Teldat Router

NTP Protocol

Doc. *DM728-I* Rev. *10.00*
February, 2003

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Chapter 1
Introduction

1. Introduction to the NTP Protocol

The NTP protocol (Network Time Protocol) is used to synchronize a set of network clocks using a distributed client and server set. The NTP protocol is constructed over UDP (User Datagram Protocol) supporting transport mechanisms not orientated to the connection.

NTP provides synchronization mechanisms with high precision and permits local clock error estimation at the same time as finding out the reference clock characteristics.

The object of the service, through the NTP protocol, is to make sure that all the devices connected to an accurate clock source synchronize with it. Each NTP client therefore sends requests to various NTP servers and processes the replies when these arrive. This permits you to select the most accurate clock at any given moment and to synchronize it according to the examples received.

The Teldat router incorporates a NTP client in order to synchronize its clock with external sources. It does not operate as a server as the hardware limitations prevent high precision being achieved.

2. Protocol

In order to carry out synchronization, the devices exchange messages similar to those described below:

2.1. Message Format

The NTP protocol operates over UDP in port 123. The following stratums are present in the UDP datagram data:

a) LEAP INDICATOR

2 bits. Indicates if at the last minute in the day a second is added/removed should the clock not be synchronized.

b) VERSION NUMBER

3 bits. Indicates the version of the protocol.

c) OPERATION MODE

3 bits. Indicates the operation mode.

d) STRATUM

1 octet. Indicates the reference stratum where the local clock is found. The 0 value is reserved. Value 1 is for primary references. The others are values for secondary references.

e) POLL INTERVAL

1 octet. Polling interval between successive NTP messages.

f) PRECISION

1 octet. Local clock precision indicator.

g) ROOT DELAY

4 octets. Indicates local clock delay with respect to the root reference.

h) ROOT DISPERSION

4 octets. Indicates the local clock dispersion with respect to the root reference.

i) REFERENCE IDENTIFIER

4 octets. Indicates clock reference. If the stratum is 0 or 1, it is encoded as a 4 octets ASCII chain, justifying to the left and filling in with zeros. If the stratum is a secondary reference, it is the reference IP address.

j) REFERENCE TIMESTAMP

8 octets. Local time where the clock was established or corrected.

k) SOURCE TIMESTAMP

8 octets. Local time when the client message was sent to the server.

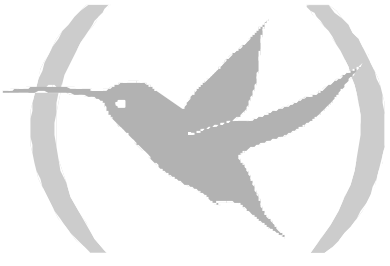
l) RECEPTION TIMESTAMP

8 octets. Local time when the NTP message arrives at the server.

m) TRANSMISSION TIMESTAMP

8 octets. Local time for the outgoing NTP message to the server.

Chapter 2
Configuration



1. NTP protocol configuration

This chapter determines which parameters need to be configured within the NTP protocol in the Teldat routers. As the operation mode is only client, the parameters needing to be configured are reduced to the following:

The global parameters needed to be configured are:

- **Client Broadcast:** Permits the NTP client to receive NTP broadcast messages from known references.
- **UMT Displacement:** Permits the NTP client to set the time zone the device is in and to be able to synchronize with any external clock source.
- **Default poll interval.**

The distinct reference parameters than need to be configured are:

- **Peer IP address.**
- **Peer NTP port.**
- **Enable as Client Broadcast:** This is only significant when the device permits client broadcast operation.
- **Poll interval:** This is only significant when the NTP client is not going to behave as client broadcast with respect to this reference.

2. NTP protocol configuration commands

The steps needed to configure the NTP protocol in the Teldat routers are described in this section. Once you have completed the NTP protocol configuration, you must save it and restart the device so the configuration takes effect.

In order to access the NTP protocol configuration environment, you must enter the following commands:

```
*P 4
Config>FEATURE NTP
-- NTP Protocol user configuration --
NTP config>
```

Within the NTP configuration environment, the following commands are available:

Command	Function
? (HELP)	Lists the available commands or options.
BROADCAST	Enables the option to be a client for servers that carry out broadcast in the network.
LIST	Displays the NTP configuration.
NO	Disables the NTP protocol or the option to be client for servers that carry out broadcast in the network. Additionally this also permits you to eliminate information for a reference peer.
PEER	Permits you to configure reference peers to the NTP protocol. Each reference pair will be identified by a number assigned by the user.
POLL	Configures the poll interval that will be used by default.
PROTOCOL	Enables the NTP protocol.
UTC	Configures the difference in hours with respect to UTC time.
EXIT	Exits the NTP configuration prompt.

Normally if you do not enter all the necessary parameters to complete the command in the command line, the device will request them.

2.1. ? (HELP)

This command is used to list all the valid commands at the level the router is configured. You can also use this command after a specific command in order to list the available options.

Syntax:

```
NTP config>?
```

Example:

```
NTP config>?
BROADCAST Client      Enables the NTP broadcast server client behavior option
LIST                  Lists current configuration
NO                    Disables some capabilities
PEER                  Configures or changes a peer
POLL Interval         Configures the poll interval to be used by default
PROTOCOL              Enables the protocol (enabled NTP client operation)
UTC Shift             Changes the difference in hours with respect to UTC time
EXIT
NTP Config>
```

2.2. BROADCAST

This command permits you to enable the NTP broadcast server client option.

Example:

```
NTP config>BROADCAST
NTP config>
```

2.3. LIST

Permits you to list the NTP protocol configuration information. You can list the global information separately from the peer information or both at the same time.

Syntax:

```
NTP Config>LIST ?
ALL
GLOBAL
PEERS
```

a) LIST ALL

Example:

```
NTP Config>LIST ALL

Global NTP Parameters
Protocol Status      Disabled
Operation Mode       Broadcast Client&Client Mode
Poll Interval        64
UTC Shift            1

NTP Peer List
ID   Peer Address         Peer Port       Broadcast Server     Poll Interval
-------------------------------------------------------------------------------
1    172.24.81.4          123             Client Mode          64
2    172.24.81.5          123             Client Mode          64
6    172.24.81.6          123             Client Mode
NTP Config>
```

b) LIST GLOBAL

Example:

```
NTP Config>LIST GLOBAL

Global NTP Parameters
Protocol Status      Disabled
Operation Mode       Broadcast Client&Client Mode
Poll Interval        64
UTC Shift            1
NTP Config>
```

c) LIST PEERS

Example:

```
NTP Config>LIST PEERS
NTP Peer List
ID   Peer Address         Peer Port       Broadcast Server     Poll Interval
-------------------------------------------------------------------------------
1    172.24.81.4          123             Client Mode          64
2    172.24.81.5          123             Client Mode          64
6    172.24.81.6          123             Client Mode
NTP Config>
```

2.4. NO

This command permits you to disable the protocol (NTP client operation disabled) or disable the option of being NTP broadcast server client. This also permits you to delete a reference peer.

Syntax:

```
NTP config>NO ?
BROADCAST
PEER
PROTOCOL
```

a) NO BROADCAST

Disables the option of being NTP broadcast server client.

Example:

```
NTP config>NO BROADCAST

Broadcast Client disabled
NTP config>
```

b) NO PEERS

Deletes a reference peer. On executing this command you will be prompted for the identifier for the peer you wish to delete.

Example:

You wish to delete the peer with identifier 4.

```
NTP config>NO PEER
ID[1]? 4
NTP config>
```

c) NO PROTOCOL

Disables the protocol (NTP client operation disabled).

Example:

```
NTP config>NO PROTOCOL
NTP config>
```

2.5. PEER

The PEER command permits you to configure reference peers to the NTP protocol. The reference peers are identified by a number assigned by the user. This can vary between 1 and 9999.

When configuring parameters for the reference peers, the command is written followed by the peer identifier and subsequently the parameter value.

If you pass an identifier that is not associated to any peer, a new peer is created with this identifier. If the identifier is associated to an existing peer, the indicated parameter for this peer is modified.

Syntax:

```
NTP config>PEER ?
ADDRESS            Configures IP address for a peer
BROADCAST          Enables broadcast for a peer
CLIENT             Enables client mode for a peer
POLL Interval      Configures poll interval for a peer
PORT               Configures peer port
```

a) PEER ADDRESS

This command permits you to configure an IP address for an NTP peer that you wish to synchronize. The first parameter to pass is the peer identifier and subsequently the IP address.

Example:

```
NTP config>PEER ADDRESS
ID[5]?
Peer Address [0.29.50.144]? 172.24.81.3
NTP config>
```

b) PEER BROADCAST

This command indicates that the NTP peer that you wish to synchronize operates in broadcast mode. Here you only need to give the NTP peer identifier that operates in broadcast mode. If the identifier is not associated to any peer, a new one is created with the default values.

Example:

```
NTP config>PEER BROADCAST
ID[1]?
NTP config>
```

c) PEER CLIENT

This command indicates that the NTP peer that you wish to synchronize operate in client mode. Here you only need to give the NTP peer identifier that operates in client mode. If the identifier is not associated to any peer, a new one is created with the default values.

Example:

```
NTP config>PEER CLIENT
ID[1]?
NTP config>
```

d) PEER POLL

This command specifies the polling interval for the NTP peer. Firstly you are prompted for the identifier of the peer you wish to configure and subsequently the interval.

Example:

```
NTP config>PEER POLL
ID[1]?3
Poll interval[64]?128
NTP config>
```

The permitted values are seconds from 16 to 1024 (some 17 minutes). This takes the power of two below the value entered. The default value is 64.

e) PEER PORT

This command specifies the port where the NTP server for the indicated peer operates.

Example:

```
NTP config>PEER PORT
ID[1]? 6
Peer Port[123]? 123
NTP config>
```

2.6. POLL Interval

This permits you to configure the poll interval to be used by default.

Example:

```
NTP config>POLL
Poll interval[64]? 256
NTP config>
```

The permitted values are seconds from 16 to 1024 (some 17 minutes). This takes the power of two below the value entered. The default value is 64.

2.7. PROTOCOL

Enables the protocol (NTP client functionality is enabled).

Example:

```
NTP config>PROTOCOL
NTP config>
```

2.8. UTC Shift

This permits you to change the difference in hours with respect to the UTC time, in this way determining the hour zone where the device is located.

Example:

```
NTP config>UTC
UTC-Shift[1]?
NTP config>
```

The permitted values are from -23 to 23. The default value is 1.

2.9. EXIT

Permits you to exit the NTP protocol configuration environment.

Syntax:

```
NTP Config>EXIT
```

Example:

```
NTP Config>EXIT
Config>
```

Return to the configuration process prompt.

2.10. SHOW CONFIG

The **SHOW CONFIG** command displays the configuration. An example has been given below in order to see what the configuration will look like. For this example, the default values have not been used so that all the available parameters are displayed.

Example:

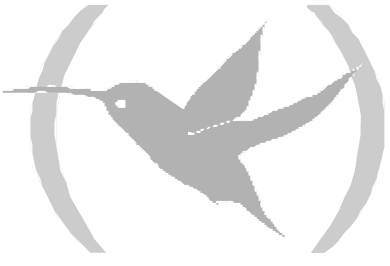
```
NTP config>SHOW CONFIG
; Showing Menu and Submenus Configuration ...
; Router ATLAS 2 8 Version 10.0.0

   peer address 1 172.24.81.4
   peer port 1 124
   peer broadcast 1
   protocol
   broadcast
   poll 128
   utc 2
NTP config>LIST ALL

Global NTP Parameters
Protocol Status      Enabled
Operation Mode       Broadcast Client&Client Mode
Poll Interval        128
UTC Shift            2

NTP Peer List
ID   Peer Address         Peer Port       Broadcast Server     Poll Interval
-------------------------------------------------------------------------------
1    172.24.81.4          124             Broadcast Client     Not Apply
NTP Config>
```

Chapter 3
Monitoring



1. NTP protocol monitoring

NTP protocol monitoring displays statistics on the exchanged or received NTP messages through broadcasting from the various peers. These are displayed separately as global statistics and in detail for each peer.

2. NTP protocol monitoring commands

The steps needed to monitor the NTP protocol in the Teldat routers are described in this section.
In order to access the NTP protocol monitoring environment, you must enter the following commands:

```
*P 3

+FEATURE NTP
-- NTP user console --
NTP>
```

The following commands are found within the NTP monitoring environment:

Command	Function
? (HELP)	Lists the available commands or their options.
LIST	Displays the NTP monitoring.
EXIT	Exits the NTP monitoring prompt.

Generally speaking, if you do not enter all the necessary parameters to complete the command in the command line, the device will request them.

2.1. ? (HELP)

This command is used to list all the valid commands at the level the router is programmed. You can also use this command after a specific command in order to list the available options.

Syntax:

```
NTP>?
```

Example:

```
NTP>?
LIST
EXIT
NTP>
```

2.2. LIST

The **LIST** command permits you to list the global statistics or the peers. The syntax is shown below.

Syntax:

```
NTP>LIST ?
GLOBAL
PEERS
```

a) LIST GLOBAL

In order to list the global information, you need to carry out the following:

```
NTP>LIST GLOBAL

Global NTP Statistics
-------------------------------------------------------------------------
Received Packets          12
Sent Packets              4
New Version Packets       12
Old Version Packets       0
Wrong Version Packets     0
Rejected Packets          0
Broadcast Packets         12
Control Mode Packets      0
Private Mode Packets      0
Client Mode Packets       0
Server Mode Packets       0
Active Mode Packets       0
Passive Mode Packets      0
Processed Packets         12
Old Packets               0
Bogus Packets             0
NTP>
```

b) LIST PEERS

In order to obtain information on the Peers, you need to enter the address and port for the Peer you wish to monitor:

```
NTP>LIST PEERS
Peer Address? [0.0.0.0]?192.7.1.1
Peer Port?[0]?123

Peer NTP Statistics
-------------------------------------------------------------------------
Received Packets          16
New Version Packets       16
Old Version Packets       0
Wrong Version Packets     0
Rejected Packets          0
Broadcast Packets         16
Control Mode Packets      0
Private Mode Packets      0
Client Mode Packets       0
Server Mode Packets       0
Active Mode Packets       0
Passive Mode Packets      0
NTP>
```

2.3. EXIT

This permits you to exit the NTP protocol monitoring environment.

Syntax:

```
NTP>EXIT
```

Example:

```
NTP>EXIT
+
```

Return to the monitoring process prompt.