

LS-SNTP is a software solution for time synchronisation in heterogenous networks using the Simple Network Time Protocol (RFC 4330).

LS-SNTP for Windows

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Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 1 |
| 1.1 | Disclaimer | 1 |
| 1.2 | Limitations of the demo version | 2 |
| 2 | Installation preparations | 4 |
| 2.1 | Product contents | 4 |
| 2.2 | What is LS-SNTP? | 4 |
| 3 | Installation | 7 |
| 3.1 | Preparations | 7 |
| 3.2 | Installation | 9 |
| 3.3 | Test/debug mode | 13 |
| 3.4 | Network installation | 13 |
| 3.5 | Uninstalling | 18 |
| 4 | Configuration | 19 |
| 4.1 | Server | 19 |
| 4.2 | Client | 21 |
| 4.3 | Setting the clock | 23 |
| 4.4 | Network interface cards (NICs) | 26 |
| 4.5 | Extras | 28 |
| 4.6 | Registering | 30 |
| 4.7 | Example configurations | 30 |

1 Introduction

1.1 Disclaimer

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1.2 Limitations of the demo version

The demo version of LS-SNTP differs in two points from the full version.

- The program may not be used for longer than 7 days. These 7 days however are only counted while the program is running. If you use the program only for 8 hours a day you may try the software for 21 days in total. Only the time the program is actually running will be counted. If you choose to remove the software after the trial period and reinstall it afterwards, the full 7 days will be available to you again.

- Every time the program is started on Windows NT/2000/XP/Server 2003 the software will display the amount of time used from the trial period so far (see figure 1.1). On Windows 95/98/ME you will not see this message due to technical reasons. The software will not start or provide time synchronisation until you confirm this dialog.



Figure 1.1: How much time from the trial period has been used so far?

The source code of the demo version and the full version is identical. This way you can be sure you are actually testing the same product you will be using later. Once you registered the software it is sufficient to enter the serial number into the registration dialog and restart the program.

1.2.1 How do I register LS-SNTP?

If possible, please use our online shop available on the internet at http://www.linum.com/redirect/jump/action=order&id=slws*.

2 Installation preparations

This chapter describes all prerequisites necessary for a successful installation of LS-SNTP. Unless otherwise specified, the instructions do not differ between Windows NT/2000/XP/2003 Server and Windows 95/98/ME.

2.1 Product contents

- 1 Software-CD
- 1 Manual
- 1 Serial number¹

2.2 What is LS-SNTP?

The Simple Network Time Protocol² (SNTP) is a subset of the Network Time Protocol³ (NTP). NTP is based on a simple client/server architecture. An important design-goal for NTP was supplying larger networks with the correct time without complicated configuration. Once installed, a NTP system will configure itself largely by itself. The NTP server will communicate with its clients using an unsecured UDP protocol on port 123.

SNTP differs from NTP only in the accuracy and reliability possible. While a NTP client/server synchronizes with several time sources and calculates an average from that, a SNTP client/server will only use one time source. The additional effort however is normally unnecessary for synchronizing a LAN with a target accuracy within a few hundred milliseconds. SNTP is backward-compatible with NTP however without the added complexity. The data format used by NTP and SNTP is identical so client/server systems using both standards can be easily combined. SNTP however has not as many requirements regarding the operating system and is therefore especially suitable for synchronization of PC systems using Windows 95/98/ME and

¹ The serial number is enclosed in a separate envelope which is included in delivery.

² Described in RFC 4330.

³ Described in RFC 1305.

Windows NT/2000/XP/2003 Server. While a NTP client/server¹ will use 4–6 MB RAM, a SNTP client/server will use as little as 512 KB to 1 MB RAM. Another issue is the accuracy of the system clock. For a NTP system the system clock of Windows 95/98/ME and Windows NT/2000/XP do not have the necessary accuracy. Both Windows 95/98/ME and Windows NT/2000/XP/2003 Server use an accuracy of about 7.5 ms to 15 ms². To take advantage of NTP's possibilities, the accuracy should be within microseconds.

The most important things about NTP at a glance:

- NTP provides very high accuracy. Internally NTP uses a resolution of $\frac{1}{2^{32}}$ ps ($\sim 232,8$ Picoseconds).
- NTP is optimized for synchronization of many computers. Using multicast mode makes it very resource-effective and is therefore suited for time synchronization in large LANs.
- NTP is available for most hardware platforms. It is the standard protocol for time synchronization on UNIX systems. XNTP³ is a free implementation of NTP for various UNIX variants written by David Mills. For SUSE Linux (versions 6.3 and higher) we have created a manual that describes installation and configuration of XNTP in detail. It is available on the internet at <http://www.linum.com/redirect/jump/action=redirect&id=xntp> (German).

SNTP Client

RFC 4330 describes three different modes for a SNTP client.

Multicast: The NTP client waits for NTP broadcasts of a NTP server and does not send any NTP messages itself. The SNTP client remains completely passive.

Unicast: The NTP client asks a preset NTP server and evaluates the answers.

Anycast: In this mode, the SNTP client sends a NTP broadcast and waits for a NTP server's valid NTP answer. After this, the NTP client switches to unicast mode and uses the address received in reply to its broadcast as preset for the NTP server.

SNTP Server

The LS-SNTP server is only available for Windows NT/2000/XP/2003 Server.

¹ The data refers to XNTP for Windows NT.

² For detail see: „Inside Windows NT High Resolution Timers“ [http://technet.microsoft.com/de-de/sysinternals/bb897569\(en-us\).aspx](http://technet.microsoft.com/de-de/sysinternals/bb897569(en-us).aspx)

³ The complete source code for XNTP for UNIX is available at <http://www.ntp.org>.

2 Installation preparations

RFC 4330 specified three modes for SNTP server: Unicast, anycast and multicast. The modes differ only slightly¹ and are all supported by the LS-SNTP server.

¹ The modes differ only in the way the sender address is specified in the NTP data packet.

3 Installation

This chapter will guide you through the installation of LS-SNTP for Windows 95/98/-ME/NT/2000/XP.

System requirements on Windows NT/2000/XP/2003 Server

The requirements for using LS-SNTP on Windows NT/2000/XP/2003 Server:

- Windows NT 4.00 with SP3, Windows 2000, Windows XP or Windows 2003 Server
- Intel x86 compatible CPU
- at least one LAN adapter with TCP/IP protocol support
- 2 MB unused disk space

System requirements on Windows 95/98/ME

The requirements for using LS-SNTP on Windows 95/98/ME:

- Windows 95/98/ME
- at least one LAN adapter with TCP/IP protocol support
- 2 MB unused disk space

3.1 Preparations

First, you will have to decide on which computer the LS-SNTP server¹ should be installed. Obviously, the LS-SNTP server itself should have a sufficiently accurate clock. The system clock on the LS-SNTP server should therefore be set automatically. For this purpose you can use a free time server² from the internet or a local time source such as our radio clock decoder software for Windows NT/2000/XP³.

¹ The LS-SNTP server can only be installed on a Windows NT/2000/XP/2003 Server system.

² The Physikalisch-Technische Bundesanstalt (PTB) operates two time servers in Germany named `ptbtime1.ptb.de` und `ptbtime2.ptb.de`. The PTB is responsible for sending out the official time in Germany.

³ More information about LS-DCF77 for Windows NT/2000/XP is available at http://www.linux.mcom/redirect/jump/action=redirect&id=slwd*.

If you want to operate your NTP time server on SUSE Linux (versions 6.3 and higher), we recommend reading our guide for XNTP. It can be found on the internet at <http://www.linum.com/redirect/jump/action=redirect&id=xntp> (German).

The NTP server should have the following requirements:

- A sufficiently accurate system clock, set using a reference time.
- Centrally reachable from all computers you want to synchronize. This means, routes¹ to all NTP client should be as short as possible.
- Fast reply times to UDP requests. Installing a NTP server on a intranet server for example is most likely bad, as the the computer is already used to capacity due to requests sent to the webserver.

Note that it is not necessary to install the LS-SNTP server on a Windows NT/2000/-2003 Server server system. An always-on Windows NT Workstation, a computer with Windows 2000 Professional, Windows XP Home or Windows XP Professional² is equally suited as long as the requirements described above are met.

Install the LS-SNTP software on the computer acting as the NTP server first. Write down the IP address or FQDN³ of your NTP server. You will need it when installing the LS-SNTP clients.

Next, decide the amount of accuracy the clients have to reach. In most cases, it is sufficient that the system clocks of computers in a LAN/WAN don't differ more than 1–2 seconds. In those cases, using NTP in multicast mode is recommended. Precision is mostly around 50 ms, as long as the multicast interval is not larger than 360 seconds. You may still choose to use NTP unicast or NTP anycast for individual computers that need higher precisions.

3.1.1 Managing serial numbers

To ease installation and maintenance we have put a lot of effort into intelligent serial number management. That way, we make sure that you will have to enter the serial number only for the LS-SNTP server in most cases. Only in case you use NTP servers of other companies (or a Linux NTP server), the serial number has to be entered for the clients as well.

LS-SNTP has two different modes. The restrictions of the demo version do not apply to the mode „REGISTERED“. In the mode „DEMOVERSION“ the restrictions described in section 1.2 on page 2 are active.

¹ Using the PING command, you can check how long a packets takes to reach its destination.

² Remember to update the configuration as described on page 12 during installation.

³ Fully Qualified Domain Name, such as ptbtime1.ptb.de.

The LS-SNTP clients try to switch to the mode the LS-SNTP server is using automatically. On startup, the LS-SNTP client checks, whether a valid serial number was entered. If this is the case, it switches into the „REGISTERED“ mode. If no serial number was entered, the configured time source (see figure 4.2 on page 22) decides, how the LS-SNTP client asks for the serial number.

- In NTP multicast mode, the client will wait for the broadcast of a NTP server. After that the NTP multicast server is contacted and asked for its mode. The LS-SNTP client then switches to the mode of the server, i.e. the LS-SNTP client will always use the mode of the LS-SNTP server. In case the NTP server does not reply or the answer is erroneous, the client waits for another NTP broadcast and asks the NTP multicast server at most four additional times.
- In unicast mode, the preset NTP server is asked directly for its mode. At most five trials are made to discover the LS-SNTP server's mode.
- In anycast mode, a broadcast is sent. The first replying NTP server is asked for its mode. As in unicast mode, at most five trials are made to discover the LS-SNTP server's mode.

In case the LS-SNTP client could not discover the mode of the server, a message is shown (see figure 1.1 on page 3, just like on the LS-SNTP server). The software will not continue to provide time synchronisation until you confirm this dialog.

3.2 Installation

The installation program is provided as a self-extracting program file. If you got the software on a CD, please insert it into your drive and wait until the CD menu is loaded. Enter the first two digits of your serial number into the input box. You will be taken to the screen where you can install LS-SNTP. If you got the software from the internet, please just execute the file `WNTP142.EXE`.

Welcome

Few seconds after starting the installation, you are greeted with an installation wizard. Continue by clicking .

In case the installation is aborted or the installation program cannot be started, please read the following section. Otherwise, continue straight to the section *Readme* on the following page.

Installation cannot be started

Just like many software producers, we use the Wise InstallMaster software to create our installation programs. If one of these programs (not necessarily ours) crashed during installation, the problems described here will occur. The installation cannot be started at all, i.e. after starting the program it will appear to do nothing and not provide any feedback at all, or shortly after the installation has been started an error message appears and the installation is canceled. To resolve this issue, proceed as following:

- Check whether the environment variables `TEMP` and `TMP` point to a valid directory. These directories need to have a few megabytes unused disk space. Please make sure, you have sufficient read- and write-permissions for these directories.
- Delete all unused files from the directories in the `TEMP` and `TMP` directory. Pay special attention to files starting with “`glb`“. These files are created by the Wise InstallMaster and are the most likely cause for the problems.
- Please restart your computer. This is necessary to completely remove all erroneous DLL files from memory that Wise InstallMaster may have loaded.

Readme

Important information that was not available when this manual was created will be shown here. Please read all the information that is displayed carefully.

Update

If an older version of LS-SNTP is installed on your computer, the installation program will offer you an update routine. Otherwise please continue with the section *Serial number*.

If you do not want to update but do an installation from scratch, you will have to remove the existing version of LS-SNTP first and restart the installation wizard afterwards. Likewise, it is not possible to install a older version over a newer version of LS-SNTP. In this case you also will have to remove the currently installed version of LS-SNTP before you can continue.

When updating, the existing settings will be transferred if possible. The currently installed version of LS-SNTP will be replaced by the new version. The installation continues with the step *Copying files* in section 3.2 on the next page.

Serial number

You are asked to enter your serial number. Please pay attention to the information from section 3.1.1 on page 8 regarding serial numbers.

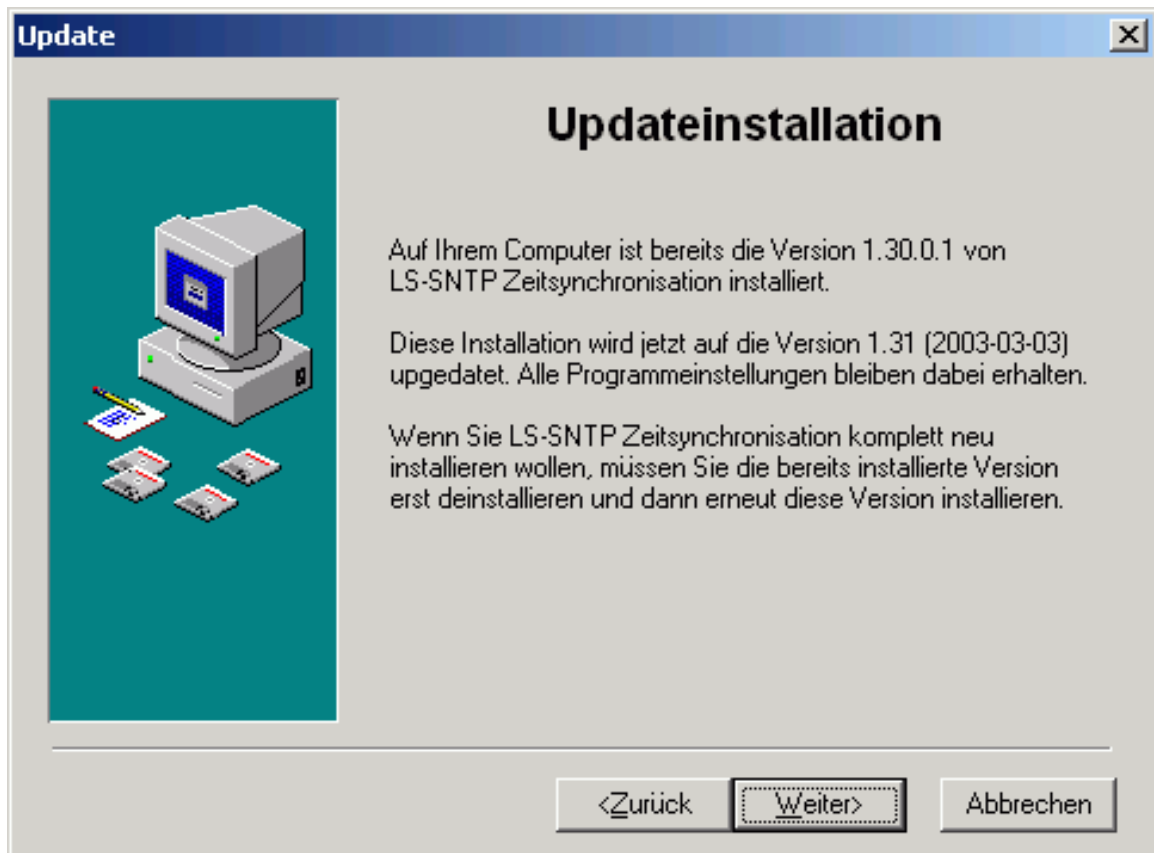


Figure 3.1: Should an update be installed?

Choosing components

Here you can select the components (see figure 3.2 on the next page), you want to install.

On client systems for example you may want to disable installation of the documentation.

Selecting the target directory

Here you are asked to choose where on your hard disk you want LS-SNTP to be installed. Please choose a local directory.

Copying files

Now, the selected components of LS-SNTP will be installed to the directory of your choice.

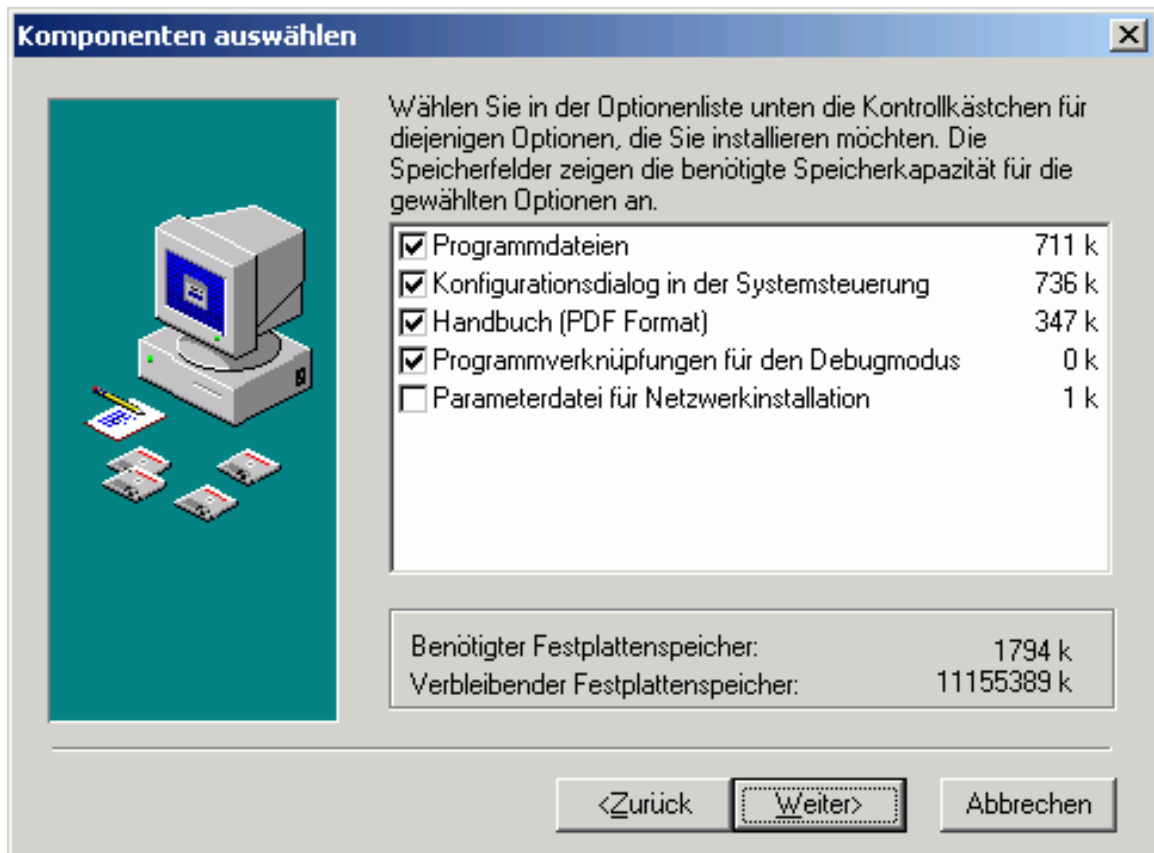


Figure 3.2: Which components should be installed?

Configuration

After all components have been successfully installed, the installation program on Windows NT/2000/XP will ask you, whether the software should be configured as a „client“ or a „server“. When the installation program is run on a Windows NT/-2000/2003 server system, „server“ will be the recommended choice. On Windows 95/98/ME/XP the software will be configured as „client“.

If required, the configuration dialog enables you to do further configuration. A new entry LS-SNTP can be found in the control panel to configure the LS-SNTP service. This dialog is explained in detail in chapter 4 on page 19. Afterwards, all changes necessary will be made to your system configuration and entries to your registration database will be written. Finally, the shortcuts or program groups will be created and on Windows NT 4.0/2000/XP/2003 Server or Windows 95/98/ME an entry will be added to Control panel→Add/Remove Programs that you can use to remove the software later.

Starting the service

The installation program will provide you with an option to start the LS-SNTP service.

Finished

The installation is now finished. You do not need to restart your computer.

3.3 Test/debug mode

The functionality of LS-SNTP is „hidden“ from the user. No distracting dialogs or other other messages will be shown. This results in the „disadvantage“ of no messages being shown during installation and test. So we decided that our software should include a debug-mode from version 1.20 onward.

To activate the debug mode, a LS-SNTP service must not be running. To terminate the service on Windows 95/98/ME use the program `sntpdn.exe`¹. On Windows NT/2000/XP/2003 Server please terminate the service using the control panel or by entering the command „`net stop sntp`“ in a command line window. After shutting down the service you will have to restart with the parameter „-debug“. To do this, please open a command line window, change to the directory where LS-SNTP has been installed and start the service using the following command:

For Windows NT/2000/XP/2003 Server: „`sntp_nt -debug`“

For Windows 95/98/ME: „`sntp_w95 -debug`“

The LS-SNTP service will now print all relevant messages to the console² so you can now easily spot any problems that might occur.

3.4 Network installation

To make the installation of a large number of workstation as easy as possible, a so-called „quiet installation³“ is possible. This installation method is perfectly suited to install the software during a login. To do this, the installation program can be used

¹ This file is copied to the installation directory and marked as „hidden“. Depending on the settings of your file manager, it may therefore not be visible for you.

² Writing to a logfile is currently not supported.

³ The possibilities of the network installation have been vastly improved with versions 1.10 and higher. It is now possible to set all configuration parameters to predefined values during install time.

directly as a login script. During installation, any messages normally sent to screen will be suppressed. The user will not notice the installation at all.

For the network installation to be successful, some prerequisites have to be met. Please follow these instructions closely. Network installation consists mainly of the following steps:

- Installation and configuration of the LS-SNTP server. After configuration, the LS-SNTP server should be started and be available to the clients constantly throughout the installation process.
- Installation of the LS-SNTP client on a client machine. It does not matter on which machine you install it. This computer will be used to preconfigure the software after installation.
- Exporting the configuration data from the client.
- Adjusting the parameter file for network installation.
- Adjusting the login scripts of the users (client computers) to start the installation program during login.

3.4.1 Installation of the LS-SNTP server

Install the LS-SNTP server. Make sure you follow the directions from section 3.1 on page 7. The installation does not differ from a normal installation. Just make sure the LS-SNTP server is available to the LS-SNTP clients during installation.

3.4.2 Installation of the first LS-SNTP client

Install the LS-SNTP client. Make sure you follow the directions from section 3.1 on page 7. Afterwards, configure the client according to your needs. Note that all settings you change on this client will be valid for all clients you install later using the network installation method¹. This holds true for the settings of the network interface card detection as well.

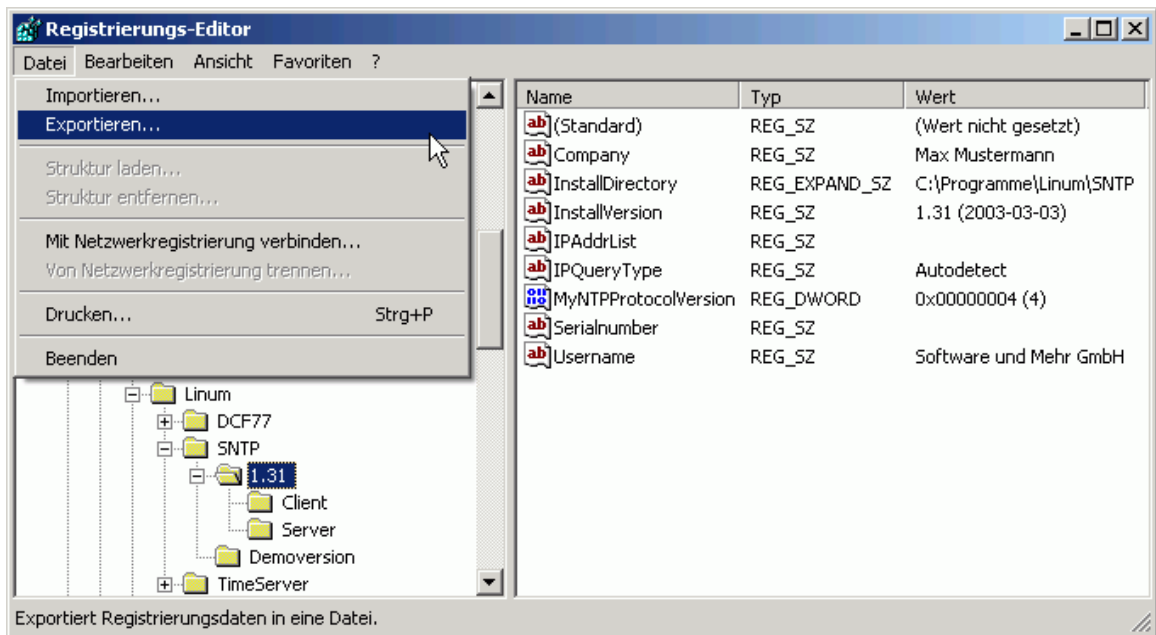


Figure 3.3: Exporting parts of the registration database for network installation.

3.4.3 Exporting the registration database

After making sure the settings on the first client are correct¹, you have to export the part containing configuration data from LS-SNTP of your registration database. To do this, start the program REGEDIT and change to the HKEY_LOCAL_MACHINE\SOFTWARE\Linum\SNTP\1.42 tree, as shown in figure 3.3. Make sure the section with the configuration data of LS-SNTP is highlighted as shown in figure 3.3. Now, export the tree using the menu item Registry→Export registration file. We recommend using the file name wntp142.reg.

Even on Windows NT/2000/XP/2003 Server the program REGEDIT must be used instead of REGEDT32! The import of the registration file will be done by REGEDIT. Files from REGEDIT and REGEDT32 are not compatible.

¹ It is also possible to change the settings for different groups of clients. If you want this, you have to change the login script so it specifies the correct parameter file containing the correct configuration file depending on the client group when starting the installation program.

¹ A good way to test your settings is enabling the debug mode, see chapter 3.3 on page 13.

3.4.4 Adjusting the parameter file for network installation

When adjusting the parameter file¹ for network installation you will have to pay very close attention to not making any errors. As no error message will be shown during installation on the client, it is very hard to notice typing errors (such as wrong filename or missing permissions). Also note that some parameters are case-sensitive. That means “Yes“ is not the same as “YES“!

Example parameter file “wnntp130.NET“:

```
NETWORK_INST=Yes
IMP_REGFILE=J:\SNTPINST\WNTP130.REG
MAINDIR=C:\Linum\SNTP
COMPONENTS=A
SNTP_START=A
```

The parameters have the following meanings:

NETWORK_INST *Must be specified!* You have to set this setting to **Yes** or the network installation will not be started.

IMP_REGFILE Full path to the exported registry file. This file will be imported by all clients during installation. Make sure, all clients have read-access to this file.

MAINDIR This is the directory LS-SNTP will be installed to. The entry has to be a directory on a local drive of the client. In case it does not already exist, it will be created by the installer.

COMPONENTS This entry specifies, which components of LS-SNTP will be installed, it corresponds to the component screen as shown in figure 3.2 on page 12. The files are divided in groups, represented by a single letter A-D as following.

- A** The LS-SNTP service (must always be installed).
- B** The configuration dialog found in the control panel. If the clients do not need further configuration, this component does not need to be installed.
- C** This manual in PDF format for the acrobat reader.
- D** Entries in the start menu or the program group for LS-SNTP’s debug mode will be created. If you disable this component, you can always start LS-SNTP in debug mode using the techniques described in section 3.3 on page 13.
- E** The example file for network installation.

¹ An example file can be installed from the components list during installation, see figure 3.2 on page 12.

SNTP_START After installation finishes, the LS-SNTP service is started.

- A Start service
- B Don't start service

3.4.5 Adjusting the login script

Finally, the login script has to be changed for all users on whose workstations LS-SNTP should be installed. Please take note of the following:

- If you use a single login script for all operating systems on your network, make sure that computers running MS-DOS and/or Windows 3.1x do not try to start the installation. This can be accomplished for example by querying the installed DOS version.
- If you want to install LS-SNTP on Windows NT/2000/XP computers using network installation, the installation program itself has to be run under a user account with sufficient permissions (for example: a service will be created). Normally, only administrators and powerusers have the permissions required for installation. Because of the security concept of Windows NT/2000/XP it is not possible for the installation program to grant itself the necessary permissions. A login script for the installation on Windows NT/2000/XP could therefore look similar to the following:

```
REM Install LS-SNTP
NET USE J: \\MAJESTIX\TEMP
RUNAS /user:TEST\Administrator J:\SNTPINST\WNTP130B /S /M=J:\SNTPINST\WNTP130.NET
REM Install LS-SNTP
```

In this example, the program `RUNAS`¹ is used which grants the installation program administrator privileges. The most commonly used systems which provide such functionality are SMS by Microsoft and ZENworks by Novell NetWare.

To suppress messages and make sure the installation does not require user interaction, the installation program `WNTP142.EXE` has to be started using the parameter `„/S“`. This parameter suppresses *any* messages or prompts normally issued by the installation program. That means no warnings or error messages will be shown as well. In case you run into problems installing the software on a client, try to start the program without the `„/S“` parameter to be able to see error messages. Additionally to the parameter `„/S“`, you will also have to specify the `„/M=<path to parameter file>“` parameter. Using this parameter you specify the location of the parameter file for the network installation. The parameter file (see section 3.4.4 on the previous page)

¹ Note: The program `RUNAS` is shipped with Windows 2000. However, you can start the installation with any other program that provides the same functionality.

contains the information which components you want to have installed as well as the target directory of the installation.

/S Suppress all messages

/M path to and name of the parameter file

3.5 Uninstalling

On Windows NT/2000/XP/2003 Server you will have to be logged in as Administrator to be allowed to uninstall the software.

You can find the entry for removing the program `LS-SNTP time synchronization` at `Control panel` → `Add/Remove Programs`. After selecting the respective entry and confirming the prompt for confirmation, the software will be removed from your computer. Restarting the computer is only necessary in case you want to reinstall LS-SNTP in demo mode. In this case you will have to restart your computer before you can reinstall LS-SNTP again.

3.5.1 Silent uninstall

Just like there is a silent installation you have the possibility to uninstall the software without any prompts or messages. To do this, start the program `UNWISE.EXE` using the parameter `/A <path>\INSTALL.LOG`. Both the files `UNWISE.EXE` and `INSTALL.LOG` can be found in the directory you specified at install-time. Note however that the file has the attribute `hidden` set, so it is not normally visible.

4 Configuration

Configuration of the LS-SNTP service is performed using a dialog in the control panel.

In the control panel you will find an icon (when in icon view mode) or an entry with the name LS-SNTP Configuration for LS-SNTP time synchronization (when in detail view mode).

4.1 Server

The LS-SNTP server is only available on Windows NT/2000/XP/2003 Server.

4.1.1 Activating the SNTP server

Here you decide, whether the LS-SNTP server is activated or not.

4.1.2 SNTP Multicast

Here you decide, whether the LS-SNTP server should operate in NTP multicast mode (in short: broadcast for a network segment) and if so, how often the NTP broadcasts should be sent.

Also, you can choose which ports the SNTP multicasts should be sent to. Specify as many ports as needed, separated by spaces. The standard port 123 is entered by default.

4.1.3 Selecting the SNTP port

If you require it, you can bind the LS-SNTP server to another port than 123 by entering the respective number here. You can use this for example to run the windows time service and LS-SNTP at the same time.

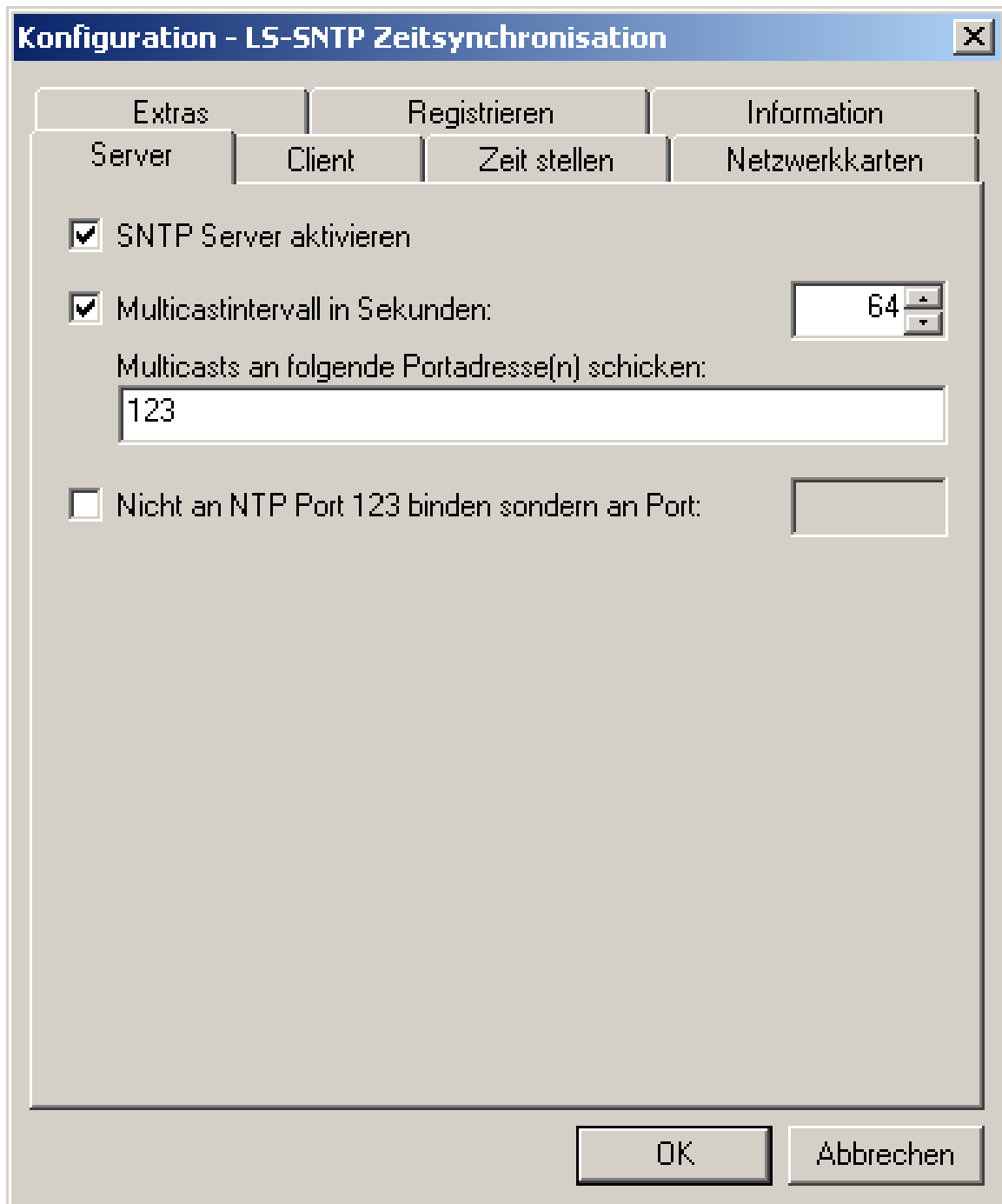


Figure 4.1: Configuration dialog of the server

4.2 Client

4.2.1 Activating the SNTP client

Here you can change the setting for the LS-SNTP client. If required, the LS-SNTP client can also be completely deactivated here.

4.2.2 Time source

Here you can decide, which NTP mode the LS-SNTP should use.

Unicast: NTP server: The client asks the specified NTP server and the NTP server answers directly. The NTP server is queried by each client separately and has to answer each client separately. If a NTP server is specified, the LS-SNTP client will only use this server. NTP messages of other server or NTP broadcasts will be ignored. Using this mode means higher accuracy than using the multicast mode but results in a lot higher network traffic. The higher accuracy is achieved by measuring latency in the network. This however will only matter with slower communication mediums (such as WAN connections). Only use this setting, when the latency of your communication medium is very high (WAN connections using ISDN or similar) or you want to make sure the computer accepts only this NTP system as a time source.

Starting with version 1.30 it is possible to specify multiple NTP servers in a list. LS-SNTP contacts the specified NTP servers in the order specified until a valid response is received and the NTP reference time according to the status window is correct. LS-SNTP will continue working with this server until it does not respond anymore or the NTP reference time according to the status window is no longer valid.

A list of free-to-use NTP stratum 1 and 2 servers on the internet is available at <http://www.eecis.udel.edu/~mills/ntp/servers.html>. In Germany, you should always prefer the time servers operated by the PTB ptbtime1.ptb.de and ptbtime2.ptb.de, in case you cannot or don't want to use a radio clock of your own.

Anycast: Look for NTP server: In this mode, the LS-SNTP client automatically looks for a NTP server in the same subnet. On startup, the LS-SNTP client sends a broadcast to its subnet and waits for answers of NTP servers. The NTP server which responds first is selected to be used. After selecting the NTP servers, this mode works identical to the unicast mode. If required you can also choose to send the anycast requests to a port other than 123.

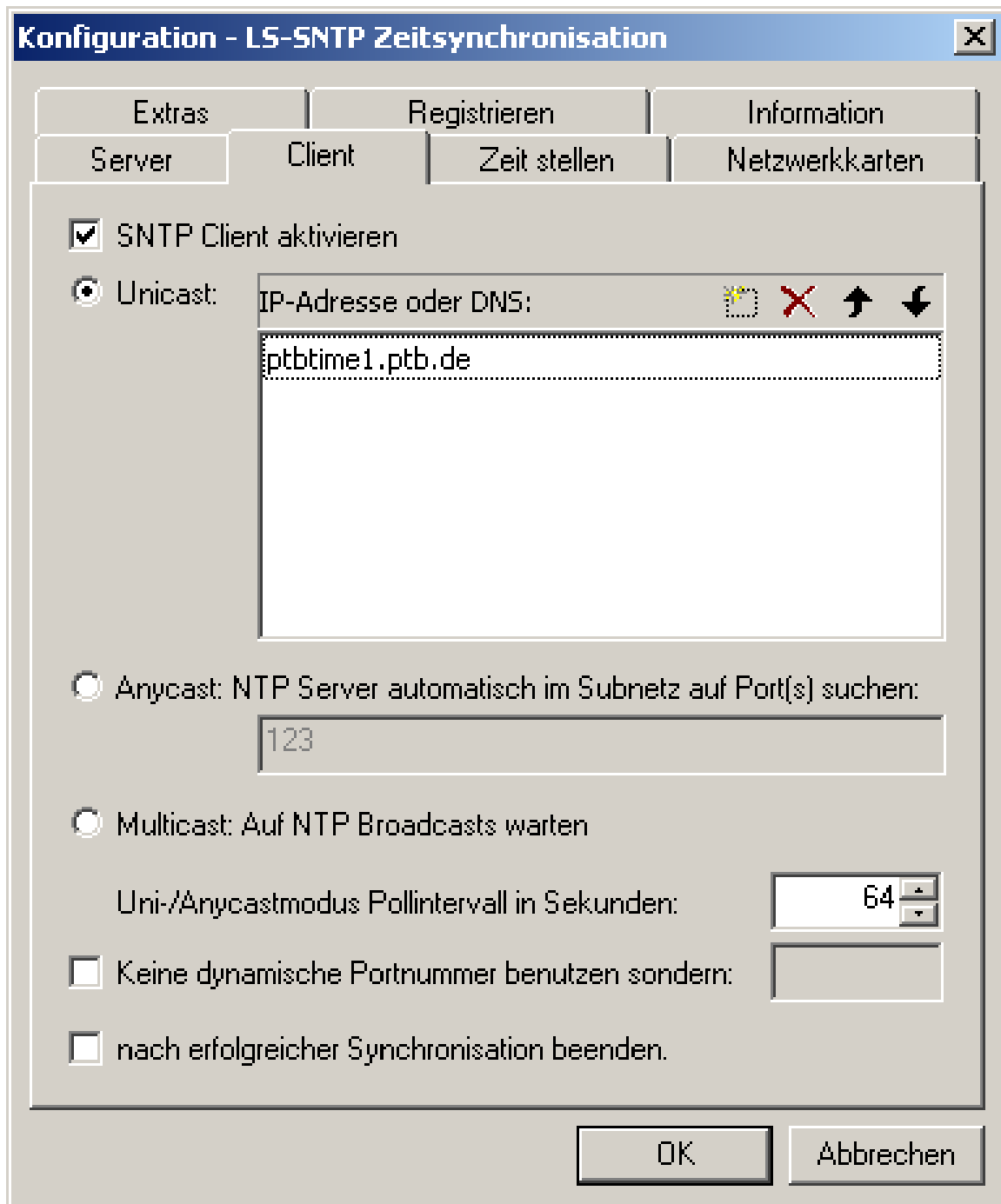


Figure 4.2: Configuration dialog of the client

Multicast: Accept NTP broadcasts: If you choose the multicast mode, the LS-SNTP client listens on all local network interfaces for NTP broadcast messages.

This setting is very resource-effective because the NTP server only needs to send a single broadcast message to supply a whole network segment with the correct time. Also, the clients will accept broadcasts from any NTP server and synchronize with it. This mode is more fault-tolerant in case a NTP server fails because the clients can still be reached by other NTP servers.

4.2.3 Polling interval

This setting controls how often the LS-SNTP client synchronizes its clock with the NTP server when in unicast or anycast mode.

4.2.4 Dynamic port number

When the LS-SNTP client is not in multicast mode, it will bind to a random port number that windows selects from a pool of port numbers on startup. If you're working with a firewall, it may be favorable to know not only the IP address but also the source port of a connection. So if you specify 555 in this field, all UDP packets originating from the LS-SNTP client will use 555 as source address.

4.2.5 Terminate after successful synchronization

You can also choose to synchronize the clock on your computer only once after startup¹. As soon as the time has been synchronized for the first time, the LS-SNTP service will shut down.

4.3 Setting the clock

4.3.1 Never synchronize system clock

When this option is selected the system clock of your computer is never synchronized by LS-SNTP.

Suppose you want to check, whether LS-DCF77 for Windows works correctly with your radio clock. You activate this setting and start LS-SNTP in debug mode. To achieve higher accuracy, you should use LS-SNTP in unicast mode using a small polling interval. Afterwards you start LS-DCF77 for Windows and let LS-DCF77 synchronize your clock. LS-SNTP shows the time difference between the local clock

¹ This option cannot be selected when the LS-SNTP server is installed.

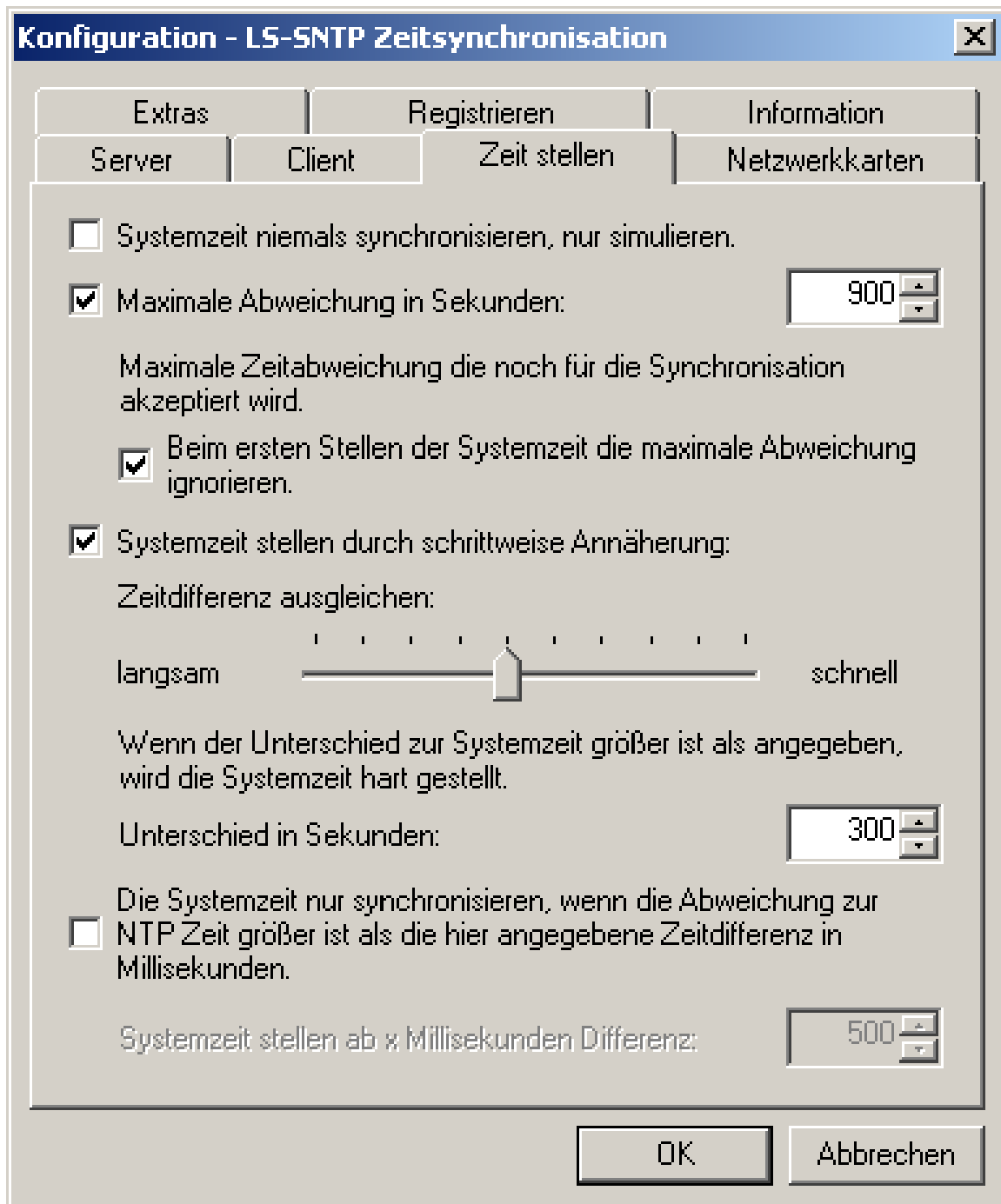


Figure 4.3: How do you want the system clock to be set?

and the NTP server every time it polls the NTP server. If the difference levels out at ± 0 -50 ms, the time synchronization works as expected. The difference of the NTP

server to your local clock is contained in the line „*SNTP-Client: Time difference to <IP address of the NTP servers> is $\pm x$ seconds.*“.

An accuracy better than ± 10 ms is not possible. Exact time synchronization is not possible due to the fact that Windows cannot process the signals of the radio clock or the network in real-time. Therefore there will always be certain differences between LS-SNTP and the product you want to test.

4.3.2 Maximum difference to system clock in seconds

As the information for a NTP server is ultimately trusted (as long as the NTP message is formally correct) your computer may encounter large time differences (also see item 4.2.2 on page 22). This can become a problem if the reference clock of the NTP server fails or the reference time of the NTP server is changed for some other reason. If you want to synchronize the system clock only in certain boundaries, you can set a maximum allowed difference between the system clock and the NTP server's time in seconds here. If this boundary is exceeded, the NTP message is discarded.

After a reboot the system clock of your computer may be completely wrong. If you want the security of the setting [Maximum difference to system clock in seconds] but still want to accept any time when the NTP server is first contacted after startup, activate the setting [Ignore maximum difference on first synchronization]. In this case, the maximum difference between system time and ntp server time will be ignored when the first synchronization is made (and only then!).

4.3.3 Adjust system clock incrementally

The possibility to adjust the system clock incrementally is only available on Windows NT/2000/XP.

Here you can specify, whether the system clock should be adjusted to the reference time faster or slower and which difference should cause the reference time to be applied instantly.

This setting is useful primarily for systems with databases. When activated, the system clock will be adjusted over time so no time jumps occur. When a difference of 2 seconds to the system time is detected, the system clock is not instantly adjusted by those 2 seconds. Instead, the system clock will be (de)accelerated. In case the difference is greater than the number of seconds specified under [Difference in seconds] the system clock is set instantly.

Technical information regarding: Adjusting the system clock incrementally

Using the slider [equalize time difference] (see figure 4.3 on page 24) the adjustment time ($t_{Adj.}$) of the system clock is modified. Set to „slow“ the system time is corrected by ± 1 ms, set to „fast“ by ± 10 ms every time the system clock is updated.

The system clock on Windows NT/2000/XP is updated ≈ 10 ms on most computers. The exact interval the system clock is updated depends on the hardware used and the number of CPUs. The following example will always assume $t_{upd.} = 10$ [ms].

So if the slider is set to the slowest setting, correcting a time difference of 60 seconds ($\Delta t = 60$ [s]) to the system clock takes 10 minutes ($t_{sync.} = 600$ [s]). This value can be calculated using the following formula:

$$t_{sync.}[s] = \frac{\Delta t[s] \cdot t_{upd.}[ms]}{t_{Adj.}[ms]} = \frac{60[s] \cdot 10[ms]}{1[ms]} = 600[s] = 10[min]$$

If the slider is set to the fastest setting however, the following values result:

$$t_{sync.}[s] = \frac{\Delta t[s] \cdot t_{upd.}[ms]}{t_{Adj.}[ms]} = \frac{60[s] \cdot 10[ms]}{10[ms]} = 60[s] = 1[min]$$

With a time difference of 3 minutes and 26 seconds using a medium setting ($\Rightarrow t_{Adj.} = 5$ [ms]) for adjustment speed the situation is like this:

$$t_{sync.}[s] = \frac{\Delta t[s] \cdot t_{upd.}[ms]}{t_{Adj.}[ms]} = \frac{206[s] \cdot 10[ms]}{5[ms]} = 412[s] \approx 7[min]$$

Whether setting the slider to „fast“ or „slow“ is best has to be decided depending on the respective application.

4.3.4 Respect time difference

In case you want to change the system time only if a certain difference to the NTP time is reached, you can specify the minimum difference in milliseconds here.

4.4 Network interface cards (NICs)**4.4.1 How should the TCP/IP addresses be detected?**

For LS-SNTP to work properly, it is necessary for LS-SNTP to know the TCP/IP address(es) of all used local NICs. Unfortunately, the possibility to enumerate the local TCP/IP addresses reliably was created very late by Microsoft (through the IP Helper API). This API is available only for systems running Windows 98, Windows

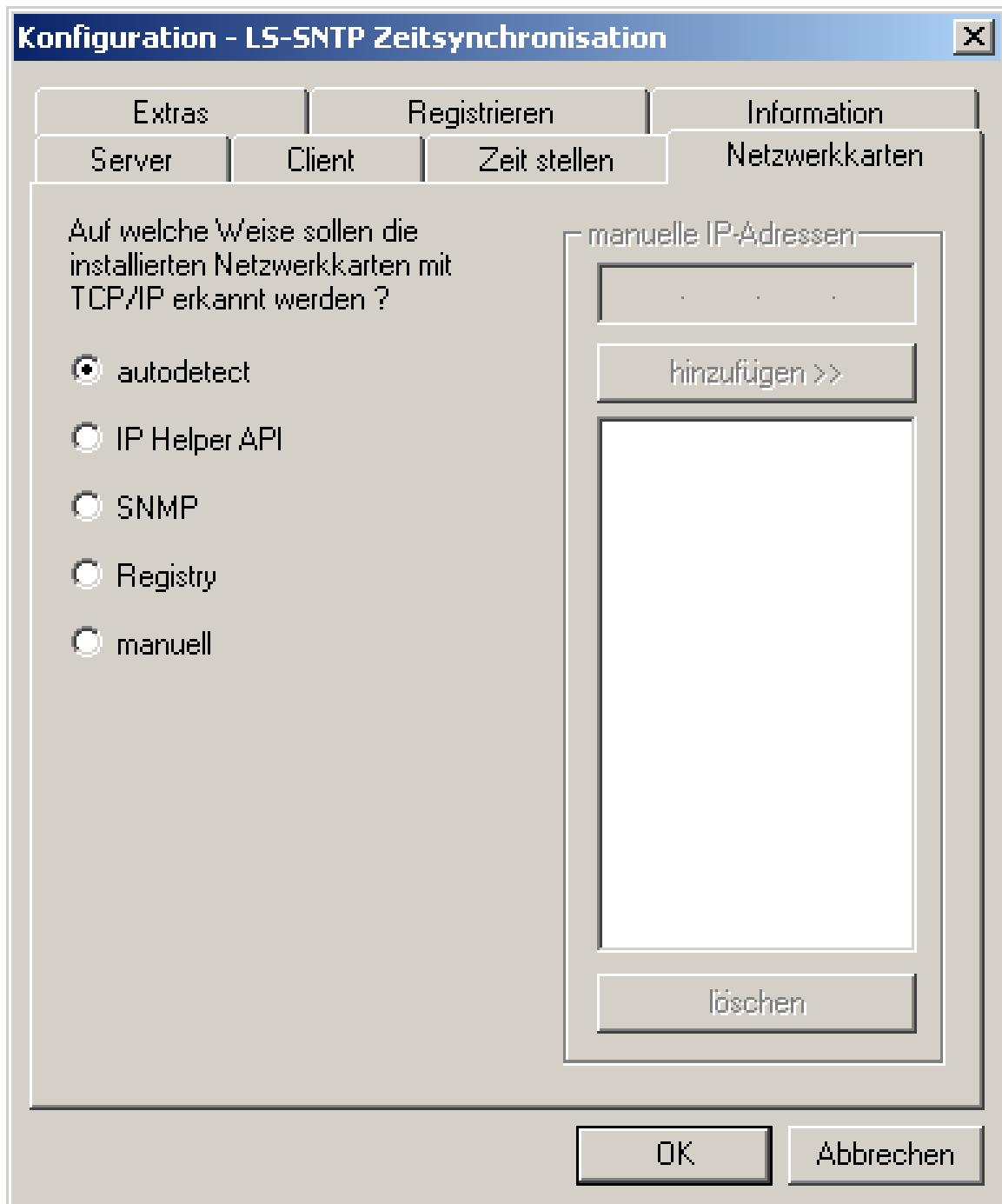


Figure 4.4: How should TCP/IP NICs be detected?

NT 4.00 with SP 4, Windows 2000 and later. Therefore, LS-SNTP tries to detect the address(es) on all earlier versions either using the registry or using SNMP¹.

¹ Simple Network Management Protocol as described in RFC 1906.

The following possibilities to detect the TCP/IP address(es) exist:

autodetect The default setting is *autodetect*. Depending on the operating system and service pack installed, one of the following methods is chosen automatically to detect the TCP/IP addresses.

| Operating system | Method |
|--------------------------------|---------------|
| Windows 95 | SNMP |
| Windows 98 | IP Helper API |
| Windows ME | IP Helper API |
| Windows NT 4.00 | Registry |
| Windows NT 4.00 SP 4 or better | IP Helper API |
| Windows 2000 | IP Helper API |
| Windows XP | IP Helper API |
| Windows 2003 Server | IP Helper API |

IP Helper API If available, the IP Helper API should be used. It is present on Windows 98, Windows NT 4.00 with SP 4, Windows 2000, Windows XP, Windows 2003 Server and later.

SNMP Using a SNMP request, the software tries to detect the local TCP/IP addresses. This method is well suited for systems using DHCP. If you have RAS installed, using the **Registry** would be a better choice.

Registry The TCP/IP addresses are fetched directly from the registry. This method is meant to work with RAS but might cause problems when working with DHCP. The recommended method when using DHCP is **SNMP**.

manual You can also specify the TCP/IP addresses to be used by LS-SNTP manually. That way you can also use LS-SNTP in case all the other methods fail.

4.5 Extras

4.5.1 NTP version number in the NTP data packet

The data format of NTP has not changed since version 2. This enables NTP 2, 3 and 4 servers and clients to communicate without problems. However, NTP 2 servers and clients accept NTP requests and responses only if the NTP version number in the NTP data packet matches version 2. In such special cases when LS-SNTP should communicate with a NTP 2 server or client, the version number in the NTP data packet must be changed.

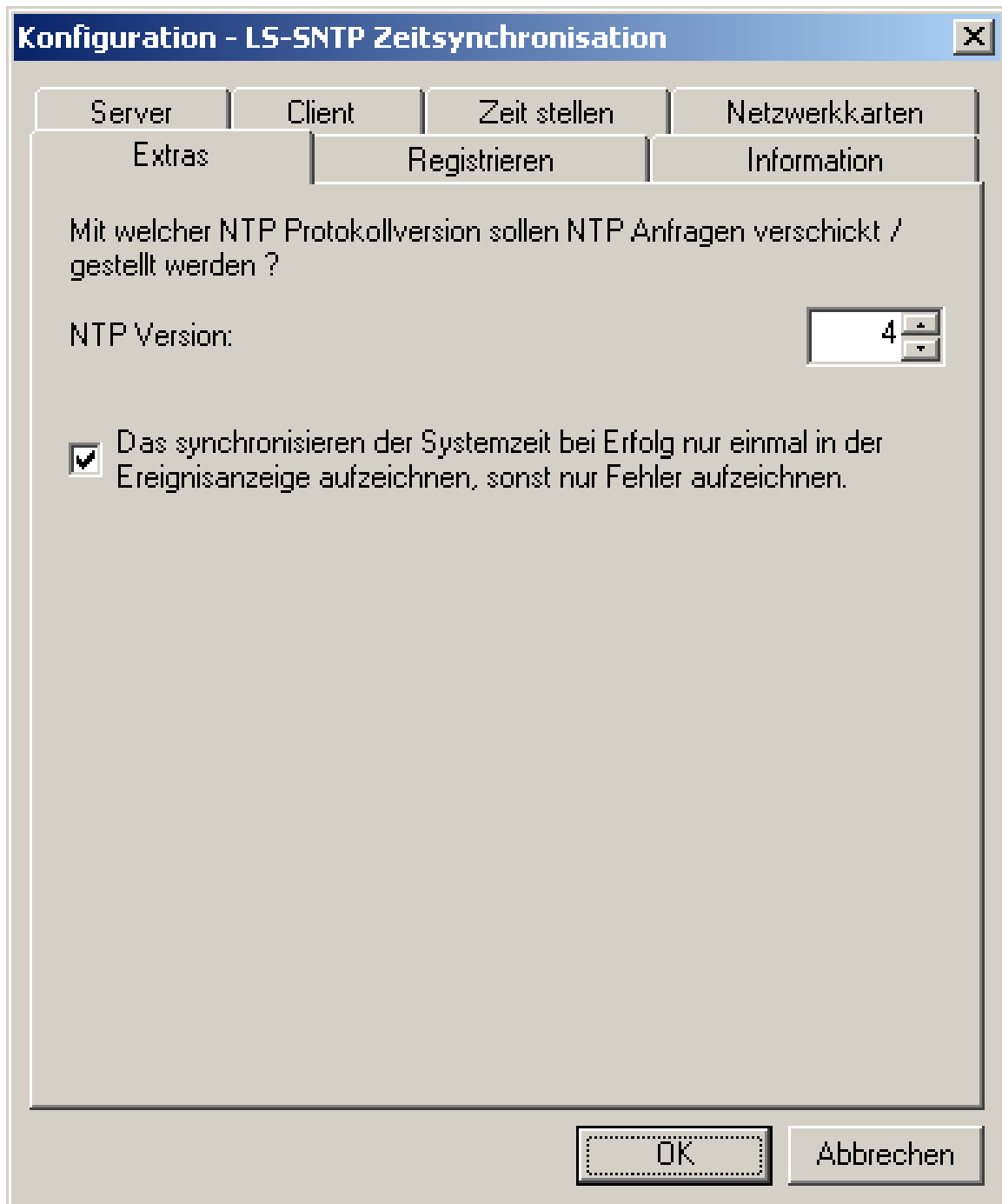


Figure 4.5: Extras of LS-SNTP.

4.5.2 Log only one consecutive successful synchronization

Only available on Windows NT/2000/XP/2003 Server!

LS-SNTP logs every synchronization to the system log. To avoid filling up the system log with lots of messages about successful time synchronizations, these messages can be suppressed. When enabled, only the first successful synchronization will be written to the system log. If an error occurs however, it will always be logged, regardless of the setting of this option.

4.6 Registering

Once you registered your demo version of LS-SNTP, you have to enter your serial number. After entering the serial number, you have to restart the software. Entering the serial number is not necessary for the clients in most cases. Please refer to section 1.2 on page 2 for details.

4.7 Example configurations

4.7.1 LS-SNTP in a WAN

Task: A company with three branches wants to make sure all computers on the network run with the correct time. The head office of the company is Munich, the branches are located in Hanover, Hamburg and Düsseldorf. The branches are connected to the head office using ISDN-Routers via dial-up lines. Every branch has a Windows NT server, the workstations run Windows 95/98/ME and Windows NT/2000. The network protocols TCP/IP and IPX/SPX are in use.

Proposed solution: In the head office, our radio clock decoder software LS-DCF77 for Windows NT is installed together with LS-SNTP. The LS-SNTP server is installed on the Windows NT server and works in multicast mode. In the branches, LS-SNTP is also installed on the Windows NT servers. These servers however use the IP address of the Windows NT server in the head office in Munich as their time source. Also, the polling interval is raised from 64s to 3600s. In the branches, time is also distributed using NTP multicast mode.

Using the described solution, the complete company network is synchronized very resource-effective. The DCF77 radio clock in the head office supplies the master server with the correct time. The LS-SNTP servers in the branches get their time from the server in the head office. To minimize the dial-up costs, time between the

LS-SNTP servers of the branches and the LS-SNTP server of the main office is only synchronized every hour (=3600s).

For experienced system administrators there is also another solution to minimize the dial-up costs: Many routers also provide a possibility to transfer data on certain ports (in this case 123) only if a connection already exists. If no connection exists, the packet is discarded. In this case, the polling interval can be set to 64s without problems because time synchronization will not trigger a connection. Using the described setup in those circumstances does not incur increased dial-up costs but uses the already existing line for time synchronization.

4.7.2 LS-SNTP in a heterogenous network

Task: A network consists of a Novell NetWare 4.11 server, a Novell NetWare 3.12 server, a Linux computer as mail gateway and a Windows NT server. Clients use MS-DOS 6.22, Windows 95/98/ME and Windows NT as operating systems. The protocols TCP/IP und IPX/SPX are installed. The Novell NetWare 4.11 and the Novell NetWare 3.12 servers, as well as the MS-DOS clients, only use IPX/SPX, the Windows 95 workstations partly use IPX/SPX, partly TCP/IP. The Windows NT clients use TCP/IP.

Solution: The Novell NetWare 4.11 server is equipped with our LS-DCF77 radio clock decoder software for Novell NetWare. In order for the Novell NetWare 3.12 server to receive the correct time, the multi server extension TimeSlave is installed. On the Windows NT server LS-SNTP is installed. To synchronize the clocks between the Novell NetWare 4.11 and the Windows NT server, IPX/SPX has to be installed on the Windows NT server (and only there). Then, the service NsyncNT (included with the LS-DCF77 radio clock decoder software for Novell NetWare) is installed on the Windows NT server. This service synchronizes with the Novell NetWare 4.11 server. On the Linux computer, XNTP is installed and configured with the Windows NT server as time source. The MS-DOS computers are synchronized using the TSR TIMESYNC. Depending on whether the Windows 95 workstations work with TCP/IP or IPX/SPX the LS-SNTP client is used or NSyncW32. The programs TIMESYNC and NSyncW32 are both included with the LS-DCF77 radio clock decoder software for Novell NetWare.