OTC

This document describes launching of graphic and console applications using OTC Terminal software.

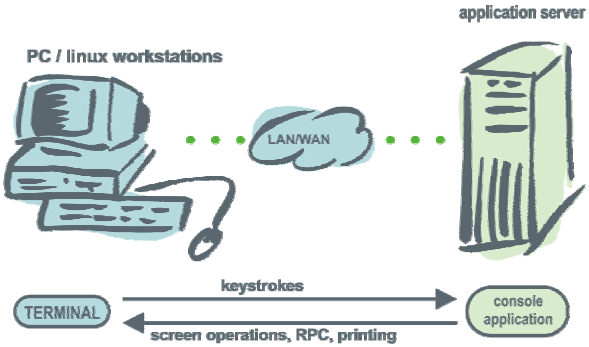
Terminal GUI
Terminal Console
V. 2.4

User manual

Table of contents

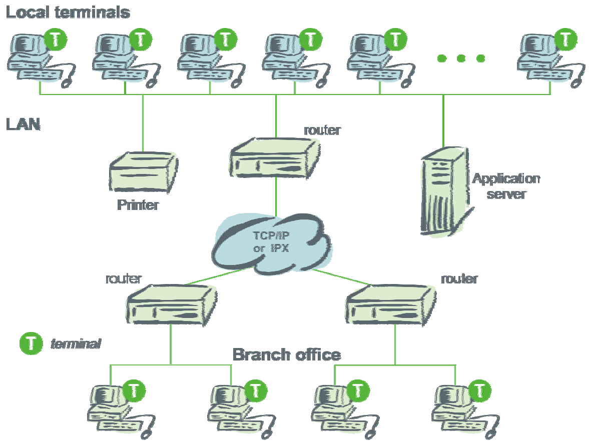
I. General characteristic of the product

Terminal GUI (Graphical User Interface) is a software package that allows terminal (remote) execution of Windows applications on Windows servers. Upon user's request Terminal GUI launches a GUI application on an application server and redirects individual elements of the graphical interface such as windows, menus or icons onto the terminal system, thus allowing remote execution.



Terminal GUI can be used to launch both the applications, which take advantage of the users graphical interface, and those executed in Windows console mode. The applications do not require modifications or attaching of additional libraries as was the case for previous versions of the Terminal (Terminal xBase).

The software consists of two parts – Terminal server and Terminal client. The Terminal GUI server is installed on the computer which is to be the application server, and is responsible for authorization handling and launching of the application. The Terminal client (*gte.exe*) is a program which is installed and executed on terminal computers. The two systems communicate via the TCP/IP network. The low throughput requirements make it possible to work not only in a local network but also in wide area (WAN) network using dedicated connections or VPN Internet channels. If advanced encryption options are used, communication over open Internet links is possible.



Terminal Console is identical to Terminal GUI but allows execution of applications in Windows console mode only. The present documentation of Terminal GUI refers to Terminal Console as well. Any existing differences between the two programs are clearly pointed out.

II. Terminal GUI - main features

Handling of GUI applications (Terminal GUI only)

Terminal GUI allows launching of applications which use a windows graphical user interface (GUI). This is regardless of the library used by the application to handle the user interface. It can be implemented by direct Win32 API calls or through one of the higher level libraries such as MFC, WinForms, Delphi VCL, COM objects, etc.

Handling of console applications

Terminal GUI and Terminal Console handle 32-bit Windows console applications. Console applications are handled in text mode, which reduces the server load and the amount of data transmitted over the network. Since the standard handling of Windows console is rather slow, a large part of it was reprogrammed. Significant improvement of console performance on the server side and a reduction of the processor load was achieved. As a consequence, simultaneous launching of large numbers of console applications on the server is now possible.

Seamless windows integration

Terminal GUI does not grant access to the whole server desktop. Instead, only windows created by the launched application appear on the terminal. We believe that this solution offers the following advantages:

- It limits the possible interference of the user with the application server environment. For multi-user business applications it is not recommended for the user to be allowed to modify and configure the server environment which can happen in case of full desktop access. The adopted solution limits user’s access to what is granted by the application.
- It is more comfortable, since the access to the application windows is direct, and not via an additional window which shows the image of the desktop.

- It generates less network activity, since only modifications of the application windows are transmitted without any information concerning the desktop.

Mapping of terminal station printers

To facilitate work in a centralized environment, Terminal GUI allows the use of terminal station printers by the application executed on the application server. The printers are made available to the application automatically, without the need to install them on the server. Two methods of remote printing are implemented – using the Windows metafiles or bitmaps.

Two authorization variants

The application executed on the application server can be executed directly on the account used by the Terminal server (authorization by Terminal) or on another Windows user account (authorization by Windows). If the application is executed within a Windows user account, it works with the environment and permissions of the Windows user. The use of Windows user account for application execution allows a better control of the application on the operating system level.

Optimization of network transmission

A multilevel data compression has been introduced to optimize the amount and the characteristic of the network traffic. The use of local handling of the mouse cursor on the terminal station improves the comfort of working with a remote application. Additionally, it is possible to use an optimization of the mouse cursor handling which blocks constant sending of the cursor position during mouse movement. The software implements special options which allow to test Terminal GUI performance in different network conditions.

Encryption of network transmission

To ensure secure transfer of information the terminal allows encryption of network transmission. Three symmetrical encryption algorithms controlled from the terminal server configurator (*TMTool*) are available:

- AES with a 128 or 256 bit key,
- 3DES with a 192 bit key,
- OTC Prop – an OTC algorithm of low security but high efficiency (practically does not put any load on the server).

An asymmetric RSA algorithm with a public key is used to negotiate the connection conditions. The ensuing transmission is encrypted using the chosen symmetrical algorithm. The algorithms listed above are available for GUI clients and all 32-bit text-application clients running on Windows, PocketPC and Linux systems. For CA-Clipper applications and clients only the „OTC Prop" algorithm is available. If the administrator chooses AES or 3DES encryption, he can still allow CA-Clipper applications to use the „OTC Prop" algorithm at the same time. If such explicit permission is not given, the CA-Clipper application can not be launched in terminal mode. The permission has to be granted from the *TMTool* configurator level.

Graphic editor of application parameters

The *gte.exe* program, which serves as a client for launching GUI and console applications, allows specifying the complete set of parameters from the command line. Alternatively, it allows editing of those parameters using a simple graphic application. This is a significant assistance, especially for inexperienced users.

Virtualized application work environment

An application executed in the terminal mode can log in as a Terminal user or as a Windows user. In case of a Windows user login the application works with the environment and permissions of the selected Windows user.
Regardless of whether the application executed in the terminal mode logs into the Windows system or not, it is executed in a special, virtualized environment. Such an environment is created at the start of the application and is being used by this application and all processes that it starts, either directly or by the „out-of-process" COM objects. If another application is started from the same terminal station, a new virtualized environment is created for it and its child processes.
The features of the virtualized environment:

- It has its own main window (desktop), with resolution corresponding to the terminal resolution.
- It has its own name space for classes and windows.
- It has its own name space for the following system objects: mutexes, semaphores, shared memory blocks, tasks, timers, events.
- It has its own printers mapped according to the application launch options.

Possible extension of the application and client by using attached interfaces (API)

No changes to the application code are necessary in order to launch it using the Terminal GUI program. However, if the standard functionality of the Terminal is not sufficient, it is possible to extend the client application by using interfaces of the Terminal. Extension possibilities include:

- Attaching to *gte.exe* the dedicated RPC (remote procedure call) procedures which can be called from the application using the RPC mechanism.
- Calling from the application or from the RPC code of built-in library functions allowing for instance for the transfer of files between the server and the terminal.
- A dedicated interface for xHarbour application users, which allows attaching of RPC procedures written in xHarbour, and libraries containing xHarbour functions compatible with earlier versions of the Terminal.

More details concerning the use of the application and client interfaces and the RPC procedures can be found in the programmers manual.

System requirements

Following operating systems are supported at this time:
Application server system:

- Windows 2003
- Windows XP
- Windows Vista
- Windows 2008

Terminal system:

- Windows 2008
- Windows 2003
- Windows XP
- Windows Vista
- Windows 2000
- Windows 98
- Windows Me (has not been tested)
- Linux (at this time for console applications only)

III. Installation

Terminal server installation

Terminal GUI server is to be installed on the computer which will be used as the application server. The application server must run on one of the following systems:

- Windows 2003
- Windows XP
- Windows Vista
- Windows 2008

1. The Terminal server must be installed by a user that belongs to the Administrators group.
2. If Terminal GUI is already installed on the server, it must be uninstalled first. To uninstall, choose the proper Menu option and restart the computer afterwards.
3. Next, start the trmsv.exe installer and follow the instructions. The default installation directory of the Terminal server is c:\trmsv.
4. Restart the system to complete the installation.
5. Set the graphic parameters of the server. The server must work in the True color graphic mode (32 bits per pixel). The display resolution must not be inferior to that of the cooperating terminal stations.
6. Switch on Themes service.
   To do that open the Control Panel / Administrative Tools / Services, choose the Themes service, change the Startup Type to Automatic, select “Start” and “OK”. After enabling of the Themes service change the active Theme in the following manner:

   ✓ On Windows XP/2003:
   go to Control Panel / Display, go to tag Themes, select Theme "Windows XP" and confirm "OK".

   ✓ On Windows Vista:
   go to *Control panel* → *Personalization* → *Color and windows style*. Select the "*Windows Vista base*" and confirm pressing *Apply*.

- ✓ On Windows 2008:
  Same as on Windows Vista. Sometimes it is necessary to install additional system components by using the *Server Manager* → *Features*: choose *Desktop Experience*.

7. On Vista/Windows 2008 the users account control (UAC) must be switched off in the following way: *Control panel* → *User accounts* → *Turn on / off the users account control function:* uncheck *use „Users account control"*.
8. If the application will be launched from Windows accounts (Windows authorization) make sure that:

- ✓ The accounts have been added to the *Terminal GUI users* group created by the terminal installer.
- ✓ On Windows XP/2003 those accounts must be part of the *Administrators* group, otherwise some elements of the graphic interface might not be displayed and the application will not work properly.
- ✓ Those accounts **are not** restricted accounts.

ATTENTION!

If, despite following this installation list, problems persist, additional information can be found in the *guiinstall.txt* file.

Terminal client installation

Terminal client is installed on the computers which will be used as terminal stations. The Terminal client can work on the following systems:

- Windows 2008
- Windows 2003
- Windows XP
- Windows Vista
- Windows 2000
- Windows 98
- Windows Me (has not been tested)
- Linux (at this time for console applications only)

1. If Terminal client is already installed on the terminal station, it must either be uninstalled using the proper Menu option, or a different installation directory must be selected during installation.
2. Next, start the *trmclpl.exe* installer and follow the instructions. The *trmclpl.exe* installer includes Terminal client software for all versions of Terminal. To install Terminal GUI client only, uncheck all options except for *Terminal GUI Client* and *Configurator of the Terminal server*. The default client installation directory is `c:\trmcl`.
3. At this time the terminal station must work in the True color graphic mode (32 bits per pixel). For proper functioning of the software, the display resolution of the client must not be larger than the display resolution of the server.

Installation validity test

For a quick installation validity test do the following:

On the server:

1. Start the Terminal server from the menu
   Start → OTC Terminal Server → Terminal Server.
2. Press *Start* in the Terminal server window.
3. Create the Terminal user:

   - ✓ Launch the configurator (TMT) using the *Preferences* button in the Terminal server window.
   - ✓ In the configurator window choose *Preferences/Users*.
   - ✓ Press *User accounts*.
   - ✓ Fill the fields **Name** (e.g. test), **Password** (e.g. testpwd) and **Confirm** (e.g. testpwd)
   - ✓ Add the Terminal user by selecting *Add*.
   - ✓ Confirm saving of the file and exit the configurator.

On the terminal:

1. Start the *gte.exe* Terminal client from the menu
   Start → OTC Terminal Client → Terminal Client.

2. Fill data necessary to start a terminal session.

   - ✓ In tab ***Login***:
     User Name (test),
     Password (testpwd)
   - ✓ In tab ***Application***:
     Application path (c:\windows\system32\notepad.exe),
     Working directory (c:\windows\system32)
   - ✓ In tab ***Server & Transmission***:
     Address (IP address of the Terminal server, numerical or symbolic)

3. Start the application by selecting the *Run application* button. If everything is in order the notepad application should start on the server, its window should appear on the terminal.

IV. Terminal GUI client – the gte.exe program

The *gte.exe* program is the client of the Terminal GUI/Console software. The *gte.exe* can be used to remotely launch Windows programs that will be executed on the application server. The *gte.exe* can be executed in graphic or command line mode.

Using the *gte.exe* client in graphic mode

Launching of the *gte.exe* client without any application start parameters or with the `–SHOWGUI` parameter displays the graphic editor of session start parameters. All known values of parameters are initially placed in the proper text fields and can be modified by the user.
Parameters of the Terminal GUI client are divided into five tabs:
Login, *Application*, *Server & transmission*, *Printers* and *Options*.
Additionally, the address of the server on which the application will be started is displayed in the upper part of the window. The lower part of the window contains two buttons:

Run application

– starts the application on the server. If any of the required parameters are missing the application will not be started and the cursor will be moved to the first of the fields that must be properly filled. If the application starts correctly, all parameters (apart from the password) will be saved, overwriting any previous values. The password can be saved on users request by selecting the option „Save password".

Cancel

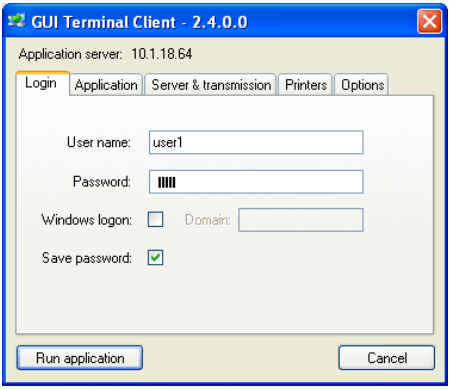
– cancels launching of the application; the *gte.exe* client terminates, any changes of the parameters are discarded.

Described below are the contents of tabs of the *gte.exe* client.

„Login” tab

Contains parameters which are used for user identification:

- *User name* – a text field containing the user name recognized by the authorization mechanism of the Terminal OTC server or, if the option „Windows logon” is checked, by the Windows authorization mechanism. This is the equivalent of the –`USER` command line option of *gte.exe* (p. 22).
- *Password* – a text field used for password of the user defined by the user name given above. The password is not displayed when typed in. This parameter is the equivalent of the –`PASSWD` command line option of the terminal client (p. 23).



GUI Terminal Client - 2.4.0.0

Application server: 10.1.18.64

User name: user1

Password: |||||

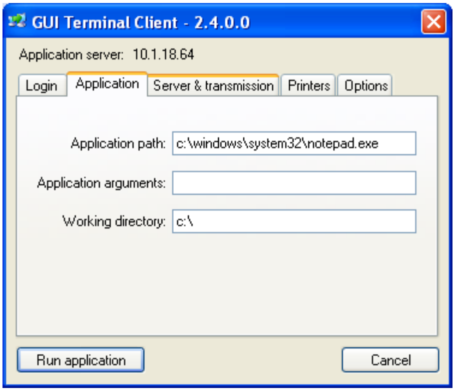
Windows logon: □ Domain:

Save password: ☑

- *Windows logon* – a checkbox used for specification if the user name and password given above are to be used for OTC Terminal authorization or for Windows authorization mechanism. For Windows authorization the domain in which the user account is created must be given. This is the equivalent of the –`WINLOGON` command line option of *gte.exe* (p. 22).
- *Domain* – a text field to define the domain name. If the „Windows logon” button is unchecked the „Domain” field is not active. This is the equivalent of the `–DOMAIN` command line option of the terminal client (p. 23).
- *Save password* – a checkbox which states if the password given above is to be saved along with other parameters. If this checkbox remains unchecked the user will be asked to type in his password every time *gte.exe* is started.

„Application” tab

This tab contains the parameters which identify the application that is to be started.



Application server: 10.1.18.64

Application path: c:\windows\system32\notepad.exe

Application arguments:

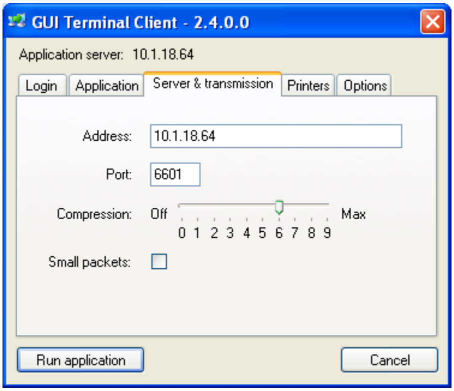
Working directory: c:\

- *Application path* – a text field to input the full application name including the full and explicit path name. Do not input any application arguments into this field. A separate field is used to pass arguments. In *gte.exe* command line mode the path name is given after the terminal options and the working directory of the application (p. 28).
- *Application arguments* – a text field containing the parameters (arguments) of the starting application. In the command line mode the arguments are given at the end of the command (see description on page 28).
- *Working directory* – a text field to input the working directory of the starting application. The directory should be given as a full, explicit path name. In the command line mode the working directory is given immediately after the terminal options (see description on page 29).

„Server & transmission” tab

This tab contains information which identifies the application server and the network transmission parameters.

- *Address* – a text field used to input the IP address or the name of the application server. The name must be resolved by the DNS/WINS. The address introduced in this field is displayed in the upper part of *gte.exe* client window as well, regardless of the active tab. This parameter is the equivalent of the –ADDR command line option of *gte.exe* (p. 24).



Application server: 10.1.18.64

Address: 10.1.18.64

Port: 6601

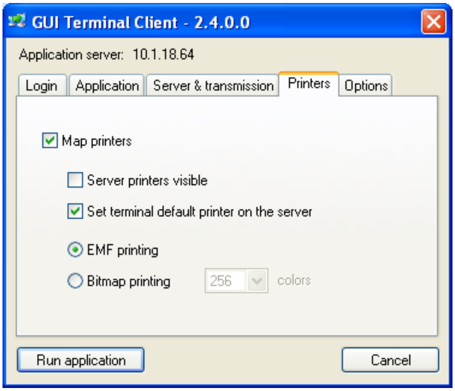
Compression: Off 0 1 2 3 4 5 6 7 8 9 Max

Small packets: □

- *Port* – a text field which defines the TCP port number where OTC Terminal server awaits the client connections.. The port number must be given as a decimal number, the default value is 6601 (hexadecimal: 19C9). The equivalent of this parameter in command line mode is the –PORT option (p. 24).
- *Compression* – a slider used for selecting the data compression level that is to be used for transmission between the client and the server. Level **0** switches the compression off altogether. The default setting is **6**. Selection of a higher value will produce a slightly better compression but will result in a large increase of the server load.
- *Small packets* – a checkbox, which allows to limit the size of the data packets sent from the application to the terminal client. If the option is checked the size of a single packet is limited to 512 bytes. This option is very useful when working on a garbled network link as it reduces the number of retransmitted packets, thus reducing the load.

„Printers" tab

The parameters placed in the „Printers" tab allow configuration of the printouts created by the terminal client.



Application server: 10.1.18.64

☑ Map printers

□ Server printers visible

☑ Set terminal default printer on the server

● EMF printing

○ Bitmap printing 256 colors

- *Map printers* – a checkbox which determines if the printers defined on the client station should be mapped on the application server. If this option remains unchecked, all remaining printing parameters become inactive. Keeping this option unchecked is equivalent to the `-NOPRN` parameter in *gte.exe* command line mode. More information can be found in the description of the `-NOPRN` option on page 27.
- *Server printers visible* – a checkbox which determines if the application should see the printers defined on the application server. The server printers are not seen by default. If this option is selected the application will see the printers of both the terminal and the server. The parameter is the equivalent of the `-SVPRN` option of the command line mode (see description on page 27).
- *Set terminal default printer on the Server* – a checkbox which determines if the default printer defined on the terminal should also become the default printer of the application on the server. If this option remains unchecked, the default application printer will not be defined, or it will be the default server printer (if the application can see the printers of the application server). Keeping this option unchecked is equivalent to the `-NODEFPRN` parameter in *gte.exe* command line mode. The description of the `-NODEFPRN` option can be found on page 28.
- *EMF printing/Bitmap printing* – switches between the two printing methods:

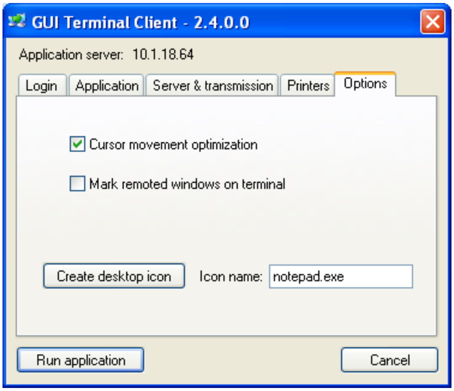
  ✓ printing using the EMF (enhanced metafile) files – the default method

  ✓ printing using bitmaps – to be selected if EMF printing fails

If bitmap printing is selected an additional field becomes active, with a list which determines the number of colors of the transmitted bitmap. Detailed information can be found in the description of the `–BINPRN` option on page 27.

„Options" tab

This tab is used to define additional parameters of the terminal and allows creation on the clients station desktop of an icon/shortcut which can be used to automatically launch the remote application with a predefined set of parameters.


GUI Terminal Client - 2.4.0.0

Application server: 10.1.18.64

Login | Application | Server & transmission | Printers | Options

☑ Cursor movement optimization

□ Mark remoted windows on terminal

Create desktop icon   Icon name: notepad.exe

Run application   Cancel

- *Cursor movement optimization* – a checkbox which allows switching on of the mouse cursor optimization in order to limit the network traffic. Detailed information about this function can be found in the description of the `-CROPT` command line option of *gte.exe* on page 24.
- *Mark remoted windows on terminal* – a checkbox which determines if the remote windows on the terminal are to be marked by an additional symbol in the upper left corner. This option allows for better distinction of windows created by remote applications using Terminal from local windows of the client station. The equivalent of this parameter is the `–RMARK` command line option of *gte.exe* described on page 26.
- *Create desktop icon* – this button can be used to create on the terminal desktop an icon/shortcut for easy starting of a remote application. The shortcut is created based on the parameters given in all tabs of the *gte.exe* window. The name of the shortcut is defined by the user in the *Icon name* text field. The shortcut will not be

created if any necessary parameters are missing and the cursor will be moved to the missing text field in the respective tab. To start the application using the shortcut, double click on the icon and input the password if necessary.

- *Icon name* – a text field to input the name of the shortcut which will be created using the *Create desktop icon* button.

Using the *gte.exe* client from the command line

The *gte.exe* client can be called from the command line with the application start parameters in the following way:

```
gte [options] workingDirectory programName [parameters]
```

where `[options]` - none or several call options as described below:

-HELP

Displays a brief summary of available options of *gte.exe*.

-WINLOGON

By default, the Terminal server launches applications within the user account on which it is running. The parameters `-USER` and `-PASSWD` determine the Terminal user name and password of a user, which must be defined earlier in the Terminal using the *TMTool.exe* program. The option `-WINLOGON` requests the application to be launched within the given Windows user account. In such a case, the parameters `-USER` and `-PASSWD` refer to a Windows user name and password. The user account must be defined in the Windows server system and must be a member of the *Terminal GUI users* group defined by the server installer. On WindowsXP and Windows2003 systems, the user must be a member of the *Administrators* group.

-USER=user_name

The option is used to specify the name of the Terminal server or Windows user, whose account will be used to launch the application.

Example:

```
-USER=mike
```

-PASSWD=user_password

The option is used to specify the password of the Terminal server or Windows user, whose account will be used to launch the application.

Example:

```
-PASSWD=mysecretpwd
```

-DOMAIN=user_domain

For Windows authentication (`-WINLOGON`) this option allows to specify the Windows domain of the user defined by the `-USER` and `–PASSWD` parameters. If the application is to be launched by a local user (not belonging to a domain), the option `–DOMAIN` should not be used, or the name of the computer which is running the Terminal server program should be substituted for the domain name.

-ADDR=name_or_ip

The option allows to give the symbolic (domain) address or the IP address of the application server on which the application will be launched.

Example:

```
-ADDR=appserver.mynet.com
-ADDR=10.1.23.55
```

-PORT=server_port

The option allows to change the server port which is used by the Terminal server for connection. The port number is given in decimal. The default port number is `6601`.

Example:

```
-PORT=6000
```

-CPRn

The option allows to define the compression level of the compression used for the network transmission of data. The parameter `n` can assume values from 0 to 9, where 0 switches the compression off altogether and 9 is the highest available compression level. If the `–CPRn` is not used, the default compression level is set to 6.

-CROPTn

The option switches on (`-CROPT1`) or switches off (`-CROPT0`) the optimization of the mouse cursor movement on the terminal. When the optimization is active, the cursor position is sent to the application 150 ms after the cursor movement stops. Thanks to this, the elements of the interface over which the cursor is moved are not getting activated, which reduces the network traffic. If the optimization is switched off, new positions of the cursor are being sent constantly as the cursor moves. Switching the optimization off increases the network traffic, yet it gives an appearance of a faster reaction of the user interface. It should be used only if the network connection is good, e.g. when working on a LAN network.

-PKTn

For some network devices it is necessary to limit the maximum size of the package transmitted over the network between the terminal and the application. This can be done using the `–PKTn` option. The parameter `n` can take values from 1 to 3, depending on the maximum packet size that is to be set (1=1024 bytes, 2=512 bytes, 3=256 bytes).

-NETSTAT

An auxiliary option to check the amount of data transmitted between the application and *gte.exe*. The *gte.exe* program creates an additional, small window which is used to display communication statistics.

Rcv blocks -	number of packets sent from the application to *gte.exe*
Rcv Network -	number of kilobytes sent over the network from the application to *gte.exe*

Rcv uncpr - number of kilobytes received by *gte.exe* after decompression
Snd blocks - number of packets sent from *gte.exe* to the application
Snd Network - number of kilobytes sent over the network from *gte.exe* to the application
Snd uncpr - number of kilobytes received by the application after decompression

A separate copy of *gte.exe* and thus a separate window with the communication statistics is created for each process. The communication statistics window can be closed at any time without affecting the functioning of the application.

-LINK=kbps

An auxiliary option – allows to artificially limit the link throughput to the given number of kilobytes per second. The given value is assumed to be the link throughput for uplink and downlink traffic independently. This option is very useful for testing of the application behavior in limited link throughput conditions. For a reliable emulation, the real throughput of the link between *gte.exe* and the application must be several times larger than the tested value.

Example:

```
-LINK=128
```

The value limits the network throughput to 128 kbps.

-DELAY=ms

An auxiliary option – introduces artificially an additional network transmission delay. The delay appears at each sending and receiving of a network packet. The option is very useful to test the application behavior in conditions of large connection delays. The delay value is given in milliseconds. It is recommended to use the average delay value between the client computer and the application server as given by the PING program.

Example:

```
-DELAY=30
```

-UPLINK=kbps

An auxiliary option – allows to artificially limit the throughput of the link in the direction from *gte.exe* to the application to the to the given number of kilobytes per second. The option is very useful for testing of the application behavior in limited link throughput conditions. For a reliable emulation, the real throughput of the link between *gte.exe* and the application must be several times larger than the tested value.

-DOWNLINK=kbps

An auxiliary option – allows to artificially limit the throughput of the link in the direction from the application to *gte.exe* to the given number of kilobytes per second. The option is very useful for testing of the application behavior in limited link throughput conditions. For a reliable emulation, the real throughput of the link between *gte.exe* and the application must be several times larger than the tested value.

-RMARK

An auxiliary option – if given, the remote windows on the terminal are being marked by a sign in the upper left corner. In the test version, the sign is a short skew line pointing towards the lower right corner. This option allows to easily distinguish between the windows of remote applications launched using the Terminal and local windows on the terminal system.

-SHOWGUI

The *gte.exe* program can be started without any parameters or with a set of parameters not sufficient to correctly establish a link with the server and launch an application. In such a case a window allowing to input the missing parameters will appear. If in the command line the user name (`-USER`), password (`-PASSWD`), the address of the server (`-ADDR`), the working directory (***workingDirectory***) and the name of the application (***programName*)** have been given, *gte.exe* will attempt to establish the connection with server and start the application without switching over to the parameters editor mode. The parameter `-SHOWGUI` forces the program to enter the parameters editor mode before establishing the connection, even though all required parameters are given.

-NOPRN

If the `–NOPRN` parameter is used, *gte.exe* does not perform printer mapping. In such a case the `–SVPRN`, `-NODEFPRN` and `-BINPRN` parameters are ignored, the application does not see any printers of the terminal system, while it can see printers installed on the application server. If the `–NOPRN` parameter is not specified at the start of the program, the application on the server can see the terminal system printers under their names with an attached `@ERATERM` postfix. The details of mapping and handling of the printers are determined by the following parameters: `–SVPRN`, `-NODEFPRN` and `-BINPRN`. Mapping of the printers involves reading of parameters of all the printers installed on the terminal system. It is done at the first call of the application to any function related to the printer handling and can take from a few seconds up to a few minutes. Thus, if the application is not going to use the printer it should be started with the `–NOPRN` parameter.

-SVPRN

The parameter determines if the application should see the printers defined on the application server. By default, the server printers are not seen. If the `–SVPRN` parameter is given the application can see printers defined on both the terminal and the server.

-NODEFPRN

If a default printer is defined on the terminal, at the start of the application it becomes the default printer of the application. If such an assignment is not desirable, it can be blocked by the `-NODEFPRN` parameter. In such a case the default application printer will not be defined, or it will be the default server printer, if the application can see the printers of the application server.

-BINPRN

The default method for transmitting of printouts from the application to the terminal printer is by using metafiles (enhanced metafile). The printout is created on disk as a metafile and sent to the printer after it is **fully** completed. This method is not always successful. In some cases the printouts do not appear on the printer, or appear in a wrong form, or appear only after exiting from the application. If this happens it is advised to use bitmap printing. Bitmap printing can be switched on using the `–BINPRN` option. If this option is switched on, the images of subsequent pages of the printout are saved as bitmaps and sent to the printer one page at a time. Bitmap printing requires more memory since it is necessary to store high resolution bitmaps in memory. The resolution of bitmaps corresponds to the printer page resolution which is often very high. A 256 color bitmap is created by default. In order to save memory we advise to use 2 or 16 color bitmaps whenever possible. To switch the color resolution of the bitmap the parameters `–BINPRN1` (two colors) or `–BINPRN2` (16 colors) can be used. The parameter `-BINPRN3` (256 colors) is equivalent to `-BINPRN`.

workingDirectory – the working directory of the application. If the path contains any spaces it should be specified in quotation marks, e.g.

```
  ”C:\Program Files\myprog”.
```

The working directory should be given as seen on the application server.

programName – the full path of the launched application (program). If the path contains any spaces it should be specified in quotation marks, e.g.

```
      ”C:\Program Files\myprog\prog.exe”.
```

The working directory should be given as seen on the application server.

[parameters] – optional parameters that will be passed to the *programName* program. If the parameters contain any spaces they should be specified in quotation marks, e.g.

```
  ”par 1”  ”par 2”  par3
```

Examples of *gte.exe* calls:

- Starting an application with parameters, without printer mapping

```
gte -addr=10.1.18.41 -user=test -passwd=testpwd -noprn
"c:\program files\app" "c:\program files\app\main.exe"
"par 1" "par 2" par3
```

- Starting an application with metafile printing (default)

```
gte -addr=10.1.18.41 -user=test -passwd=testpwd
"c:\program files\app" "c:\program files\app\main.exe"
```

- Starting an application with two color bitmap printing

```
gte -addr=10.1.18.41 -user=test -passwd=testpwd  -
binprn1 "c:\program files\app" "c:\program
files\app\main.exe"
```

- Starting an application within a Windows user account

```
gte -addr=10.1.18.41 -user=winuser -passwd=winpwd
-domain=office –winlogon "c:\program files\app"
"c:\program files\app\main.exe"
```

V. Terminal GUI –server configuration

The program *TMTool.exe* (Terminal Management Tool) allows to configure the parameters of Terminal GUI server. Principal functions of the program are listed below:

- Displaying information about the server (license ownership, number of users, running time).
- Reading/modifying/saving of the server options.
- Creating/modifying/removing the server user accounts.
- Monitoring of terminal application (RAM usage, CPU time, network protocols, addresses, etc.).

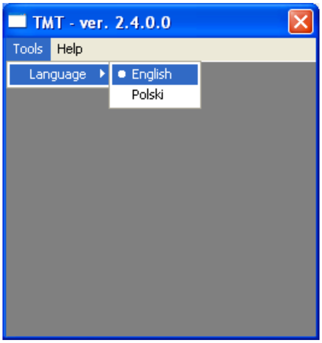
The program communicates with the Terminal server via the network (using the UDP/IP protocol) and thus can be executed on any Windows system computer with access to the IP network. The ***TMTool*** can manage several Terminal servers simultaneously (up to 64).

Starting and configuring the *TMTool* program

The ***TMTool*** program can be started directly from the Terminal server by selecting a button, or as a separate application launched from the *Start Menu* or from the command line of the operating system. The ***TMTool*** started by the Terminal server can manage the operation of this server only. The program can manage several Terminal servers if it is started as an independent application.

Starting the program from the Terminal server

The Terminal server does not have built-in configurator and monitor functionalities. For all modification of server parameters, changes in user accounts and viewing of session parameters an external ***TMTool*** module must be used. For easy access it can be started directly from the main Terminal window by selecting the *Preferences & Monitor* button. Starting of the module will automatically connect the process with the server that is to be managed and will block any connections to other servers. In the main ***TMTool*** window a limited *menu* will appear, which can be used to change the language of the user interface and the program messages.



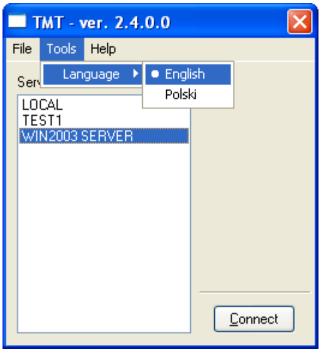
In another window, information about the managed server will appear. The contents of the information window are described in section „*Main information window*" on page 35.

Starting of the program from the „Start Menu" or from the command line

After the installation of the Terminal server using the supplied installation program, a shortcut to the module ***TMTool*** – *Terminal Management Tool* will appear in the *Start Menu*. Using this shortcut or calling:

```
> tmtool.exe
```

from the command line, starts the ***TMTool*** program in the „multi-server" mode, allowing to manage up to 64 Terminal servers.



In the main program window, beside the *Tools* menu, a *File* menu appears. It can be used to add, remove or modify the access parameters of managed servers. Apart from that, a list of the servers is displayed in the window along with a *Connect* button. The configuration of the ***TMTool*** program is done by choosing the language of the graphic interface and messages and by defining the list of servers, which can be managed. Those functions are accessible from the main menu of the program.

Main menu

The program main menu consists of three submenus: *Files*, *Tools* and *Help*. If the ***TMTool*** module was started from the Terminal GUI server, the only action allowed by the menu is to change the language version of the program. All three submenus are active in the „multi-server" mode of the program – when it is started from the *Start Menu* or from the command line:

- *File* – contains a set of functions to manage the list of servers and the command to exit the program.
- *Tools* – contains the function to change the language of the graphic interface and the program messages. Available now are two languages: *Polish* and *English*.
- *Help* – contains the function to open the program information window. Most information about the functions of the program are available as tips displayed automatically after the mouse cursor is placed over the selected item.

File Menu

The functions of the *File* menu allow adding, removing and changing the position of entries on the list of managed servers. Each entry is identified by a name (*nickname*) and corresponds to a set of parameters which give access to the server (the protocol, address and port). Following functions are available:

- *New connection*
- *Remove connection*
- *Modify connection*

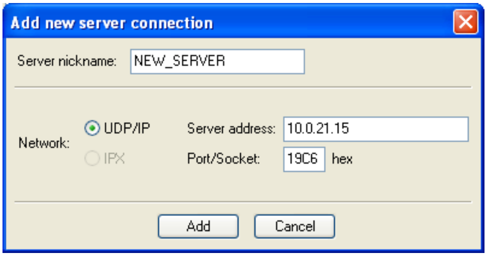
Additional functions:

- *Save list of connections* – saves the list of managed servers with corresponding connection parameters in the Windows Registry or in the configuration file.

- *Exit* – terminates the ***TMTool*** application.

New connection function

Selecting the *New connection* function brings up a dialog window. The window is used to enter the server connection parameters.



Server nickname: NEW_SERVER

Network: ● UDP/IP ○ IPX

Server address: 10.0.21.15

Port/Socket: 19C6 hex

The window contains following information fields:

- ✓ *Server nickname* – a character string selected by the user, which will be used to identify the connection (server) in all dialog windows of the ***TMTool*** program.
- ✓ *Network* – the communication protocol; at this time the IPX/SPX protocol is not implemented.
- ✓ *Server address* – the network address of the managed server, given as a numerical address (as shown in the figure) or as a symbolic host name (e.g. `terminal.company.com`).
- ✓ *Port/Socket* – port number which will be used by the Terminal server to await commands of the ***TMTool*** module (default port number is 19C6 hexadecimal or 6598 decimal).

Two buttons are available:

- ✓ *Add* – add entry to the list of connections.
- ✓ *Cancel* – cancel editing and do not add the new server to the list.

Modify connection function

The function uses the same window layout as the *New connection* function. The only difference is that the name of the connection can not be edited and the button *Add* is replaced with *Modify*. All other parameters are the same.

Remove connection **function**

After confirmation, this function removes an entry from the list of connections.

Save list of connections **function**

After confirmation, this function saves the list of connections and the selected language of the graphic interface in the configuration file or in the Windows Registry (depending on the version). Manual editing of the registry or the configuration file is not recommended.

Exit **function**

Terminates the ***TMTool*** application, asking if the changes made to the list of connections are to be saved.

Connecting to Terminal server

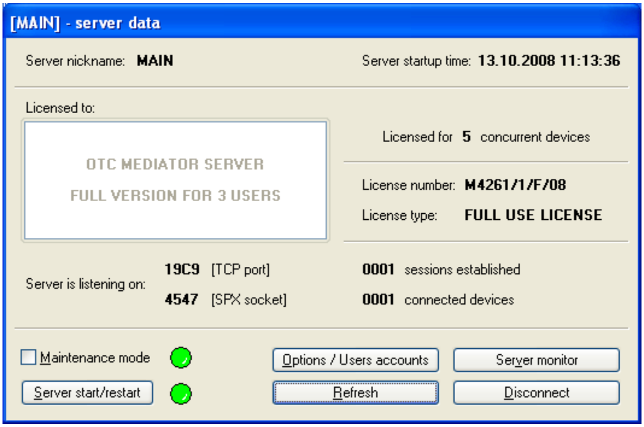
To connect to a Terminal server choose the name of the connection corresponding to this server from the list and press the *Connect* button. The server may ask for the access password (if activated before). If all connection parameters are correct, the network link is operational and no other ***TMTool*** is connected to the server, the main information window corresponding to the inspected server will appear. Otherwise, an error message will be displayed. After the connection is established, the *Connect* button becomes inactive if the same server is selected from the list.

Main information window

The main information window contains essential information about the connected Terminal server:

- ✓ Name of the connection (as defined on the list of connections).
- ✓ Date and time of the server launch.
- ✓ Name and address of the license owner.
- ✓ Maximum allowed number of sessions or connected computers (depending on the license type).
- ✓ License type (full – ***FULL USE***, evaluation – ***EVALUATION***, developers – ***DEVELOPMENT***).

- ✓ License number.
- ✓ TCP port and/or SPX socket which are used by the server to await calls from the terminals (if the server has not been activated using the *Start* button or one of the protocols has not been implemented 'xxxx' sign will appear).
- ✓ Number of existing sessions.
- ✓ Number of connected devices (workstations) – always smaller or equal to the number of sessions.



[MAIN] - server data

Server nickname: MAIN

Server startup time: 13.10.2008 11:13:36

Licensed to:

OTC MEDIATOR SERVER

FULL VERSION FOR 3 USERS

Licensed for 5 concurrent devices

License number: M4261/1/F/08

License type: FULL USE LICENSE

Server is listening on: 19C9 [TCP port] 4547 [SPX socket]

0001 sessions established

0001 connected devices

□ Maintenance mode

Several buttons which are used to start individual functions of the ***TMTool*** application are located in the lower part of the main information window.

- *Maintenance mode* – checking of this field switches the server to the maintenance mode. In this mode the server does not accept any logins. The already connected sessions work normally. After the maintenance mode is selected the green sign next to the selection field will change to red. Logins will no longer be blocked and the sign will change color to green after the maintenance mode is switched off.
- *Server start/restart* – clicking this button will restart the Terminal server. All active sessions will be disconnected. The green sign next to the button will temporarily change color to yellow and return to green after restart. A restart with the maintenance mode selected will disconnect all sessions and prevent any new connections.
- *Options/User accounts* – opens a dialog window of the Terminal server configurator which allows changing the parameters of the server and starting dialog window to manage the Terminal server user accounts. The parameters and

the layout and contents of the *Options* dialog window are described in the „*Configuration of Terminal server*" section on page 37. The handling, layout and contents of the *User accounts* window are described in the „*User accounts* " section on page 39.

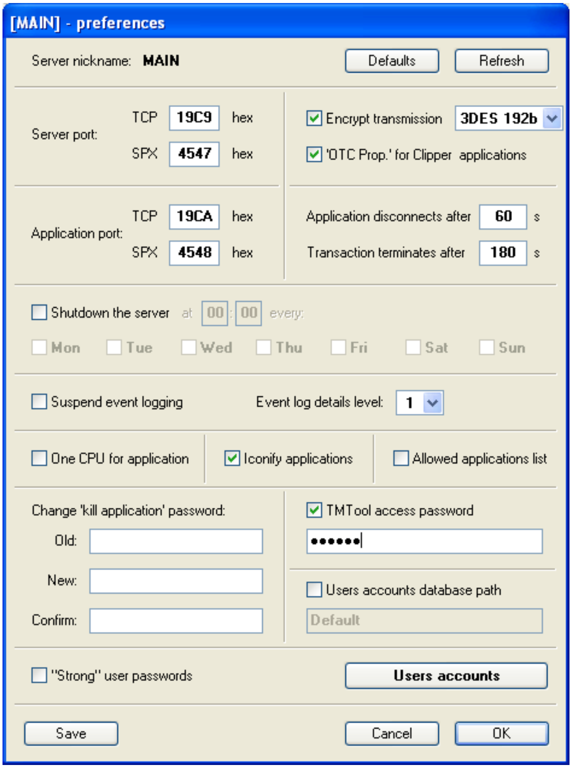
- *Server monitor* – opens a dialog window which allows to monitor the status of all active sessions, in particular the address of the client station, the user name, and the memory and CPU usage. It can also be used to terminate ("kill") a session. For a detailed description of the monitor see the „*Server*" section on page 43.
- *Refresh* – reads current information from the server and refreshes the contents of the information window.
- *Disconnect* – disconnects the session with the managed server. In the multi-server work mode this activates the *Connect* button in the main window of ***TMTool***. *Disconnect* terminates the ***TMTool*** module altogether if the program was started from the Terminal server using the button, thus in the single server mode.

Configuration of Terminal server

Current values of all parameters are read from the server at the start of this dialog window.

Two buttons are located in the upper part of the window:

- *Defaults* – sets all parameters to default values (use this function with caution as the default values overwrite all previously made and unsaved changes).
- *Refresh* – reads current values of the parameters from the Terminal server (this function overwrites all previously made and unsaved changes as well).



[MAIN] - preferences

Server nickname: **MAIN**

Server port: TCP 19C9 hex; SPX 4547 hex

☑ Encrypt transmission 3DES 192b

☑ 'OTC Prop.' for Clipper applications

Application port: TCP 19CA hex; SPX 4548 hex

Application disconnects after 60 s

Transaction terminates after 180 s

□ Shutdown the server at 00 : 00 every:

□ Mon □ Tue □ Wed □ Thu □ Fri □ Sat □ Sun

□ Suspend event logging

Event log details level: 1

□ One CPU for application ☑ Iconify applications □ Allowed applications list

Change 'kill application' password:

Old:

New:

Confirm:

☑ TMTool access password ••••••

□ Users accounts database path

Default

□ "Strong" user passwords

Available configuration options

- *Server port* – a text field with the port/socket number on which the server awaits connections from user terminals. Default setting for the TCP/IP protocol is **19C9h** (**6601** decimal), and **4547h** (**17735** decimal) for the IPX/SPX protocol.
- *Application port* – a text field which is used to define the port/socket number of the first application launched on the server. Default setting for the TCP/IP protocol is **19CAh** (**6602** decimal), for the IPX/SPX protocol: **4548h** (**17736** decimal). Successively launched applications are assigned subsequent port numbers (if one of the ports is used/blocked it will be skipped and the application will be allocated to the next available port number).
- *Encrypt transmission* – a checkbox used for switching on the encryption of transmission between the terminal and the application. The encryption causes

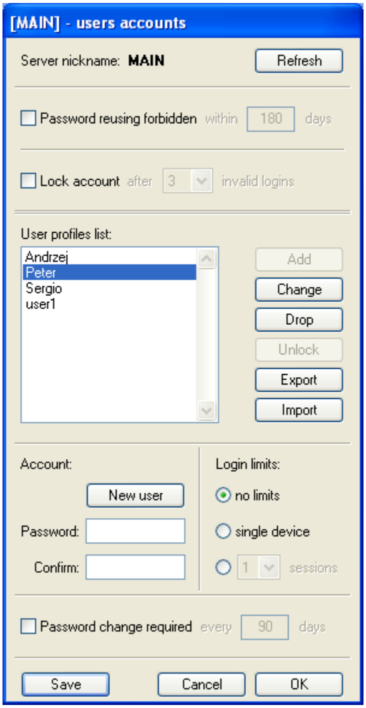
slightly larger load on the server. By default, the encryption is switched off. After selecting, a list of available encryption algorithms becomes active (the encryption algorithms and methods are described in section „*Encryption of network transmission*" on page 8)

- *'OTC Prop' for Clipper applications* – a checkbox which determines if the CA-Clipper text applications which do not have symmetric encryption capabilities can use the simple and fast *OTC Prop* algorithm. If this field is not active it will not be possible to start a CA-Clipper application if AES or 3DES encryption method is selected.
- *Application disconnects after* – a text field giving the time in seconds after which no network activity from the terminal will cause a session disconnection (default value is 60 seconds). The application is terminated by server, unless it is executing a terminal transaction. In such a case the parameter *Transaction terminates after...* is considered.
- *Transaction terminates after* – a text field giving the time in seconds after which an application which is executing a terminal transaction will be terminated (even before the conclusion of the transaction) in case of a session disconnect. The default value of the parameter is 180 seconds.
- *Shutdown the server* – a selection field which allows to switch on an automatic shutdown of the Terminal server at a given time on selected days. After activating this option the remaining fields (the hour, minute, and day of the week) will become active. Enter the time of the server shutdown and mark the days on which the option is to be active. By default this option is not active.
- *Suspend event logging* – a checkbox which disables writing of events to the terminal logs (not recommended). By default this option is not active (writing to event logs enabled).
- *Event log details level* – a selection list assuming values from 0 to 2 which determines how many details will be written to the event log. The value 0 means that only the most important messages will be written, the value 2 is for all messages to be written. The default value of the parameter is 1.
-
- *One CPU for application – for CA-Clipper applications only – every application is bound to one CPU which executes its code*

- *Iconify applications* – if this checkbox is selected, the console windows of text applications will start as icons (minimized) on the task bar. By default this option is active.
- *Allowed applications list* – if this checkbox is selected, the server verifies at each login if the launched application is on the list of allowed applications. The connection is rejected if the called application is not on the list. The list of allowed applications is stored in the file *allowed.aps* which is a text file. Each line of the file corresponds to an application and contains the full path with the file name of the program written exactly as in the parameter of the of the *te.exe* program. By default this option is not active.
- *Change 'kill application' password* – a text field to define or modify a password which enables terminating ('killing') of a running application from the *te.exe* text terminal level. The application must be identified by the PID process identifier. To change the password, type in the current password into the first field and the new password into the remaining two fields. The new password must be confirmed by retyping it correctly.
- *TMTool access password* – a checkbox which determines if the server will require a password from the ***TMTool*** application. The password must be entered in the text field below the checked selection field. The password must be at least 8 characters long and must contain at least one digit, one letter and one non-alphanumeric character. By default this option is not active.
- *'Strong' user passwords* – if this selection field is activated the system does not accept simple and easy passwords. All user passwords must be at least 8 characters long and must contain at least one digit, one letter and one character from the following set: ! @ # $ % ^ & * ( ) _ + = [ ] { } | , . < > ? : ; " '. Passwords defined before this option was activated remain valid. By default this option is not active.

User accounts

The dialog window *User accounts* is used to add, modify and remove user accounts in the Terminal server. The current list of the Terminal server users is read in when the window is started. The button *Refresh* is located in the upper part of the window and can be used at any time to reload the list of the accounts from the server. This function should be used carefully as it might cause overwriting of recently made, unsaved changes. The pictures below show the *User accounts* dialog window while a user account is being modified (on the left) or added (on the right).


[MAIN] - users accounts

Server nickname: **MAIN**

□ Password reusing forbidden within 180 days

□ Lock account after 3 invalid logins

User profiles list:

Andrzej
Peter
Sergio
user1

Account:

Password:

Confirm:

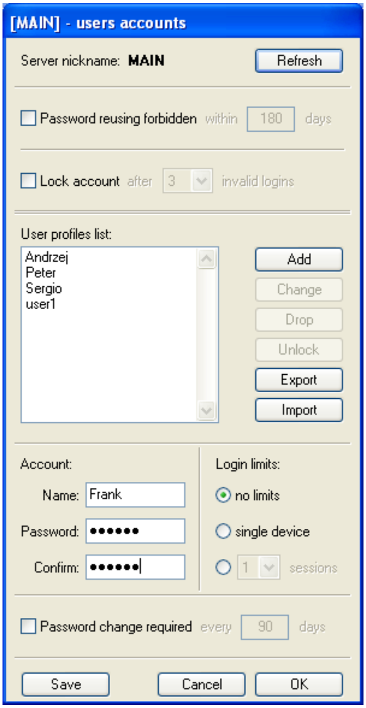
Login limits:

● no limits

○ single device

○ 1 sessions

□ Password change required every 90 days


[MAIN] - users accounts

Server nickname: **MAIN**

□ Password reusing forbidden within 180 days

□ Lock account after 3 invalid logins

User profiles list:

Andrzej
Peter
Sergio
user1

Account:

Name: Frank

Password: ••••••

Confirm: ••••••

Login limits:

● no limits

○ single device

○ 1 sessions

□ Password change required every 90 days

Two checkboxes which define global parameters of user accounts are located in the upper part of the window:

- *Password reusing forbidden* – if this checkbox is checked, the user can not choose a new password that is identical to one that has been used before, within a given time. The time used to remember old passwords can be given in a field below, which becomes active when the *Password reusing forbidden* option is selected. The default value is 180 days.
- *Lock account* – if this field is selected, the account will be blocked after a number of failed login attempts. The number of failed login attempts which will cause the account to be blocked can be chosen from a selection list below. The list becomes active when the *Lock account* option is selected.

The main part of the window is the list of user accounts of the server. The four buttons beside it can be used to manage the entries on the list:

- *Add* – adds a new user to the list.
- *Change* – confirms the change of parameters for the selected account.
- *Drop* – removes the selected account from the list.
- *Unlock* – unlocks account locked after a number of failed logins. The button becomes active when the locked account is selected on the list.

Two more buttons are located below:

- *Export* – exports the list of accounts including the account parameters to a text file. The function opens a dialog window which allows to choose the directory and the file name used to save the data.
- *Import* – imports the list of accounts from a text file. The format of the list is described in the last part of this section. The function opens a dialog window which allows to select the data file. After a file is chosen, the user is asked if all existing accounts should be removed. The program will report any format errors in the imported text file.

Each user account is characterized by a following set of properties and parameters:

- *Name* – a text field which can contain any ASCII characters. The length of the name is limited to 30 characters.
- *Password* – a text field to enter the user password. The length of the password is limited to 30 characters. If the *Strong user passwords* function is not active the password can be any sequence of ASCII characters from 1 to 30 characters long. If the *Strong user passwords* function is active the password must be at least 8 characters long and must contain at least one digit, one letter and one character from the following set: ! @ # $ % ^ & * ( ) _ + = [ ] { } | , . < > ? : ; ” ’. The password must be confirmed by retyping it correctly.
- *Login limits* – a selection of login restrictions imposed on a given user. The log in access for a given account can be restricted to one or several sessions, or limited to only one workstation. The maximum number of active sessions that can be held by the user can be chosen from a selection list.
- *Password change required* – a checkbox that allows to select the validity time of a users password. After a selected time, defined in days in the adjacent text field, the user must change his password. By default this restriction is not active. After it is activated the default validity time of a password is 90 days.

Following buttons are located in the lower part of the dialog window:

- *Save* – sends the modified list of user accounts to the Terminal server. After completing the operations on the list of accounts the list must be sent and saved in a configuration file of the managed server.
- *Cancel* – closes the window without confirming of any changes that have been made.
- *OK* – closes the dialog window and checks for modifications. If any changes have been made, asks if the changes should be sent to the server.

Adding a new user

Selecting of any entry from the user list is interpreted by the system as preparation for a modification or removal of an account. Thus, the field *Name* is substituted by the *New user* button. Selecting this function switches the dialog to the adding of a new user mode. Information about the new account (user name, password and password confirmation, restrictions and password validity) must be entered and confirmed by selecting the *Add* button.

Modification of the account parameters

Select the account to be modified from the list and enter the parameters that are to be changed. When done press the *Change* button.

Removing a user account

Select from the list the account to be deleted and press the *Drop* button. The account will be removed after confirmation.

The format of the import text file

Each line contains description of an account. Subsequent parameters must be separated by a space or a tabulator:

- *User name* – the length of the user name is limited to 30 characters. The user name must be composed of alphanumeric characters. If the name contains a space it must be given in square brackets: [user name],

- *Password type* – letter ‘P’ for a password written as clear text, letter ‘E’ for an encrypted password.
- *Password* – a character string given in curly brackets. According to the *Password type* option, the password can be given as clear text or encrypted.
- *Login restrictions* – one of the numbers ‘0’, ‘1’ or ‘2’. ‘0’ – no restrictions, ‘1’ – from one computer only, ‘2’ – limited number of sessions.
- *Limited number of sessions* – if the limited number of sessions restriction is selected, the maximum number of sessions which can be held by the user (accepted values are 1–99).
- *Enforce password change* – letter ‘Y’ – yes, ‘N’ – no.
- *Password validity in days* – a number, accepted values are 1–999.

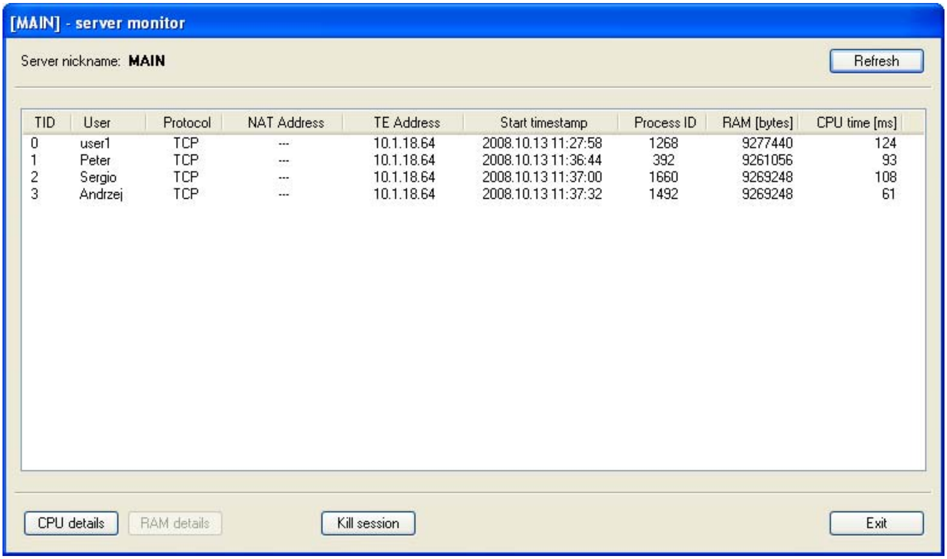
The default file extension is **.txp*, files with other extensions can also be read.

Server monitor

The server monitor presents the information about terminal sessions running on the application server at the moment. It also provides a tool to remove selected session, which for some reason can not be closed from the user terminal.

Following information is displayed in the monitor window:

- ✓ Session number
- ✓ User name / account name
- ✓ Communication protocol
- ✓ NAT address of the workstation (if used)
- ✓ Address of the user workstation
- ✓ Date and time of the session login
- ✓ ID of the application process on the Windows server (PID)
- ✓ Memory usage
- ✓ CPU time used by the application



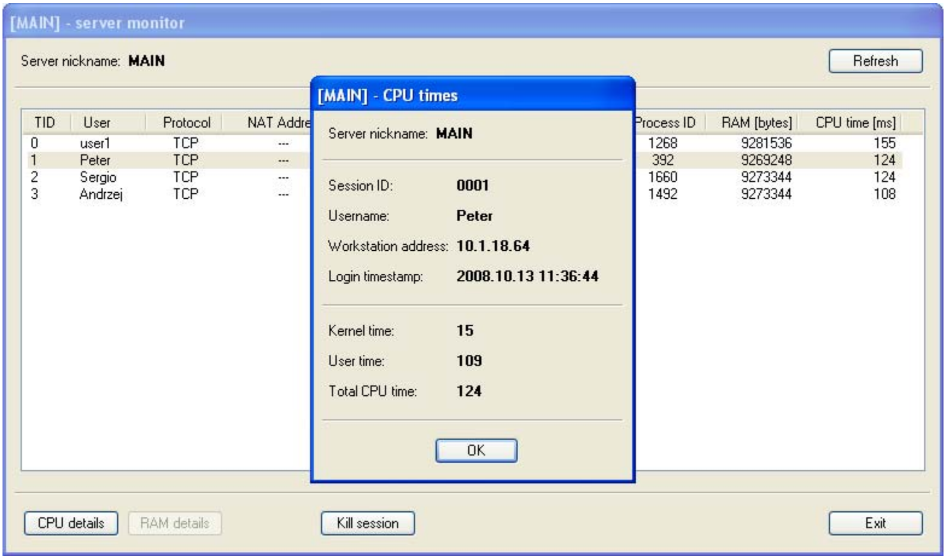
Server nickname: **MAIN**

TID	User	Protocol	NAT Address	TE Address	Start timestamp	Process ID	RAM [bytes]	CPU time [ms]
0	user1	TCP	---	10.1.18.64	2008.10.13 11:27:58	1268	9277440	124
1	Peter	TCP	---	10.1.18.64	2008.10.13 11:36:44	392	9261056	93
2	Sergio	TCP	---	10.1.18.64	2008.10.13 11:37:00	1660	9269248	108
3	Andrzej	TCP	---	10.1.18.64	2008.10.13 11:37:32	1492	9269248	61

The contents of the window can be sorted by any column by clicking on the header of that column. By default the contents of the window are sorted by the TID session number. If the user selects sorting by another column, a '*' sign will appear in the header of that column.

The dialog window contains a number of additional buttons:

- *Refresh* – reads current information from the server, the content of the window is replaced by the new information.
- *CPU details* – opens a dialog window which shows information about the CPU used by the application divided into the user CPU time and the system kernel CPU time.
- *RAM details* – opens a dialog window which contains detailed information about the memory used by the application.
- *Kill session* – terminates the selected session regardless of its status.
- *Exit* – closes the monitor window and returns to the main dialog window.



Server nickname: **MAIN**

TID	User	Protocol	NAT Addre	Process ID	RAM [bytes]	CPU time [ms]
0	user1	TCP	---	1268	9281536	155
1	Peter	TCP	---	392	9269248	124
2	Sergio	TCP	---	1660	9273344	124
3	Andrzej	TCP	---	1492	9273344	108

Server nickname: **MAIN**

Session ID: **0001**

Username: **Peter**

Workstation address: **10.1.18.64**

Login timestamp: **2008.10.13 11:36:44**

Kernel time: **15**

User time: **109**

Total CPU time: **124**

VI. Testing of terminal operation on a slow network link

The most reliable method of testing the terminal work of applications on slow network links is a test in real conditions on a network link on which the application will be used. Since such tests are not always possible the *gte.exe* program offers a number of options which can be used to perform such tests on a LAN network. The *gte.exe* allows to emulate slow network link working conditions according to the supplied parameters of the network link. If the application is to be used on a symmetric link (one on which the throughput is the same in both directions), it is best to use the option:

```
–LINK=kbps,
```

which defines the throughput of the emulated network link in kilobytes per second. For instance, for a single base ISDN channel of 64 kbps the correct option is:

```
-LINK=64
```

If the application is to be used on an asymmetric network link (such as ADSL), it is necessary to define separately the network link throughput from *gte.exe* to the server (`-UPLINK`) and from the server to *gte.exe* (`-DOWNLINK`). For instance, for ADSL 512 connection with an uplink throughput 128 kbps, proper options are:

```
-UPLINK=128 –DOWNLINK=512
```

Apart from the throughput, the network links are characterized by the delay induced by telecommunication devices. The best method to measure the network link delay is by using the `PING` command, for instance for Windows:

```
ping –n 100 10.1.1.1
```

After sending of 100 packets the command will display among others the average delay time of packets in milliseconds. If this time is greater than 0, it is advised to specify it using the `–DELAY` option. This will make the network link emulation more adequate. If the delay time is given, ½ of this value modified by a random component is lost each time network packet is sent or received by *gte.exe*. Emulation tests should

be carried out on a fast network, e.g. a LAN network. On such network the additional delays induced by the actual transmission are negligible.
Another option useful for testing of the application work in slow network conditions is `-NETSTAT`. If called with this option, the *gte.exe* will open a small window containing the statistics of network traffic. The most important value „*Rcv Network*" shows the number of bytes send from the application to *gte.exe* over the network link. The value „*Snd Network*" is the number of bytes sent in the opposite direction. It is less crucial since the network traffic to the application is usually much smaller. The value „*Avg bandwdth*" is the average used bandwidth of the network link from the application to *gte.exe*. This value is calculated by dividing the total network traffic in this direction by the running time of the application.