MANUAL

Meinberg Protocol Simulation

mpsv2

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Meinberg Radio Clocks GmbH & Co. KG

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1 Imprint

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3 Introduction

Congratulations that you have purchased the Meinberg Protocol Simulation Software.

This manual explains the most important simulation functions and will help you get started. The simulation software allows tests of NTP-time servers, NTP-clients, PTP-time servers, PTP switches and many other devices for network synchronization. Amongst other these devices can be tested on general functionality in relation to the appropriate protocol, response time, packet loss rates and responses to failure or the handling of increased load. By using a suitable and well equipped system, you can for example simulate about 1.000.000 NTP clients or up to 500 PTP slaves at full rate.

The following simulation modes are supported by the software:

NTP
```
NTP Clients (IPv4, IPv6)
NTP Server (IPv4, IPv6)
```

PTPv2 (IEEE 1588-2008)
```
Unicast Slaves (IEEE802.1/Ethernet Layer 2, IPv4, IPv6)
Unicast Masters (IEEE802.1/Ethernet Layer 2, IPv4, IPv6)
Unicast Controllers (IEEE802.1/Ethernet Layer 2, IPv4, IPv6)
Multicast Slaves (IEEE802.1/Ethernet Layer 2, IPv4, IPv6)
Multicast Masters (IEEE802.1/Ethernet Layer 2, IPv4, IPv6)
```

In this manual you will first be explained, in a "Quick start guide", how to start the simulation service.

After that, the structure of the main dialogs of the remote control interface (mpsrc) and the most important functions of how to set up a connection and the configuration of the simulation will be described in detail.

Should you notice any mistakes in the handling of the software, please help us to correct them, by writing an e-mail to support@meinberg.de. Thank you very much for your help and have fun using the Meinberg Protocol Simulation!

4 Basics

4.1 USB Live Linux

The simulation is delivered on a USB stick, with a bootable Linux live system. Via this system, you can start the software on any 64bit-systems without installation effort.

4.1.1 Boot procedure

Insert the USB stick with the imprint "Meinberg" into one of your USB ports and restart the system. Make sure that in the BIOS, the booting of USB sticks is activated and that the USB stick is at top priority of the boot order.

The following boot menu should appear on your screen if the boot order was correctly configured.

Now, you can choose between graphical user interface "MPS Live Linux (desktop)" or terminal mode "MPS Live Linux (Terminal)".

4.1.2 Network configuration

Configuration via graphical user interface

To make the configuration via graphical user interface, log in as user: "meinberg" with the password: "live", after a successful boot procedure. Your screen should show the following picture:

After logging-in, click on the marked symbol on the right side at the lower edge of the screen and after that on "Network Settings". In this field you can make settings for the network adapter.

In the window "Networking" click on "Add Profile" to create a new profile for one of the network adapters. It appears a new window called "New Profile". Select the tab "Identity", enter a name for this profile and select the network adapter (MAC address) for which the profile has to be created. This done, click on the tab "IPv4" and configure the IP settings as you desire. Confirm your entry with "Add". To configure more IP addresses, repeat the procedure. To finalize the network configuration you have to restart the system.
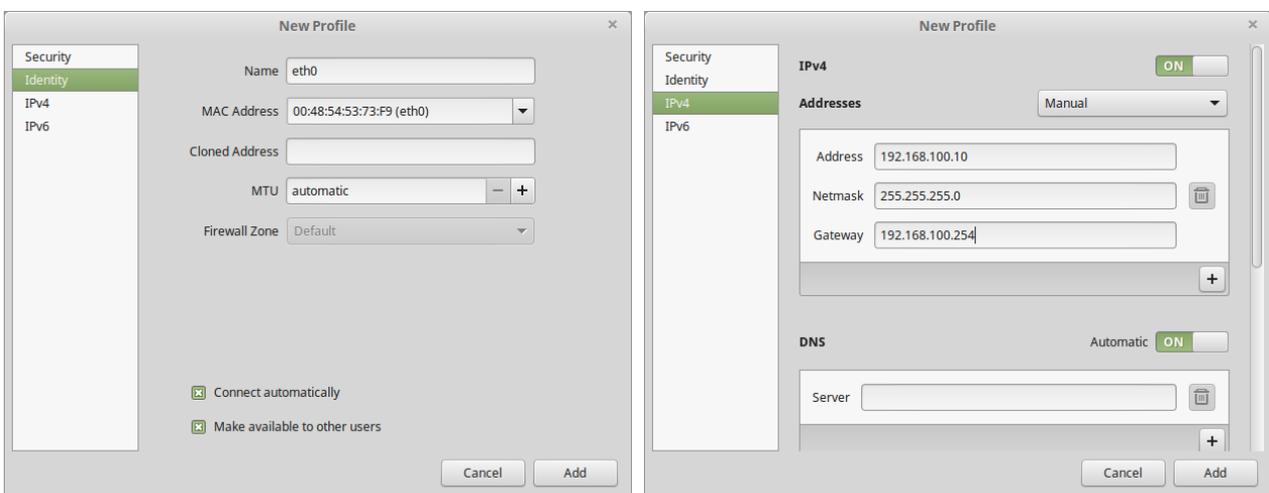
Configuration via terminal

To make the configuration via terminal, select "MPS Live Linux (Terminal)" in the boot menu.

You will automatically log in as user: "meinberg". For an overview of all installed network adapters, type in the command "ifconfig". Write down the MAC address (HWaddr) of the adapter, for which you would like to configure an IP address.

```
meinberg@mps-live ~ $ ifconfig
eth0      Link encap:Ethernet  HWaddr 00:48:54:53:73:f9
          inet addr:172.16.101.9  Bcast:172.16.255.255  Mask:255.255.0.0
          inet6 addr: fe80::248:54ff:fe53:73f9/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:72238 errors:0 dropped:105 overruns:0 frame:0
          TX packets:475 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:6848997 (6.8 MB)  TX bytes:82892 (82.8 KB)

eth1      Link encap:Ethernet  HWaddr 00:22:15:ab:01:a8
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
          Interrupt:20 Memory:fe700000-fe720000

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:19587 errors:0 dropped:0 overruns:0 frame:0
          TX packets:19587 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:9668588 (9.6 MB)  TX bytes:9668588 (9.6 MB)
```

Type in the command: "nmcli connection add type ethernet ifname *[name of the network adapter]*" to create a profile.

```
meinberg@mps-live ~ $ nmcli connection add type ethernet ifname eth0
Connection 'ethernet-eth0' (4e10e70e-b975-47ea-a148-3ae46931756b) successfully added.
meinberg@mps-live ~ $
```

With the command "nmcli connection edit ethernet-*[name of the network adapter]*" you will enter the configuration menu of the new profile.

```
meinberg@mps-live ~ $ nmcli connection edit ethernet-eth0

===| nmcli interactive connection editor |===

Editing existing '802-3-ethernet' connection: 'ethernet-eth0'

Type 'help' or '?' for available commands.
Type 'describe [<setting>.<prop>]' for detailed property description.

You may edit the following settings: connection, 802-3-ethernet (ethernet), 802-1x, ipv4, ipv6, dcb
nmcli>
```

Now, type in "set ethernet.mac-address" and confirm with the enter key. Type in the MAC address you wrote down before and confirm with the enter key. By using the command: "set connection.interface-name *[name of the network adapter]*" you assign the profile to the appropriate adapter.

```
nmcli> set ethernet.mac-address
Enter 'mac-address' value: 00:48:54:53:73:f9
nmcli> set connection.interface-name eth0
nmcli>
```

Using the command: "set ipv4.method manual" or "set ipv4 method auto" you can select between a static and a dynamic IP address. If you want to configure a static IP-address use the command: set ipv4.addresses *[IP-address/netmask]*.

```
nmcli> set ipv4.method manual
nmcli> set ipv4.addresses 192.168.100.10/24
nmcli>
```

With the commands "save" and "activate" you can save and activate the settings you have made. Exit the configurator with the command: "quit". To configure more IP-addresses, repeat the procedure. To complete the initial setup, restart the simulation service with the command: "mps restart".

```
nmcli> save
Connection 'ethernet-eth0' (4e10e70e-b975-47ea-a148-3ae46931756b) successfully updated.
nmcli> activate
Monitoring connection activation (press any key to continue)
Connection successfully activated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/7)
```

4.2 Installation on an independent system

In addition to the possibility of using the simulation service via live Linux, you can install it on any self-sufficient 64-bit Linux system. You will find the installation file on the partition "mps-setup" on the USB stick with the imprint "Meinberg". Alternatively, you can download it, according to your distribution (Debian, Ubuntu, Mint / CentOS, SuSE) at:

https://www.meinberg.de/download/software/mpsv2/mpv2_debian.zip
**https://www.meinberg.de/download/software/mpsv2/mpv2_centos.zip**

Now, extract the zip archive and start the installation script "install" via the command line. After the installation you can start the simulation using the command: "(sudo) mps start" in the remote control mode or directly via the command line. Please note, that the execution of the simulation service requires root privileges. More information about the control types can be found in the following chapter.

5 Control

5.1 Control via Remote Control Interface

5.1.1 Connection on the same computer

In order to configure and control the simulation on the same computer, start the live Linux system with the graphical user interface and log in as user: "meinberg" with the password: "live". Now, start the Remote Control Interface by double clicking on the desktop icon "MPS Remote Control". Double click on the panel "Localhost" and login as user: "root" without the need of a password.
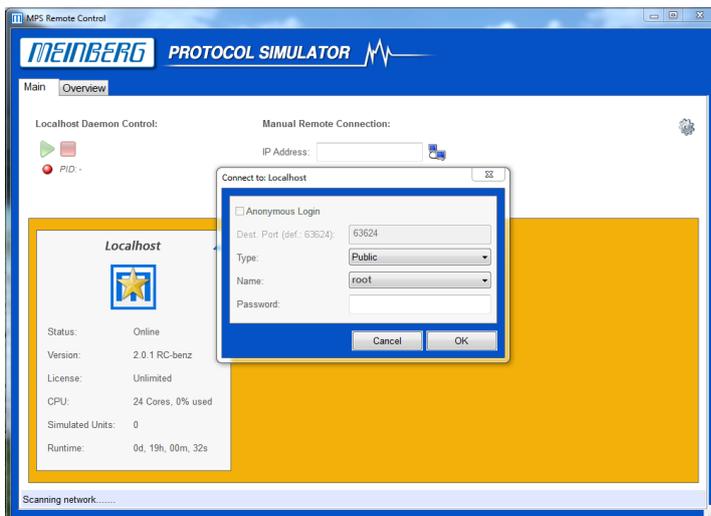
5.1.2 Connection from a remote computer

Alternatively, you can also configure and control the simulation from a remote Windows or Linux system.

Installation on a Windows system

Download the Remote Control Interface installation program from Meinberg's website at:

https://www.meinbergglobal.com/download/software/mpsv2/mpsrc_win_setup.exe

Alternatively, you can also find the program on the partition "mps-setup" on the USB stick with the imprint "Meinberg".

Attention: Do not remove the USB stick while the "Live-System" is still running.

After a successful installation adjust your firewall settings, so that TCP-Port 63625 and UDP-Port 65353 are unlocked. The ports to be used for this purpose can be changed afterwards.

Installation on a Linux system

Download the installation program MPSv2 from Meinberg's website at:

https://www.meinberg.de/download/software/mpsv2/mpsv2_linux.zip

Alternatively, you can also find the program on the partition "mps-setup" on the USB stick with the imprint "Meinberg".

Attention: Do not remove the USB stick while the "Live-System" is still running. Now, extract the zip archive and start the installation script "install" via the command line.

Connection after successful installation

After the successful installation, you can start the Remote Control Interface by using the Linux command: "mp-src" or for Windows by double-clicking on the desktop icon "MPS Remote Control". Now, double click on the panel with the name of the simulation computer and login as user: "root" without the need of a password.
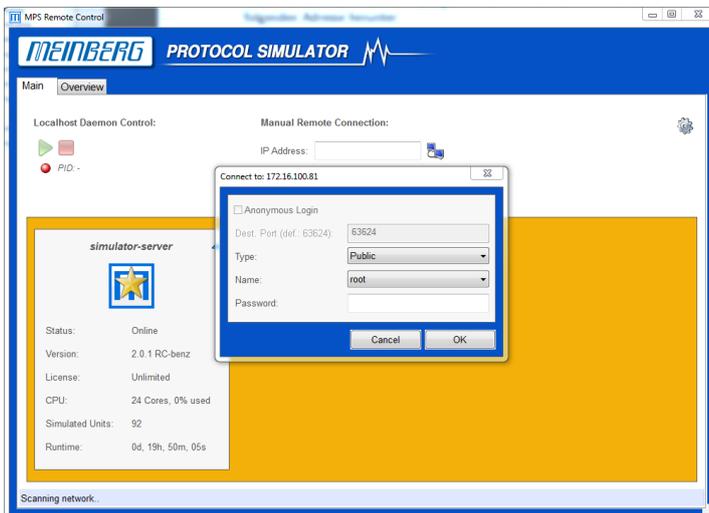
5.2 Control via the command line

To start the simulation service via the command line with the following parameters, it must, if it is running in the remote control mode, first be terminated with the command: "(sudo) mps stop".

5.2.1 Required parameters

>	**-m**,	**–mode**	Simulation mode ("NTP"/"PTP")
>	**-c**,	**–count**	Number of units to be simulated
>	**-i**,	**–interface**	Network adapter (e.g. "eth0")

5.2.2 Optional Parameters

>	**-hw**,	**–hwAddr**	MAC address of the first unit to be simulated [default: EC:46:70:FF:00:00]
>	**-p**,	**–protocol**	Network protocol ("L2"/"IP4"/"IP6") [default: "IP4"]
>	**-ip**,	**–ipAddr**	IP address of the first unit to be simulated [default: 172.26.1.1/2000::1]

NTP configuration options:

>	**-ra**,	**–refAddr**	NTP server address
>	**-pt**,	**–pollType**	NTP polling mode (0 = user-defined, 1 = fast sync, 2 = standard) [default: 2]
>	**-di**,	**–defPollIntv**	Standard polling interval [default: 4 (2 EXP 4 = 16 seconds
>	**-ci**,	**–custPollIntv**	User-defined polling interval (ms) [default: 500]

PTP configuration options:

>	**-tt**,	**–transmType**	Transmission mechanism (0 = Unicast, 1 = Multicast) [default: 1]
>	**-ck**,	**–clockType**	Device type (0 = Master, 1 = Slave, 2 = Controller(uc)/Auto(mc)) [default: 1]
>	**-dm**,	**–delayMech**	Delay mechanism (0 = Peer2Peer, 1 = End2End) [default: 1]
>	**-dn**,	**–domainNum**	Domain number [default: 0]
>	**-ai**,	**–annIntv**	Announce interval (2(x Sec., -7..7) [default: 0]
>	**-si**,	**–syncIntv**	Sync interval (2(x Sec., -7..7) [default: 0]
>	**-ri**,	**–reqIntv**	Request interval (2(x Sec., -7..7) [default: 0]
>	**-hm**,	**–hybridMode**	Hybrid mode (0/1) [default: 0]
>	**-pm**,	**–priMasAddr**	Primary unicast master or controller address [default: EC:46:70:FF:F0:00/172.26.0.1/2000::1]
>	**-am**,	**–altMasAddr**	Alternative unicast master or controller address

5.2.3 Options

>	**-d**,	**–daemon**	Start the simulation in the Remote Control mode
>	**-n**,	**–netInfo**	Display information about the network adapter and terminate the service
>	**-l**,	**–license**	Show license information and terminate the service
>	**-s**,	**–stats**	Display statistics every second
>	**-f**,	**–statsFile**	Write statistics into a file every 30 seconds
>	**-h**,	**–help**	A list of all possible configuration parameters

Parameter list
For a complete list of all possible configuration options enter the command: "mpsd -h" or "mpsd –help". Please note that a simulation can only be started either in the remote control mode or via the command line, but not in parallel.

6 Remote Control Interface

6.1 Main Tab

The main tab consists of four functional areas.
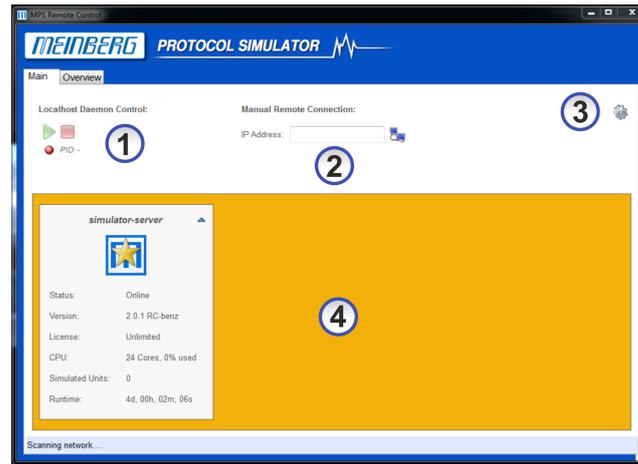
The individual areas will be described in the following sections.

6.1.1 Localhost Daemon Control

If the Remote Control Interface was started on a Linux system, the simulation service can be started, stopped and monitored in this area. This function is only available, when using Linux, since it is not available on Windows systems.


With the "Play" button, the service can be started and stopped with the "Stop" button. In the "PID" area, both, the current status and process-ID are displayed, as long as the service is running.

6.1.2 Manual Remote Connection

If the service does not automatically appear in the overview (4), i.e. due to blocked UDP-Ports, the connection to a simulation service can also be done manually. To do so, enter the IP address of the simulation computer in this area and click on the button which is used to establish the connection. Now, the window for the connection (user selection, password entry) should appear. More information can be found in the description of overview (4).

6.1.3 Remote Control Settings

To open a new window with the title "Preferences" click on the gearwheel icon. In this window you can make general settings for the Remote Control Interface.
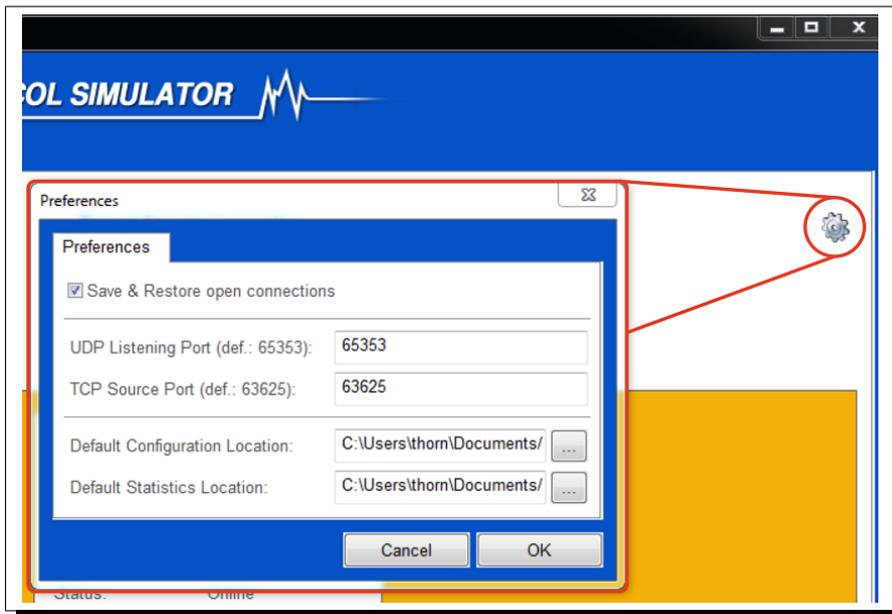
Configuration Options:

Save & Restore open connections
If this function is activated, all open connections will be saved when the Remote Control Interface is terminated and automatically restored at the next start.

UDP Listening Port
The simulation service sends (if enabled) UDP broadcast packets with general information about the service to the network. In this field the corresponding source port can be configured. By default, port 65353 is used. Attention: Once the setting has been changed, only the services which use the same destination port will be detected automatically! Therefore, remember to also change the settings for the service. The required steps are explained in chapter "Connection Tab".

TCP Source Port
A connection to a simulation service is set up with the help of the transmission protocol "TCP". The source port which should be used can be set under "TCP Source Port". As default, port 63625 is used.

Default Configuration Location
The default target path for group configurations can be selected under "Default Configuration Location".

Default Statistics Location
The target path for saved statistical files can be selected under "Default Statistics Location".

6.1.4 Overview of detected simulation services

Automatically detected or manually registered services are displayed in the service overview (4).
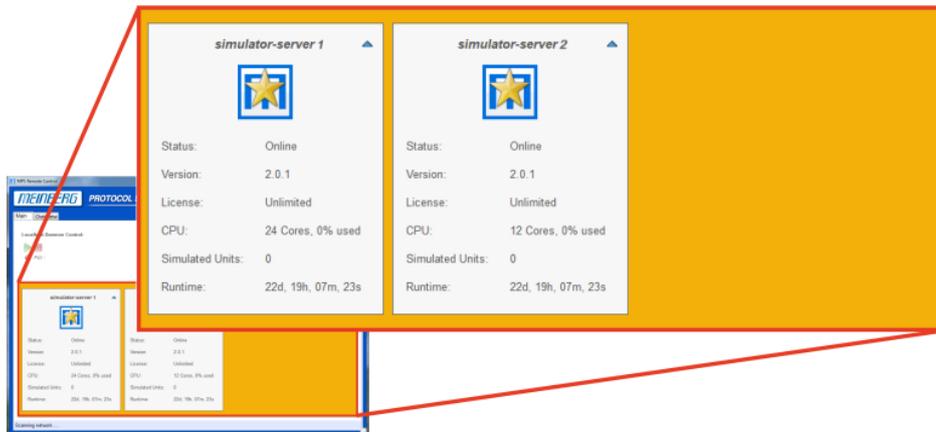
The following options are available to connect to one of the services:

- Double click the Meinberg Star Icon
- Left click on the blue arrow icon of the service → Connect
- Right click on the panel of the service → Connect

To establish a connection, a connection window will appear, in which you can make the following settings:

Setting options:

Anonymous Login
An anonymous login can only be made without user name and password. This function is only possible if it is activated in the simulation service.

Dest. Port
"Dest. Port" stands for the destination-port of the TCP connection and can only be configured, if the service was added manually. For an automatically detected service the field is already filled in.

Type
In the field "Type" you can select the user type. "Public" users are introduced by previously mentioned UDP packets, whereas "Private" (secret) users remain unknown and have to be entered manually by the respective user. The type is determined once at each user creation.

Name
Depending on the previously selected user type you can either choose a public user or enter your private user name.

Password
In this field type in your personal user password.

Confirm your entry with "OK".

Please Note:
Upon delivery, only the user "root" without password exists. After the first login with the user name "root", you can change the user database as desired.

6.2 Connection Tab

After having successfully established a connection with a simulation service, the connection tab will open up.
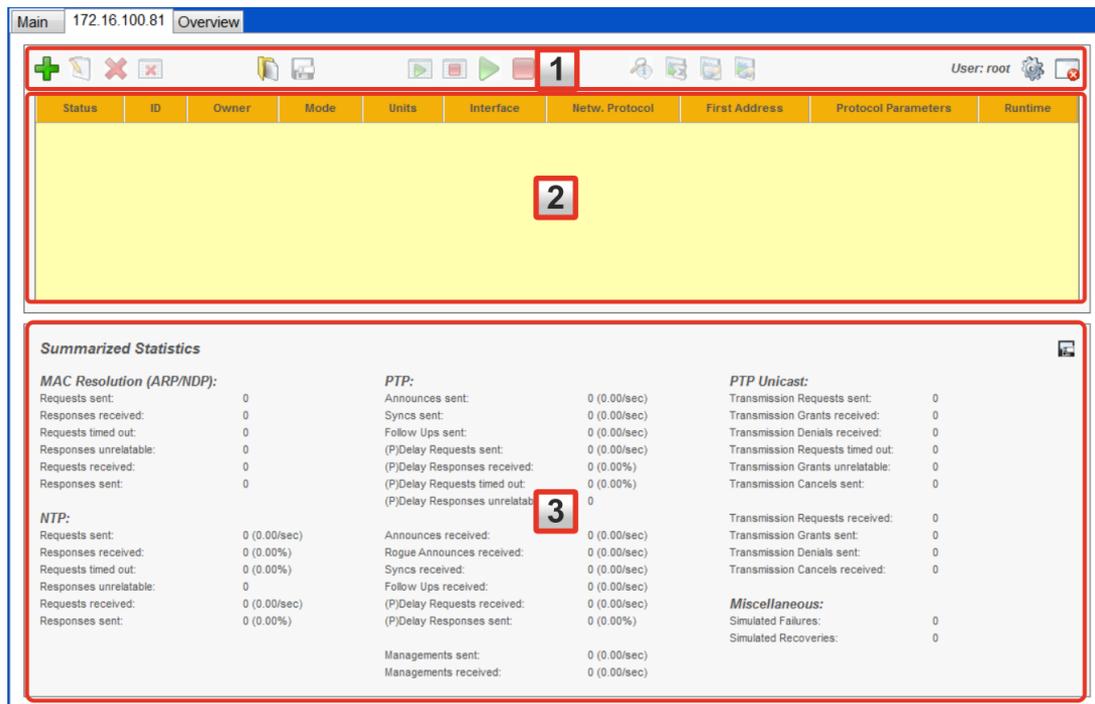
In area 1, the main menu to configure, control and monitor the simulation service, is displayed.

1	➕	Create a new simulation group
2	📝	Edit an available group
3	✖	Delete the selected group(s)
4	▣	Deletion of all available groups
5	📂	Opening of a group configuration file
6	💾	Saving the current group configuration
7	▶	Starting all Groups
8	■	Stopping all Groups
9	▶	Starting the selected Group(s)
10	■	Stopping the selected Group(s)
11	🔍	Status details of the selected Group(s)
12	📊	Statistics / Figures of the selected Group(s)
13	📋	Resetting all Group Statistics
14	📋	Resetting Statistics of the selected Group(s)
15	⚙	Default settings of the simulation service
16	⊗	Disconnect

The following chart shows the individual symbols and their fundamental functions.

6.2.1 Symbol 'Add' - Create a new simulation group

By clicking on the symbol "Add", a window to perform group configurations opens up. This window is divided into a main tab (Main), a special tab (Special) and other protocol specific tabs (NTP, PTP...).

Main Tab (Main)

Simulation Mode
Simulation mode (NTP or PTP). Depending on the selected mode, additional protocol specific tabs will be faded in or hidden.

Group Name
Name of the group.

Simulated Units
Number of units to be simulated (i.e. NTP Clients or PTP Slaves). For each additional simulated unit the configured MAC and IP address will be incremented.

Network Interface
The network adapter which shall be used.

MAC Cache
Type of the simulated MAC address storage. Depending on the selection, a separate MAC cache per simulated unit (Per Unit) or total cache per group (Per Group) will be created.

MAC Cache Timeout
The validity period of an entry in the MAC cache, in seconds.

Network Protocol
The network protocol which shall be used (IPv4, IPv6, IEEE 802.3). Depending on the selected protocol a MAC and / or IP address must be configured subsequently.

First MAC Address
MAC-address of the first simulation unit. The calculated MAC address of the last unit will be displayed in the field "Last MAC Address".

First IP Address
IP address of the first simulation unit. The calculated IP address of the last unit will be displayed in the field "Last IP Address". Depending on the selected network protocol, an IPv4 or Ipv6 address must be configured.

Subnet Mask / Network Prefix
Number of netmask bits. Depending on the configuration, a corresponding network address will be displayed in the field "Network IP Address".

Gateway
Activation of the gateway configuration. At activated gateway, the corresponding address of the gateway to be used, can be configured in the next field "Gateway IP Address".

DSCP
Differentiated Service Code Point (Per Hop Behavior), which can be used for prioritization of IP packets in switches.

TTL/Hop Limit
TTL (Time to live) determines the number of possible hops between start- and end nodes of network packets.

Request Timeout
Standard validity period of a request in milliseconds (i.e. NTP Request), before it is marked as unanswered.

Special Tab (Special)
In the tab "Special", special features such as VLAN, failure simulation or Date-/Time- simulation can be switched on or off and configured. If the features are switched off, the corresponding configuration fields will be deactivated.

VLAN Tagging

Priority (PCP)
Prioritization of VLAN packets.

Drop Eligible
Setting the Drop Eligible Bits (dropping of packets in case of congestion).

ID
ID of the VLAN tag (0-4095)

Ignore Untagged Packets
Prevent the reception of untagged packets.

Failure Simulation

Time Between Failures (TBF):
Period of time between two simulated failures of a unit in seconds.

Time To Recover (TTR)
Period of time between the beginning of a simulated failure and the recovery of a unit in seconds.

Date/Time Simulation

Simulated Date
Date of the simulated group.

Simulated Time
Time of the simulated group.

Leap Second
Indication, whether for the next possible leap second insertion point, a positive or negative leap second shall be inserted.

NTP Tab (NTP)

Depending on the selected simulation mode, you can make specific settings for NTP clients or server in this tab.

Stratum
The stratum value (NTP server level) of a simulated NTP server.

Precision
The time precision which the server announces to the outside.

Root Delay
Estimated round trip delay to the primary reference clock.

Root Dispersion
Greatest possible time error in relation to the primary reference clock.

Reference ID
ID of the current reference, in form of a reference clock type, an IPv4 address, a MD5 Hash (IPv6) or an un-synchronized condition.

Source Port
Source port of outgoing NTP packets, which is to be used.

Client Simulation
Switching the NTP client simulation on or off. Depending on the condition, the following entry fields are activated or deactivated. Independent from the client simulation, the server function is basically always activated.

Server IP Address
IP address of the NTP server, which shall be tested.

Polling Interval
NTP polling mode (user-defined, fast sync, standard). Depending on the selected mode, different entry fields are faded in or hidden.

In the user-defined mode, the length of the polling interval (user-defined interval) must be specified in milliseconds. Next to the "Fast Sync Interval" in milliseconds the duration (Fast Sync Duration) in seconds, the target percentage of answered requests, as well as the standard interval (Fast Sync Default Interval) after the end of the duration and fulfillment of the target percentage are needed in seconds, in the "Fast Sync" mode.

PTP Tab (PTP)

Depending on the selected simulation mode, you can make specific settings for PTP in this tab.

Transmission Type
Transmission type of PTP packets (Unicast or Multicast). Depending on the selected "Transmission Type" different control panels are faded in or hidden.

Clock Type
Clock type of the simulated unit(s). For the transmission via unicast, you can select from the clock types "Slave", "Master" and "Controller" (Unicast Load Balancer). In the Multicast mode you can as well choose between "Slave" and "Master". Additionally, the type "Auto" is available, which automatically decides between "Slave" and "Master" (Best Master Clock Algorithm). Also at the selection of the clock type, different control panels are faded in or hidden, and possible additionally required configuration tabs are displayed.

Profile
Configuration set, or PTP profile. Depending on the selected transmission type you can choose between "Telecom G.8265.1" and "SMPTE" (Unicast) or "Power C37.228", "Telecom G.8275.1" and "SMPTE" (Multicast). When you select a profile, appropriate standard defined parameters are preset and possible additionally required control panels faded in. Profile specific parameters will be explained in detail, at the end of this chapter.

Timestamping Mechanism
Timestamping mechanism. The possibility to choose between "One-Step" and "Two-Step". Follow-Up packets are only generated in the "Two-Step" procedure.

Domain Number
PTP domain number. By using the domain number, you can separate the PTP traffic onto different domains.

Announce Receipt Timeout (Multicast)
Number of "announce" intervals, which a simulated device is waiting for, before it marks a detected "Master" as passive and reacts in the appropriate way depending on the set clock type.

Announce Interval (Multicast Master, Auto / Unicast Slave, Controller)
Interval that sends out "announce" packets. In the "Unicast" mode this parameter is configured on the "Slave's" side and is requested from the corresponding "Master" by the "Slave". In the "Multicast" mode, the "Announce Interval" is configured directly at the "Master".

Sync Interval (Multicast Master, Auto / Unicast Slave)
Interval that sends out "Sync" (and "Follow-up") packets. In the "Unicast" mode this parameter is configured on the "Slave's" side and is requested from the corresponding "Master" by the "Slave". In the "Multicast" mode, the "Sync Interval" is configured directly at the "Master".

(P)Delay Request Interval (Multicast / Unicast Slave)
Interval that sends out "(Peer) Delay Requests" packets. In the "Unicast" mode this parameter is configured on the "Slave's" side and is requested from the corresponding "Master" by the "Slave". In the "Multicast" mode, the interval is configured for all clock types, for the "Master" it means the maximum possible request rate and for the "Slave" it means the actually used rate.

Delay Mechanism (Multicast)
The mechanism which is to be used for the calculation of the delay. In "E2E" (End to End) mode, "Delay Requests" and "Delay Response" packets are send, in "P2P" (Peer to Peer) mode, "Peer Delay Requests" and "Peer Delay Response" packets.

Hybrid Mode (Multicast)
If "Hybrid Mode" is activated, "Delay Request" packets are directly send to the Master via Unicast, to avoid unnecessary multicast traffic.

Max. Requests (Unicast Master)
Maximum number of incoming "Delay Request" packets per second, which a simulated Unicast Master is able to handle. This parameter is only necessary, if PTP Unicast "Load Balancing" (ULB) is used.

Transmission Duration (Unicast Slave, Controller)
Validity of a Unicast packet subscription (Announce/Sync/Delay Request) in seconds.

Unicast Load Balancing (Unicast Slave)
If ULB is activated, the entry fields "Group IDs", "Recommendation Validity" and "Avoid Master Hopping" are enabled and instead of "Primary Master Address", "Alternate Master" and "Alternate Master Address"; "Primary Controller Address", "Alternate Controller" and "Alternate Controller Address" are displayed. Furthermore, functionalities for the communication with unicast controllers are enabled by specific ULB TLVs.

Group IDs (Unicast Slave)
Accepted "Group IDs" of proposed Unicast Masters, at the use of ULB. 255 is to be used as "Wildcard Group ID".

Recommendation Validity (Unicast Slave)
Number of subscription intervals, for which a proposed Master is used. After expiry, a new request is send to the controller.

Avoid Master Hopping (Unicast Slave)
If activated, it prevents the simulated Slave to switch between two Masters, which are both being proposed due to their identical quality characteristics.

Primary Master Address (Unicast Slave)
IP Address of the Unicast Master, which is to be used first.

Primary Controller Address (Unicast Slave - ULB)
IP Address of the Unicast Controller, which is to be used first.

Alternate Master (Unicast Slave)
Configuration activation of an alternate Unicast Master, which is only to be used, if the primary Master is not accessible.

Alternate Controller (Unicast Slave - ULB)
Configuration activation of an alternate Unicast Controller, which is only to be used, if the primary Controller is not accessible.

Alternate Master Address (Unicast Slave)
IP Address of the Unicast Master, which is to be used alternatively.

Alternate Controller Address (Unicast Slave - ULB)
IP Address of the Unicast Controller, which is to be used alternatively.

UTC Offset
Current difference of the TAI time scale to UTC, due to leap seconds. At the evaluation of PTP packets, the "UTC Offset" is used to calculate the "Delay" and the "Offset".

Profile Version (C37.238 Profile)
The power profile version, which is to be used. Depending on the selected version, different and additional configuration possibilities are displayed in the tab C37.238.

Destination MAC Address (G.8275.1 Profile)
The target MAC Address of PTP packets in the G.8275.1 Profile.

PTP Unicast Load Balancing Reiter (PTP ULB)

In this tab, you can make specific configurations for the PTP Unicast Controller.
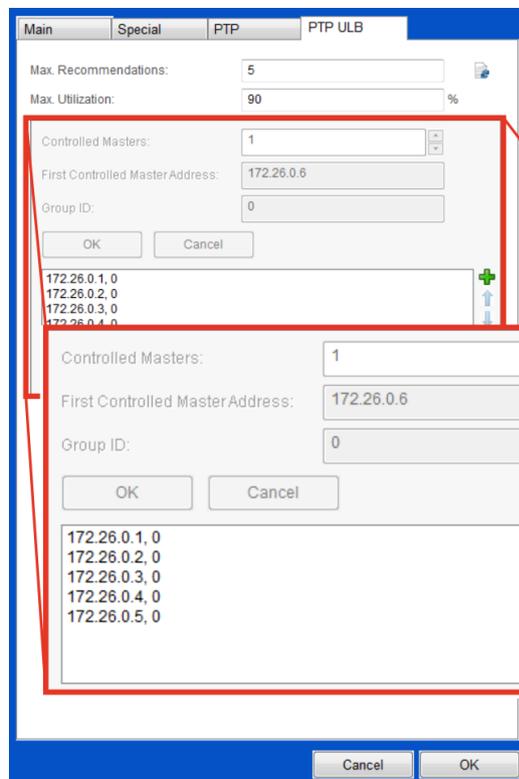
Max. Recommendations
Maximum number of recommended Masters, in an answer to a Slave request.

Max. Utilization
Maximum utilization of the controlled Masters. After exceeding this limit value, a Master is no more recommended.

PTP Quality Tab (PTP Master)

In this tab you can configure the quality parameter of simulated PTP Masters, which, among others, are crucial for the result of the "Best Master Clock Algorithm" (BMCA).

Priority 1
Priority 1. First priority parameter in the BMCA. Value range: 0-255

Clock Class
Traceability of the time and frequency precision. Second quality parameter in the BMCA. Value range: 0-255.

Clock Accuracy
Clock accuracy. Third quality parameter in the BMCA.

Clock Variance
Maximum possible clock variance. Calculated with the "Allan Deviation". Fourth quality parameter in the BMCA. Value range: 0-65535.

Priority 2
Priority2. Fifth quality parameter in the BMCA. Value range: 0-255.

Steps Removed
Number of "Boundary Clocks" between the Master and the Grandmaster.

GM Clock ID
PTP Clock ID of the Grandmaster.

Time Source
Time Source, i.e. "GPS". When selecting the time source "Custom", an additional entry field for a user-defined hexadecimal value fades in ("Custom Time Source").

Time Scale
Used time scale. You can choose between the standard PTP time scale and any other scale.

Time Traceable
Shows, if the current frequency can be traced back to a reference clock.

Frequency Traceable
Zeigt an, ob die aktuelle Frequenz auf eine Referenzuhr zurückzuführen ist.

PTP SMPTE Tab (PTP SMPTE Master)

In this tab you can make specific settings for the Master operation in the SMPTE profile. The corresponding values will be taken over into the "Synchronization Metadata TLV".

System Frame Rate
Standard frame rate of the simulated device. When choosing the framerate "Custom", an additional entry field for a user-defined rate in Hz fades in.

Master Locking Status
Additional information about the clock class, which shows the current synchronization status.

Time Address Flags
Divided in "Drop Frame" and "Color Frame Indication".

Current Local Offset
Current Offset of the system time to the local time in seconds.

Daily Jam Time
Point in local time (in ten-minute intervals) since midnight, for jamming ST 12-1 time address to local time.

Dailight Saving
Divided in "Current", "Next Discontinuity" and "Previous Daily Jam Time". Shows if at these times it is either summer- or wintertime.

PTP C37.238 Tab (PTP C37.238 Master)

In this tab you can make specific settings for the Master operation in Profile C37.238. The corresponding values are taken over into the "C.37.238 TLV". Depending on the selected profile version ("Profile Version"), different configuration possibilities are offered.

Grandmaster ID
ID of the simulated "Power Profile Grandmaster". Value range: 0-255.

Network Time Inaccuracy
Know inaccuracy of the network time in nanoseconds.

Alternate Time Offset (C37.238-2011)
Offset of an individual time scale to UTC in seconds.

Alternate Time Scale Name (C37.238-2011)
Name of the individual time scale.

STD UTC Offset (C37.238-revision)
Standard offset to UTC, at activated "Daylight Saving Time" in seconds.

STD Time Zone Name (C37.238-revision)
Name of the time zone, at inactivated "Daylight Saving Time".

Includes DST (C37.238-revision)
Shows if a time zone should be configured for the "Daylight Saving Time" or not.

STD Time Adjustment (C37.238-revision)
The time, when it is switched from "Daylight Saving Time" to standard time. Is divided in "hour of day", "day of week", "week of month" and "month".

DST UTC Offset (C37.238-revision)
Offset to UTC, at activated "Daylight Saving Time" in seconds.

DS Time Adjustment (C37.238-revision)
The time, when it is switched from standard time to "Daylight Saving Time". Is divided in "hour of day", "day of week", "week of month" and "month".

DS Time Zone Name (C37.238-revision)
Name of the time zone at activated "Daylight Saving Time".

6.2.2 Symbol 'Edit' - Edit an available group

When you click on the symbol "Edit", the window for group configuration, which was explained in detail in the previous chapter, opens up. In this window, all previously made configurations can be changed at any time later.

### 6.2.3 Symbol 'Delete' - Delete the selected group(s)

When you click on the symbol "Delete", the selected group or groups will be deleted. Ongoing groups will automatically be stopped before deletion. Please note, that deleted groups cannot be restored.

6.2.4 Symbol 'Delete All' - Deletion of all available groups

When you click on the symbol "Delete All", all configured groups will be deleted. Ongoing groups will automatically be stopped before deletion. Please note, that deleted groups cannot be restored.

6.2.5 Symbol 'Open' - Opening of a group configuration file

When you click on the symbol "Open", a new window opens up to select a saved group configuration (*.mps). After your selection and a subsequent click on "Open" the current group configuration is deleted and the saved configuration is uploaded.
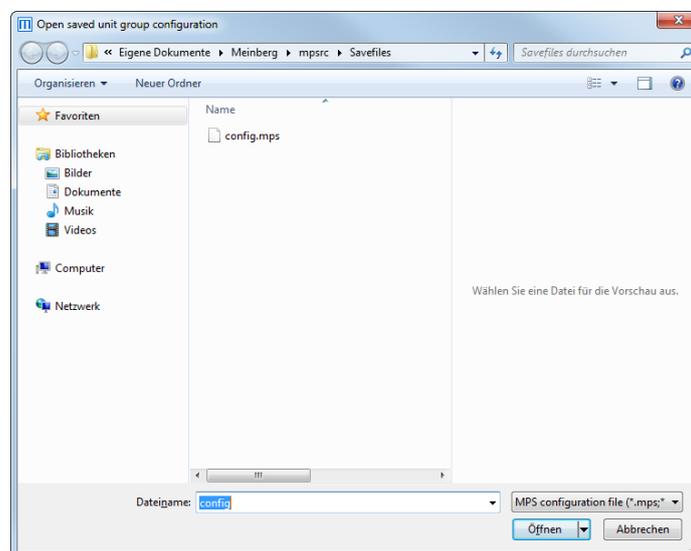
6.2.6 Symbol 'Save' - Saving the current group configuration

When you click on "Save", a window opens up to save the current group configuration. After you enter the file name and click on the button "Save", the current configuration is saved.

6.2.7 Symbol 'Run All' - Starting all Groups

When you click on the symbol "Run All", all listed simulation groups are started.

6.2.8 Symbol 'Stop All' - Stopping all Groups

When you click on the symbol "Stop All", all listed simulation groups are stopped.

### 6.2.9 Symbol 'Run' - Starting the selected Group(s)

When you click on the symbol "Run", all the selected simulation groups are started.

6.2.10 Symbol 'Stop' - Stopping the selected Group(s)

When you click on the symbol "Stop", all the selected simulation groups are stopped.

6.2.11 Symbol 'Status Details' - Status details of the selected Group(s)

When you click on the symbol "Status Details", a new window opens up, which displays details about the current simulation status. Depending on the simulation type (NTP, PTP Master / Slave, PTP Controller), the displayed information differs from one another. Using the navigation buttons (arrow left, arrow right) you can select the device, for which the details should be displayed.
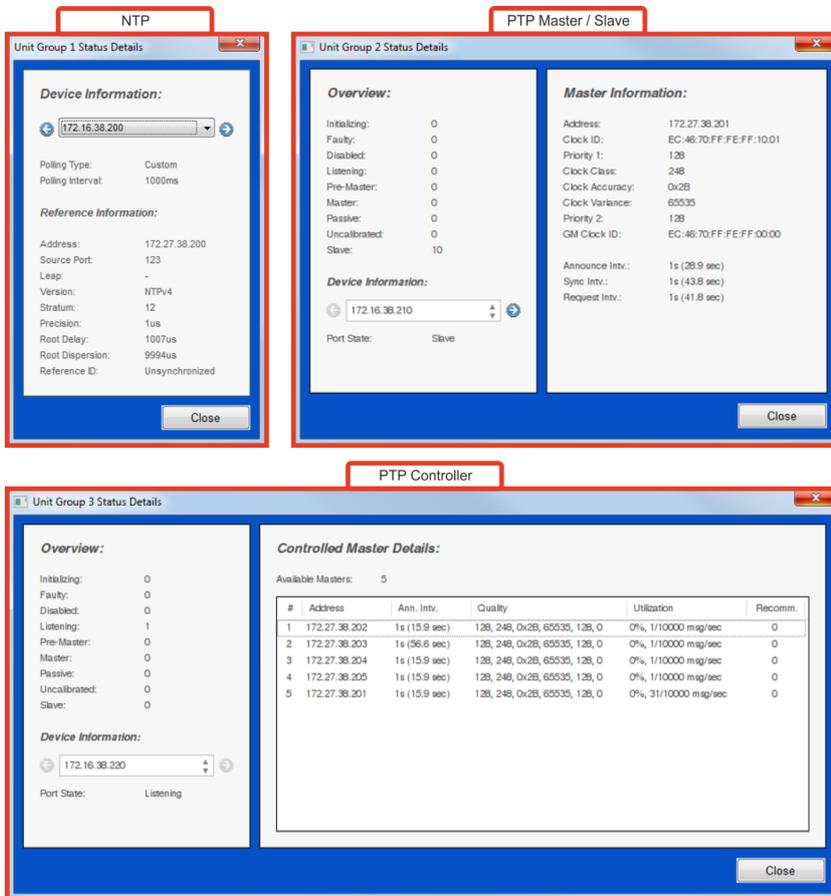
6.2.12 Symbol 'Statistics Summary' - Statistics / Figures of the selected Group(s)

When you click on the symbol "Statistics Summary" a window opens up, which displays a summary of the current simulation statistics. If you have not selected a simulation group, a complete statistics is displayed. If a group is selected, only a group specific statistics is shown.
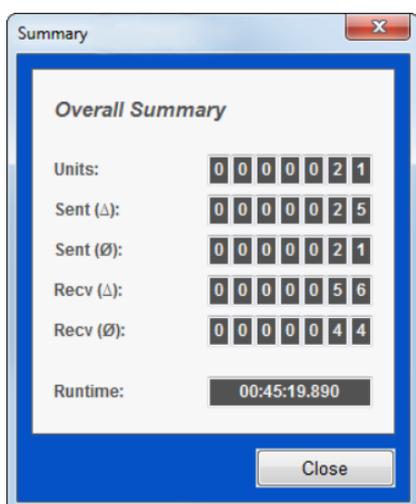
6.2.13 Symbol 'Reset All Statistics' - Resetting all Groups

When you click on the symbol "Reset All Statistics", all the statistics are reset. Please note, that a reset cannot be reversed. This is why you should not forget to save the statistics before you reset them.

6.2.14 Symbol 'Reset Statistics' - Resetting Statistics of the selected Group(s)

When you click on the symbol "Reset Statistics", the statistics of the selected group(s) are reset. Please note, that a reset cannot be reversed. This is why you should not forget to save the statistics before you reset them.

6.2.15 Symbol 'Daemon Preferences' - Default settings of the simulation service

When you click on the symbol "Daemon Preferences", a new window opens up where you can configure the simulation service. This is divided into the following five tabs:

Basic Settings (General):
In this tab you can configure general settings, e.g. the type of user registration.
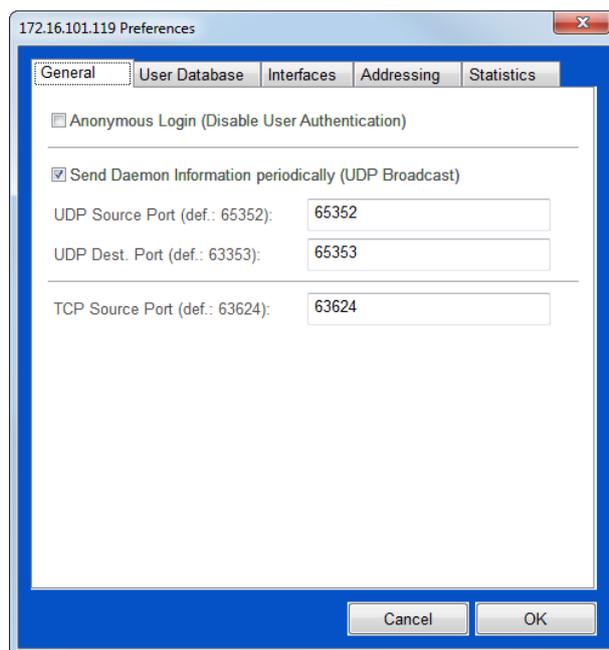
Anonymous Login (Disable User Authentication)
If you activate the anonymous login, the user authentication will be disabled. Users will automatically login as "Anonymous".

Send Daemon Information perdiodically (UDP Broadcast)
Switching on and off the every second transmission of UDP broadcast packets, by which simulation services are detected on the network automatically from the "Remote Control Interface".

UDP Source Port
UDP source port for the transmission of UDP Broadcast Packets. Default settings: 65352.

UDP Dest. Port
UDP destination port, to which UDP Broadcast Packets are send. Default settings: 65353.

TCP Source Port
TCP source port, which is used to establish a connection to the "Remote Control Interfaces".

User Management (User Database)
In this tab you can create, edit or delete a user profile. When registering for the first time, only the user: "root" without a password exists. If you want to create an additional profile click the "+" button.
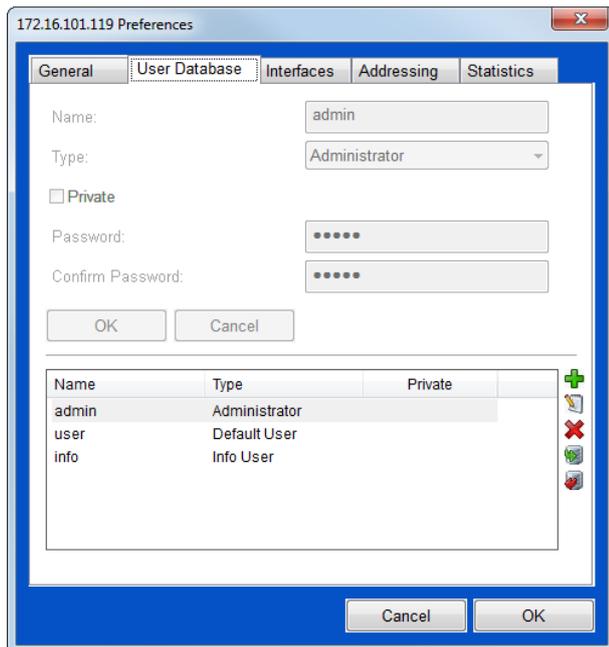
Name
Freely selectable user name.

Type
The rights of a user depend on its user type. The "Administrator" has unlimited configuration rights. The "Default User" can basically use all the control functions, but is not allowed to configure the simulation service. The "Info User" can only view the statistics of the simulation groups.

Private
Switching the "Private" function on or off. "Private User" are not published via the UDP Broadcast Packets, they must be known and entered manually.

Password / Confirm Password
Freely selectable password (min. 1 character). To confirm, reenter the selected password.

Network Interfaces (Interfaces)
In this tab all the network interfaces of the simulation computer are listed. The use can assign an alias to each interface (i.e. network description). Furthermore, Name, MAC address, as well as all the assigned IP-addresses can be displayed.
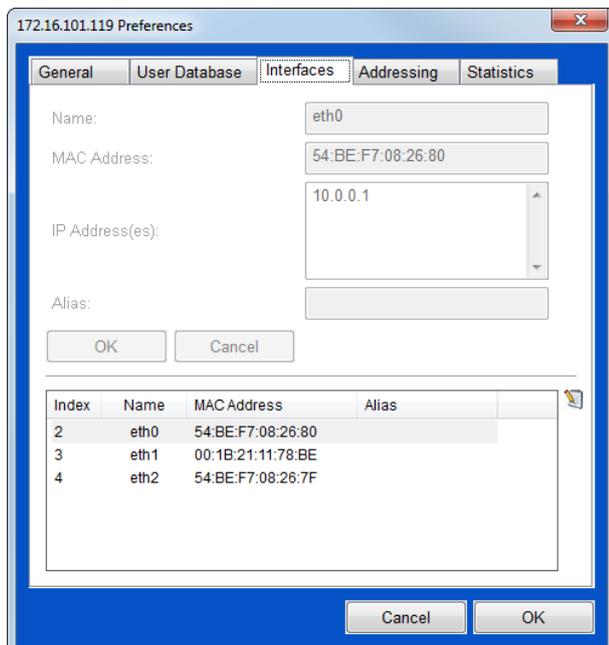
Network Addresses (Addressing)
In this tab you can configure limits and default values for MAC, IPv4 and IPv6 addresses.

Min. MAC Address
Smallest configurable MAC address.

Default MAC Address
Standard pre-set MAC address.

Max. MAC Address
Biggest configurable MAC address.

Min. IPv4 Address
Smallest configurable IPv4 address.

Default IPv4 Address
Standard pre-set IPv4 address.

Max. IPv4 Address
Biggest configurable IPv4 address.

Min. IPv6 Address
Smallest configurable IPv6 address.

Default IPv6 Address
Standard pre-set IPv6 address.

Max. IPv6 Address
Biggest configurable IPv6 address.

Statistics (Statistics)

Print Statistics to stdout every second (-s)
Switching on or off the "every second" data output of the simulation statistics to "stdout" (standard output).

Print Statistics to file periodically
Switching on or off the cyclical recording of the simulation statistics.

Interval
Time period between two saving processes of simulation statistics in seconds.

File
File path and file name of the cyclically recorded statistics file.

6.2.16 Symbol 'Disconnect'

By clicking on the symbol "Disconnect" a connection to the simulation service is closed.

6.2.17 Group Overview

In area 2 (see chapter "Connection Tab") you will find a list of configured simulation groups. Next to the detailed information on the simulation parameters, it also contains a status display (green = active, red = inactive), information about the owner of the group (Owner) and the current runtime (Runtime) of the simulation.

Right-click on the headline to fade-in or hide individual columns.
With a **Right-click** on individual or several selected groups a context menu appears. This offers an additional possibility to perform functions from the main menu.
With a **Double-click** on one of the simulation groups you get directly to the edit window of the group.
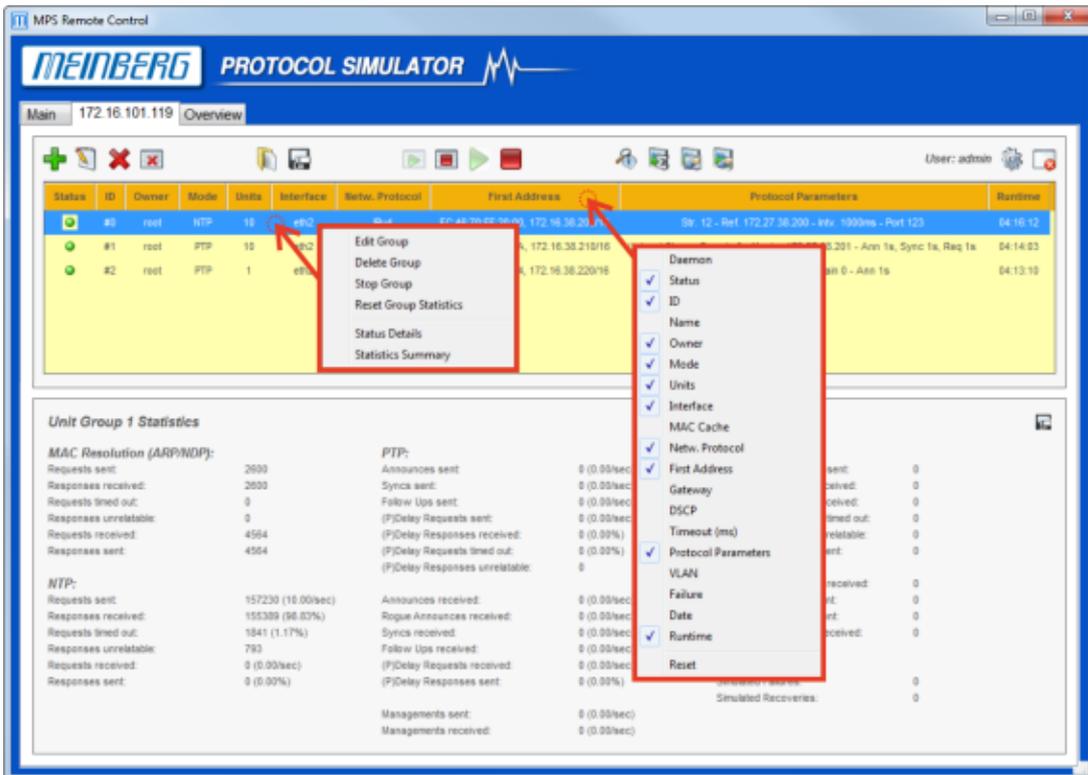
6.2.18 Simulation Statistics

In area 3 (see chapter "Connection Tab") you will find an overview chart of the current simulation statistics. If in the group overview one or more groups are selected, the statistics will only be displayed for the selected group(s). Otherwise a summarized complete overview will be displayed. To deselect a selected group, left-click on the headline of the group overview.

To save the statistics click on the saving symbol (see graphic):

6.3 Overview Tab

In the overview tab, the groups which have been created on connected simulation services are displayed in a list. The overview tab is similar to the connection tab, the only difference is that is does not have the configuration menu. Double-click on one of the simulation groups and you will directly get to the corresponding connection tab. In addition, the saving symbol offers the possibility to save a summary of all simulation statistics.