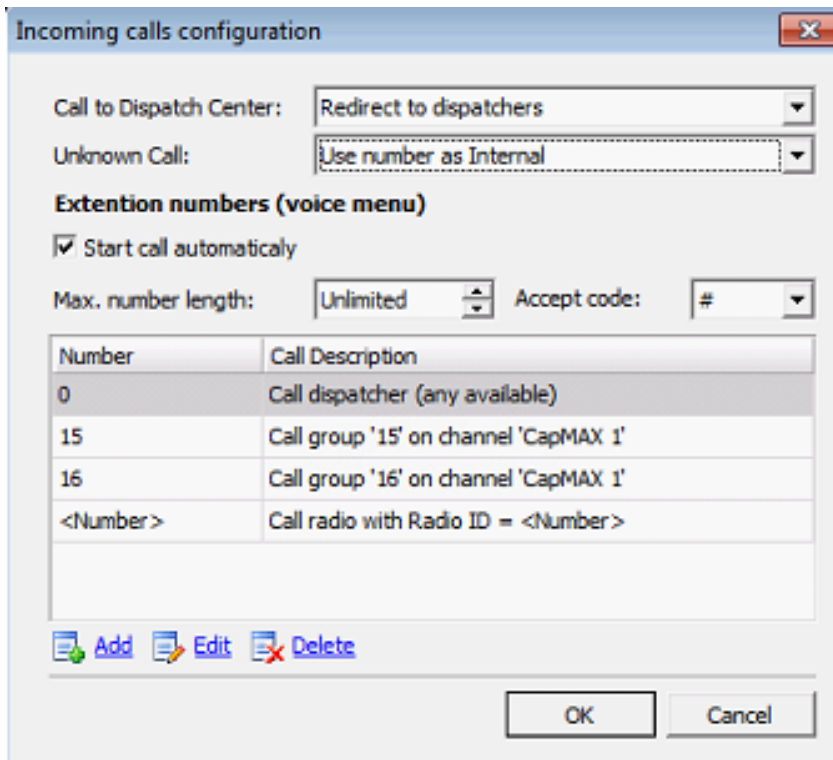


Figure 29: Configuring incoming calls

- **Call to Dispatch Center:** Select **Redirect to dispatchers** to redirect phone calls to online dispatchers.
  - **Unknown Call:** Select **Use number as Internal** to apply the rules if a non-registered number is dialed.
5. In the **Incoming calls configuration** window, add rules for making phone calls to radio groups. To add a rule, click **Add** and specify the rule settings.

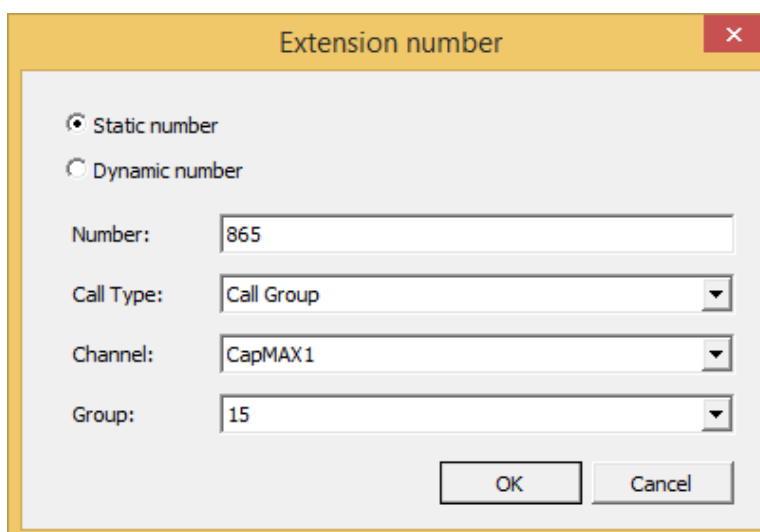


Figure 30: Defining a rule

- **Static number:** Select this option to assign a static dial number to a group ID. Specify a non-used dial number, the channel, and the group ID that can use this channel. The call type must be **Call Group**.

**Note:** If you cannot find your talk group in the **Group** drop-down menu, make sure you have added a group voice path for this group. For details, refer to section 5.2.3. Configuring Connection to MNIS VRC Gateway (page 21).

- **Dynamic number:** Select this option to use the dial number format <prefix> <group\_id>. Specify the prefix, the system, and the call type (select **Call Group**). The group ID will be identified dynamically from the dialed number. For instance, if you specify 12 as a prefix and the phone user dials 1233, the rule will redirect the call to Group 33.