ConSEL PLUS – Configuration of ConSEL PLUS hardware and software

for Capacity Plus Multi-Site operation

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AUTHORIZED APPLICATION PROVIDER MOTOTRBO MOTOROLA SOLUTIONS

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0. Basic assumptions for Capacity Plus (Capacity Plus Multi-Site) system design.

- The repeaters operate in **digital mode** (digital channel) in the **DMR** standard **with a purchased licence (for Capacity Plus Multi-Site operation -HKVN4063A).** Setting up the repeaters in analogue or mixed mode does not allow for network connectivity.
- The repeaters are connected to each other via an IP network. The IP network must have stable parameters, i.e. the resulting transmission delays must not exceed **90 ms** and must have a stable character. The manufacturer recommends that network fluctuations be less than 60 ms.
- One of the repeaters is defined as **Master repeater,** the others as **Peer** repeaters**.** The **Master repeater** requires **a static address in the IP network**. Repeaters defined as Peer can have an IP address assigned from a DHCP server.

1. Tasks of devices / applications in the system.

1.1. Capacity Plus Multi-Site (CPMS) system devices.

- **Master:** a repeater responsible for registering new repeaters/applications and notifying other repeaters/applications about changes in the network. After registering Peer devices or applications, the Master repeater distributes information about current participants to all network users. The Master repeater does not verify every transmission from Peers. Disconnecting the Master repeater from the network does not break up the established IPSC system.
  Note: Master repeater requires a STATIC IP ADDRESS.
- **Peer:** a repeater that retransmits audio and signals received from another site.

1.2. Applications running on Capacity Plus Single Site system

- **RDAC** (Repeater Diagnostics and Control):An application for system administration, allowing for monitoring (control) of operation of repeaters in the MOTOTRBO system. The RDAC software is seen as an additional repeater in the IP Site Connect system network.
- **MNIS (**MOTOTRBO Network Interface Service) is a Windows service application handling data between computer applications and MOTOTRBO radios. It is used on systems where Control Station cannot be used or is not needed. For IP Site Connect operation, repeaters used for data traffic require a **NAI Data License**.
- **DDMS** - Device Discovery and Mobility Service (DDMS) is a Windows application running as a service (i.e. launches automatically on Windows startup and runs in the background).It processes presence and mobility information from radios in the MOTOTRBO radio system. If DDMS is implemented with MNIS, both radio presence (radio is there) and mobility notification (radio is present and where) are supported. The channel and site where the radio transmits the ARS message shall be recorded. MNIS subscribes to DDMS to receive mobility information and uses this information to route data to the radio, wherever it is in the system.
- **ConSEL PLUS** – dispatcher application from **Aksel Sp. z o.o**.

2. Structure of Capacity Plus Multi-Site (Linked Capacity Plus).

For repeaters operating in digital DMR mode, there are two time slots to use, based on which logical communication channels can be created. After uploading a license for CPMS system to repeaters, the repeater can operate with dynamic allocation of logical talk channels (time slots) and allows for connection between different geographical areas. A Capacity Plus Multi-Site system is a combination of IPSC and Capacity Plus Single Site systems.
Before configuring a CPMS system, it is recommended to read the following documents:

- Configuration of ConSEL PLUS hardware and software for IP Site Connect.
- Configuration of ConSEL PLUS hardware and software for Capacity Plus Single Site.

In a Capacity Plus Single Site system it is possible to connect up to 15 devices in one location / site, of which one is of **Master** type and the rest are of **Peer** type.

These 15 connected devices include:
- Disabled repeaters
- Enabled repeaters operating in analogue mode
- Enabled repeaters operating in digital mode
- Maximum of 5 RDAC application connections to the system
- Third-party applications (the application is seen by the system as Peer)

Repeaters in a Capacity Plus Single Site system operate with a virtual dynamic rest channel. A rest channel is a virtual "token" toggled between available radio resources. After setting up a call for a specific conversation, the virtual "token" informs other radios about the radio channel on which the next radio call will be set up.

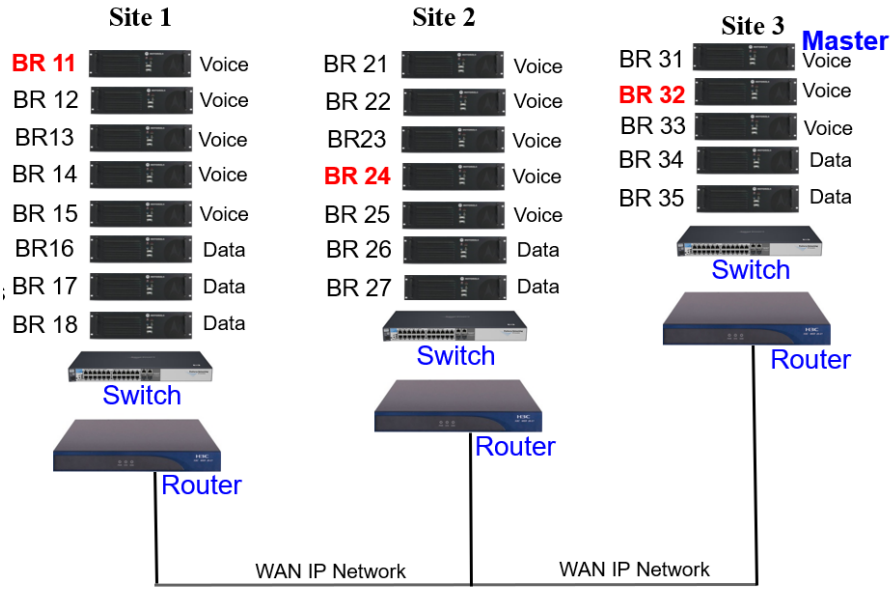

Figure 1 Capacity Plus Multi-Site system design.

3. Repeater configuration for Capacity Plus Single Site operation.

CPS and RM Configuration Client are Motorola's software applications for configuration of MotoTRBO devices.

Figure 2 CPS – repeater configuration software.

CPS is a software that allows you to configure repeaters and upload configurations via USB port.
RM Configuration Client is a software that allows you to configure repeaters and upload configurations via USB and LAN.

Note: The first programming of the repeater must be carried out via USB port.

After reading the device, an SLR5000 repeater can be configured in both programs.
When choosing to edit the configuration for a selected repeater in RM Configuration Client, a window opens identical to that for CPS configuration.

3.1. Reading the radio in CPS.

Figure 3 CPS – radio reading.

3.2. Reading the radio in RM.

The device you want to read must be added to the database with complete information.

Figure 4 RM – radio reading.

Once a configuration has been created on the server, the selected configuration can be edited.

3.3. Editing the configuration.

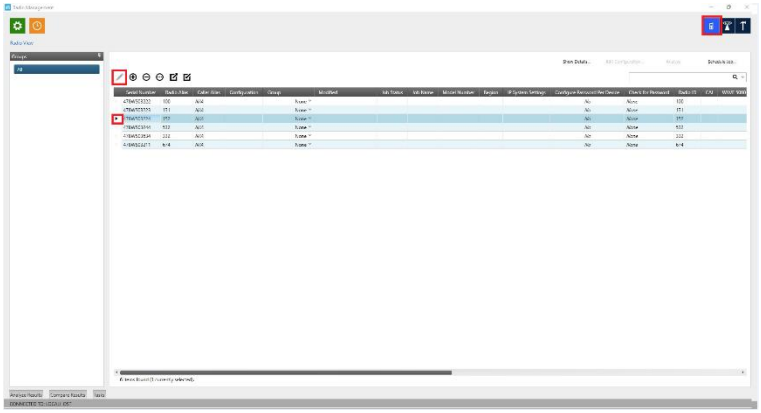

Figure 5 RM – editing configuration for selected device – select from icons

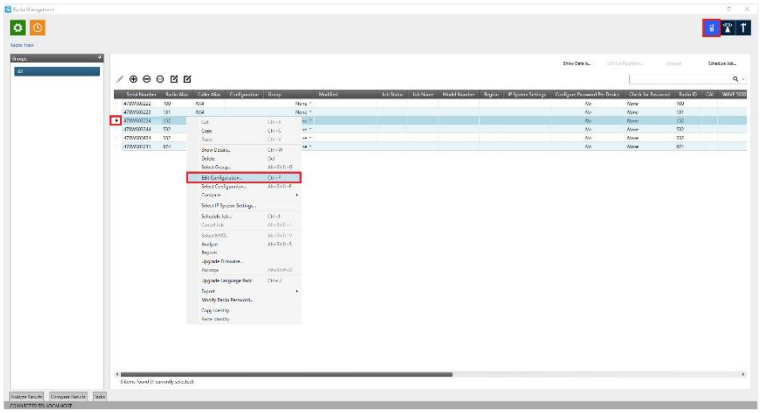

Figure 6 RM – editing configuration for selected device – right-click selection.

When choosing to edit the configuration for a selected device in RM Configuration Client, a window opens identical to that for configuration in CPS.

4. Repeater Configuration for Capacity Plus Single Site operation

After reading the device in CPS or editing the configuration in RM, you need to verify that the repeater is enabled for Capacity Plus Single Site operation.

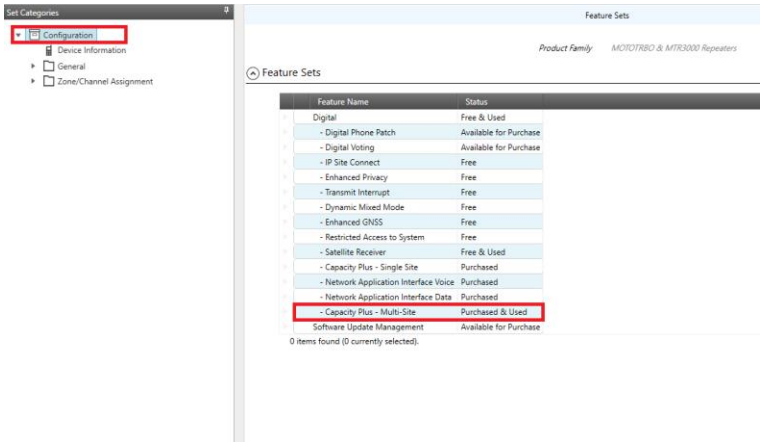

Figure 7 Repeater settings for Capacity Plus Multi-Site – licence verification.

Next you can see the tabs that need to be configured for operation in Capacity Plus Multi-Site.

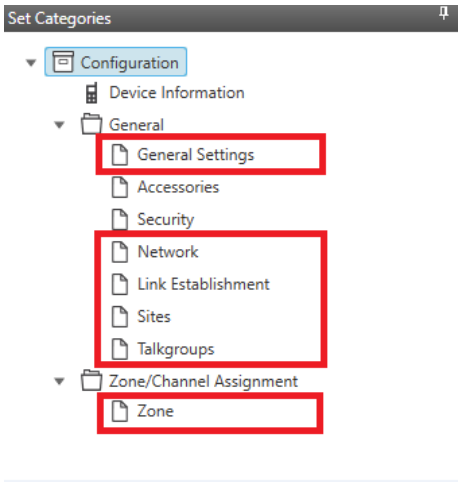

Figure 8 Repeater settings for Capacity Plus Multi-Site – necessary changes.

4.1. General settings.

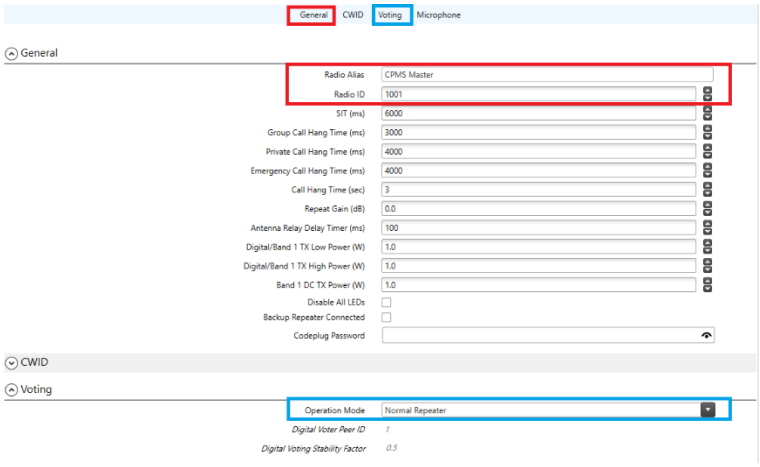

Figure 9 Repeater settings for Capacity Plus Multi Site – general settings.

Enter the following:

- Repeater/radio name: any description
- Repeater/Radio ID: to be placed outside the subscriber contact list
- Operating mode: working as a normal repeater.

4.2. Network settings.

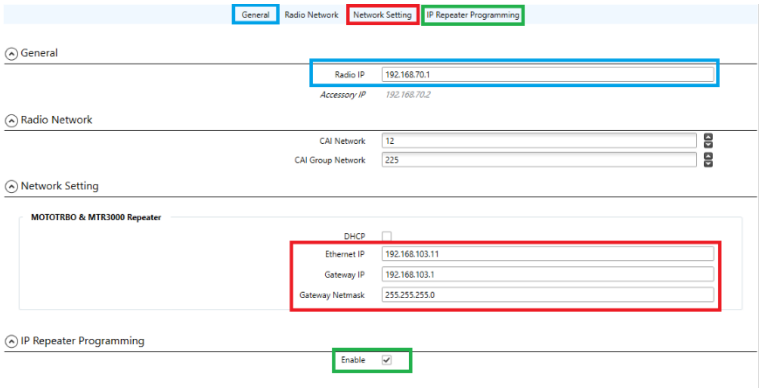

Figure 10 Repeater settings for Capacity Plus Multi Site – network settings.

Radio's IP address as seen from the PC at the USB port.
It is necessary to define IP addresses for repeaters from the network side.
Master repeaters must have static IP addresses.
Peer repeaters may have DHCP settings.
If repeaters are to be reprogrammed via the IP network, it is necessary to enable the IP Repeater Programming option.

4.3. Connection setup

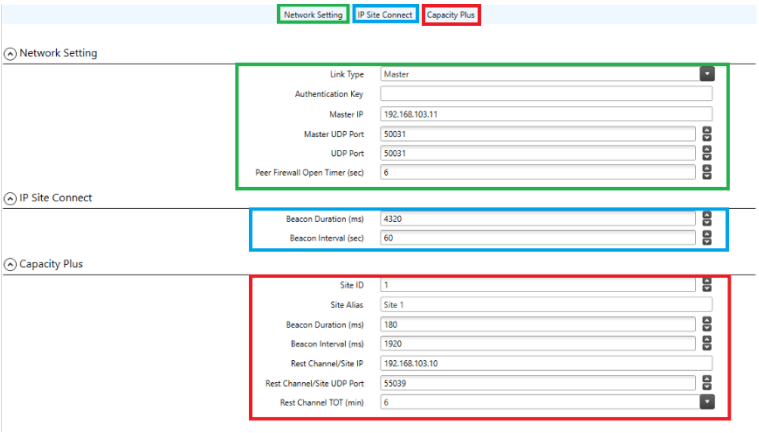

Figure 11 Settings for Capacity Plus Multi-Site operation – connection setup – settings for Master repeater.

Define the repeater's function in the system: **Master/Peer**.
In each repeater to operate in the Capacity Plus Single Site system, you can enter the authentication key for logging on to the Master device (the key provides a type of device authentication).
By default, Peer devices communicate with the Master via port **50000**. In the IPSC system, the Master's UDP port number is port **50000** for connection setup – notification to the Master and registration.
The operating port of the Master repeater can have any number; when changing it, remember to enter the port number correctly in Peer devices.
In the Capacity Plus tab, define the rest channel ("virtual token") parameters as IP / port for Site.
For all repeaters in the system, enter the same parameters for the rest channel at a given Site. (Different parameters for different Sites).
Note: The IP of the rest channel must be from the same subnet as the physical repeater interface from the network side.

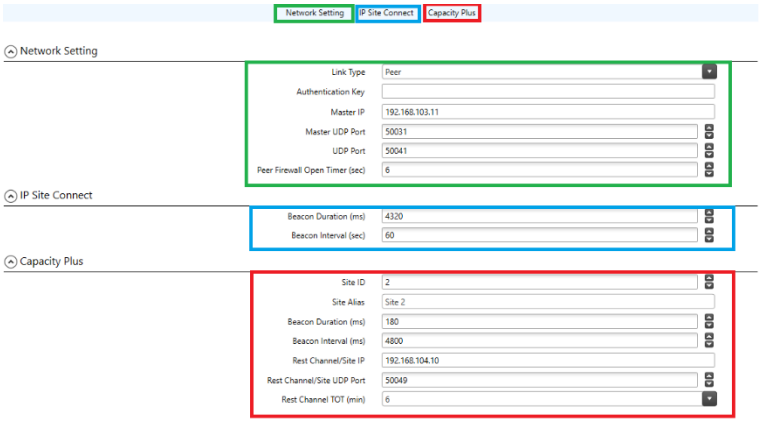

Figure 12 Settings for Capacity Plus Multi-Site operation – connection setup – settings for Peer repeater.

4.4. Channel zone assignment.

Under Zone / Channel Assignment tab, add a channel working in Capacity Plus Multi Site system and edit it.

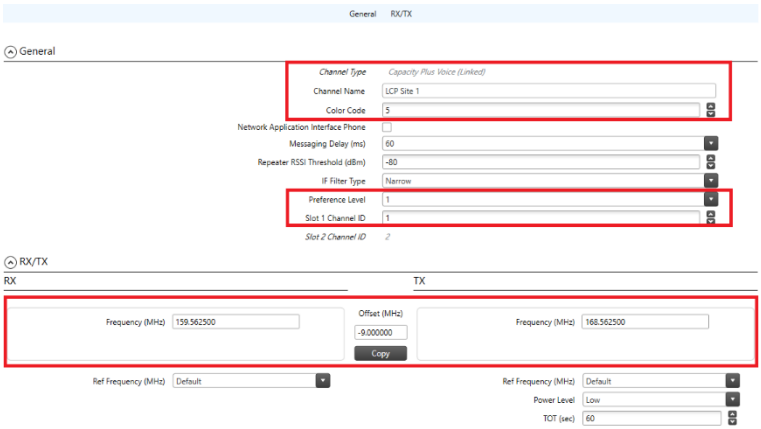

Figure 13 Repeater settings for Capacity Plus Multi Site – zone – representation of channels in a table.

Once a zone is selected, you can add (+) a channel: Audio Capacity Plus (Linked)

Specify the Preference Level (1 is the highest preference level) to determine channel priority.

Specify the channel ID of the slot, reflecting the number of repeaters in the sites, with subsequent odd values up to: 2*(number of repeaters) -1.

For the radio channel, specify the RX/TX operating frequencies and the colour code.

4.5. Locations / Sites

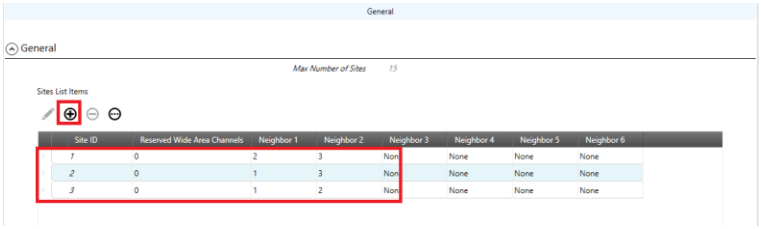

Figure 14 Repeater settings for Capacity Plus Multi Site – locations/sites.

Depending on the number of sites in the Capacity Plus Multi-Site system, a map of adjacent sites should be defined in the Master repeater.

When Capacity Plus Multi-Site requires retransmission of talkgroups in a wide area, a number of channels can be reserved for the wide area.

4.6. Talkgroups.

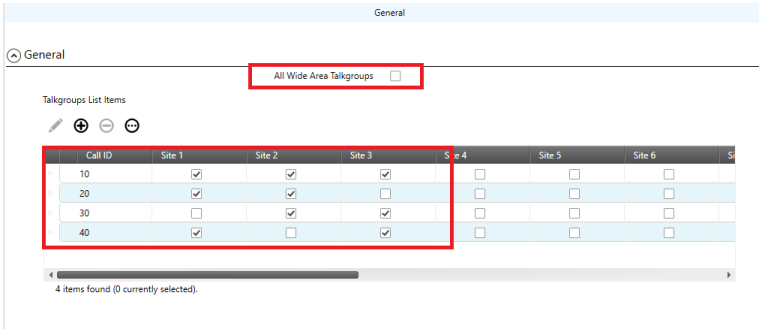

Figure 15 Repeater settings for Capacity Plus Multi Site – Talkgroups.

In the Talkgroups tab, you can define which talkgroups are to be retransmitted to which sites.

You can select to have all talkgroups retransmitted by all sites.

5. Configuration of subscriber radios for Capacity Plus Multi Site

In CPS, in the General/General settings tab, enter the subscriber radio ID according to the acquired contact list.

In CPS under the General/Network tab, set the network parameters and communication ports for the service.

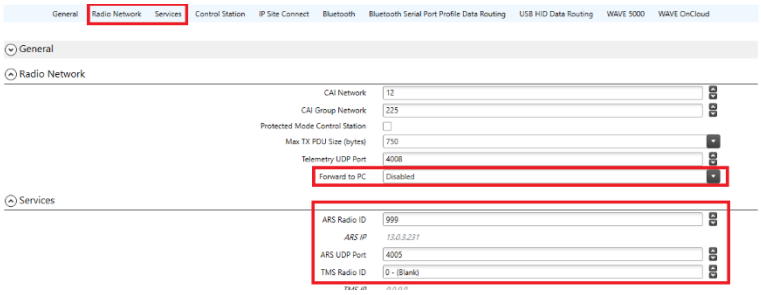

Figure 16 Subscriber radio settings (Capacity Plus Multi-Site) – network settings.

In the Radio Networks tab, disable computer data transfer.

In the ARS ID Services tab, enter the ID of the managed base radio.

For the subscriber radio in the CPS, similarly to the managed base radio, enter the parameters for: contacts, receive lists, Capacity Plus System Lists according to the template presented earlier.

In the Capacity Plus Personality tab, modify the setting for ARS sending.

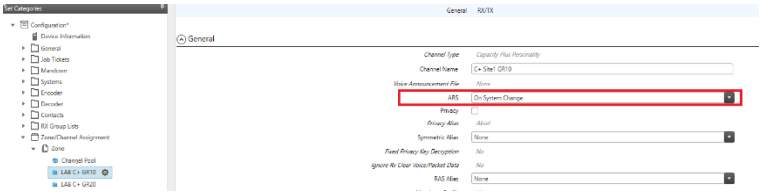

Figure 17 Subscriber radio settings (Capacity Plus Multi-Site) – personality settings.

6. SCK Client configuration – working with NAI protocols.

The use of NAI protocols in ConSEL PLUS software requires the purchase of a licence in the form of a HASP hardware key.

It is necessary to activate the licence in the repeaters:
NAI Voice HKVN4211A
NAI Data HKVN4212A

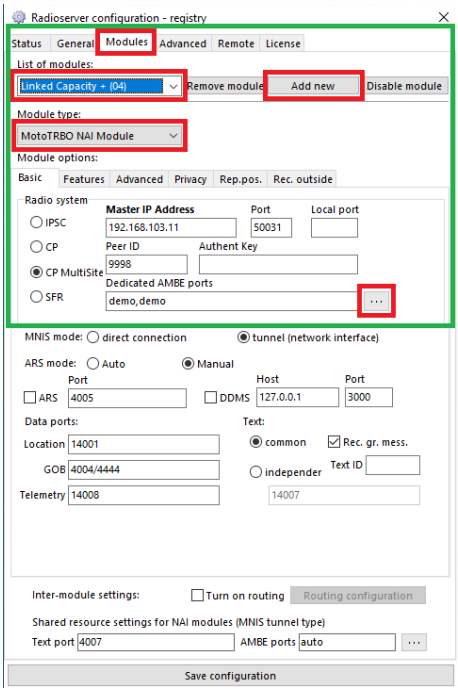

Figure 18 ConSEL PLUS settings – radio server for NAI (Capacity Plus Multi-Site).

In the Modules tab, add a new module under a new name (Linked Capacity Plus) or use the default basic module.
Once the module has been added, set the module type as MotoTRBO NAI.
Specify in which radio system the module will work – select CP Multi Site.
For the selected system, enter:

- address of the Master repeater working in Capacity Plus.
- port on which the Master communicates
- ID with which the SCK Client is to work
- authenticate the key

The ConSEL PLUS SCK Client software is based on AMBE software audio codecs.
After entering these parameters, Save the settings and restart the service.
After restarting the service, the Status tab shows successful connection of the service to the Master repeater.

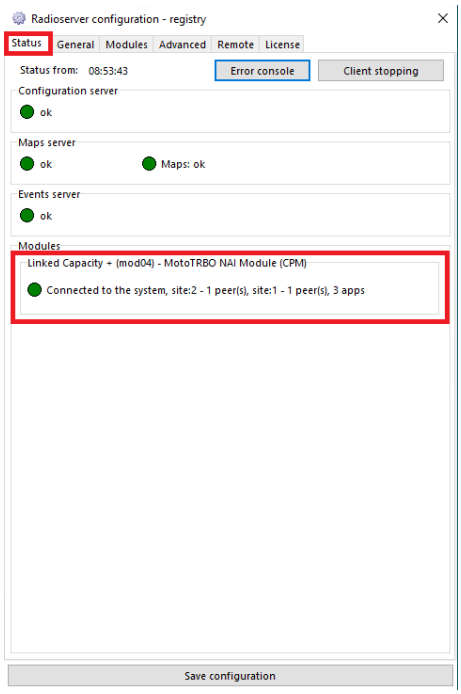

Figure 19 ConSEL PLUS Status – radio server for NAI (Capacity Plus Multi-Site).

7. ConSEL PLUS console configuration – operation with NAI protocols.

When using NAI protocols and direct connection of the radio server to the repeater. A software defined (virtual) radio can be connected to a single repeater in the ConSEL PLUS system client.
In the ConSEL PLUS system client, select:
Side menu/Administration/Radio Consoles Configuration
Select Add Radio Module to create the first virtual radio.

Select the module operation as console.
Enter:

- Radio server address – network address of the computer on which the radio server is running (local address 127.0.0.1 in case of installation of radio server and console on the same computer).
- SckClient module number – use the α icon to read the available radio server modules and select the module for the configured radio network from the list of radio communication modules running on the radio server – the basic module is selected by default.
- Playback device – from the list of available devices in the system, select the device that will play back the voice communications on the console.
- Recording device – select the device to act as a microphone from the list of available devices in the system
- Module Type: NAI CP(M)

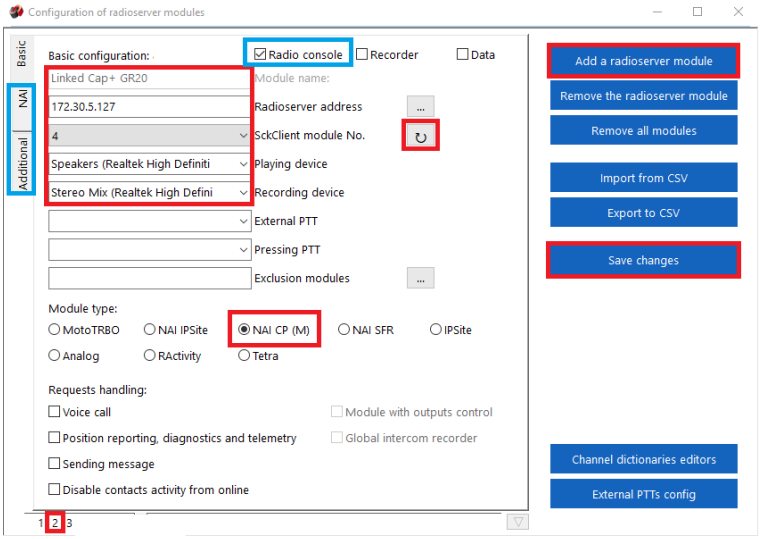

Figure 20 ConSEL PLUS radio console settings for NAI (Capacity Plus Multi-Site).

For the virtual radio created in the NAI tabs, you need to enter:

- ID of virtual base radio
- Default receive and transmit talkgroups

Figure 21 ConSEL PLUS radio console settings for NAI (Capacity Plus Multi-Site).

Select Add Radio Module to create another virtual radio and enter the same data as for the first virtual radio.
In the ConSEL PLUS software for Capacity Plus Multi Site you can create the required number of call groups for local and global calls.

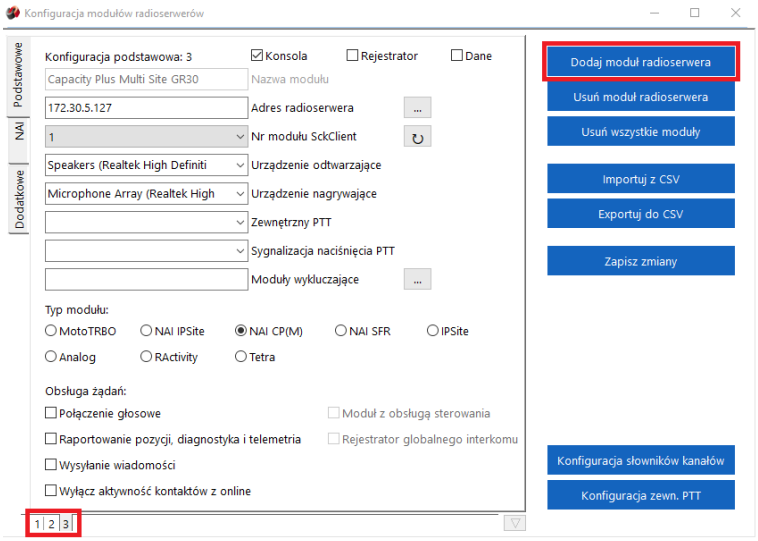

Figure 22 Multiple ConSEL PLUS radio consoles settings for NAI (Capacity Plus Multi-Site).

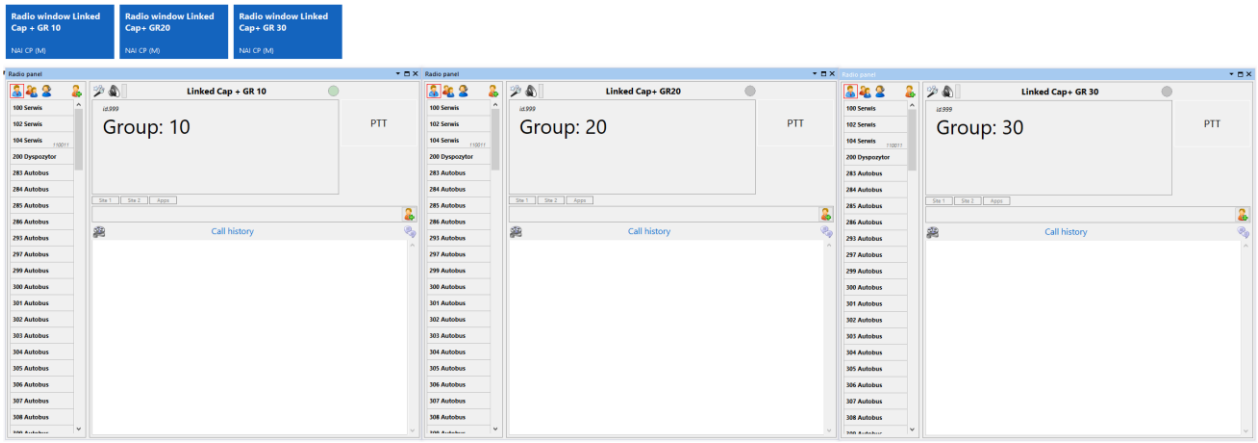

Figure 23 Multiple ConSEL PLUS radio consoles settings for NAI (Capacity Plus Multi-Site).