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Monitoring and Control System for RACOM Data Networks

RANEC

version 6.0.0.12
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1. Introduction

Ranec (Racom Network Center) is designed for monitoring and controlling the running of MORSE¹ data networks. The topology of the network is graphically displayed on a background of a suitable map. Ranec uses its own means to monitor network operation, indicate current fault states and allow the course of important network parameters over the past period to be displayed. It also allows network configuration to be altered in the Linux environment. Ranec is built for the control desk enabling fast indication of faults and location of their causes.


For the user Ranec comprises of four main parts:

- **Maps** - Ranec uses raster and vector maps and maps consisting of named points. Maps and networks can be displayed using the WGS 84 or JTSK geographic systems of coordinates. More maps may also be used at once. Maps may overlap each other or are automatically switched between according to the current scale on the screen.
- **Networks** - Elements of the radio network are represented by graphical symbols. Each symbol has the necessary information stored about its position, parameters and relation to other elements. Elements may be spaced consistent with the map at their geographical coordinates or in a selected raster independent of the map for creating logical diagrams, or completely at random. Ranec comes with an editor for working with these elements. The resulting files containing the topology of the network may either be stored to the selected directory or to the MySQL database in the connected server. Ranec allows the Setr control program to be started for a selected point. In the Linux environment it allows downloading of point configurations, drawing connections according to the actual routing, and also a number of other functions.
- **Statistics** - Program daemons can be launched in the server for collecting statistical data from the monitored network at selected intervals. It is possible to obtain general information about operation of the network in the past period from data stored to the MySQL database. Information about the availability of individual points of the network are obtained in a similar manner and these points are indicated on screen in real time.
- **Configuration** - The cooperating database, screen settings, graphical parameters of elements, method of displaying maps and their selection, and the name of the displayed network are defined here. The current configuration can be stored to file and used on next starting Ranec.

The first time Ranec is launched in the Windows environment

File `ranec.exe` should be moved to the Ranec directory. When adding the file `ranec.mo`, then the czech version of Ranec appears. File `ranec.mo` may be replaced by another file containing a different language version, however, the filename `ranec.mo` must be kept. Start `ranec.exe`.

The program starts running with the default configuration which can be saved using the command **System** > **Save configuration** to file `ranec.cnp` in the current directory. This file is generally portable between different versions of Ranec program. However it is recommended to start Ranec without the `ranec.cnp` file also with default configuration in case of change the Ranec version. Only then save the new configuration `ranec.cnp`.

Add the vector map `crasr.rvm` and network configuration `net1.rtd` to the current directory. Using command **Show** > **Map layers** open dialogue box **Map list**. Use icon  to select and add map file

¹ <http://www.racom.eu/>

crasr.rvm and press "OK" to show the map. Use command **Topology**>**Open file** to select and add net1.rtd. Use command **Show**>**Zoom all layers** to display the whole map and the simple network.

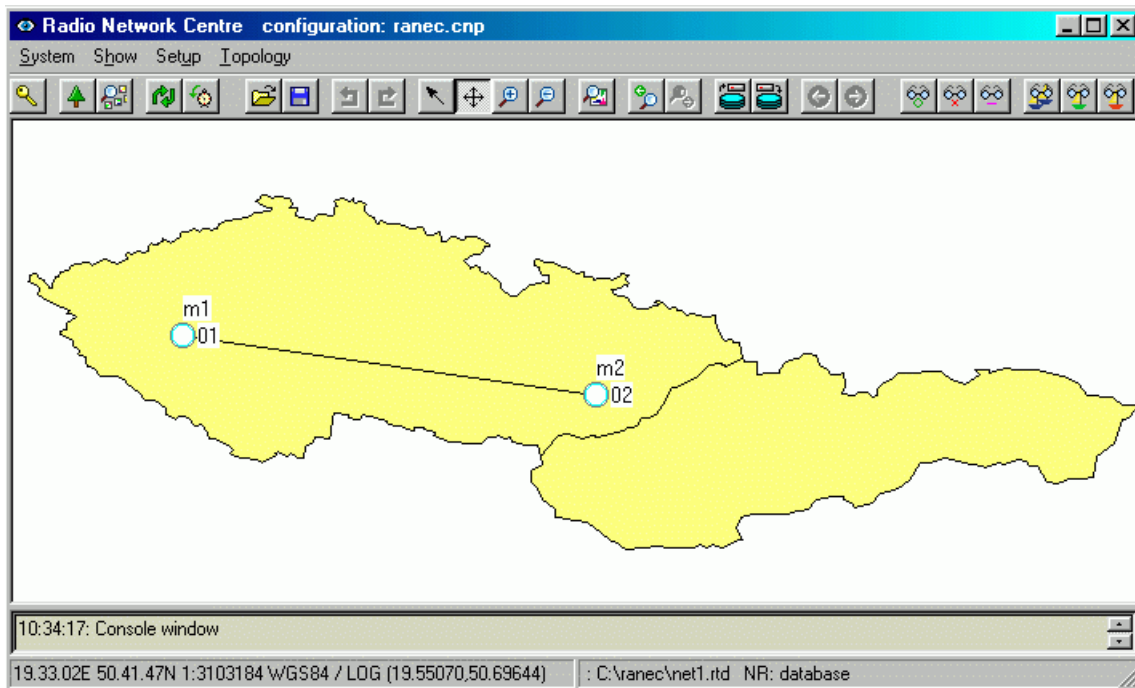


Fig. 1.1: Screen appearance

Use command **System**>**Save configuration** to save the resulting program settings.

Ranec directory

Using the pack `mswin-i386-5.1.0.5-utils-ranec.zip` on the www.racom.eu, Download, Software, Ranec or newer installation pack `ranec-install-5.1.0.7-i386.exe` create the Ranec directory. It's main file `ranec.exe` is mentioned in the previous paragraph. The content of directory:

Name	Ext	Size	Date	Attr
[..]		<DIR>	21.09.2007 08:26	----
morse	bat	90	02.03.2007 12:35	-a--
ranec	exe	7 443 968	27.06.2007 16:18	-a--
ranec	mo	84 147	20.09.2007 08:39	-a--
rr_setr	bat	150	27.06.2007 15:56	-a--
uninstall	exe	35 174	21.09.2007 08:26	-a--
VERSION	txt	7	20.09.2007 08:39	-a--

The file `rr_setr.bat` contains the path to `Setr.exe`:

```
call morse.bat
C:\Racom\Utils\setr -pIP%RR_MAS_HOST% %1 %2 %3
```

The file `morse.bat` contains the address of MAS which serves for communication between Ranec and the MORSE network:

```
rem IP address of the MAS host
set RR_MAS_HOST=192.168.0.83
```

Both files need to be maintained in up-to-date state. The file `ranec.mo` contains the czech version of the Ranec dialogs. After removing the file `ranec.mo` the Ranec can be started in english version.

In the Linux environment

the file `ranec.mo` containing the czech version of dialogs can be saved in the directory

`/usr/share/locale/cs/LC_MESSAGES`

In this case the command `ranec` runs czech version and the command `LANG=en ranec` runs english version.

2. Description of the Ranec Program

The layout of the desktop

At the upper edge there is a command bar which can be used to start part of the commands. The second part is started from the context menu on clicking the graphic symbols of the network with the right mouse button. Some of the commands are also available on the tool bar, and the menu also contains certain hotkeys. These hotkeys, e.g. Ctrl+W, are not included in the description and therefore it is useful to observe the open menus. In the lower part of the screen there is a switch on/switch off console window where messages about potential errors in the progress of work are written. Information about coordinates are written at the bottom on the left and on the right information about displayed networks and databases.

2.1. Control menus

The command bar contains the general control menus. The last of them changes according to the selected working layer, see section Section 2.2, “Desktop options”. Those commands which are used often also appear as icons on the toolbar. Here is an overview of the control menus and the functions they contain:

System menu

- Login - connecting Ranec to the database, see Section 4.1, “Database”.
- Save configuration - saves the configuration to file ranec.cnp
- Print - prints the active area on screen.
- About - contains the stated version of Ranec, e.g. 5.0.6.53
- Exit - ends work with the Ranec application.

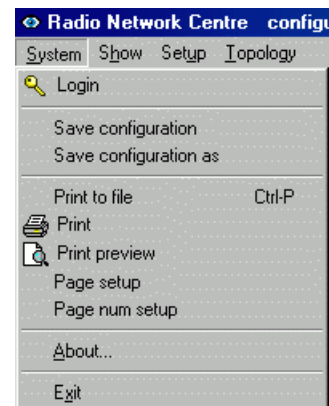


Fig. 2.1: System menu

Show menu

- Show/Hide - option for displaying the toolbar with icons and the console with messages about program operations.
- WGS/JTSK - select between WGS84 and JTSK, see Section 3.1, “Maps - Introduction”.
- Define ROI - work with Region of interest, see Section 3.1, “Maps - Introduction”.
- Map layers - switching between modes of operation, see Section 2.2, “Desktop options”.

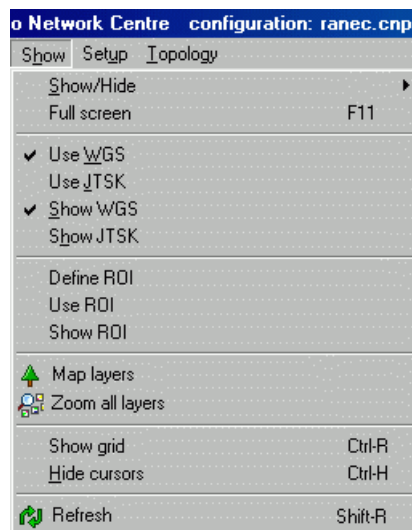


Fig. 2.2: Show menu

- Zoom all layers - for setting such a scale so that all desktop layers marked as *visible* are visible.
- Show grid - switches the grid on, see Section 4.4, “Geographical and Logical Coordinates”.
- Hide cursors - hides cursors which have been created for various purposes.
- Refresh - refreshes the colour scale indication of the availability of individual nodes.

Setup menu

- **Alarm**

- Alarm setup - selects the networks in the database which will be monitored by the alarm daemon, see Section 6.6, “Displaying Alarms”.
- Alarm history - history of changes to alarm states, see Section 6.6, “Displaying Alarms”.
- Periodical alarm refresh - automatically refreshes the normal state.

- **Database**

- Database info - name of database, log database, name of server and user.
- Select Main tablespace - selection of database for topology.
- Select Log tablespace - selection of log database.
- Remember password - helps if you forgot your password.
- Privileges - changing passwords, access for new users.
- Debug - for development purposes.

- **Program configuration...Ctrl+W**

- Miscellaneous
 - startup login - only in Linux
 - verbose - number of system messages, basic setting is 0
- Net resource - ZD settings, see Section 4.2, “Data Source”.
- Coordinate system
 - doraster - switch grid on / off
 - gridX, gridY - grid dimensions, see Section 4.4, “Geographical and Logical Coordinates”.
 - screen width / height - screen dimensions, see Section 3.1, “Maps - Introduction”.
 - surfBack - background color
- Intervals - time intervals for:

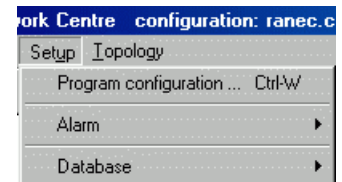


Fig. 2.3: Setup menu

- displaying alarm and log graphs
- generating links between nodes
- RSS distribution
- location of mobile station
- Cursors - parameters for drawing auxiliary surveying circles, see Section 5.3, “Context Menu”, Cursor
- Alarm color - assigning colors to individual alarm states.
- Alarm parameters - see Section 6.6, “Displaying Alarms”.
 - Refresh alarms on startup - only in Linux
 - Length, offset - parameters for alarm history
 - Check alarm daemon, see Section 6.5, “Daemons ”.
- Connection
 - addrMAS - daemons connect to the MORSE network via this address
 - nettim - timeout for access to the network
- Diagnostic - for development purposes

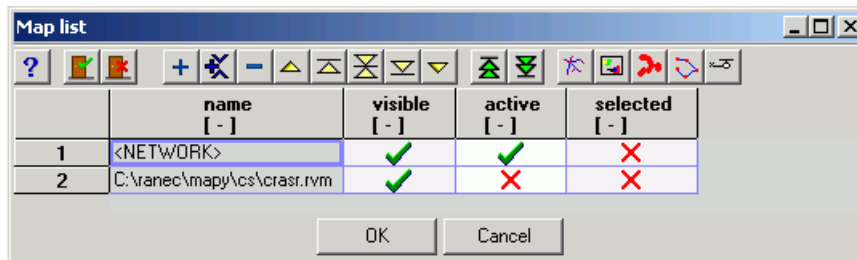
Alternative menu

This menu changes according to the selection **Show**▷ **Map layers**. See the links below for individual descriptions of work with them:

- Topology -Chapter 5, *Network Topology* - Network containing nodes and other network elements
- Vector map -Section 3.2, “Vector Maps”
- Raster map -Section 3.3, “Raster Maps”
- Simple map -Section 3.4, “Point Maps (Simple Maps)”
- RSS mapa -Chapter 7, *RSS map* - Strength of RSS signal on mobile station route
- Mobile -Chapter 8, *Mobile Station Map* - Mobile station route
- Location -Chapter 9, *Position of Mobile Station* - Immediate position of mobile station

2.2. Desktop options

Using command **Show** > **Map layers** open the window **Map list**, which changes the further behaviour of the desktop and the alternative menu. The window contains a list of various types of map and network layers used:



Layers are drawn and overlap in order from the lower row to the upper row. The order of selected layers can be changed using the arrows **Move row up** and **Move row down**. In the column **visible** displayed layers are marked by a tick and invisible layers by a cross. The mark can be changed by double clicking or pressing the space bar.

In the column **active** only one symbol must be ticked. According to the type of layer selected in this way (rvm, rrm, rsm, topology, rss, log, loc) the offer of the command and tool bar and context menu **changes**. The active layer file appears at the bottom edge of the screen.

Layers can be added using the icons:

- Topology Network topology, insert or create a specific network in the next steps
- Maps Raster, vector, point maps, maps can also be added by clicking the icon
- Rss Map of signal coverage
- Log Route of movement of mobile stations
- Loc Immediate position

New layers can be added also using icon , the highlighted layer can be removed using icon .

First we will look at working with maps, and then with networks and mobile stations.

2.3. Setr in the Ranec system

It is possible to work with Setr at nodes drawn on the Ranec screen. This provides us with a wide range of possibilities for carrying out diagnostics and configuration within the network. Setr can be started by clicking the right mouse button on the node symbol: **Node** > **Tools** > **Node** > **Service terminal**.

Selection of the version of Setr

From version 6.0.0.12 and higher it is possible to automatically select the version of Setr based on the version of firmware in the called radio modem. The function can be switched on or off by selecting **Setup** > **Program configuration** > **Diagnostic** > **check Ver.**

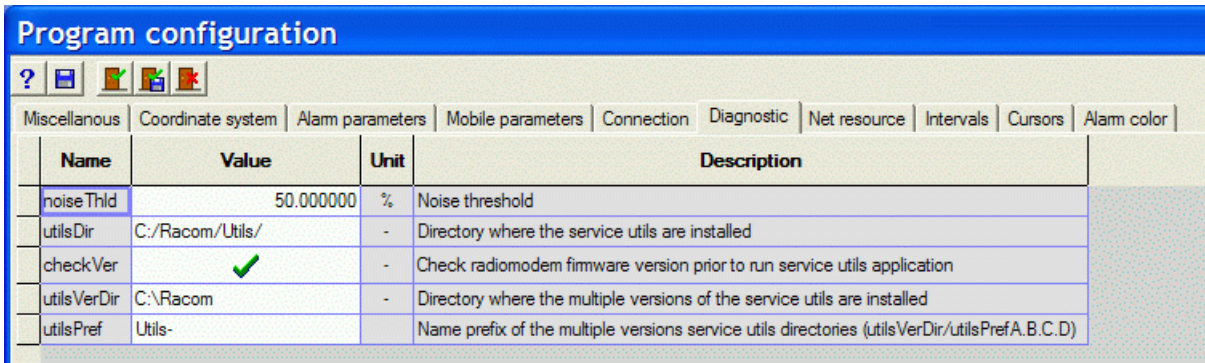


Fig. 2.4: Setr utility localization

The parameter `utilsDir` is used to designate the folder in which Setr is launched without distinguishing between versions. Parameter `checkVer` is marked with a cross.

If `checkVer` is marked with a check then the version of Setr is ascertained. After the application of command **Node** > **Tools** > **Node** > **Service terminal** a packet is sent to the destination CU with a query for the version of firmware. Based on the ascertained main module fw a folder is defined in which Setr is searched for communication with the CU:

- the first part of the address is determined by parameter `utilsVerDir`, here it is **C:\Racom**
- the second part of the address is determined by parameter `utilsPref`, here it is **Utils-**, this parameter can also be empty
- the third part of the address is formed from the received version of fw, for example:

version of fw	address	Setr location
745	7.0.45.0	C:\Racom\Utils-7.0.45.0\setr.exe
10.0.90.0	10.0.90.0	C:\Racom\Utils-10.0.90.0\setr.exe

These folders need to be prepared and the respective versions of Setr added to them. Setr selected in this way is launched and we can then use it to work with the selected CU, and where necessary with others too. For any further communication the version is not monitored again.

If we seek for Setr a missing folder, an error message appears and Setr is not launched. It is then possible to cancel the check mark in `checkVer` and try Setr from the folder according to `utilsDir`.

It is not necessary to have precisely the corresponding version of Setr in each of the folders. For example, Setr 745 will work well in folders `Utils-7.0.30.0` and `Utils-7.0.57.0`. However, it is not a good idea to mix Setr and firmware between versions outwards the boundary 7.79 and 8.11. It is also advisable to add the respective `VERSION.txt` file to the folder with Setr.

3. Working with Map Data

3.1. Maps - Introduction

Coordinate Systems

In menu **Show** > **Use WGS** or **Use JTSK** it is possible to select the mode of displaying on the desktop. JTSK is only used for maps of the former Czechoslovakia. The WGS system allows maps of all countries of the world to be displayed, however, distortion grows in the direction of the poles, which is even noticeable on the map of Czechoslovakia. The type of coordinate system is indicated on the lower left edge of the screen. The numerical value of the cursor coordinates are printed here in the WGS or JTSK form according to the selection **Show** > **Show WGS** or **Show JTSK**. The WGS coordinates in decimal are printed here in brackets, however, without the W/E and N/S differentiation. Other data contained here is the scale of reproduction. To set this value enter the dimensions of the screen to "screen width" and "screen height" in the table **Setup** > **Program configuration** > **Coordinate system**. Owing to the principles of reproduction the scale is only a guide, especially in WGS in the North-South direction.

Cursors

Cursors may be used in all types of layers. On determining distances click on the selected area using the right mouse button and select **Area** > **Cursors** > **Place cursor A**. The "distance" and "azimuth" giving the position of the mouse cursor in relation to Cursor A then appear on the left of the lower bar. If we also place a Cursor B the distance and azimuth give the position of B in relation to A. The cursor can be removed by clicking with the right mouse button on the cursor or using command **Show** > **Hide cursors**.

Region of Interest ROI

ROI (region of interest) is a defined region of the desktop used for separating points lying outside of it, e.g. for erroneous coordinates. It is defined as the outline of the current desktop using command **Show** > **Define ROI**. If **Show** > **Show ROI** is also selected the ROI region is marked by a frame. The region is activated using command **Show** > **Use ROI**. Each further use of the command **Show** > **Define ROI** defines a new region according to the current desktop cut out.

Size of Desktop

Using command **Show** > **Zoom all layers** all layers marked as "visible" are loaded to the desktop. Icons **Window scrolling**, **Zoom in**, **Zoom out** are used in all types of layers. They are used to change the desktop cut out by dragging or using the selected rectangle. On the contrary **Zoom to display all** sets the cut-out to contain only the "active" layer. In the case of the active layer **Topology**, **Rss**, **Log**, **Loc** display an intersection of the territory of this layer with the region of interest ROI, if ROI is defined.

3.2. Vector Maps

A vector map file uses the suffix `.rvm` (racom vector map). It can be used in both systems WGS and JTSK. A vector map is created by abscissas described by vectors which display, for example, the outline of the territory or road lines. A vector map containing contour lines is used for constructing altitudinal cross-sections through the terrain, see *Point maps*. The vector map containing the digital model of the terrain has the `.rem` extension and allows cross-sections and models of terrain coverage by the radio signal to be created. If it is selected as "active" the *Vector map* item containing the already known

commands for moving the desktop cut-out appear in the command bar. The new command **Zoom all** applies to the desktop cut-out changes.

3.3. Raster Maps

The map is contained in a `.bmp` type file and a `.rrm` (racom raster map) type positioning file appertains to it. Only the `.rrm` file which already contains the link to the `bitmap .bmp` is inserted into the List of map layers. Raster maps are different for the WGS and JTSK systems.

3.3.1. Raster Maps in the WGS 84 System of Coordinates

This coordinate system uses the Cartesian network of meridians and parallel lines. The model should have the same character. If, however, meridians converge on the model only a small section of this model may be used depending on our demands on map accuracy. On scanning we should take note of the alignment of meridians with the north-south direction. Save the the file as `name.bmp`. We should also create a positioning file with the same name `name.rrm`, which has the following structure:

```
filename=svet.bmp
top=      +81.00
bottom=   -62.00
left=     -95.00
right=    +129.00
coordinate system= WGS
minscale= 10000000
maxscale= 200000000
```

Meaning of items:

filename	path to file name.bmp
top	latitude of the upper edge of the map, degrees in decimal
bottom	latitude of the lower edge of the map
left	longitude of the left edge
right	longitude of the right edge
coordinate system	type of system for displaying map - WGS/JTSK
minscale	determination of the limit of the scale when the map is still displayed. On selecting a more detailed view the map no longer appears.
maxscale	determination of the limit of the scale. On spanning a larger territory on screen the map no longer appears.

3.3.2. Raster Maps in the JTSK system

Maps of Czechoslovakia were created in the JTSK system and the system can also be used for nearby surroundings of Czechoslovakia. Meridians converge here to the north and parallel lines are cambered. On scanning it is necessary to place the model in such a way that its meridians are inclined to the right compared to the vertical edges of the image according to this specification:

meridian	is in lined by distance	for the distance belonging to
10°v.d.	1°30'	5°s.z.š.
15	1°	
20	0°30'	
25	0°	

A positioning file, e.g. `prehledka.rmm`, consists of:

```
filename=prehledka.bmp
bottom= -1231258.36
top= -928690.617
right= -426427.2
left= -909188.46
coordinate system=JTSK
minscale=250000
maxscale=2000000000
```

The meaning of items is similar to the previous case. Coordinates of the edges of the map are entered in another way, however. In the JTSK system they are set as coordinates in metres from the reference point, which lies approximately at coordinates: 24°49' v.z.d., 59°51' s.z.š. (near Helsinki). We can find the necessary coordinates using Ranec and its data on the lower left of the desktop.

3.3.3. Context Menu

If the raster map is selected as "active" an option of 4 cursors appears on clicking the right mouse button on the desktop. They are used in the WGS only for specifying map positions on the desktop. Cursor A can be located in the upper left edge of the map in a familiar location. Cursor C can be located at the coordinates where we want to shift the map with point A to. Similarly we can locate cursor B on the lower right and mark its position with cursor D. Now use command **Raster map**►**Place map**. Acknowledge or correct the target position of point A which is offered to the place of point C. Similarly point B is placed to point D. Now open the directory where `ranec.exe` is located and view the new positioning file `hokus.rmm`. If satisfied with it copy it to `map.bmp`, for example, under the name `map.rmm`. On opening this map again its position is amended according to the definition of point A,B.

3.4. Point Maps (Simple Maps)

This map allows you to insert points designated by geographical coordinates and to name them. The point map supplemented by the respective vector map allows altitudinal cross-sections of the terrain to be taken and also simulation of propagation of the radio signal into the terrain. Maps of type `.rsm` (racom simple map) can be used in WGS84 and JTSK coordinate systems. Point coordinates are entered in WGS84.

3.4.1. Map Format

A map is created in file name.rsm and contains records in this format:

```
longitude;latitude;name;height;type;size;color;
```

- longitude and latitude can have one of three forms:

```
degrees.minutes.seconds.tenths and hundredths of a second:
00.00.00.00;00.00.00.00; (3 decimal points) nebo
```

degrees.minutes.tenths and hundreths of a minute:
 00000.00;0000.00; (5 and 4 places before the dot) or

degrees in decimal:
 000.000000;00.000000; (1 to 3 places before the dot)

the number of places before the decimal point and the number of decimal points is decisive

- a name is an arbitrary label which then appears in the map
- height of mast in metres, needn't be filled in
- type determines the form of the label in the map: 0 - nothing, 1 - cross, 2 - circle, 3 - square, 4 - diamond, 5 - triangle, 6 - triangle on its tip
- size of symbol if it should be different from the common parameter **Simple map> Configure layer> Element> icon size**
- colour of symbol in 0xBBGGRR format, if it should be different from the common parameter **Simple map> Configure layer> Element> iconCol**

example of colour: 0xFF0000 is blue, 0x00FF00 is green

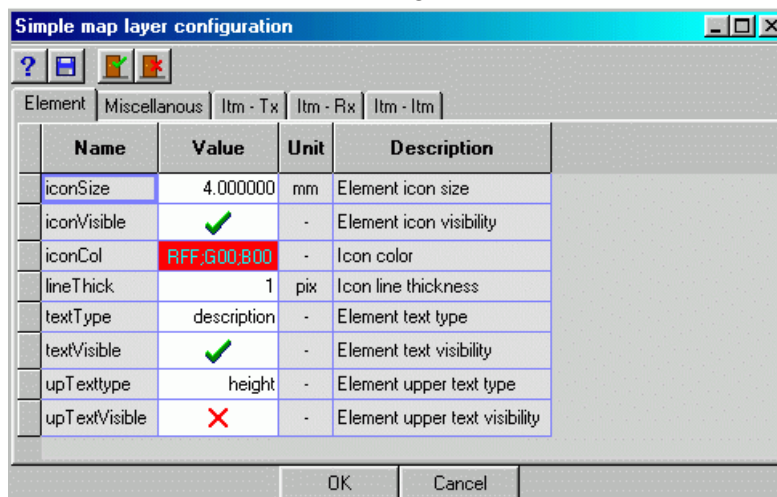
Example of file mesta.rsm:

```
14.25.00.00;50.05.00.00;Praha;;1
#01425.00;5005.00;Praha;;1
01548.00;5013.00;Hradec Kralove;50;6
-2.688256;5.058072;Tikobo;300;1
```

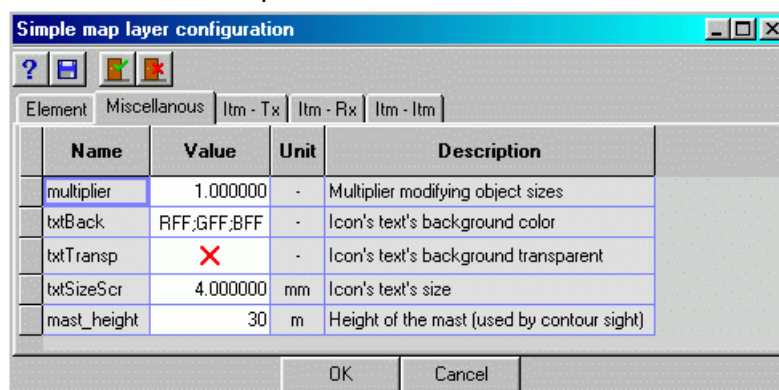
Items behind the # symbol are notes and do not appear on the map.

3.4.2. Configuration of Layers

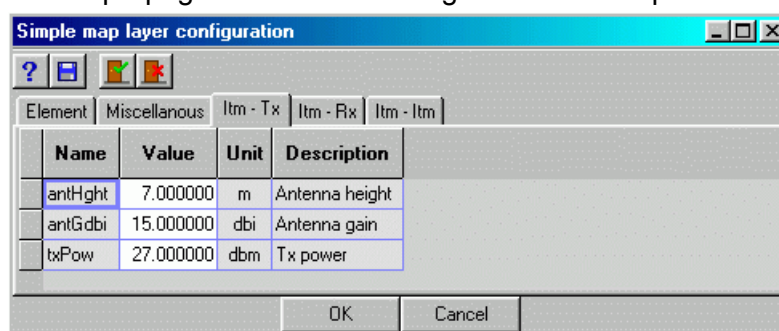
The active *Point map* allows for selection of basic display parameters using the command **Simple map> Configure layer** (Ctrl+E). The meaning of parameters is described in the table. The *textType* offers a selection for the name of the point or its height.:



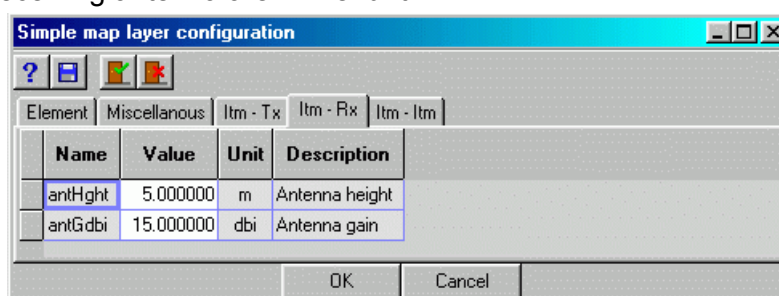
The Misc. menu provides several other parameters:



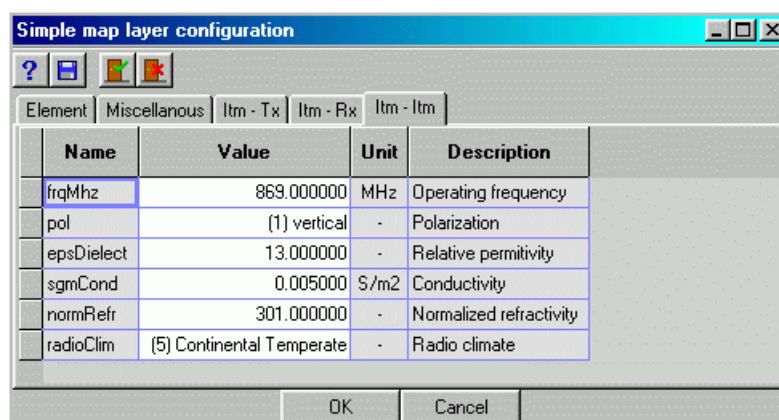
For computer simulation of propagation of the radio signal transmitter parameters are required:




Parameters of the receiving antenna are in menu Itm - Rx:



The last menu contains attributes of the environment which are important for propagation of the radio signal:

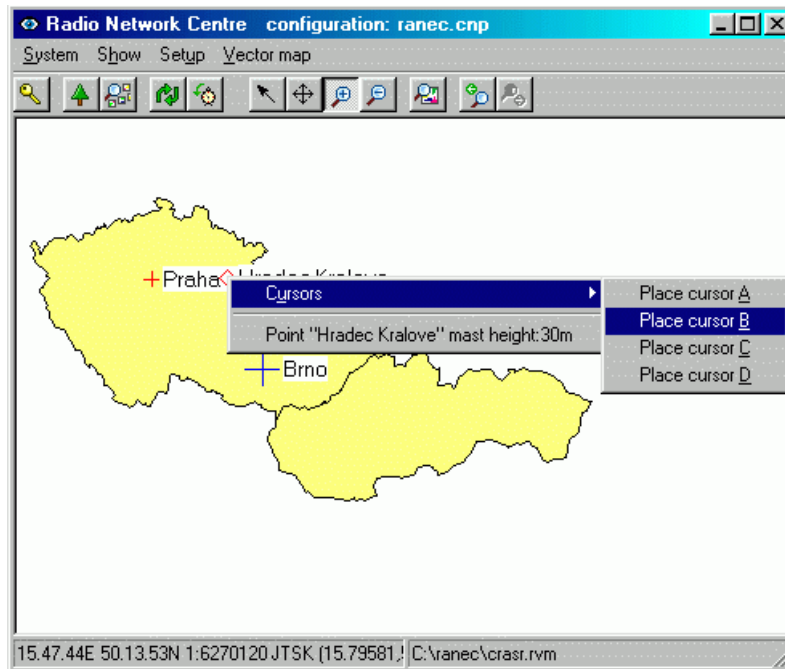


3.4.3. Context menu and terrain cross-section

It is worth mentioning the principles of switching between working modes here. We can use the icon  for opening the menu *Map list* and here we select one of the layers as active:

- <NETWORK> for editing network elements
- map.rsm for generating cross-sections and a model of coverage
- <RSS> for changing the size of RSS symbols

Click with the right button on the rsm map element to enter the context menu:



Here there is information about the name of the point and the height of the pylon at this point. It is also possible to place a cursor at this point. Cursors can be positioned at any point on the map.

Terrain profile using the digital model

A point map is selected as the "active" map. Map.rem containing the digital model of the terrain is marked as "selected". Using the right mouse button place cursor A at the beginning of the cross-section and cursor B at the end. Using command **Simple map** > **DEM Sight** generate a cross-section of the terrain. Place A is on the left and B on the right. We can modify the appearance of the graph using **Legend** icons. The height of the antenna above the terrain at point A is defined in menu **Simple map** > **Configure layer** > **lrm-Tx** > **antHght**, the height of the receiving antenna at point B in **Simple map** > **Configure layer** > **lrm-Rx** > **antHght**.

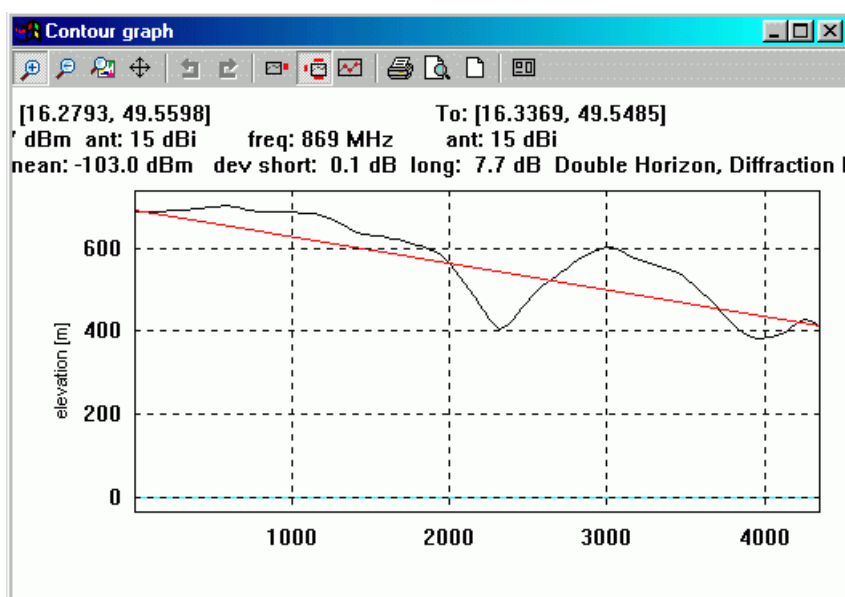


Fig. 3.1: Cross-section of the terrain generated using the digital model

Radio signal coverage

The digital model of the terrain allows you to determine the theoretical coverage by the radio signal. Again the Point map is "active", the map of the digital model is "selected", and the receiver is marked by cursor A. Cursors C and D are placed in the two opposite corners of the rectangle which designates the modelled area. Create the model using command **Simple map** > **Signal coverage**. In the example of coverage the route of the cross-section from the previous example is drawn.

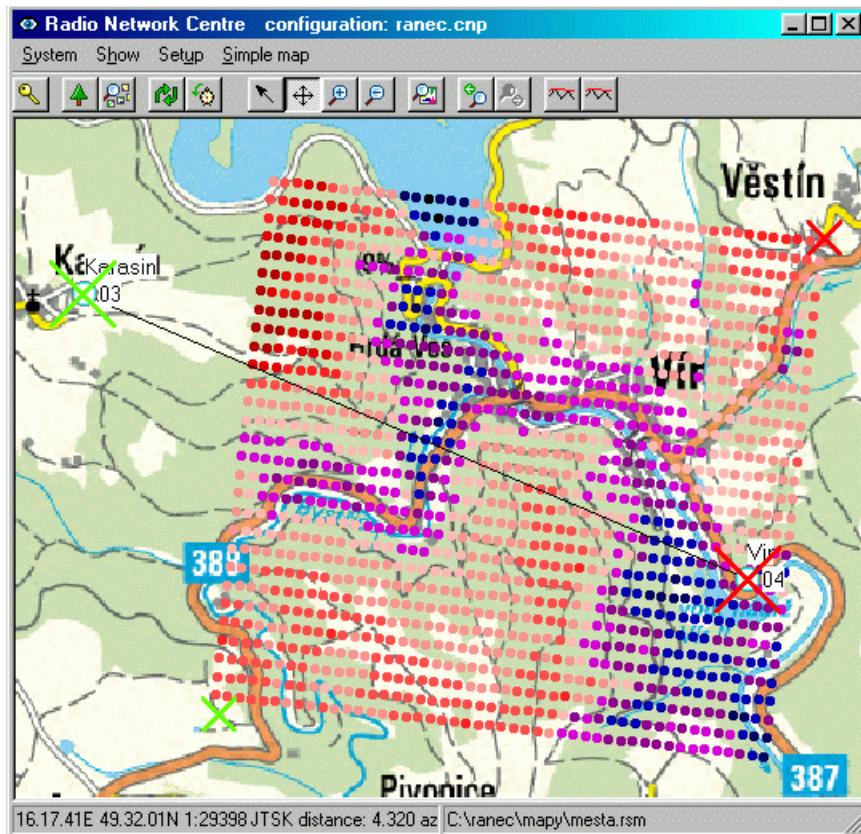


Fig. 3.2: Model of terrain coverage by the radio signal

The strength of the signal received from the transmitter at point A is calculated and highlighted in colour in the grid points. Its density is defined in menu **Settings** > **Program configuration** > **Coordinate system** > **gridX, gridY**. The grid must be suitably defined so that its points lie within the modelled area. We can view the grid using command **Show** > **Show grid**. A new map layer <RSS> was formed when creating the model of coverage. If we select it as "active" we can then set the necessary parameters, such as size of coloured symbols and visibility of text in menu **RSS map** > **Configure layer** > **Element**. The text is set to "rss". In menu **RSS map** > **Configure layer** > **Rss color** we can read and even change the colour scale, which expresses the calculated strength of the signal at individual points. We can also obtain the strength of the signal from the context menu by clicking the right button on any of the points of the Rss network.

Profile of the terrain using map contour lines

If the point map is selected as "active" it is then possible upon using vector maps with contour lines to draw a cross section through the terrain with the direct view between end points. In the menu **Show** > **Map layers** mark the point map as "active" and "selected", vector map with layers as "selected". Use the right mouse button to select the starting point of the route and Site cursor A here, and cursor B at the end point. On the lower bar of the screen read the distance and bearing from point A to B. If any of the selected Sites were located to a point of an .rsm map then mast height is defined at this point and the view is taken from this height above the sea. If a point not on an .rsm map was selected then the height defined in **Simple map** > **Configure layer** > **Miscellaneous** > **mast height** is taken as the mast height. Now using command **Simple map** > **Contour Sight** draw the profile from point A to B. Use the **Zoom all** icon to display the whole length of the graph. The curved surface of the earth at sea level and the height profile of the terrain including the curvature of the earth's surface and a straight view from point A to B is seen here. Point A is on the left side of the graph, point B is on the right.

Additional data can be added using the three **Legend** icons. The time scale on axis X has no sense here. The quality of the cross-section is given by the contour lines used by the map.

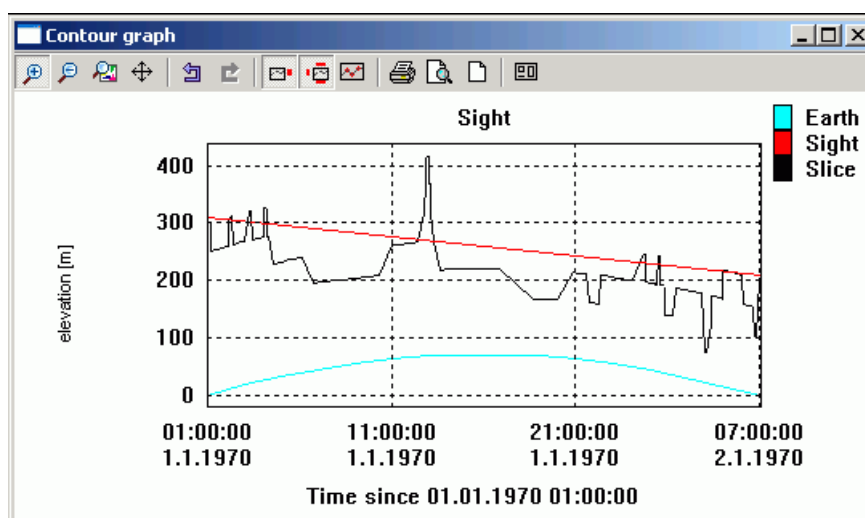


Fig. 3.3: Cross-section of the terrain generated using the map contour lines

4. Organisation of Work with Networks

The next description corresponds to the state where the <NETWORK> layer is selected as **active** in the dialogue box **Show** > **Map layers**.

4.1. Database

Database MySQL is the primary area for storing the topology of the network and statistical data. We can log on to it using command **System** > **Login**. In the login window add the name of the server and the selected database within it. It is possible to read and write in the database if logged in using the name and password of the owner of the database. If you login to another database, i.e. the name of the database and username are different, it is only possible to read. The successfully connecting to the database is indicated by the green colour of icon **Load net from database**. After loading some network from the database the message is written on the right hand side of the lower bar:

```
network: database@server [user]
```

After logging in, by determining the server and the user, we can change the database selection in the server using command **Setup** > **Database** > **Select Main tablespace**.

Besides the main database used for storing network topology a database is also used for storing logs, which are continuously obtained records about network operation. Selection of this database is possible using the command **Setup** > **Database** > **Select Log tablespace**. The overall information is then provided in the message **Setup** > **Database** > **Database info**.

Work with Ranec is limited when not connected to the databases.

4.2. Data Source

Manual storage and reading of network topology can be done to file (**Topology** > **Save to file** or **Open file**) or to the MySQL database (**Topology** > **Save to database** or **Load from database**). When working with the network a situation may arise whereby the network is read automatically. In this case either the database or directory is selected in the dialogue box **Setup** > **Program configuration** > **Net resource**. For selecting the directory the path to it is also determined here. The database is already selected in the menu **Setup** > **Database**. Selection of data sources is indicated on the bottom right hand side of the bar behind the label **NR** (Net resource).

4.3. Storing Topological Data

The topology of the current network is registered in the main memory of the computer where there is only one network. Before passing to another network, i.e. also before entering a nested network, it is necessary to record the topology of the current network so that edited changes are not lost. The entry can be made to the selected directory or to the MySQL database. Saving to the directory directly saves information about all network elements to file, e.g. `net1.rtd`. On saving to the database the network elements are incorporated into the database system and assigned a unique number. After saving we are called on to reload the network from the database so that elements in the PC also appear with their new recorded parameters. Graphically this registering in the database is noticeable by a change in the colour of the outline of the new element from green to black. Due to this registering it is not advised to use save network under a new name as this may create unwanted duplicity of two networks with the same registration number in the database. The name of the current network is indicated on the bottom right of the bar indicating the database or directory from where the network was loaded. ZD information is not related to the origin of the network.

```
network : database@serveru [user] ZD: directory
```

4.4. Geographical and Logical Coordinates

Each of the elements of the edited network is tied to a specific position called a **Site**. The site is marked with a cross and has specific **Geographical coordinates**. Other elements are connected to the Site, for example a node or IP host which has **Logical coordinates**. GEO and LOG coordinates are the same in the beginning. If the element (node) is moved then its LOG coordinates change whilst Site remains at the original GEO coordinates. This move is conditional on switching the editor to LOG mode using command **Topology>Set logical coodinates active**. The resulting status is indicated on the lower left bar with LOG or GEO.

The command **Topology>Objects selection** serves for shifting elements. In this mode it is possible to mark certain elements with a drawn frame or using the left mouse button. By pressing *Shift* we can add other elements to the selection. Now, using the left button, drag an element together with the other selected elements. *Site* marks remain in their original position at their GEO coordinates. The *Site* image is at the GEO coordinates and the elements image at different LOG coordinates. To finish the move use the context menu. Click on the selected element (not *Site*) with the right mouse button and selecting **Coordinates>Log->Geo** we achieve a shift of *Site* to the position of its element (LOG coordinate is recorded to the GEO coordinate). By selecting **Coordinates>Geo->Log** the element is returned to its original *Site*. An element can also be shifted from it context menu by overwriting items **Attributes>logX** and **logY**.

The raster is a graphical aid for positioning elements to diagrams. It can be switched on in the WGS system of coordinates using command **Setup>Program configuration>Coordinate system>doraster**. It appears as a square grid with spacing selected in menu **Setup>Program configuration>Coordinate system>gridX** and **gridY**. The desktop context menu allows network elements to be Sited to the nearest raster intersection point. If elements are shifted with the raster on they "latch" on to the raster intersection points.

5. Network Topology

If the <NETWORK> layer is switched on as "active" the option **Topology** appears in the command line and on clicking on various desktop elements with the right mouse button various context menus appear. These tools can be used to edit the network image.

5.1. Topology Menu

The Topology menu offers three types of return commands:

- Undo zoom/scroll returns or refreshes changes of desktop cut outs and shifts
- Undo change returns or refreshes editing changes
- Network history: go back returns or refreshes the previously displayed network

For editing a network image 3 groups of tools are available:

- Editor configuration Open: **Topology** > **Configure layer** (hereinafter Ctrl+E). Properties common for the whole topology layer such as size and visibility of elements... In dialogue tables white fields can be edited. Enter them using the spacebar or double clicking the left mouse button.
- Context menu Open: Click on the network element with the right mouse button. For editing individual elements such as add, delete, shift, find position...
- Attributes Open: Context menu, first active item. Properties of individual elements and their modification such as position, name, address ...

These tools are further subdivided according to network elements

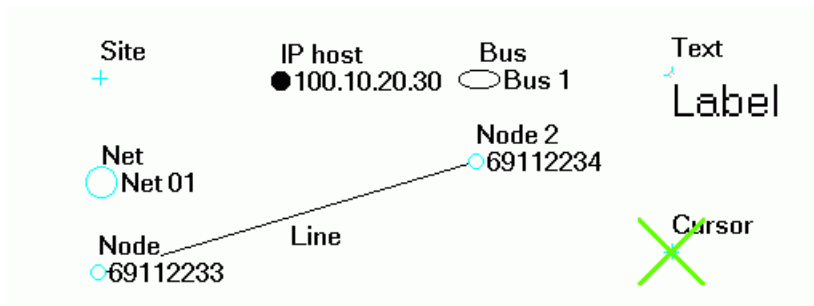


Fig. 5.1: Network elements on the desktop

- Desktop Free space between network elements.
- Site Symbol determining the position of the element in GEO coordinates. Some of the following elements are added to Site. The symbol is a cross.
- Net Expresses that another network has been inserted into the current network. The symbol is a larger sized circle.

Node	Node of the MORSE network, i.e. the basic building block of the network with a MORSE address. The symbol is a smaller sized circle.
IP Host	Basic element of an IP network with an IP address. The symbol is a black circle.
Bus	Bus to which more IP hosts or nodes are connected. The symbol is an oval.
Text	A standalone block of text. The symbol is the text itself.
Link	Link between elements of the network. It symbolises the communication path defined by routing. The symbol is a line between two elements.
Cursor	Additional element used for measurement purposes. The symbol is a slanted cross.

Below is an overview of the tools available.

5.2. Editor configuration

Open using command **Ctrl+E**. The submenus for individual elements are presented here in a single table:

General	Site	Net	Node	Mobile	IP host	Bus	Text	Link	Double click
	icon size	icon size	icon size	icon size	icon size	icon size	icon size		Desktop
	icon vis	icon vis	icon vis	icon vis	icon vis	icon vis	icon vis		Site
txt size	text type	text type	text type	text type	text type	text type			Net
txt colo	text vis	text vis	text vis	text vis	text vis	text vis			Node
txt trans			utex typ	utex typ					IPhost
			utex vis	utex vis					Bus
	dim vis			arr size				arr size	Text
	dim abs			link vis				link vis	Link
	CUvert			tlink typ				tlink typ	
	CUcon			tlink vis				tlink vis	
hideDE	dA off			aliasB					
hideDM	dB off			aliasMS					
	shift G			aliasMC					
usePath	as CU								
fPath	as M-L								
sPath	as Site								

Meaning of abbreviations in the table :

icon size	icon size
icon vis	icon visibility
text type	text type (address, frequency, description...)
text vis	text visibility (hidden or displayed text)

utex type	type of upper text of the node (located at the position of Site text)
utex vis	visibility of the upper text of the node
txt size	txt size for all elements
txt colo	colour of text background by an icon
txt trans	transparency of text backgrounds by an icon
hideDE	hide Details Enable - for large scale (map of large territory) only the upper text of the node or name of the Place is displayed
hideDM	hide Details - scale from which details are left off
usePath	start MORSE application with path file
fPath	path file for MORSE application
sPath	auxiliary parameters for MORSE application
dim vis	visibility of links between Site elements
dim abs	elements drawn in relation to Site in the absolute or relative position
CUvert	other CU at a common Point are lined up into one column
CUcon	if more nodes are used in the CU only one node is drawn
dA off	dimA offset, distance between columns, i.e. between neighbouring CU
dB off	dimB offset, distance between rows, i.e. between nodes in one CU
shift G	permitted shifting of Site in geographical coordinates
as CU	automatic selection of all elements on a common CU after marking one of them
as M-L	automatic selection of elements at a common Site if not moved from positions dim A, dim B
as M	aut. selection of all elements at a common Point
arr size	size of connection arrow
link vis	visibility of connection link
tlink typ	text of link - type of text
tlink vis	text of link - visibility of text
aliasB	translation of addresses - bases
aliasMS	translation of addresses - selection mask
aliasMC	translation of addresses - change mask

Working with the editor

The basic element is the Site with geographical coordinates X,Y (see Attributes). Other elements with logical coordinates, e.g. nodes, are located on it.

The element's symbol for each type of element has a designated size and visibility (**Ctrl+E > Node > icon size** and **icon visible**). The element comes with text with optional content and visibility (**Ctrl+E > Node > text type** and **text visible**). The Site text is positioned higher than the text of the connected element so that they are both visible at the same time. In addition the node can use the upper text which can only be viewed alternately with the Site text (**Ctrl+E > Node > up text type** and **up text visible**).

The size of all element icons can be set in the menu (**Ctrl+E > General > txt size**). From here it is also possible to jointly control the common parameters like the colour or transparency of text backgrounds and font size (**Ctrl+E > General > text Back, text Transparency, text Size**). The content of text blocks is entered when inserting individual elements, or using the Attributes menu.

The basic element of the MORSE network is the node. One to five nodes are contained in the *Communication unit* (CU), which most frequently is an MR400 series modem or the older MR25 model. For more information see the MORSE Firmware Documentation on www.racom.eu.

If more nodes in a common CU are used at one Site, the node symbols are positioned with their addresses under them with a spacing of rows **Ctrl+E > Site > dimB offset**. The number of spacings from the Site is given in **Attributes > element > dim B**. Similarly there can be more CU at one Site, which then form another column. The spacing of columns with symbols is **Ctrl+E > Site > dimA offset**, the order of the column for the given element is in **Attributes > element > dim A**. Additional links which connect added elements to the Site can be visible or hidden **Ctrl+E > Site > dim Visible**. The location of elements in relation to the Site can be represented absolutely or relatively (the positions of unused elements are not empty, but elements with higher dim coordinates are moved onto them). **Ctrl+E > Site > dim Absolute**.

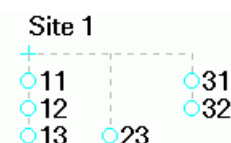


Fig. 5.2: Relationship to Site

Element shifts are possible in LOG coordinate mode **Topology > Set logical coordinates active**, or possibly with a subsequent Site shift (see above). The second possibility for a Site shift in GEO mode is using the switch **Ctrl+E > Site > En Geo Move**.

In the editor it is possible to define operations generated by double clicking the left mouse button on various elements of the network. Select in the dialogue box **Ctrl+E > Doubleclick**.

In the dialogue box **Ctrl+E > State Color** it is possible to define 10 different colours for marking the states of nodes. They are used for illustrating the result of the operation "Obtain the state of time synchronisation", see the desktop context menu.

5.3. Context Menu

The context menu is the main editing tool. By clicking with the right mouse button on certain elements of the network the respective menu will open. All menus can be seen below.

Desktop	Site	Network	Node	Mobile	IPhost	Bus	Text	Link
		Nm Net	Nm Node	Nm Node	Nm IP	Nm Bus	Nm Text	Nm Nodes
	Nm Site	Nm Site	Nm Site	Nm Site	Nm Site	Nm Site	Nm Site	
Attributes	Attributes	Attributes	Attributes	Attributes	Attributes	Attributes	Attributes	Attributes
		Site	Site	Site	Site	Site	Site	
Cursors	Cursors	Cursors	Cursors	Cursors	Cursors	Cursors	Cursors	
Tools			Tools	Tools				Statistics
			Diag mob	Diag mob				
Add	Add	Add link	Add link	Add link	Add link	Add link	Add link	
		St link	St link	St link	St link	St link	St link	
		Fin link	Fin link	Fin link	Fin link	Fin link	Fin link	
	Delete	Delete	Delete	Delete	Delete	Delete	Delete	Delete
Search	Position	Coord	Coord	Coord	Coord	Coord	Coord	
Snap								
Paste	Copy	Copy	Copy	Copy	Copy	Copy	Copy	
Add sel	Cut	Cut	Cut	Cut	Cut	Cut	Cut	
File		Enter sub						
Undo				Info mobil				
Redo				LOG map				
Custom				RSS map				

Meaning of abbreviations in the table :

- Nm element, Nm Site The name of the element with the address and name of the Site to which the element belongs.
- Nm Nodes Addresses of nodes between which there is a link
- Attributes Specifies parameters, whose common properties were set in the editor, for individual elements. The white field describes the state of the element and can be edited upon double clicking with the left mouse button. The grey fields are only for information, containing records from the database and serving for debugging needs. More detailed see the next section.
- Site Links to Site submenu, which is part of each element.
- Cursors Allows cursor A to be inserted, which serves for making immediate distance measurements here. If cursor B is entered then the distance A-B is measured. Distance and bearing are printed on the lower edge of the desktop.
- Tools The tools submenu has more functions and will be expanded below.
- Statistics A graphical representation of logs is described in section Section 6.7, "Displaying Logs"
- Diag mob Diagnostics of mobile network elements
- Add The submenu Add serves for positioning new elements in the network. On inserting a new element coordinates, the name of the Site and the address are produced for ap-

	proval or correction. On inserting the element to the Site the table of attributes of the inserted element opens for filling with parameters. "Add net" means inserting a new network. "Add net icon" means adding a link to an existing network.
Add connection	<p>The command starts to draw the connection from the selected element. End it by clicking the left mouse button on the destination element.</p> <ul style="list-style-type: none"> • Add connection - begins to draw a connection from the selected element. End it by clicking the left mouse button on the destination element. • Beginning of the connection - <i>St link</i> - connections will be run from this element until a new starting element is selected • Termination of the connection - <i>Fin link</i> - draws a connection to the selected element
Delete	Deletes an element from the network. The Hide cursor command deletes the cursor from the desktop.
Search	Allows a Site or node to be found from the list.
Position	Provides the coordinates of Site.
Coord	The Coordinates menu provides the option of transferring an element or Place. A more detailed description is given in chapter Section 4.4, "Geographical and Logical Coordinates". Besides the Geographical and Logical position the Relative position is also here, see Figure 5.2, "Relationship to Site".
Snap	Allows elements to be moved to the nearest point of intersection on the auxiliary raster. The raster is switched on using command Setup > Program configuration > Coordinate system > doraster . Snapping to the raster can only be used in the Logical coordinates mode. Cancel snapping by using command Topology > Undo change . It is used on drawing logical drawings of the network irrespective of geographical location.
Copy, Cut, Paste	These commands are used for moving elements to another network. It is not suitable to paste to the original network as an element is positioned in the same Site according to its own coordinates resulting in unwanted duplicity in the database. Before copying "Select object" needs to be selected on the tool bar and an element selected by pressing the left button.
Add sel	Add to selection - Submenu shall be expanded below.
File	Offers opening and saving of the topology to file.
Enter sub	The command Enter subnetwork replaces the current network with a new network. If any changes were made in the current network a message appears. Caution - on selecting "Yes" nothing happens and we still have the possibility of saving the current network. On selecting "No" a new network is entered and the current network is left without saving the changes!
Undo, Redo	Returns to the last editing step.
Custom	<p>Submenu Configuration offers switching to the menu Topology > Editor configuration (Ctrl+E), and also</p> <ul style="list-style-type: none"> • Glyphs - multiplier for size of all icons and text

- Icon text - option **Ctrl+E** > **individual elements** > **text Visible**
- Icons - option **Ctrl+E** > **individual elements** > **icon Visible**

Info mobil Information about the mobile station.

LOG map Switches to layer LOG.

RSS map Switches to layer RSS.

Context menu reacts to the selection of an element using the right mouse button. Besides elements of the current layer we can also select elements of other displayed layers (topology, rsm, rrm, log, loc). Selection procedure:

- In the order according to the **Map list** from top to bottom Ranec ascertains whether the mouse cursor pointed to an element in any layer. The first element found this way calls up the context menu.
- If no element is found the context menu of the desktop for the active layer appears.

Attributes of the context menu

Attributes of elements of the topological layer are the first item of context menus. Each item has its own attributes which describe the element's properties. Attributes have a similar structure which can be seen below:

Desktop	Site	Network	Node	IPhost	Bus	Text	Link
	geoX	logX	logX	logX	logX	logX	
	geoY	logY	logY	logY	logY	logY	
		dimA	dimA	dimA	dimA	dimA	
		dimB	dimB	dimB	dimB	dimB	
		state	state	state	state	state	
		flags	flags	flags	flags	flags	
		net	net	net	net		
		descript	descript	descript	descript	descript	descript
nm net	label	nm net	M addr	IP addr	bus nm	Text	colour
	altitude		nod freq	IP name		size	line type
valid	country			type	bus type	type	thickness
note	note	note		note	note		bidirect

Meaning of abbreviations in the table :

geoX,Y Geographical coordinates respective to Site.

logX,Y Logical coordinates are the same as geographical coordinates unless the element is shifted from Site.

dimA Sequence number of the column containing the element symbol in relation to Site. The only element at Site has coordinates A=0, B=0. Nodes of the second CU have coordinates A=1.

dimB	Sequence number of the row containing the element symbol in relation to Site. The second node in the CU has coordinates B=1.
state	Auxiliary parameter.
flags	The node symbol can have different shapes determined by this attribute - circle, square, diamond, triangle up, triangle down. For other elements it is a reserve attribute.
net	Name of the network to which the element belongs.
descript	Alternative description of the element. It can be selected as <i>description</i> in the menu Ctrl+E > Node > texttype .
nm net ...	Name, MORSE address or IP address of the respective element.
Text	Writing content of auxiliary element Text.
altitude	Auxiliary parameter.
nod freq	Frequency of CU radio channel. The Link element coming from the node also receives it.
IP name	Name of PC, containing the IP host.
size	Size of Text element typeface.
valid	Elements on the desktop are valid.
country	Geographical allocation of Place.
type	Auxiliary parameter.
note	It is possible to write a note here. This note is not used by the system.
colour	Colour of the link between two elements. It is used together with the type and thickness to differentiate between different links.
linetype	Type of line (unbroken, dashed...).
thickness	Thickness of the line for the link.
bidirect	Selection of single direction (according to editing from the initial to end element) or bi-directional link.

Other context menus

differ from each other and so are listed individually below:

Cursor

By clicking on the cursor symbol we obtain a short menu .

The item **Draw circle** draws an auxiliary circle. Finish it by click. Delete it at the same time with the cursor or by cancellation by checking off in command **Draw circle**.

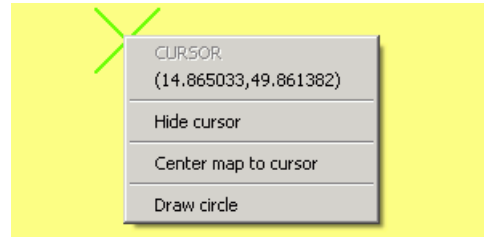



Fig. 5.3: Cursor menu

Selection

Elements of the network can be included in the selection in mode **Topology** > **Object select** (icon ). On selecting one element using the left button it is possible (in LOG coordinates) to move the element. On pressing the Shift button we can add other elements to selection using the left mouse button. We can also select more elements at once by dragging the left mouse button. By grabbing any of the selected elements with the left mouse button we can move the whole group. Pressing the right mouse button on any of the selected elements opens up the context menu of selection:

The menu applies to all selected elements. The last item "Add to selection" allows nodes of a certain shape to be added, see **Node** > **Attributes** > **Flags**.

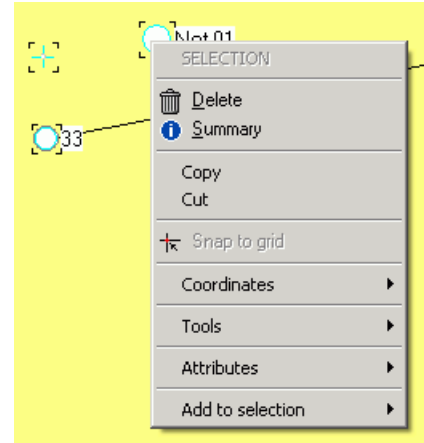


Fig. 5.4: Selection menu

Raster and Point Map

Context menu in the **Working with Map Data** chapter.

Table

By clicking on the inner field of the table we obtain the context menu. Items Jump on ... concern searching for a row in a table according to its number. Items Find a value and Sort work with columns. Use the left mouse button to select a column and then the right to draw up the context menu. We can now find the row in which our column contains the required value or we can sort table rows according to rising values of the selected column. By selecting Resize table we can tidy up the width of the table columns.



Fig. 5.5: Table menu

6. Tools Submenu

6.1. General Scheme of Network Operation Data Collection

Program daemons in the central Ranec server cyclically call designated nodes, read the necessary data from them and then store it in the database. This data is then displayed by other Ranec tools in graphs and tables. Before launching the daemons a picture of the network is created and stored in the database. Selection of queried nodes is given by their presence in the network allocated to the daemon. Nodes can be individually disabled from this selection by marking grey **Node** > **Tools** > **Node** > **Gray** or it is possible to disable all nodes of the network using **Desktop** > **Tools** > **Nodes** > **Gray**. daemons can monitor nodes in several networks. After defining the network the daemons can be prepared.

6.2. Types of Collected Data:

- ALARMS
 - information about the existence of a connection with a node
 - information about the state of its supply network/battery
 - processor temperature
- LOGS are records about operation read from CU statistical logs
 - **la** - log ila = calls log, RSS signal strength, DQ, frequency of received packet
 - **ll** - log ill = link log, number of packets successfully and unsuccessfully sent and received between two specific nodes
 - **lo** - log ilo = SCC ports log, packets which have passed through a physical SCC terminal
 - **lu** - log ilu = net user log, packets sent between SCC and a node
 - **lm** - log ilm = media log, overview of loading of the radio channel as a result of transmitting and receiving data and various intensities of interference
- GPS daemon stores data which arrives from nodes with a connected GPS signal receiver.

6.3. Data Processing

The daemon calls all network nodes one by one at the designated intervals and obtains the respective data from them.

- Alarm daemon monitors the node response time for standard calling. If the line is quiet for sometime it sends it own check query. The result is a graph with the node's reaction time to calling. If the connection is lost the node turns red, as opposed to green indicating normal status. The third possibility is that the node is blue, which indicates that a node is switched to battery supply.
- The daemon for logs reads the status of the respective statistical log. It then counts increments from the last call from obtained data. This can then be displayed in a graph.
- The GPS daemon processes the position data from the station with the GPS. The results in a picture of the immediate position of the station, the route traced or a view of RSS on the route.

6.4. Function of Daemons

The starting point is the current network in Ranec and its nodes which are not grey. A randomly ordered list of the nodes that will be polled is generated.

In the interval **Desktop> Tools> Daemon control> Daemon control** row: `a_alarm3` column: `delay` e.g. `-nd60000`, i.e. 60sec, nodes from this list are polled. The polling frequency i.e. the parameter `-nd` is chosen with regard to the acceptable net load with this communication. The recommended value of this additional load is around 1% of the network capacity. Select parameter `-nd` in the interval:

$$60\ 000 < nd < 4 \times 3\ 600 \times 1\ 000 / N$$

where N is the number of polled nodes and 4 (= 4 hours) represents the longest recommended query interval at one node. A long interval is selected in a large radio network with a lot of retransmissions, a shorter interval in a small network and the shortest interval in an Ethernet network which does not contain radio links.

It sends a so-called Long packet which ascertains, amongst other things: Ucc, power supply from the battery or network, Temperature, Rtt (round trip time), checks the setting of crons in the CU. A cron in the CU with a small delay notes a change: switch on, switch to battery, switch to network. The cron can't announce the modem is switching off, it is registered by the alarm daemon, as described below. The cron remains active even after resetting the CU to default mode, it can be switched off using command **icc**. For starting the alarm daemon against networks with modems, using older versions of fw < 5.79, in which cron is not implemented, parameter `-aD` can be used. Cron will not be started and indication of status (colour) is slower until the alarm daemon's query.

After polling the list a new list is compiled.

The alarm daemon monitors whether a packet arrived from the node in the interval 10 to 1200 sec. The interval is calculated with regard to the response time Rtt and other aspects of network loading (fast connection 10s, slower more). The alarm daemon has a separate timer for each monitored node. If a packet doesn't arrive a short packet called a sniff is sent. After three unsuccessful sniffs the node is marked red. It continues to be monitored. After the first operational packet or response to a sniff is received the node changes to green.

This process can be used in the case that monitoring is switched on for packets arriving from the network and being sent to the alarm daemon, e.g. `xxxxxx0A`. This address is in table **Desktop> Tools> Daemon control> Daemon control**. In the columns *name* and *daemon* there is the name of the network and the designation of the daemon `a_alarm3`, and in column *endofpw* there is the end byte of the alarm daemon address. Information arrives to the alarm daemon without monitoring the next time it is queried.

The alarm daemon writes the ascertained changes to a database. In addition to this about once every minute it writes the node status to the database even if there has been no change to the node. Therefore, gradually over approximately a four hour period (see above) a record is made for each node. The function **Ctrl+W> Alarm parameters> Check Alarm daemon is alive** monitors whether these records are being taken. If in time `Alarm daemon daed timeout` there is no communication between the daemon and database all nodes are changed to white indicating an indefinite monitoring status.

5 types of statistical daemon exist for individual logs `-aa`, `-al`, `-ao`, `-au`, `-am`. The statistical daemon only queries those nodes for which the alarm daemon found a functional connection. An exception can be made using parameter `-aA0`, when the statistical daemon sends queries to nodes even when the alarm daemon is not on. This attribute is useful in networks with older fw, where the alarm daemon may be a nuisance.

6.5. Daemons

The dialogue table "List of controlled daemons" can be found in the menu **Desktop**>**Tools**>**Daemon control**>**Daemon control**. Here a list of daemons which are prepared for collecting data from network nodes is made. Up to 250 rows with daemons can be prepared and these are activated as required.

	laeid [-]	name [-]	daemon [-]	typ [-]	status [-]	endofpw [-]	delay [-]	timeout [-]	repea [-]
15	15	-	-	14	uninitialized	0000000E			
16	16	-	-	15	uninitialized	0000000F			
17	70	burn	a_alarm3		enabled	00000010	-nd20000	-nt5000	-nr0
18	56	burn	a_stlog3	-aa	enabled	00000011	-nd120000	-nt12000	-nr3
19	57	burn	a_stlog3	-al	enabled	00000012	-nd120000	-nt12000	-nr3
20	58	burn	a_stlog3	-ao	enabled	00000013	-nd120000	-nt12000	-nr3
21	59	burn	a_stlog3	-au	enabled	00000014	-nd120000	-nt12000	-nr3
22	60	burn	a_stlog3	-am	enabled	00000015	-nd120000	-nt12000	-nr3
23	69	bw	a_alarm3		disabled	00000016	-nd30000	-nt12000	-nr0
24	54	tburn	a_stlog3	-aa	disabled	00000017	-nd20000	-nt12000	-nr3
25	64	mobile	a_alarm3		disabled	00000018	-nd30000	-nt12000	-nr0

Fig. 6.1: Daemon parameters

Content of table row :

- name name of the network in which the monitored nodes can be found
- daemon name of daemon. There are daemons for alarms **a_alarm3**, for statistical logs **a_stlog3**, and for gps **a_gps3**
- type there are various types of daemon a_stlog3 for individual logs -aa, -al, -ao, -au, -am
- status states are disabled (forbidden), enabled (permitted) and uninitialized
- endofpw here we read the end byte of the morse address, which the daemon detected and uses for sending queries
- delay e.g. -nd60000 is a pause in milliseconds between two queries sent by a daemon
- timeout e.g. -nt12000 is the time, in ms, the daemon waits for a response from the node
- repeat e.g. -nr3 is the max. number of attempts at making a connection
- param next parameters can be added here

Double-clicking on the table row opens **Daemon control record** which can be edited by clicking on the item. The new status is activated by pressing OK in the *Daemon control record* table. The history of changes in the *Daemon control record table* can be found in **Desktop**>**Tools**>**Daemon control**>**History**.

6.6. Displaying Alarms

In table **Setup> Alarm> Alarm setup** using icon "+" we can select the network where we want to obtain an indication of colour states of nodes. These networks must be allocated to an alarm daemon in advance for monitoring, see previous paragraph. In menu **Setup> Alarm** mark **Periodical alarm refresh**. Manual updating can be performed from here using command **Show> Refresh**. Now, after a certain time necessary for querying all nodes, the nodes change colour to green, red or blue. An overview of the states and changes to alarms over the past period can be viewed using command **Setup> Alarm> Alarm history**. This command prepares information from the database in the scope according to menu **Setup> Program configuration> Alarm parameters**. Only the last states of alarms for individual nodes are prepared for the interval between **offsetFrom** and **offsetTo**. For the interval from **offsetTo** to the present all changes of alarm states are prepared. The maximum overall number of alarms in History is determined by the **Alm Hist Len** parameter. If **Refresh alarms on startup** (Linux) is checked the nodes are coloured on starting with their current colours. In table **Setup> Program configuration> Alarm colour** it is possible to select other colours for indicating the states of nodes.

It is possible to graphically display data obtained by the alarm daemon over the elapsed period using **Node> Tools> Statistic> Alarm**. It is first necessary to select the time interval for displaying the record using **Node> Tools> Statistics> Interval**. The upper row determines the beginning (year, month, day, hour, minute) and the lower row the end of the displayed interval of records from the database. If **Until now** is used then the difference between the two rows determines the length of the interval which ends at the present time. Now it is possible to test other selections in menu **Node> Tools> Statistic>**

Alarm time response of alarm state. There are 3 states here:

state 0 normal state, green node

state 1 connection OK, supply from battery, blue node

state 2 loss of connection, red node

Response time for a packet to pass from the daemon to the node and back

Average re- mathematically modified response variation; includes the influence of prior response
sponse time times

UCC station supply voltage

Temperature temperature of the processor in the radio station

Graphs come with a tool bar with familiar functions. For example, zoom can be used for zooming in on the graph. The following icons are new:



switch on key, for explaining the meaning of graphs



switch off the description of coordinate axes in favour of the size of the graph



switch off displaying **x** denoting measured points on the graph line

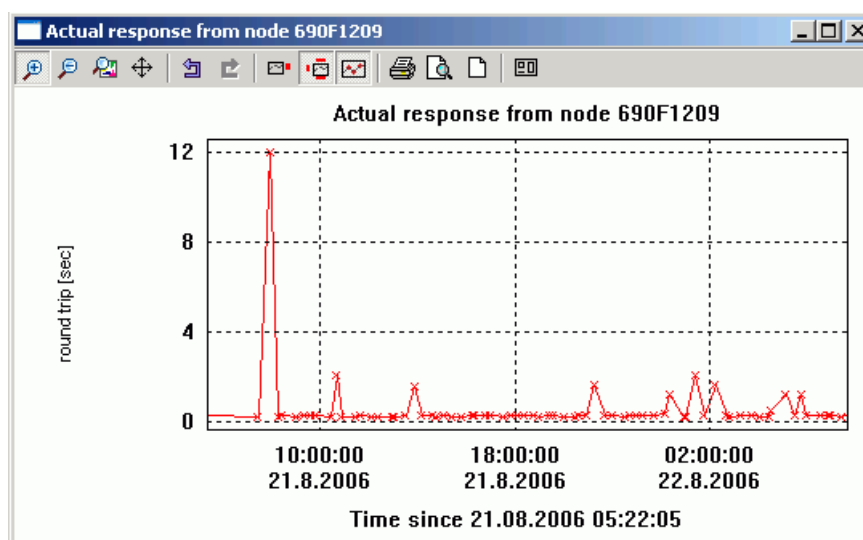


Fig. 6.2: Node response time

6.7. Displaying Logs

Logs are split into two groups according to whether they refer to the node or the line between nodes. By selecting **Node**>**Tools**>**Statistics** we obtain:

- Serial communication port - information from log "ilo", loading of physical serial ports
- User operation - log "ila", i.e. operation between the user channel SCC or ETH of the port and the node
- RF channel - log "ilm", loading of the physical radio channel split into radio transmission, reception of noise and reception of the decoded signal.

Clicking on the link between two nodes **Link**>**Statistics** it is possible to select the following information in the menu:

- Call log - from log "ila" value RSS, DQ and frequency of how they developed in time
- Link log - from log "ill" overview about the exchange of packets between two nodes; for a precise meaning of items see MORSE firmware documentation

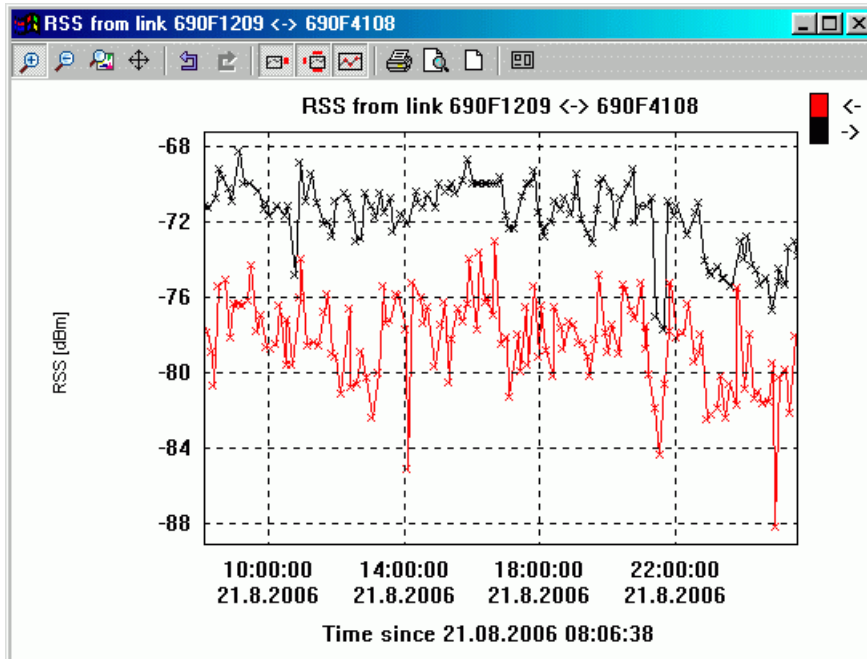


Fig. 6.3: Variation of RSS signal strength



Important

The **time synchronisation** must be set in the followed CU for properly displaying of logs. The daemons fetch the log report including the time GMT set in the asked CU. This information is saved in the database. At the displaying the time is modified according to local setting (timezone, summer time) in the Ranec client PC, which displays the diagram. When the time in CU is set wrongly, than the diagram has the wrong time coordinate also and is not visible.

This condition does not refer to the Alarm daemon diagrams. They use the Ranec server time only.

6.8. Tools in Linux

Other tools are available in the Linux operating system for working with networks.

6.8.1. Setr

Using commad **Node> Tools> Node> Service terminal** it is possible to start the **Setr** program at the selected node. This provides us with a wide range of configuration and testing tools.

Besides files `ranec.exe` and `ranec.mo` RanecClient running in Windows uses file `rr_setr.bat`, which starts Setr in the network, e.g.:

```
C:\morse-745\setr -pIP192.168.0.7 %1
```

With the help of this batch file it is then also possible to start Setr in OS Windows from the Ranec screen.

6.8.2. Configuration

Using command **Node**>**Tools**>**CNF**>**CNF upload** it is possible to save the configuration of the selected node or using **CNF download** to save the configuration to the node. Upload configuration from the whole network is possible using the command **Desktop**>**Tools**>**CNF**>**CNF upload**.

6.8.3. Time Synchronisation

Command **Desktop**>**Tools**>**Nodes**>**Fetch time sync state** is used to start the process for ascertaining how different set times of internal clocks are in network nodes. The result can be displayed using command **Desktop**>**Tools**>**Nodes**>**Import Nodes** in the form of colour-labelled nodes. Before importing clear the current colours of nodes using command **Desktop**>**Tools**>**Nodes**>**Clean**. The colour scale is defined in menu **Ctrl+E**>**State Color**.

6.8.4. Topology of Connections

Using tool **Desktop**>**Tools**>**Lines**>**Fetch routing topology** it is possible to start searching for links between nodes which are defined by routing, and possibly also with distinguished line frequencies (Obtain topology according to frequencies and routing). **Desktop**>**Tools**>**Lines**>**Fetch time sync topology** is another tool. This gives us a view of how information about the time of internal clocks is transferred between nodes. To display the result it is first necessary to delete the current drawing of connections using **Desktop**>**Tools**>**Lines**>**Delete all Lines** and then import the new diagram using **Desktop**>**Tools**>**Lines**>**Import Lines**.

7. RSS map

This layer serves for studying terrain covered by the signal for mobile stations. A requirement is connection to the database where data about the operation of mobile stations is stored. For working with the RSS map (Received Signal Strength) a separate layer is used in menu **Show>Map layers**. Clicking on the Rss icon opens up the list of mobile stations in the database. On selecting one of them a menu for selecting the time interval opens, same as the one for setting alarms. In Rss mode the following message appears on the bar at the bottom right: <RSS> adr.mobile station (number of points):database@server [user]

7.1. Menu RSS Map

The menu contains the following new possibilities:

- Interval Rss - setting of the initial and end time of records from the database
- Interval Rss Min/Max - end time points contained in the database
- Rss records - print out of the content of the database for a selected time interval

7.2. Editor Configuration for Rss Maps

Use command **RSS map> Configure layer** or Ctrl+E to draw up the following menu:

Element	Rss color	DQ color	Base color	Miscell.
icon Size	0	0	base 1	multiplier
icon Visible	70	10	base 2	
text Type	80	15	base 3	txt Back
text Visible	90	20		txt Transp
upTexttype	100	25		txt SizeScr
upTextVisible	110	28		
src Col	120	30		

- The size and visibility of the icon, and visibility of the upper and lower text are set in the Element column. The numerical value of Rss or DQ or the address of the current base station can be selected as the type of text. Src col gives the choice of according to which parameter the symbol colour will be set - according to the value of Rss or DQ or according to the address of the base station. On selecting "none" symbols will be black.
- Menu Rss color defines the Rss band and colour which it is represented by on the Rss map. It is possible to change the number of bands using commands "+" and "-", boundary values of Rss (double-clicking on the value) and colour (double-clicking on the colour).
- Menu DQ colour similarly defines the DQ (Data Quality) band and their colours.
- Menu Base color allows a list of used bases to be entered and their respective colours defined. Editing begins here by adding an empty row using command "+".
- Menu Miscell. contains known common parameters for the size and visibility of symbols.

7.3. Rss Map Context Menu

Clicking on the Rss symbol brings up a brief message with general point parameters (address of mobile station, Rss, DQ, address of base station through which the mobile station is available). The selection "element data" provides a whole set of information about the given point.

8. Mobile Station Map

This captures the route of the mobile station according to the record stored in the database. Log layers are inserted using the Log icon in the menu **Show>Map layers** in similar way to inserting Rss layers.

8.1. Mobile Station Map Menu

contains the new item:

- Mobile log - print out of the content of the database for a selected time interval

8.2. Editor Configuration for Mobile Map

Use the command **Mobile map>Configure layer** or Ctrl+E to draw up these menus:

Element	Miscell.
icon Size	multiplier
icon Visible	
icon Col	
line Thick	
line Col	
line Type	
text Type	text Background color
text Visible	text Transparent
up Texttype	text Size Scr
up Text Visible	

Meaning of parameters are the same as for the Rss editor. The following are new:

- icon Color - colour of point line
- line Thickness - thickness of connecting line line color

8.3. Context Menu of Mobile Station Map

Clicking on the Log symbol brings up a menu with a print out of general information about the point (address, speed and bearing of movement from previous point, altitude). Selecting "element data" brings up a print out out all information about the point. The "vstat" = vehicle status byte contains information about the status of inputs of the SEP unit or ADIO connected to the mobile station. The other 5 entries are bit information about the status of the CU. Direction of movement - the vector between two symbols represents movement from the initial edge to the middle of the target circle. The time interval for all images can be read and edited in the common menu **Setup>Program configuration>Intervals**.

9. Position of Mobile Station

This captures the immediate position of the mobile station supplemented by several prior positions. The Loc layer can be inserted using icon Loc in menu **Show > Map layers**.

9.1. Mobile Station Map Menu

offers the new item:

- Mobile loc - data for the displayed positions of mobile stations are contained in the table

9.2. Editor Configuration for Position of Mobile Station

Use command **Mobile loc > Configure layer** or Ctrl+E to draw up the following menus:

Element	Miscellaneous
icon Size	multiplier
icon Visible	
icon Col	
icon LCol	
line Thick	
line Col	
text Type	text Background color
text Visible	text Transparent
upTexttype	text Size Scr
upText Visible	snake Len

New parameters:

- icon Color - colour of prior positions
- icon Last Color - color current positions of mobile station
- line Thickness - thickness of connecting line
- line Color - color of connecting line
- snake Length - number of latest positions of mobile station, which are displayed

9.3. Context Menu of Mobile Station Position

Only contains the location of cursors. Updating of positions is similar as for alarms. Individually using command **Setup > Alarm > Alarm refresh** or automatically using **Setup > Alarm > Periodical alarm refresh**.

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