

T7 Release 5.0

T7 Trader GUI, T7 Admin GUI, T7 Clearer GUI – Installation Manual

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1. Introduction

There are three graphical user interfaces for the T7 trading system:

- The T7 Trader GUI which is used for On-exchange trading and T7 Entry services
- The T7 Admin GUI which is used for trader maintenance, entitlement and transaction size limit settings
- The T7 Clearer GUI, which is used for the Cash Markets only, allows clearing members to monitor the trades of their non-clearing members. Additionally it implements a function, which allows clearing members to halt further trading of their non-clearing members.

All three GUIs can be accessed via leased line connections (using a GUI-Channel) or alternatively through the Internet (native Internet connection). The T7 GUI solution relies on Oracle/Sun Java Web Start technology for delivery of the software to the participant. Once downloaded the T7 GUIs run independently of the web browser used to start the Java Web Start Process.

Please note: Internet connections require an additional security layer which requires the trading participant to create SSH key pairs and to upload the public key to the member section before using the GUIs over an Internet connection.

1.1 Document structure

Chapter 1 of this document outlines the general technical concept and requirements on the client computer and the connecting network.

Chapter 2 gives an overview of the suggested Java Runtime Environment settings.

Chapter 3 outlines the configuration and log files which are kept locally on the client computer running the GUI.

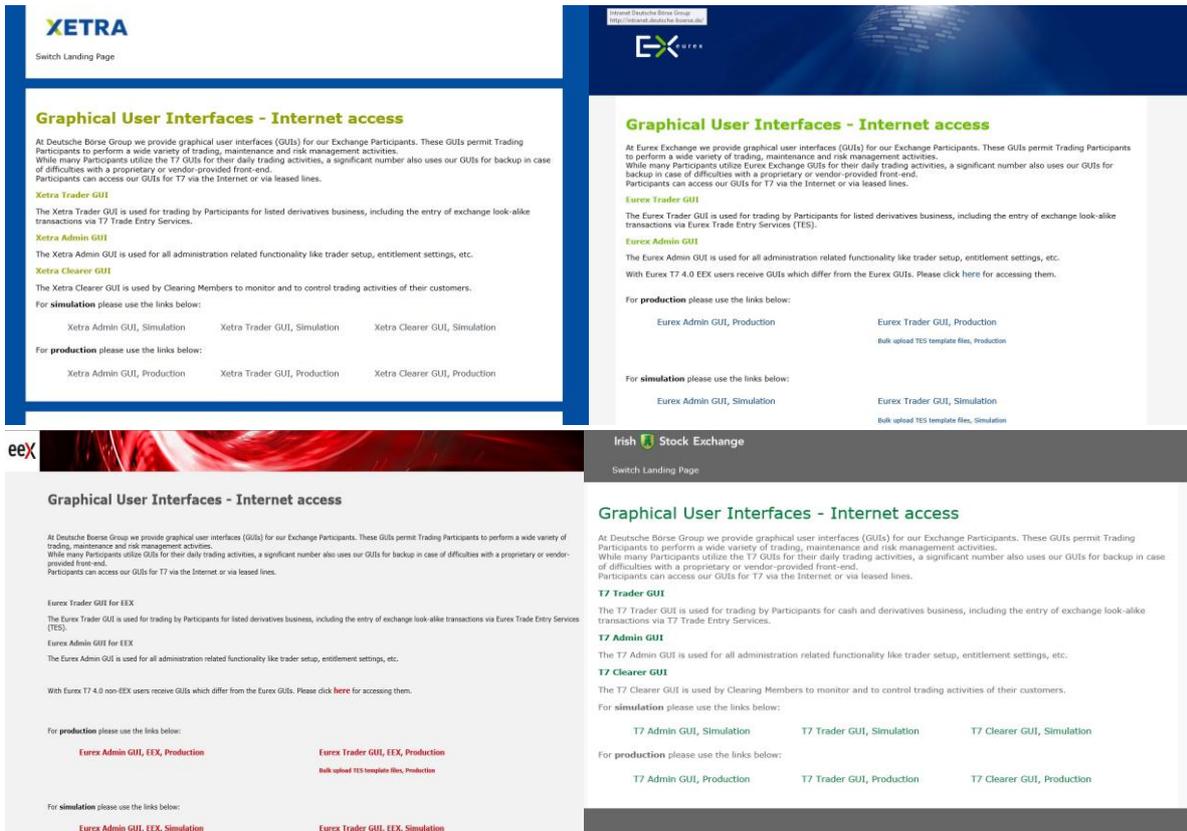
Chapter 4 applies only to Internet connections and describes in detail several approaches for SSH key creation and the procedure to upload a created public key to the Member Section of <https://member.eurexchange.com> or <https://member.deutsche-boerse.com>.

Chapter 5 summarizes a number of scenarios for testing and troubleshooting, together with links to further documentation.

1.2 T7 GUI Landing Pages

Technically the T7 GUIs are started by clicking on a link. Deutsche Börse Group provides a number of "Landing Pages" containing the links to T7 GUIs together with a brief description of the purpose of the T7 GUIs offered.

Landing pages are offered per market (i.e. Eurex, EEX, Xetra, Dublin, Vienna) and per access type (Internet, Leased Line).



The links on these landing pages to start the various T7 GUIs point to specific “JNLP” files. “JNLP” files trigger a mechanism called “Java Web Start” to download and start the latest T7 GUI binary on the client computer. See chapter 1.3 for a description of this mechanism.

Clicking on the links on the landing pages is the recommended and supported way to launch the T7 GUIs. Alternatively, it is possible to create local bookmarks to these links, which can be placed as desktop shortcuts on the client computer or stored in the bookmark collection of a browser.

Please note, in case the links on the landing pages need to be changed, such local bookmarks will become invalid, preventing the T7 GUIs from starting. Customers who decide to work with local bookmarks are obliged to monitor Deutsche Börse Group publications (i.e. Xetra and Eurex circulars). Should such a change in the GUI URLs ever become necessary it will be announced in advance via circulars.

Additionally dedicated landing pages exist which have to be used in case of a disaster recovery scenario. These pages are to be used in case the regular T7 trading back end becomes fully unavailable and Deutsche Börse Group has to run the markets from a disaster recovery data center. See the document “T7 Disaster Recovery Concept” for further details about the disaster scenario. The document “T7 Disaster Recovery Concept” can be found on the Eurex and Xetra homepages under “System documentation > Network Access”.

1.2.1 Switch Landing Page menu

Beginning with T7 release 5.0, the landing pages will introduce a “Switch Landing Page” drop down menu on the top of the screen to allow easy navigation from one market to another:



1.2.2 List of all landing pages

With the launch of T7 5.0 and the migration of the Cash Market the following landing pages will be available. Each landing page contains links to the simulation T7 GUIs, and where already available, to the production T7 GUIs too.

Market	Internet	Leased Line
Eurex Exchange	http://webgui.eurexchange.com/	http://webgui.vpn.eurexchange.com/
T7/FX	http://webgui.eurexchange.com/fx/	http://webgui.vpn.eurexchange.com/fx/
Energy Exchange	http://webgui.eurexchange.com/eex/	http://webgui.vpn.eurexchange.com/eex/
Xetra Frankfurt	http://webgui.xetra.com/	http://webgui.vpn.xetra.com/
Vienna Exchange	http://webgui.xetra.com/xvie/	http://webgui.vpn.xetra.com/xvie/
Irish Stock Exchange	http://webgui.xetra.com/xdub/	http://webgui.vpn.xetra.com/xdub/

In the case of a full failure of the main T7 data center, a disaster recovery scenario can be activated (see document “T7 Disaster Recovery Concept” mentioned above, for details). Once such a scenario has been activated market wide, the landing pages will change to the ones listed below.

Market	Disaster Recovery Internet	Disaster Recovery Leased Line
Eurex Exchange	http://webgui.eurexchange.com/emergency/	http://webgui.vpn.eurexchange.com/emergency/
T7/FX	http://webgui.eurexchange.com/emergency/fx/	http://webgui.vpn.eurexchange.com/emergency/fx/
Energy Exchange	http://webgui.eurexchange.com/emergency/eex/	http://webgui.vpn.eurexchange.com/emergency/eex/
Xetra Frankfurt	http://webgui.xetra.com/emergency/	http://webgui.vpn.xetra.com/emergency/
Vienna Exchange	http://webgui.xetra.com/emergency/xvie/	http://webgui.vpn.xetra.com/emergency/xvie/
Irish Stock Exchange	http://webgui.xetra.com/emergency/xdub/	http://webgui.vpn.xetra.com/emergency/xdub/

These are only to be used if a market wide disaster recovery situation has been announced for T7, or in case of an official disaster recovery test.

1.3 Java Web Start Details

Java Web Start is part of the Java Runtime Environment (JRE) and is automatically installed together with the JRE package.

The Java Web Start mechanism ensures that a user is always using the latest version of a given Java software package without the need for installation or upgrade procedures.

Clicking on a T7 GUI link on a T7 GUI landing page (i.e. <http://webgui.eurexchange.com/> or <http://webgui.xetra.com/>) downloads the latest version of the selected GUI if required and starts it automatically.

Each version of the T7 GUI will be stored on the local client computer within the local cache of Java Web Start. On each subsequent launch of the GUI, the locally stored version will be compared to the latest version on the Deutsche Börse Group servers. If a newer version is available this newer version will be downloaded and launched, otherwise the locally stored version is used.

The GUI version used is validated and the operation of older GUI versions is not possible.

1.4 Client PC requirements

All T7 GUIs require a Java Plugin (JRE) on the client computer. Furthermore, the end-user of the T7 GUIs needs access rights to the local Java Plugin (e.g. Plugin cache).

To access the initial website a standard internet browser is required. The browser must support the Java Plugin (JRE) available at <https://www.java.com/en/download/index.jsp>

The following browsers were tested:

- MS Internet Explorer 8, 9, 10, 11
- Mozilla Firefox 35 or newer

Other standard browsers like Google Chrome, Opera, or Safari were not tested but are considered to be possible.

1.4.1 Operating system

T7 only supports the following operating systems that have been tested together with the T7 GUIs:

- MS Windows (32-bit), x86 (MS Windows 7, MS Windows Server 2008)
- MS Windows (64-bit), x64 (MS Windows 7, MS Windows Server 2008)
- Linux (32-bit), x86, (Red Hat Enterprise Linux 6.2)
- Linux (64-bit), x64, (Red Hat Enterprise Linux 6.2)
- Oracle Solaris, Sparc, (5.x, 6.x)
- Oracle Solaris, x64, (5.x, 6.x)

Other operating systems are considered to be possible as long as they are compatible with the required Java Runtime Environment.

1.4.2 Hardware

Recommended requirements for desktop computers running one T7 GUI:

- A computer capable of running the above listed operating systems and Java Runtime Environment with at least 4 GB memory and a dual-core processor that runs at least with 2 GHz.

Display server solutions (i.e. Citrix) were not tested, but are considered to be possible.

1.5 Java Runtime Environment (JRE)

The following version of the Java Virtual Machine is supported and needs to be present on the client computer:

- Minimum: Java 8 with latest available update

Please note: In order to avoid the risk of a security breach, always install the latest update of the Java by Oracle. The T7 GUIs will not run with older versions like Java 7.

Please note: Only Oracle JRE is supported. Not any kind of third party JDK or OpenJDK.

The latest Java Runtime Environment can be downloaded from:

- <http://www.java.com/>

1.6 Network

The connection to the T7 trading system can be made through the Internet, with or without a local proxy server (with or without authentication) or over a leased line (dedicated network connection to the Deutsche Börse Group back end network).

Per concurrent T7 Trader GUI bandwidth consumption approximately 330 Kbit/s has to be expected. Bandwidth usage is mainly driven by market data updates and depends on the selected instrument profile. As the T7 Admin GUI and the T7 Clearer GUI do not receive any market data the bandwidth requirement of the T7 Admin-, or Clearer GUI is considerably lower, with the T7 Clearer GUI bandwidth depending on the number of trades reported.

Currently offered bandwidth options for GUI channels on leased lines:

- | | | |
|---------|---|--|
| 1 Mbit | ~ | estimated for 3 T7 Trader GUIs |
| 3 Mbit | ~ | estimated for 10 T7 Trader GUIs |
| 5 Mbit | ~ | estimated for 15 T7 Trader GUIs (Eurex only) |
| 10 Mbit | ~ | estimated for 30 T7 Trader GUIs |
| 40 Mbit | ~ | estimated for 120 T7 Trader GUIs |

Please note: during startup of a T7 GUI a set of reference data will be loaded by the T7 GUI. This may consume larger bandwidths, if available, for a brief time.

To start the T7 GUIs and to initiate the Java Web Start process a standard web browser should be used to navigate to a landing page, which can be reached by the following URL address:

Connection option	URL / IP address Landing Page	Ports	Protocol
Eurex T7			
Internet	http://webgui.eurexchange.com/ (193.29.90.190)	80	TCP/IP
Leased line	http://webgui.vpn.eurexchange.com/ (193.29.93.173)	80	TCP/IP
EEX T7			
Internet	http://webgui.eurexchange.com/eex/ (193.29.90.190)	80	TCP/IP
Leased line	http://webgui.vpn.eurexchange.com/eex/ (193.29.93.173)	80	TCP/IP
Eurex T7/FX			
Internet	http://webgui.eurexchange.com/fx/ (193.29.90.190)	80	TCP/IP
Leased line	http://webgui.vpn.eurexchange.com/fx/ (193.29.93.173)	80	TCP/IP
Xetra T7			
Internet	http://webgui.xetra.com/ (193.29.90.189)	80	TCP/IP
Leased line	http://webgui.vpn.xetra.com/ (193.29.93.174)	80	TCP/IP
Xetra Vienna T7			
Internet	http://webgui.xetra.com/xvie/ (193.29.90.189)	80	TCP/IP
Leased line	http://webgui.vpn.xetra.com/xvie/ (193.29.93.174)	80	TCP/IP
Xetra Dublin T7			
Internet	http://webgui.xetra.com/xdub/ (193.29.90.189)	80	TCP/IP
Leased line	http://webgui.vpn.xetra.com/xdub/ (193.29.93.174)	80	TCP/IP

Clicking one of the GUI links will initiate the Java Web Start mechanism, which will download the T7 GUI in form of a JAR file from the Web Start server. Java Web Start will verify if the current version of the GUI is already present in the local cache of the participant's client computer.

If the latest version has already been downloaded during a previous launch, the cached version is used with no download being necessary. If a newer version is available on the Web Start server, it will be downloaded automatically and stored in the local Java Web Start cache to be used in the future.

Browsing to the launch page and transferring the JAR file via Web Start is based on TCP/IP on port 80 or port 443, SSL (for future use). To serve that purpose, two sets of Java Web Start servers are used: one for Internet and one for leased line connections.

Connection option	URL / IP address Java Web Start Server	Ports	Protocol
Eurex T7 & EEX T7			
Internet	http://webgui.eurexchange.com/ (193.29.90.190)	80 / 443	TCP/IP
Leased line	http://webgui.vpn.eurexchange.com/ (193.29.93.173)	80 / 443	TCP/IP
Eurex T7/FX			
Internet	http://webgui.eurexchange.com/ (193.29.90.190)	80 / 443	TCP/IP
Leased line	http://webgui.vpn.eurexchange.com/ (193.29.93.173)	80 / 443	TCP/IP
Xetra T7, Xetra Dublin T7, Xetra Vienna T7			
Internet	http://webgui.xetra.com/ (193.29.90.189)	80 / 443	TCP/IP
Leased Line	http://webgui.vpn.xetra.com/ (193.29.93.174)	80 / 443	TCP/IP

Please note: usage of port 443 (SSL) is planned for a future release and not active yet.

As soon as the download of the JAR file has been completed or the most recent version has been found in the local cache, it will be started by the local Java Virtual Machine (JVM).

Once the T7 GUI application has been started within the local Java Virtual Machine the network communication between the client computer and the receiving proxy servers within the T7 trading architecture will be done on the ports listed below.

Eurex T7, and EEX

Environment	Connection option	IP addresses	Proxy IP subnets	Ports: Trader GUI	Ports: Admin GUI	Protocol
Production	Internet	193.29.90.203 193.29.90.204 193.29.90.221 193.29.90.222	193.29.90.192/27	80	80	TCP/IP
	Leased line A	193.29.91.225 193.29.91.226	193.29.91.224/28	8089	80	TCP/IP
	Leased line B	193.29.93.225 193.29.93.226	193.29.93.224/28			
Simulation	Internet	193.29.90.235 193.29.90.236	193.29.90.224/27	80	80	TCP/IP
	Leased line A	193.29.89.225	193.29.89.224/28	8089	80	TCP/IP
	Leased line B	193.29.95.225	193.29.95.224/28			

Eurex T7/FX

Environment	Connection option	Proxy IP subnets	Ports: Trader GUI	Ports: Admin GUI	Protocol	
Production	Internet	193.29.90.219 193.29.90.220		81	81	TCP/IP
	Leased line A	193.29.91.227	193.29.91.224/28	8090	81	TCP/IP
	Leased line B	193.29.93.227	193.29.93.224/28			
Simulation	Internet	193.29.90.235 193.29.90.236		81	81	TCP/IP
	Leased line A	193.29.89.225	193.29.89.224/28	8090	81	TCP/IP
	Leased line B	193.29.95.225	193.29.95.224/28			

Xetra T7, Xetra Dublin T7, Xetra Vienna T7

Environment	Connection option	IP addresses	IP subnets	Ports: Trader GUI	Ports: Admin GUI	Ports: Clearer GUI	Protocol
Production	Internet	193.29.90.217	193.29.90.192/27	80	80	80	TCP/IP
		193.29.90.218					
	Leased line - side A	185.102.253.161	185.102.253.160/28	8089	80	80	TCP/IP
	Leased line - side B	185.102.253.177	185.102.253.176/28				
Simulation	Internet	193.29.90.233	193.29.90.224/27	80	80	80	TCP/IP
		193.29.90.234					
	Leased line - side A	193.29.94.225	193.29.94.224/29	8089	80	80	TCP/IP
	Leased line - side B	193.29.94.233	193.29.94.232/29				

If a firewall is in place, the ports listed above need to be configured. All connections will be opened only from the client side to the Deutsche Börse Group servers. Please note that traffic over the Internet will be encrypted. Although port 80/81 or 8089/8090 is being used, firewalls will not be able to read or inspect the content (payload) of the TCP/IP packets sent on this port.

1.6.1 Leased line network aspects

For leased lines connections the outbound TCP/IP address for T7 GUI connections is expected to be within the assigned member LAN.

The technical implementation can be performed by placing a proxy server in the member LAN, taking on one side the connections to the trading desks and on the other side residing in the assigned member LAN.

Alternatively NAT'ing (static or dynamic) protocols can be implemented in the trading participant's network to shield the in-house network addresses and translate them to addresses in the assigned member LAN.

Routes to the leased line networks listed in the table in the previous chapter need to be present on the client computer. Please note that these should point to the leased lines and not to the Internet.

If present, local Internet proxy servers should implement an exception to access the leased line networks. This can be configured in .pac files of most proxy servers by commanding direct connections to the specified network/host:

```
if ( isInNet( host, "193.29.93.173", "255.255.255.255" ))  
{return "DIRECT";}
```

For leased line connections, SSH authentication is not required or possible.

1.6.2 Internet connections aspects, public key pair authentication

GUI connections established over the Internet require an additional security level for encryption and authentication, which is not present for leased line connections.

An SSH-2 key pair has to be created and the public key has to be uploaded to Deutsche Börse Group via the web portal in the Member Section of <https://member.eurexchange.com> or <https://member.deutsche-boerse.com> . Please see chapter 3 for detailed instructions on how to create an SSH key pair and how to upload the public key.

The SSH key pair is used just for authentication. The T7 GUI solutions do not establish an SSH tunnel, but encrypt the payload of the network packets on application level.

1.6.3 Local proxy servers

Customers may deploy their own proxy servers for connection via Internet or via leased lines.

If present, specify a local proxy server in the T7 GUI on the 2nd tab of the Network Connection Settings dialog (see chapters 5.2 and 5.3). If your proxy server requires authentication, please specify username and password for your proxy authentication too.

Please note: detailed proxy settings can be specified within this dialog, by activating “Use Proxy Server”. Alternatively, proxy settings can be copied automatically from the Java Control panel by activating “Use Java Settings”. When no local proxy is used at all for the T7 GUI connection, “Direct Connection” has to be selected.

The following general proxy server requirements are needed for running the T7 Admin-, T7 Trader-, or T7 Clearer GUI via proxy:

- proxy must accept „HTTP 1.1“
- proxy must understand header „Proxy-Connection“ and „Connect“ with value „keep-alive“
- proxy must understand header „Transfer-Encoding“ with value „chunked“

Known proxy server versions and limitations

- commercial proxy **BlueCoat**
 - Version SGOS 4.3, 5.4, 5.5 and 6.x known to be good
 - Version SGOS 4.2 known to be not working (End of live was 2010 according to BlueCoat)
- Open Source proxy **Squid**
 - Version 3.2.x or newer known to be good (3.5 being most recent as of writing of this document)
 - Incoming port must be configured for http11 in squid.conf

To guarantee maximum performance and most problem-free operation of the T7 GUIs, the following general recommendations can be made:

- T7 GUIs encrypt all traffic from and to the exchange. Due to this, the traffic cannot be inspected by firewalls. Firewalls sensitive to this need to be configured to allow encrypted traffic from and to the T7 IP addresses and ports. Content scan for the T7 GUI traffic needs to be disabled.
- The protocols used by the T7 GUI can be sensitive to connection interruptions. It is recommended to configure traffic to the T7 GUI IP addresses and ports with an increased priority.
- In certain scenarios, proxy servers requiring authentication themselves can cause problems in the T7 GUI communication (http 407 error). If not absolutely required by local security policy it is recommended to run the T7 GUIs via proxies that do not require authentication.

In general, the main method of communication of the T7 GUI, once they are downloaded and running on the client computer is the protocol “WebSocket” (see RFC 6455 and 7936 for details). WebSocket allows near real-time communication between the GUI application and the exchange servers.

WebSocket replaces the “Long Polling” (see RFC 6202 for details) communication method which was used by earlier versions of the T7 GUIs (Release 1.0 – 3.0), but can still be used by the T7 GUIs as a fall-back option.

1.6.4 FQDN versions

The T7 GUI landing pages and the JNLP files with all the connection details for the T7 GUIs contain IP addresses to specify the various network resources. These are described throughout this document and are considered to be the “standard” for using T7 GUIs.

In very few cases, trading participants may require landing pages and JNLP files which do not contain the static IP addresses, but rather the fully qualified domain names (FQDN) to specify the various network resources. Deutsche Boerse Group offers fqdn versions of the landing pages and of the corresponding JNLP files for those participants requiring this option.

The fqdn versions exist only in the leased line environment.

To access the fqdn version of a landing page just replace the index.html with fqdn.html.

For example:

Market	Regular Landing Page	Fqdn Version Landing Page
Eurex T7	http://webgui.vpn.eurexchange.com/index.html	http://webgui.vpn.eurexchange.com/fqdn.html
Xetra T7	http://webgui.vpn.xetra.com/index.html	http://webgui.vpn.xetra.com/fqdn.html
FX	http://webgui.vpn.eurexchange.com/fx/index.html	http://webgui.vpn.eurexchange.com/fx/fqdn.html
EEX	http://webgui.vpn.eurexchange.com/eex/index.html	http://webgui.vpn.eurexchange.com/eex/fqdn.html
Vienna	http://webgui.vpn.xetra.com/xvie/index.html	http://webgui.vpn.xetra.com/xvie/fqdn.html
Dublin	http://webgui.vpn.xetra.com/xdub/index.html	http://webgui.vpn.xetra.com/xdub/index.html

The JNLP files linked on these fqdn landing pages specify network resources with their fully qualified domain names:

```
<property name="leasedline.cryptoProxy.urls"
value="http://guiproxyp2.vpn.eurexchange.com:8089/CryptoProxy;http://guiproxyp1.vpn.eurexchange.com:8089/CryptoProxy;http://guiproxyp4.vpn.eurexchange.com:8089/CryptoProxy;http://guiproxyp3.vpn.eurexchange.com:8089/CryptoProxy"/>
```

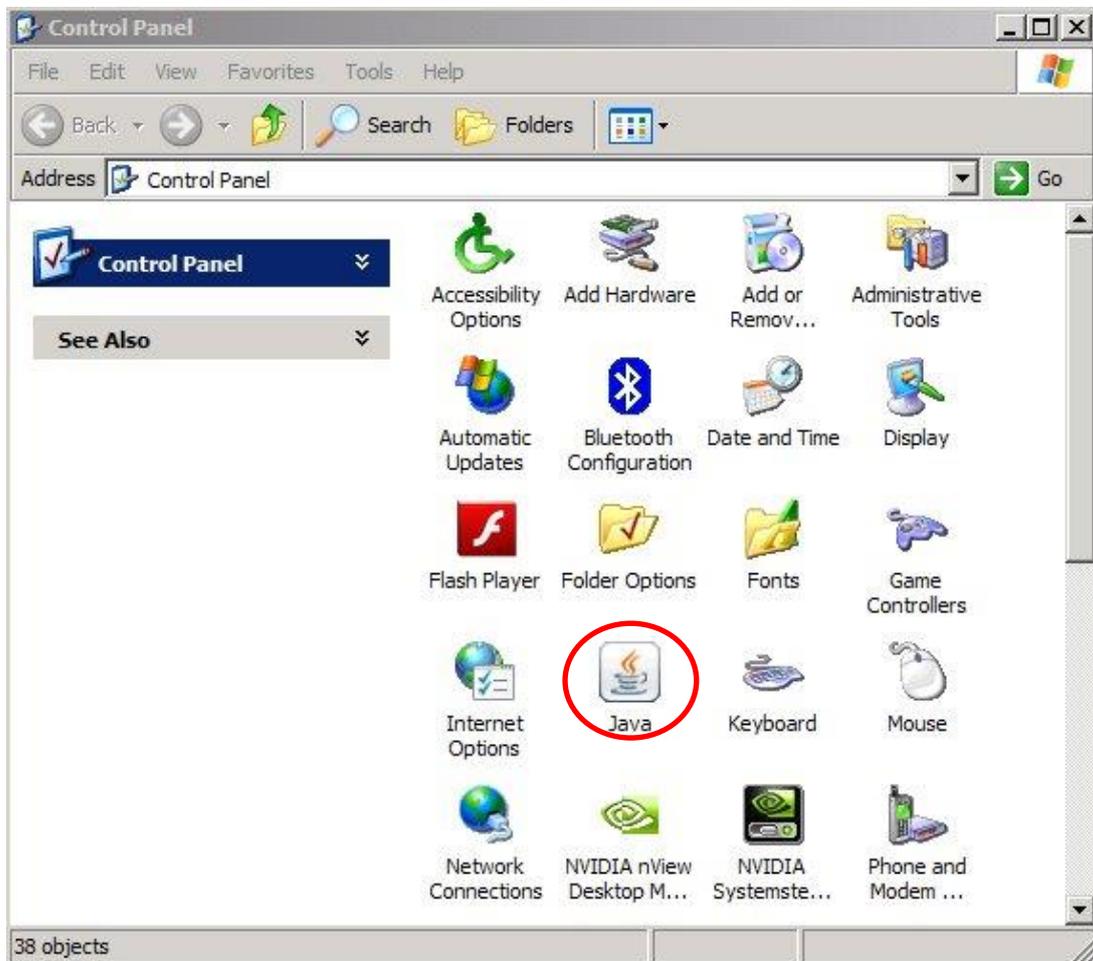
While the regular JNLP files use IP addresses to specify the very same network resources:

```
<property name="leasedline.cryptoProxy.urls"
value="http://193.29.93.225:8089/CryptoProxy;http://193.29.91.225:8089/CryptoProxy;http://193.29.93.226:8089/CryptoProxy;http://193.29.91.226:8089/CryptoProxy"/>
```

As stated above: The fqdn versions exist only in the leased line environment.

2. Java Plugin Settings on the local computer

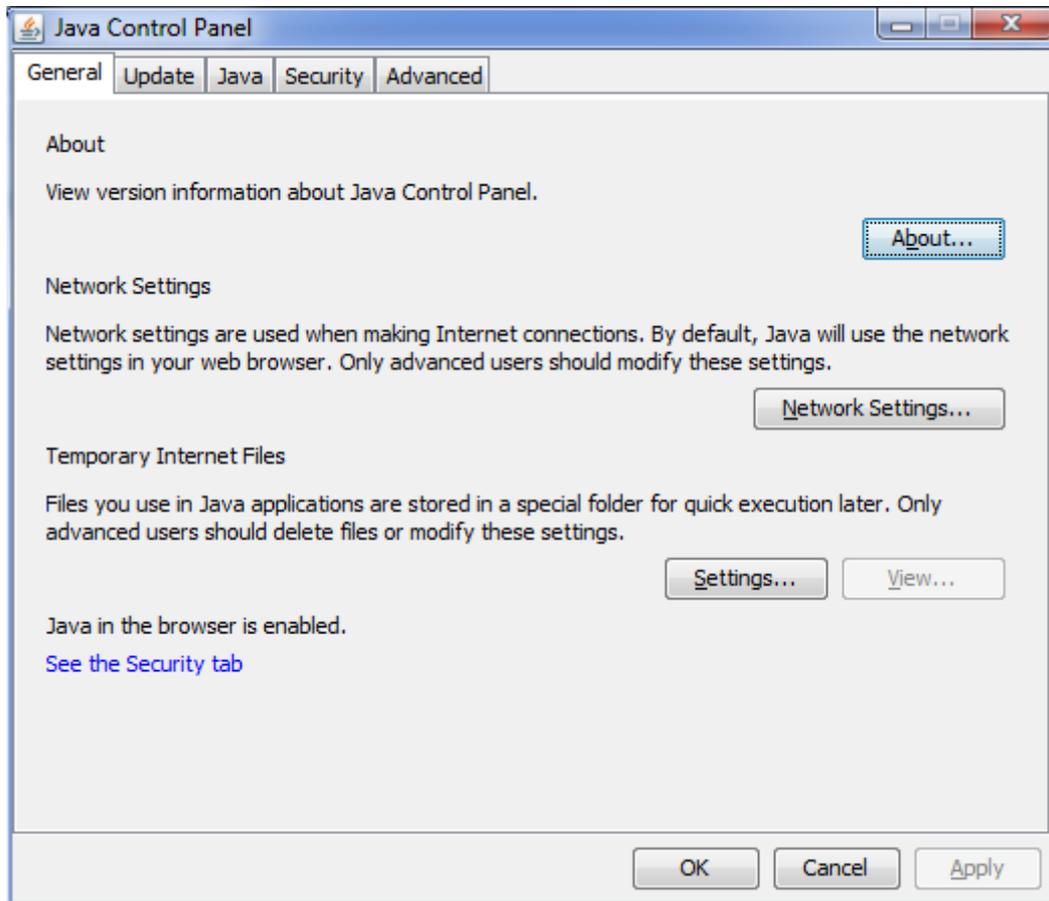
To access the Java Control Panel open the Control Panel on a MS Windows based computer.



Double click the icon „Java” to open the plugin settings. If the icon is missing, the plugin is not correctly installed.

For Linux based computers open the Java settings by selecting “Preferences” / “Java” – depending on the installed desktop environment.

The following window should open (or similar, depending on operating system and Java version used):

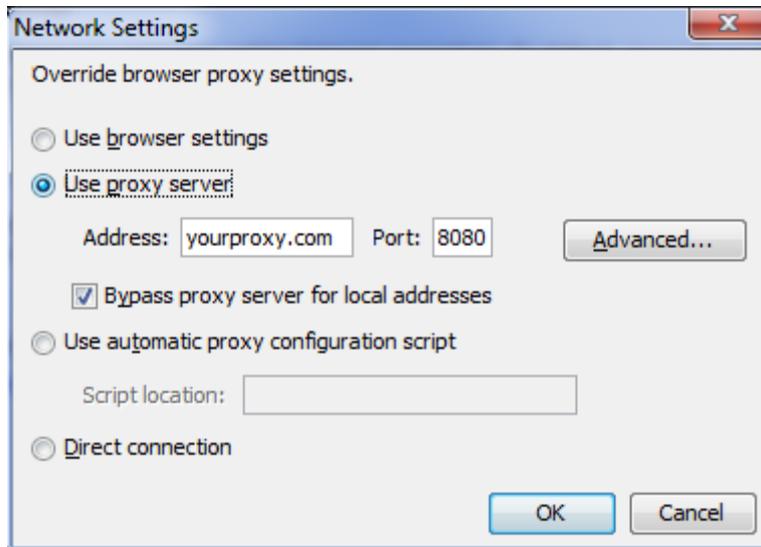


The Java plugin version can be verified with a click on „About...“:



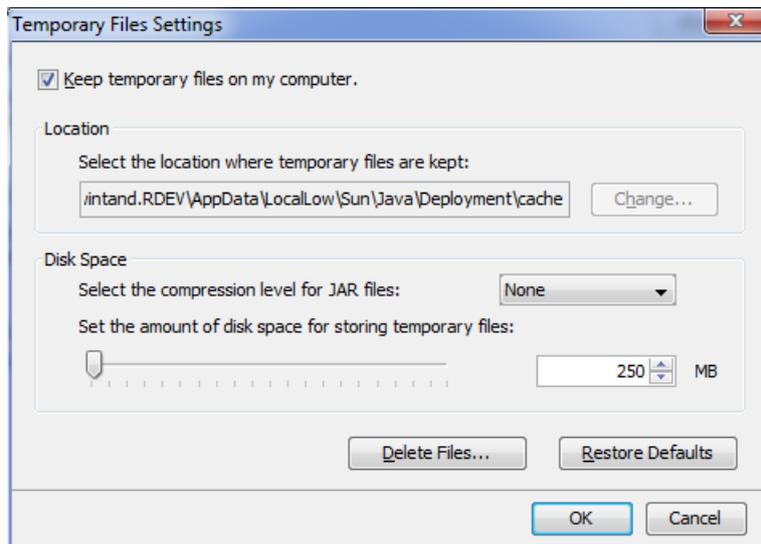
The Java version must be 8 (the latest available update version is highly recommended).

Open the network settings with a click on “Network Settings...”:



These settings are specific for your infrastructure. Normally you can use the settings from your internet browser (for Internet Explorer: Tools -> Internet Options -> Connections -> LAN Settings).

Open the settings for temporary internet files with a click on “Settings...”



It is recommended to reserve sufficient disk space (at least 120MB) for the temporary files on the local computer. The JAR files of the T7 Admin GUI, T7 Trading GUI and T7 Clearer GUI will be about 30MB per version. Disabling disk space for temporary files on the local computer will require Java Web Start to download the Eurex GUI applications with each start of the application.

The end-user of the T7 GUI applications must have read and write access to the temporary files location. If you encounter problems with the download, please try to clear the cache (Button “Delete Files...”) and download the application again.

3. Local files

All T7 GUIs store setup information and log files on the local client computer. The log files for the different T7 GUIs have distinguishable filenames like “Eurex Trader.log”, “Xetra Trader Vienna.log”, “Xetra Admin.log”.

3.1 Directory structure

The default location for these files is in the operating system user’s home directory in a sub folder “gmc” (working directory)

```
~/gmc
```

```
C:\users\\gmc
```

Within this folder sub folders for **production** and **simulation** are created. Each folder contains another folder “etc” for the GUI configuration (settings directory) and a folder “log” for the GUI log files (log directory).

3.2 Changing directories

All three directory paths stated above can easily be changed by the use of operating system environment variables.

Important: Avoid to use a network directory here, since any kind of network directory will impact the application performance significantly!

Directory	Environment Variable	Default
Working directory	GMC_WORKING_DIR	~/gmc/<environment>
Settings directory	GMC_SETTINS_DIR	~/<GMC_WORKING_DIR>/<environment>/etc
Log directory	GMC_LOG_DIR	~/<GMC_WORKING_DIR>/<environment>/log

Example, MS Windows:

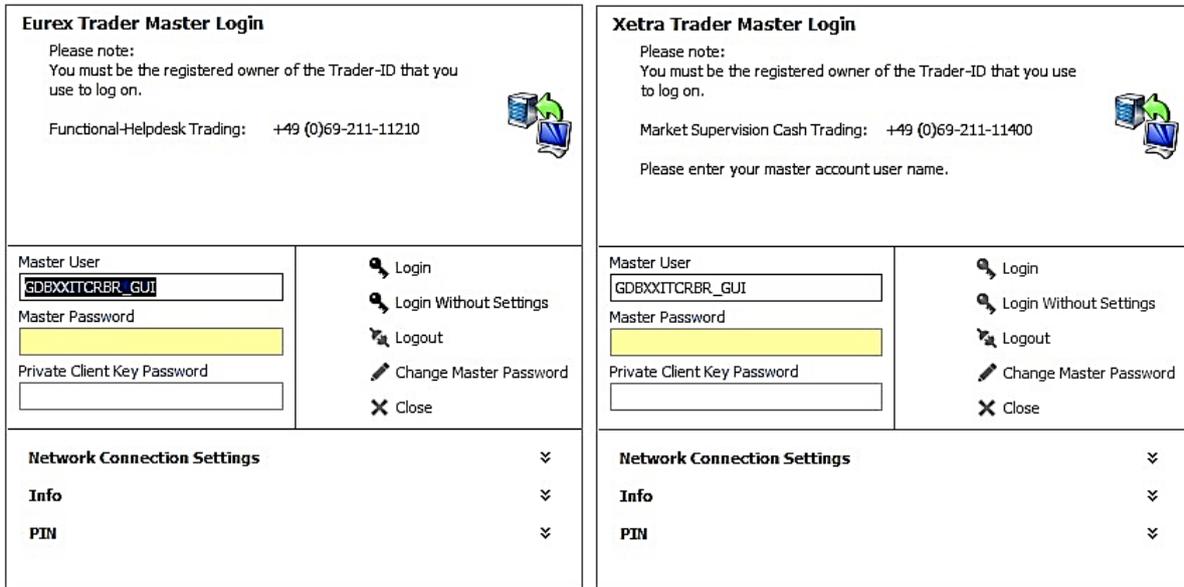
```
SET GMC_WORKING_DIR=N:\home\gmc\
ECHO %GMC_WORKING_DIR%
```

Example, UNIX (bash)

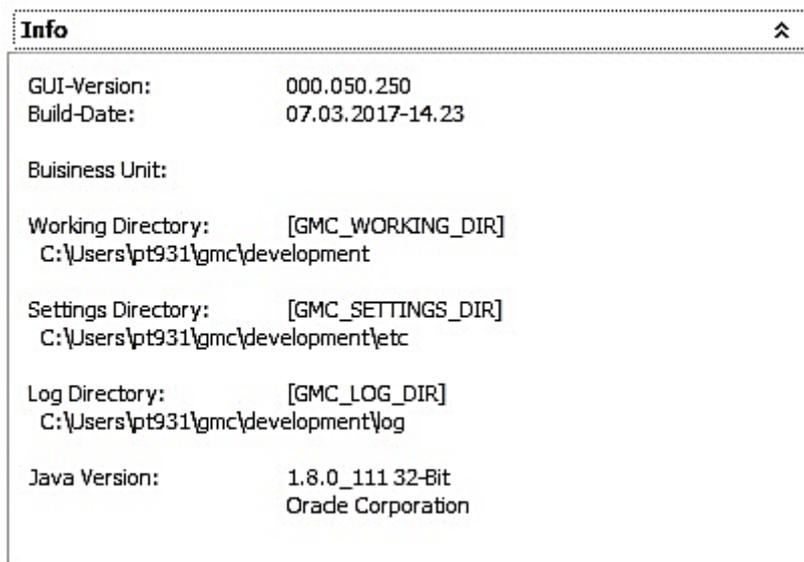
```
export GMC_WORKING_DIR=/mount/home/gmc
echo $GMC_WORKING_DIR
```

3.3 Verify local settings

Local settings can easily be verified within the GUI itself. Open a Login view and click on the blue “Info” bar at the bottom of the window:



The window will expand and display a list of the settings currently used by the GUI store and read files in the client computer’s file system:



4. SSH key pair generation

The following chapter applies only for customers who intend to run the T7 Trader GUI, T7 Admin GUI, or the T7 Clearer GUI via the native Internet. T7 GUI connections over leased lines do not require any SSH key pair authentication.

To generate an SSH-2 public/private key various freeware tools are available for download in the Internet, for instance:

- PuTTYgen.exe (available for MS Windows),
- ssh-keygen from <http://www.openssh.org> for various operating systems.

The key generation process will produce both the public and the private key.

Key pairs can be created either for an entire business unit or for individual traders. Key generation for both options is identical. The use of the keys (business unit vs. individual traders) is determined during upload into the Member Section as outlined in chapter 3.4.

To help associate keys with business unit or individual member IDs it is suggested to use corresponding filenames as indicated in the examples below.

IMPORTANT: Each key private must be protected with a passphrase. This is mandatory for the T7 simulation and for production environments.

4.1 Private and public key with OpenSSH (ssh-keygen)

After installing OpenSSH type the following command on the command line to create both, a public and a private key (in this example with a length of 3060 bytes):

```
$ ssh-keygen -t rsa -b 3060 -N <passphrase> -f /home/username/.ssh/
MEMBRTRD001
```

```
Generating public/private rsa key pair.
Your identification has been saved in /home/username/.ssh/ MEMBRTRD001.
Your public key has been saved in /home/username/.ssh/ MEMBRTRD001.pub.
The key fingerprint is:
f8:e9:1a:ee:a0:d7:2b:4a:8e:fa:4d:80:43:e0:96:1a username@host.domain.de
The key's randomart image is:
+--[ RSA 3060 ]-----+
|.                    |
|o .                  |
|E=                   |
|+o .                 |
|+ . . . S           |
|. . . .              |
|. . o.. o            |
| + +oo.o             |
|+. =o.o=o.           |
+-----+

```

The following keys will be created:

```
$ ls -al MEMBR*
-rw----- 1 username group 1675 Jul 17 16:28 MEMBRTRD001
-rw-r--r-- 1 username group  405 Jul 17 16:28 MEMBRTRD001.pub
```

The public key can be identified by the file extension “.pub”, while the private key has no file extension. Please note the different file access rules for both keys.

The private key file must be accessible from the GUI user’s workstation, but should never be distributed further.

Alternatively the tool ssh-keygen can be used in an interactive session:

```
$ ssh-keygen -t rsa -b 3060

Generating public/private rsa key pair.
Enter file in which to save the key (/home/username/.ssh/id_rsa):
/home/username/.ssh/MEMBRTRD002
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/username/.ssh/MEMBRTRD002.
Your public key has been saved in /home/username/.ssh/MEMBRTRD002.pub.
The key fingerprint is:
17:0f:1c:7b:67:bc:34:6f:a6:52:7c:4b:7e:d7:16:8e username@host.domain.de
The key's randomart image is:
+--[ RSA 3060 ]-----+
|           .          |
|          . o .       |
|         = . *        |
|          = = +       |
|         S . . +o=    |
|           . . =+=    |
|            .E.+ =    |
|            . . o     |
|                    |
+-----+

```

The following keys will be created:

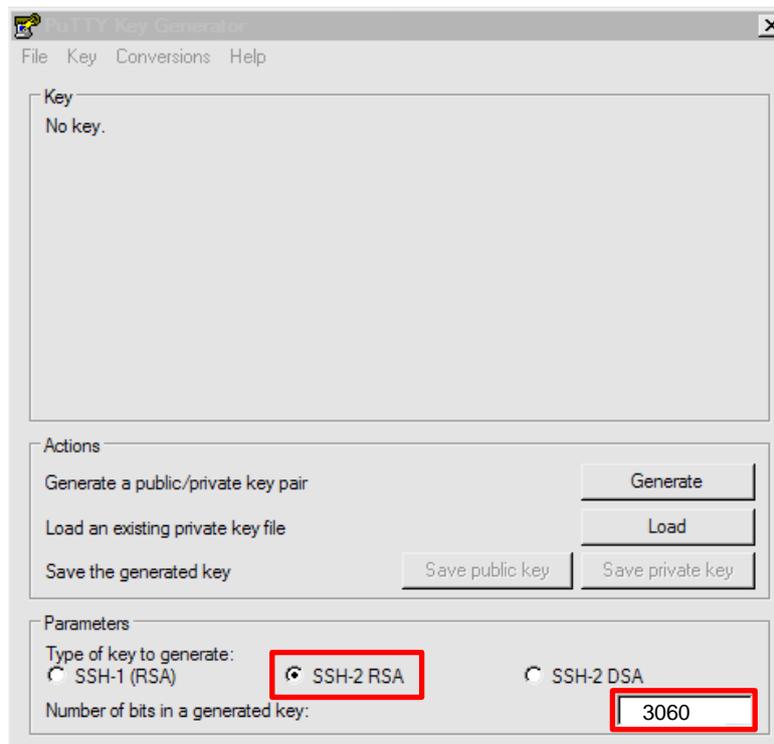
```
$ ls -al MEMBR*
-rw----- 1 username group 1743 Jul 17 16:30 MEMBRTRD002
-rw-r--r-- 1 username group  405 Jul 17 16:30 MEMBRTRD002.pub
```

The public key can be identified by the file extension “.pub”, while the private key has no file extension. Please note the different file access rules for both keys.

The private key file must be accessible from the GUI user’s workstation, but should never be distributed further.

4.2 Key generation with puttygen

The following chapter describes the key generation procedure with puttygen.exe under MS Windows. After starting PuTTY Key Generator (run “puttygen.exe”) there will be an almost empty PuTTY Key Generator screen visible.

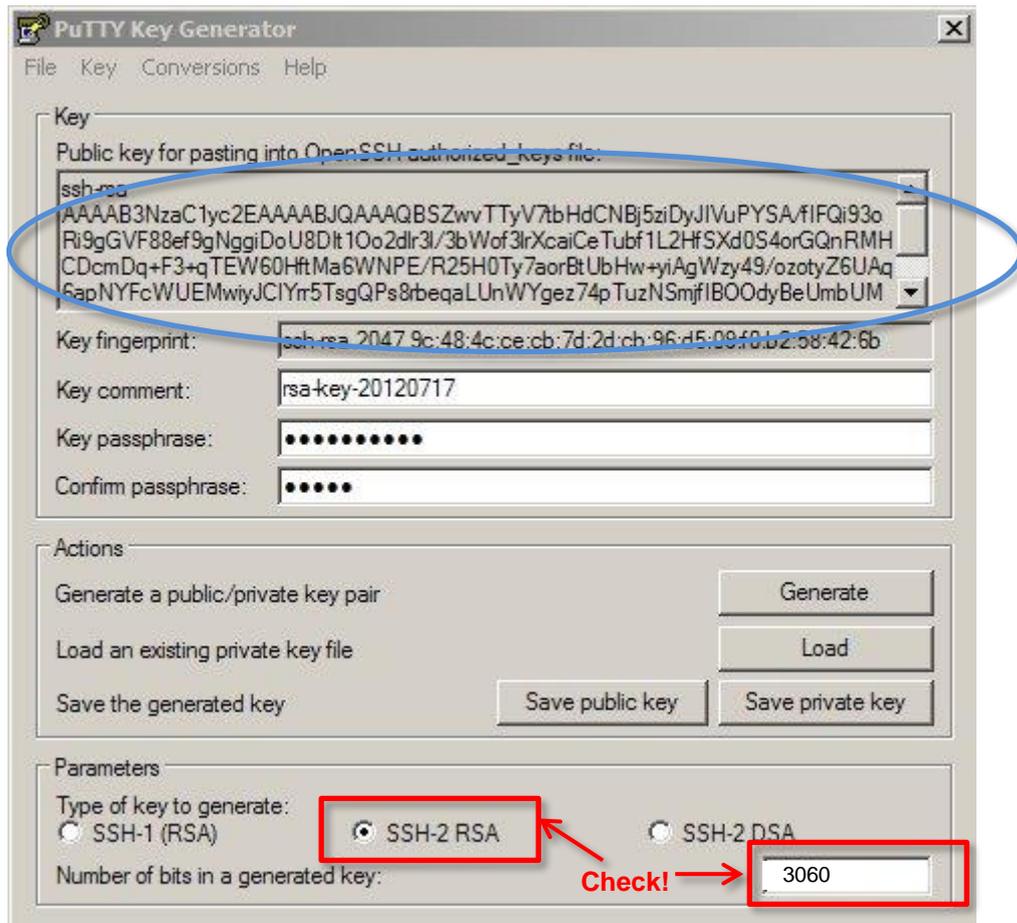


Parameters:

- Type of key to be generated: **SSH-2 RSA**
- Number of bits in a generated key: **3060** (up to 16384)

Once the parameters are set, click on “Generate” and move your mouse pointer for a while over the blank area. The key pair will be generated.

IMPORTANT: Each key private must be protected with a passphrase. This is mandatory for both the T7 simulation and for production environments.

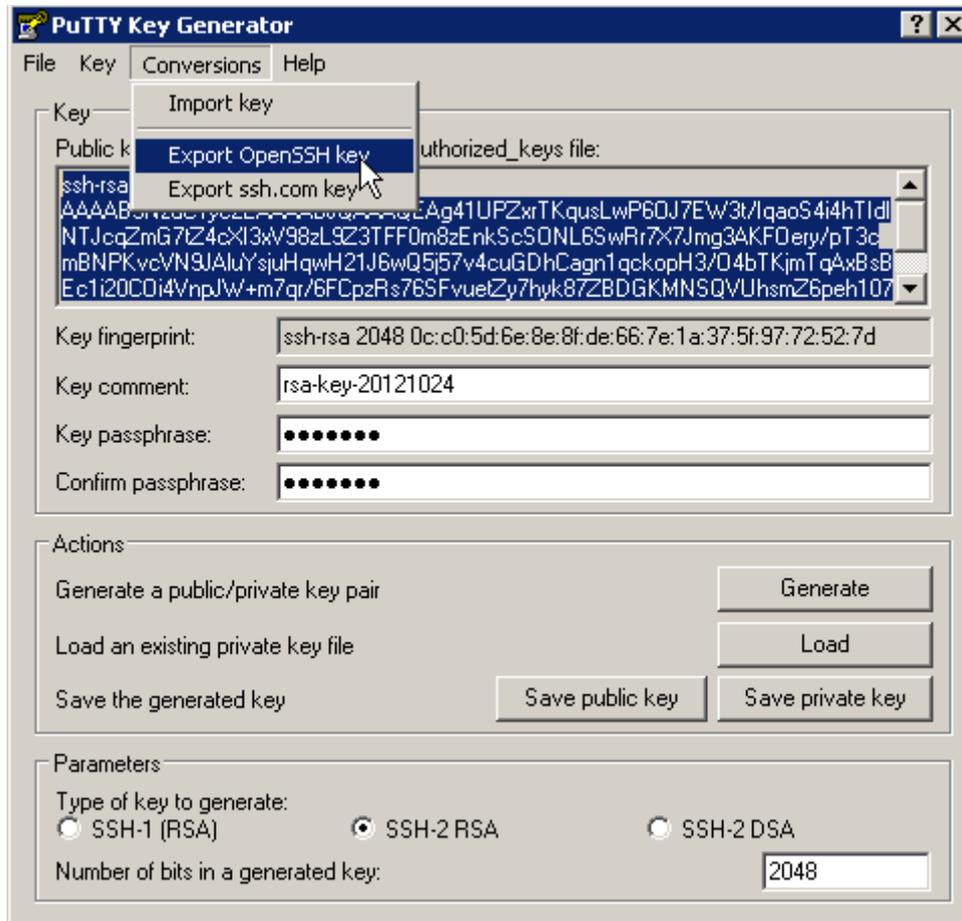


Public key: Copy the key and paste it into a text editor (e.g. Notepad), change the ending to .pub and save it on your computer.

To save the public key, select the key in the textbox with the mouse. Make sure that you have selected the full key. This may require scrolling. Copy the selected key to the clipboard (CTRL-C). Open a text editor, i.e. "Notepad" or "Editor" and paste (CTRL-V) the key into the editor. Save the file as the public key.

The public key needs to be uploaded to the Member Section of the Eurex or Xetra website. The process is described in the next chapter.

Privat key: To save the private key, click on "Conversion" in the menu bar of PuTTYgen and select "Export OpenSSH key" as shown in the screenshot below.



Both keys are required to run any T7 GUI over the internet.

Please note: Both key files must be accessible from the T7 GUI user's workstation, but should never be distributed further.

4.3 Public key – Member Section upload

The public key created as outlined above needs to be uploaded to the Member Section at <https://member.eurexchange.com> or <https://member.deutsche-boerse.com>. The user uploading public keys needs to be a registered "Technical User Administrator".

From the Member Section the key will be transferred to the proxy servers for T7 GUI usage via Internet. An uploaded key will be usable within one hour after successful upload.

Keys can be created either for the entire business unit or for individual traders. Uploaded keys are valid for one market only. Customers trading on several markets need to upload keys for each market.

Please note: Uploading a new key for a trader or a business unit overwrites any previously uploaded key.

Follow the path below to reach the T7 GUI key upload page.

DBAG Member Section-> Technical Connection-> Technical User Administration-> T7 GUIs



The path above will take you to the T7 GUI Keys page:

Once the certificate is uploaded, trading participants can access GUIs by using the following links:
 T7 GUIs for Eurex: <http://webgui.eurexchange.com/>
 T7 GUIs for T7/FX: <http://webgui.eurexchange.com/tx/>
 T7 GUIs for EEX: <http://webgui.eurexchange.com/eeex/>
 T7 GUIs for Xetra: <http://webgui.xetra.com>
 T7 GUIs for Irish Stock Exchange: <http://webgui.xetra.com/dublin>
 T7 GUIs for Vienna Stock Exchange: <http://webgui.xetra.com/vienna>

If you have any questions about your login for the T7 GUI, please contact Clearing Data Control at clearingdata@eurexchange.com.

T7 GUIs							
New Participant Key		New Trader Key		Delete Key			
Type	Market	Member ID	Trader ID	Environment	Valid to [dd.mm.yyyy]	Description	
Trader Key	EUREX			Simulation	31.12.2099		
Participant Key	EUREX			Simulation	01.11.2020		
Participant Key	EUREX			Simulation	29.08.2014		
Participant Key	XETRA			Production	02.11.2020		
Trader Key	XETRA VIENNA			Simulation	31.12.2020		
Trader Key	Eurex T7 FX			Simulation	31.12.2099		

Public keys can be uploaded and registered either for a whole business unit where every trader uses the same key (described in the chapter 4.3.1 New Participant Key) or individually for every trader individually (described in the chapter 4.3.2 New Trader Key).

4.3.1 New Participant Key

Click on “New Participant Key” to upload a key which will be used by all traders of a given business unit. Select the Member ID/Business unit, the desired market (Eurex, T7/FX, Xetra, Vienna, Dublin, etc.), the environment (production/simulation) and choose an expiration date.

Expired keys will be deleted at the expiry date. Expiry dates can be modified at any time prior to expiry. Additionally an optional text description can be added.

The screenshot shows a web form titled "Add new Participant Key". It contains several input fields and a button:

- Key Type:** A dropdown menu with "Participant Key" selected.
- Market: *** A dropdown menu with "Xetra" selected.
- Environment: *** A dropdown menu with "Simulation" selected.
- Member Id: *** A dropdown menu with "GDBXX" selected.
- Valid to [dd.mm.yyyy]: *** A date input field with "31.12.2017" and a calendar icon.
- Description:** An empty text input field.
- Public Key: *** An empty text input field.
- Upload Public Key:** A button located to the right of the Public Key field.
- Certificate Data:** A large, empty text area at the bottom of the form.

Then click on the "Upload Public Key" button. In the popup window select "Browse..." and navigate to the public key file you have created previously.

The screenshot shows a popup window titled "Upload Public Key File". It contains the following elements:

- Browse...:** A button to open a file browser.
- File Name:** A text input field containing "GDBXXITCRBR_GUI.pub".
- Save:** A button to confirm the file selection.
- Cancel:** A button to close the popup without saving.

Click on "Save" to close the popup window.

Add new Participant Key

Key Type:

Market: *

Environment: *

Member Id: *

Valid to [dd.mm.yyyy]: *

Description:

Public Key: *

Certificate Data:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAABJQAAAQEAiQuwyWxHRRjG3wN4feUYLuEM2KSix0Z5jhMWKRalg9zRFNTWnQFcsyJLHLYq3f05W5CcBYt6Onbc6s
SAQh071tA5zGqa9u6GGw/IPVZ3kqs7YFV6cWJXveP
/4yjG4Z8kzOsDYCs5y5fgQmhX9hUtsyFwBNZcbqpYFPSNaEJ+k5Po0eW88sVRkHVDhGboUqwOXVsqSbmFsYVZpqu33SprJD88AWeRst+bHI
/pg+5WAKFLHCZokz77XzWY5aYE
/6dQvgh5djcCsXl5wYJGYHx5iqqeSDhPPFaUgWhkEkDsF8ky3fc72PyESifLBPTSkGulTAxPgpW61ZJ2Aep1rpw== rsa-key-20160928
```

Network Data

IPAddress
Table is empty

Click on “Save” to complete the key upload. The screen will return to show a list of all already uploaded keys.

T7 GUIs

Type	Market	Member Id	Trader ID	Environment	Valid to [dd.mm.yyyy]	Description
Trader Key	EUREX			Simulation	31.12.2099	
Participant Key	EUREX			Simulation	01.11.2020	
Participant Key	EUREX			Simulation	29.08.2014	
Participant Key	XETRA			Production	02.11.2020	
Trader Key	XETRA VIENNA			Simulation	31.12.2020	
Trader Key	Eurex T7 FX			Simulation	31.12.2099	

Uploaded keys will be activated and ready to be used within one hour after the upload.

4.3.2 New Trader Key

Click on “New Trader Key” if you want to upload a key which is used by one individual trader. Select the Member ID/Business unit, the desired market (Eurex, Xetra, etc.), the environment (production/simulation) and choose an expiration date.

Expired keys will be deleted at the expiry date. Expiry dates can be modified at any time. Additionally an optional text description can be added.

Follow the procedure described in the previous chapter to select a local public key file and upload it.

Add new Trader Key

Key Type:

Market: *

Environment: *

Member Id: *

Trader ID: *

Valid to [dd.mm.yyyy]: *

Description:

Public Key: *

Certificate Data:

Click on “Save” to complete the key upload. The screen will return to show a list of all already uploaded keys.

T7 GUIs

	Type	Market	Member Id	Trader ID	Environment	Valid to [dd.mm.yyyy]	Description
<input type="checkbox"/>	Trader Key	EUREX			Simulation	31.12.2099	
<input type="checkbox"/>	Participant Key	EUREX			Simulation	01.11.2020	
<input type="checkbox"/>	Participant Key	EUREX			Simulation	29.08.2014	
<input type="checkbox"/>	Participant Key	XETRA			Production	02.11.2020	
<input type="checkbox"/>	Trader Key	XETRA VIENNA			Simulation	31.12.2020	
<input type="checkbox"/>	Trader Key	Eurex T7 FX			Simulation	31.12.2099	

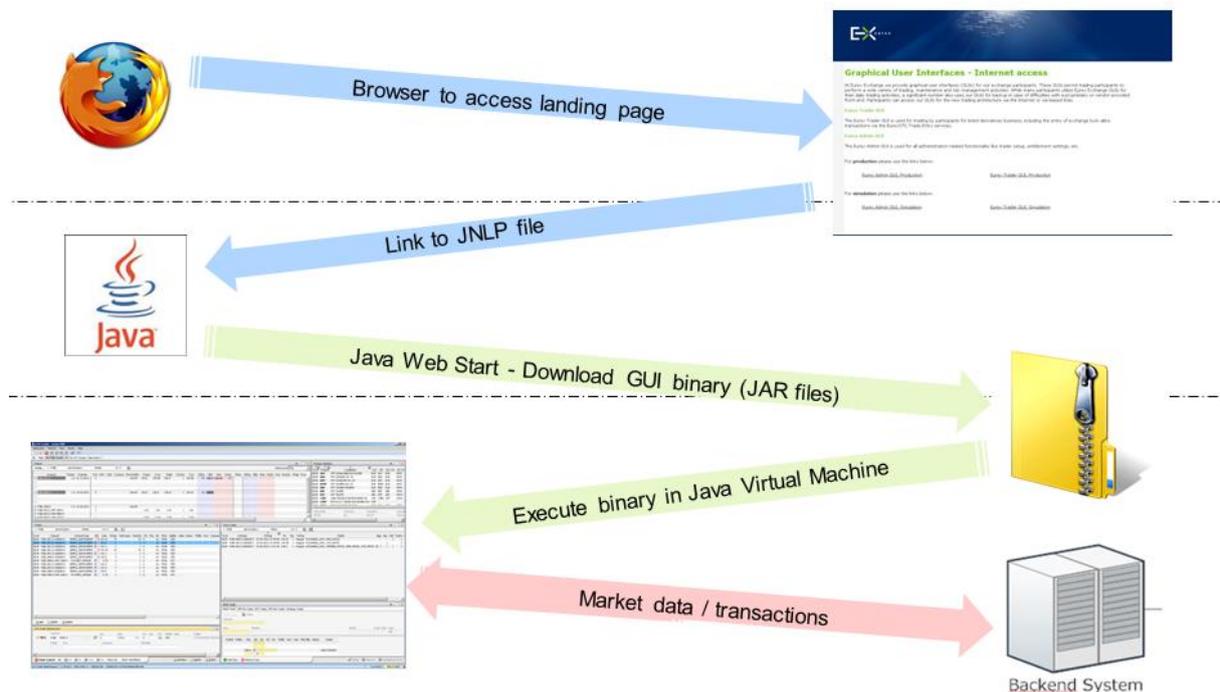
Uploaded keys will be activated and ready to be used within one hour after the upload.

5. Troubleshooting

Although the setup of the T7 Admin GUI, T7 Trader GUI and/or T7 Clearer GUI is straight forward and relatively simple, the following chapters give some advise on troubleshooting in case connectivity cannot established in the first place.

5.1 Three tiers of T7 GUI communication

The whole process of downloading, starting and running the T7 GUI consists of three tiers:



5.1.1 Tier I, Web browser -> landing page -> JNLP file

Any web browser can be used to navigate to the landing pages (Internet <http://193.29.90.190>, leased line <http://193.29.93.173>). The GUI links on the landing page lead to JNLP files. If the mime type is set correctly to the javaws binary, a click on the link will launch Java Web Start. Proxy settings in the web browser are only relevant for accessing the landing page.

5.1.2 Tier II, javaws -> Web Start, JAR File delivery

The JNLP files contain information about the JAR files Java Web Start needs to download. This communication is still on port 80 to the same addresses used above. Proxy settings within the Java control panel apply here.

5.1.3 Tier III, Running GUI -> T7 (crypto) proxies

The T7 GUI itself, once running, will open a connection to one of a set of so called “T7 (crypto) proxies). These T7 (crypto) proxies handle incoming T7 GUI communication and forward the communication to the T7 back end. On Internet connections, the T7 (crypto) proxies handle the x.501 GUI key handshake – hence the “crypto” in the name. All available T7 (crypto) proxies are defined in the JNLP files.

The T7 GUI will pick one of the T7 (crypto) proxies listed in the JNLP file to open a communication channel which is then used further on for communication from the running GUI to the T7 back end.

Example Eurex T7 (see chapter 1.6 for other network addresses):

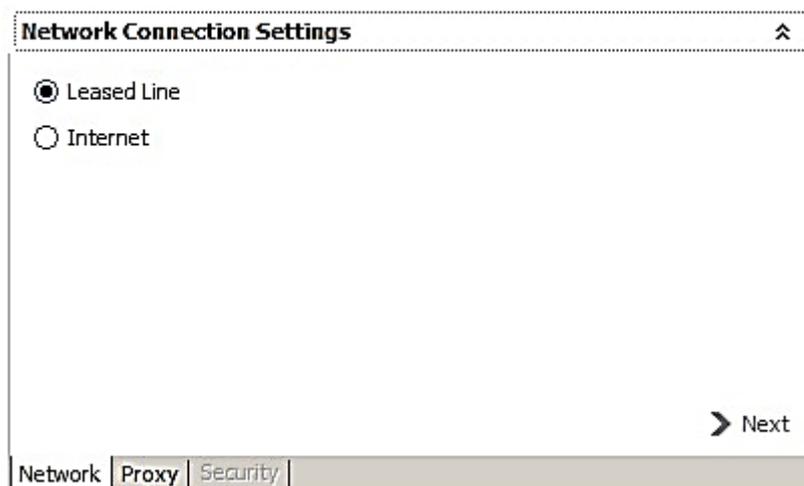
Leased line	Simulation: 193.29.89.224/28, 193.29.95.224/28 Production: 193.29.91.224/28, 193.29.93.224/28
Internet	Simulation: 193.29.90.224/27 Production: 193.29.90.192/27

5.2 Verify connectivity, Internet

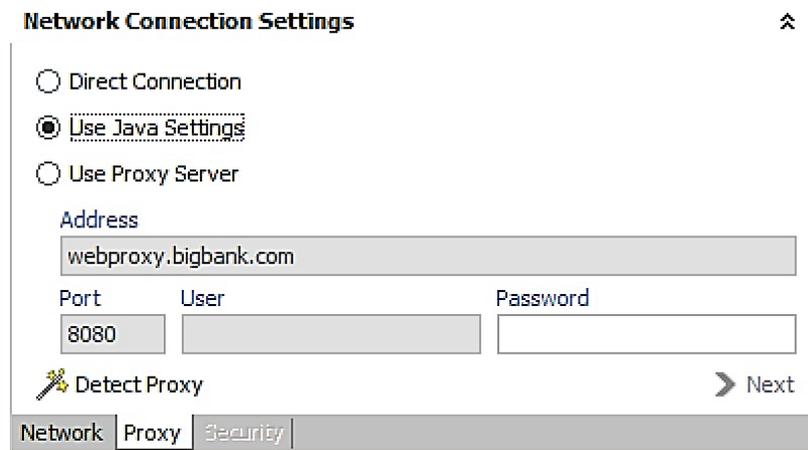
Open a web browser and navigate to <http://webgui.eurexexchange.com/> , or <http://webgui.xetra.com> . A T7 GUI landing page for Internet connectivity should be displayed. If not, verify that your browser can reach the Internet. Check local proxy settings.

Clicking on any of the presented T7 GUI links will trigger the Java Web Start process. If not, verify the network settings of your Java plugin as described in chapter 2. If a local proxy server is present, this should be configured in the Java plugin as in the web browser.

The selected T7 GUI will start after the Java Web Start process has been completed. In the login screen, open network settings and select Internet.



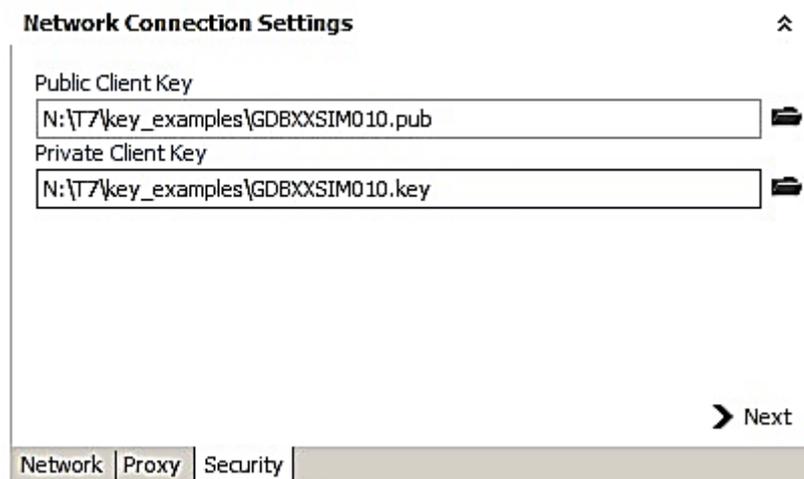
If present, specify a local proxy server on the 2nd tab. If your proxy server requires authentication, please specify username and password for your proxy authentication too.



The screenshot shows the "Network Connection Settings" dialog box with the "Proxy" tab selected. The "Use Java Settings" radio button is selected. The "Address" field contains "webproxy.bigbank.com". The "Port" field contains "8080". The "User" and "Password" fields are empty. There is a "Detect Proxy" button with a key icon and a "Next" button with a right arrow icon. The bottom of the dialog has three tabs: "Network", "Proxy", and "Security".

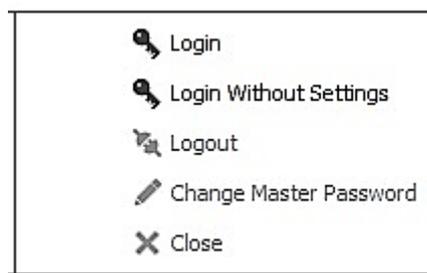
Please note: detailed proxy settings can be specified within this dialog, by activating “Use Proxy Server”. Alternatively, proxy settings can be copied automatically from the Java Control panel by activating “Use Java Settings”. When no local proxy is used at all for the T7 GUI connection, “Direct Connection” has to be selected.

On the 3rd tab point to your public **and** private SSH key, matching the previously uploaded public key.



The screenshot shows the "Network Connection Settings" dialog box with the "Security" tab selected. The "Public Client Key" field contains "N:\T7\key_examples\GDBXXSIM010.pub" and has a file icon to its right. The "Private Client Key" field contains "N:\T7\key_examples\GDBXXSIM010.key" and has a file icon to its right. There is a "Next" button with a right arrow icon. The bottom of the dialog has three tabs: "Network", "Proxy", and "Security".

After the required configuration is complete, the Login button becomes active. Clicking on the login button connects the T7 GUI with the exchange. If not, verify the data entered in the network settings of the T7 GUI.



5.3 Verify connectivity, leased line

5.3.1 Simple checklist for simulation network configuration test via leased line

Please note: IP addresses below are an example for Eurex simulation only. See chapter 1.6 for other markets and for production addresses.

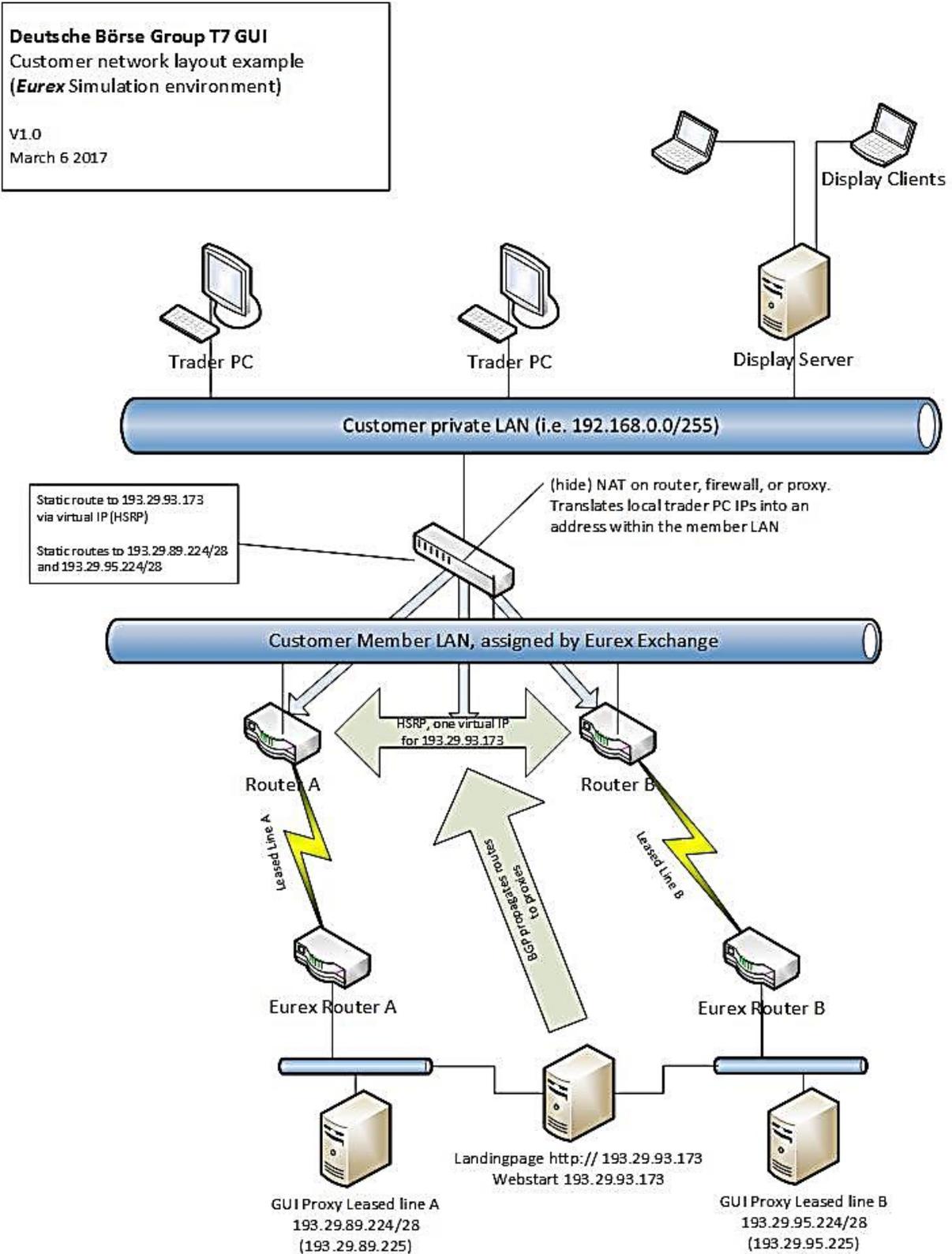
- 1.) Find the correct member LAN to connect from. In the member portal, go to "Request & Configuration". Get an X-Con for ETI and/or GUI channel. Take note of the "MEMLAN IPnet". This is the network from which you should connect:
- 2.) Find the router assignment to back end half "A" and "B" in the same X-Con
- 3.) For initial testing put a computer into the assigned member LAN.
- 4.) Add three static routes to this computer
 - route 193.29.89.224 255.255.255.240 -> pointing to router for BE half "A" (alternative subnet naming 193.29.89.224/28)
 - route 193.29.95.224 255.255.255.240 -> pointing to router for BE half "B" (alternative subnet naming 193.29.95.224/28)
 - route 193.29.93.173 255.255.255.255 -> pointing to either one of the routers or a virtual HSRP address.
- 5.) Test basic connectivity using telnet on the test computer
 - telnet 193.29.93.173 80 -> you should get an open port on a webserver
 - telnet 193.29.89.225 80 -> you should get an open port
 - telnet 193.29.95.225 80 -> you should get an open port

(use port 8089 instead of port 80 to test T7 Trader GUI on a dedicated GUI channel on leased line)
- 6.) Verify with the GUI software (only if the telnet tests above were successful)
 - Open URL <http://193.29.93.173> in a browser on the test computer
 - Click on the "T7 Admin GUI" link for Simulation. -> Java Web Start will initiate, download the GUI and start it.
 - Provide a trader ID (ending with "_GUI") and a password. Make sure you enter letters in the password as **uppercase**. Click on "Login".
 - After a while, reference data will be downloaded and the Welcome Screen of the Admin GUI will open.
 - If not, verify that the proxy settings for Webbrowser, Java and T7 GUI are set according to local requirements on the client computer.

If all above works, add HSRP fail-over for 193.29.93.173 if desired. Add NAT'ing device between Member LAN and trading floor network.

See chapter 1.6 for other markets and for production addresses.

5.3.2 Example simulation network setup, leased line



5.3.3 Application test over leased line

Open a web browser and navigate to <http://webgui.vpn.eurexchange.com> (or <http://webgui.vpn.xetra.com>). The landing page for leased line connectivity should be displayed. If not, verify that routes to 193.29.93.173 (Eurex) and/or 193.29.93.174 (Xetra) are present in your local network, pointing to your leased lines and that you resolve the fqdn hostnames (webgui.vpn.eurexchange.com and webgui.vpn.xetra.com) both to the IP address 193.29.93.173 (or 193.29.93.174 for Xetra). Verify local proxy settings. If a local proxy is present and used by the web browser for accessing the Internet, ensure that an exception for network 193.29.93.173 (or 193.29.93.174 for Xetra) has been created as described in chapter 1.6.1.

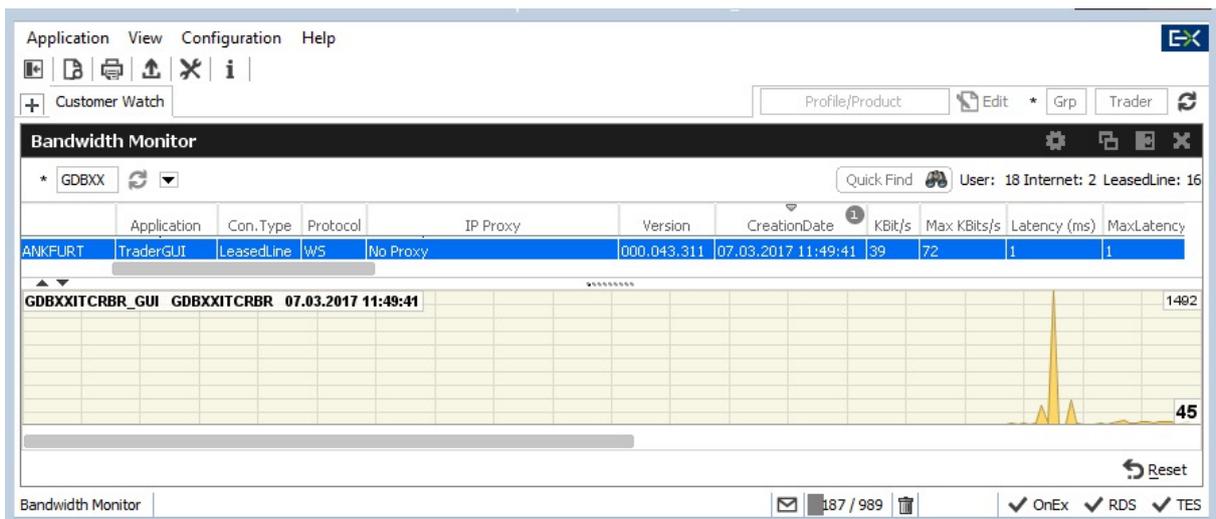
Clicking on any of the presented T7 GUI links will trigger the Java Web Start process. If not, verify the network settings of your Java plugin as described in chapter 2. If a local proxy server is present, this should be configured in the Java plugin as in the web browser. Verify that routes to 193.29.93.173 (or 193.29.93.174 for Xetra) are present in your local network, pointing to your leased lines.

The selected T7 GUI will start after the Java Web Start process completes. In the login screen, open network settings and select leased line.

Clicking on the login button connects the selected T7 GUI with the exchange. If not, verify that routes to the proxy addresses listed in chapter 1.6 are present in your local network, pointing to your leased lines. Note: you need to have routes set to both networks per environment if you use two leased lines for redundancy.

5.4 Bandwidth monitoring

Once connected to the T7 trading architecture, the bandwidth monitor view in the T7 Admin GUI allows online monitoring of bandwidth usage and GUI latency for all users of within a business unit. Use the "Chart" checkbox to create a real time diagram of bandwidth usage per GUI instance:



5.5 General issues

Symptom	Possible causes	Measure
T7 Trader GUI, T7 Admin GUI or T7 Clearer GUI does not start via desktop link.	Miscellaneous	<ul style="list-style-type: none"> Start the T7 GUI via the URLs described in chapter 1.4 which is the recommended procedure.
Java Web Start does not start; instead a .jnlp file is downloaded.	Java Web Start not correctly installed	<ul style="list-style-type: none"> Verify Java Plugin version and installation according to chapter 2. The mime type of JNLP files should be linked to the Java Web Start executable (javaws) in your local JRE installation.
Java Web Start starts, but immediately shows an error. T7 GUI does not start.	Application can not be downloaded or saved	<ul style="list-style-type: none"> Ensure that you have write access to the temporary cache location and the disk is not full. Ensure that the downloaded jar archive was not changed by an internal virus scanner.
Java Web Start starts, but the GUI JAR file is not downloaded.	Access to the GUI infrastructure at Deutsche Börse Group impossible	<ul style="list-style-type: none"> Verify if the proxy settings of the Java Plugin match your network setup as described in chapter 2. Ensure that no firewall is blocking the traffic to the IP addresses listed in chapter 1.4
The selected T7 GUI starts, but login is denied with error message „Wrong user or password” in “Master Login” window.	Wrong credentials for trader master account	<ul style="list-style-type: none"> Ensure that the master login matches your trader id ending with “_GUI”. The master login password will be initially identical to your existing trader account login. Upon first login to T7 every user is required to choose a new password.
T7 Admin GUI starts, but login is denied with error message „Connection error” in “Master Login” window.	Basic network connectivity between client computer and T7 back end servers failing	<ul style="list-style-type: none"> Follow the network test procedures outlined in chapters 5.2 and/or 5.3 Verify local proxy setting <u>in GUI config</u> Verify no firewalls are blocking relevant ports and all routes are set.

5.6 Java tools

A local Java installation will contain a number of helpful tools for additional monitoring in case of problems.

5.6.1 Java console

It is possible to monitor technical status messages of the T7 GUI application by activating the Java Console. Select "Show console" or "Hide console" in the "Advanced" tab of the Java Control Panel to do this.

5.6.2 Monitoring and cleaning of the local Java Web Start application cache

Old and deprecated versions of the T7 GUI software can be removed from the local cache using the Java Application Cache Viewer.

Windows: go to the Control Panel (**Start > Settings -> Control Panel**) and double-click on the Java icon. Select the "General" tab, then "Temporary Internet Files" and click on the "View..." button. This will open the Java Application Cache Viewer.

Linux: go to the Preferences Menu (**Preferences > Java**). Select the "General" tab, then "Temporary Internet files" and click on the "Settings..." button to open the Temporary File Settings dialog. Click on "View Applications..." to open the Java Application Cache Viewer.

5.7 Related Documents

Documents related to T7 are available on the Eurex website <http://www.eurexchange.com> under the path:

Technology > T7 > System Documentation

And on the Xetra website <http://www.xetra.com> under the path:

Technology > T7 Trading Architecture > System Documentation

The following documents may be of particular interest for user of the T7 GUIs:

Document	Description
Participant and User Maintenance Manual	<ul style="list-style-type: none"> A document assisting service administrators maintaining participant and user related data in Eurex Exchange's T7.
T7 GUI – Manual	<ul style="list-style-type: none"> A document providing a detailed description of the T7 GUI solutions, the T7 Trader GUI, T7 Admin GUI and the T7 Clearer GUI.
T7 Network Access Guide	<ul style="list-style-type: none"> A document providing details on the network access options for the various interfaces T7, F7 and Eurex Clearing. It includes detailed technical background information, such as router equipment information and port numbers for the configuration of firewalls.
T7 Disaster Recovery Concept	<ul style="list-style-type: none"> A document describing the measures which need to be taken in the unlikely event of a complete failure of the main T7 data center.
User Manual – Request and Configuration	<ul style="list-style-type: none"> A document providing help for the use of the tools available in the Member Section of Deutsche Börse Group. Please note, this document is available in the Member Section.

5.8 Contacts

For any questions, you may have about GUI setup process please contact your Technical Account Manager using your VIP number or e-mail cts@deutsche-boerse.com.

For questions regarding the Member Section please contact the Member Section Team Tel: +49-69-211-1 78 88 or e-mail member.section@deutsche-boerse.com.

6. Change log

The change log serves as a record of the latest major changes.

No	Date	Chapter	Change
1.0	26 July 2012	-	Creation of document
1.3	19 July 2013	All	Updated text and screenshots to reflect Eurex Exchange's T7 release 1.1
2.0	12 August 2013	1.4	Update for T7 release 2.0. Java 1.7 optional.
3.0.0	14 September 2015	All	Update to reflect Eurex Exchange's T7 release 3.0 including Java update.
4.0.0	8 September 2016	1.4	Update including EEX and required Java 1.8 update.
4.1.0	21 November 2016	1.5	Added Eurex T7/FX IP addresses and URLs
5.0.0	13 March 2017	All	Updated for T7 5.0 including Cash Market Migration
5.0.1	07 June 2017	1.6	Added T7 5.0 cash market network details for production
5.0.2	19 June 2017	1.6.3, 5.2	Added new GUI proxy option "Use Java Settings"