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# Network Time Protocol

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## Feature description

Network Time Protocol (NTP) is a feature used to synchronize local clocks across the network to a single, accurate, third-party Network Time Protocol server (typically a radio clock, atomic clock, or other Coordinated Universal Time (UTC) source).

### Time distribution across the network

The Network Time Protocol server obtains true time from the dedicated source, then sends that time to the Call Server, either directly over routers, or by proxy through the Signaling Server (depending on user configuration). The Call Server then distributes the time to the rest of the network.

### Network Time Protocol Server

CS 1000 Network Time Protocol can accommodate one or two Network Time Protocol servers on the system: one primary server for regular operation (mandatory), and an optional secondary server for backup in case of primary failure. To enable the Network Time Protocol feature, you must input the IP address of your primary and (if applicable) secondary servers.

### Mode of communication

CS 1000 Network Time Protocol supports two modes of communication:

- Call Server to Network Time Protocol server over ELAN subnet.

- Call Server to Network Time Protocol server through the Signaling Server.

**Call Server to Network Time Protocol over ELAN subnet**

With this mode of communication, the Call Server sends time requests to the Network Time Protocol server over the ELAN subnet. The firewall provides ELAN subnet security. After the Call Server receives the time from the Network Time Protocol server, it then distributes that time to nodal components on the network.

**Call Server to Network Time Protocol through the Signaling Server**

With this mode of communication, the Signaling Server acts as the proxy for time request transfers between the Call Server and the Network Time Protocol server. This mode of communication uses a TLAN subnet connection between the Call Server and Network Time Protocol server, thus enhancing security.

**Network Time Protocol threshold levels**

If the time difference (delta) between the Call Server and the Network Time Protocol server passes certain threshold limits, the system generates alarm messages according to the severity level: Minimum, Warning, or Critical. Use LD 117 to increase or decrease the limits for these thresholds.

During manual synchronization, if the delta passes any of the threshold levels, the system generates an error message and asks if you want to update the time. Click **Yes** to accept the time change, or **No** to revert to the system time before the latest synchronization. During background synchronization, if the delta passes any of the threshold levels, the system generates the appropriate error message, but updates the time without asking for user confirmation.

**Secure mode of operation**

CS 1000 Network Time Protocol can operate in secure or insecure mode. In secure mode, the protocol uses Message Digest Algorithm 5 (MD5) signatures to authenticate the exchange of timestamps. To run Network Time protocol in secure mode, configure the following security parameters:

- Key ID: a number used to generate the message-authentication code
- Private Key: a secret key shared by the CS 1000 system and the NTP server, used to encrypt the MD5 value

**Time zone**

You must configure the offset between your local time zone and Coordinated Universal Time (UTC). The UTC offset corrects the timestamp according to the offset value entered by the user in LD 117 or Element Manager.

**Daylight-Saving Time**

If Daylight-saving time applies to your local time zone, then you must implement the Daylight-saving adjustment in LD 2 or from Element Manager.

**Mode of synchronization**

To enable the mode of synchronization, you can then synchronize the time across the CS 1000 network to the Network Time Protocol server. Network Time Protocol supports two modes of synchronization:

- manual
- background

**Manual mode of synchronization**

Manual mode allows for a single, system-wide update of local system clocks to NTP server time. You can perform the manual update from LD 117 or Element Manager.

**Background mode of synchronization**

In background mode, the Call Server queries the NTP server at regular time intervals, as specified in LD 117 or Element Manager. When using background mode, you must also specify an offset value (in minutes) by which NTP avoids interfering with other scheduled background routines.

**Network Time Protocol status**

Use the STAT NTP command and CS 1000 Network Time Protocol in LD 117 to check the current status of NTP. Status information displays in four categories—current NTP configuration, last NTP configuration, last synchronization error, and counters—and includes the following fields:

- NTP enabled or disabled (if disabled, the report includes no further information).
- IP addresses of the primary and secondary NTP servers
- local time zone offset from UTC
- time difference (delta) between system time and NTP server
- current threshold level: Minimal, Warning, Maximum
- secure mode of operation set to secure or insecure
- packets sent
- packets received

NTP status information also appears on the Date and Time page in Element Manager, under the Network Time Protocol field.

**Print NTP parameters**

Use the PRT NTP command and CS 1000 Network Time Protocol in LD 117 to display the current configuration of NTP. Displayed parameter includes the following fields:

- IP addresses of primary and secondary NTP servers
- values for the three threshold levels: Minimum, Warning, and Maximum.
- security mode: secure or insecure
- Key ID (if NTP is running in secure mode)
- time interval
- local time zone offset from UTC
- synchronization mode: manual or background

**Feature interactions****Network Time Synchronization**

CS 1000 Network Time Protocol(NTP) and Network Time Synchronization (NTS) are mutually exclusive features. If you enable NTP, you cannot then make the NTS slave active. Any attempt to do so results in an error message indicating that you should disable NTP. Similarly, if you make the NTS slave active, you cannot then enable NTP. If you attempt to enable NTP, the Call Server sends an error message indicating that you should disable the NTS feature.

**Geographic Redundancy**

The Geographic Redundancy feature replicates databases from one Call Server to a secondary Call Server in a physically-distanced location. However, because many Network Time Protocol parameters depend on location — UTC offset, for example—The Network Time Protocol database does *not* replicate to the secondary Call Server. Therefore, the NTP configuration does not survive a geographic redundancy switchover.

**Call Detail Recording**

Call Detail Recording (CDR) identifies the calling and called parties and notes the time and duration of the call. If an NTP synchronization takes place between the start time and end time of the call, the duration for all segments of the call can become inconsistent, with some timestamps generated before the synchronization took place, and some generated afterwards.

**Traffic Analysis**

In Traffic Analysis, calculating the time it takes the system to transfer collected data depends on the current time of the system. If NTP synchronization changes system time during a period of heavy traffic, this

can affect the time calculation. If traffic analysis has already been done for that hour, the system does not try to update the time again during that particular hour.

**Call accounting/call tracking**

Accurate call accounting/call tracking depends on accurate call start and end times. If the NTP time update takes place between the start and end of a call, disruption of accurate billing can occur.

**Manual time updates using LD 02**

When Network Time Protocol (NTP) is enabled, you cannot manually update the system clock from LD 02. If you attempt a manual time update from LD 02, the Call Server generates an alarm indicating that NTP is running and that, to change the time manually, NTP must be disabled in Element Manager or LD 117.

**Attendant Console Time and Date key**

When Network Time Protocol (NTP) is enabled, the system protects accuracy and reliability of network time by restricting manual time changes using the Time and Date key on Attendant consoles. If you attempt a time change using the Time and Date key, the Call Server generates an alarm indicating that NTP is running and that, to change the time manually, NTP must be disabled in Element Manager or LD 117.

**Feature implementation using LD 117**

Use these procedures to implement the CS 1000 Network Time Protocol in LD 117.

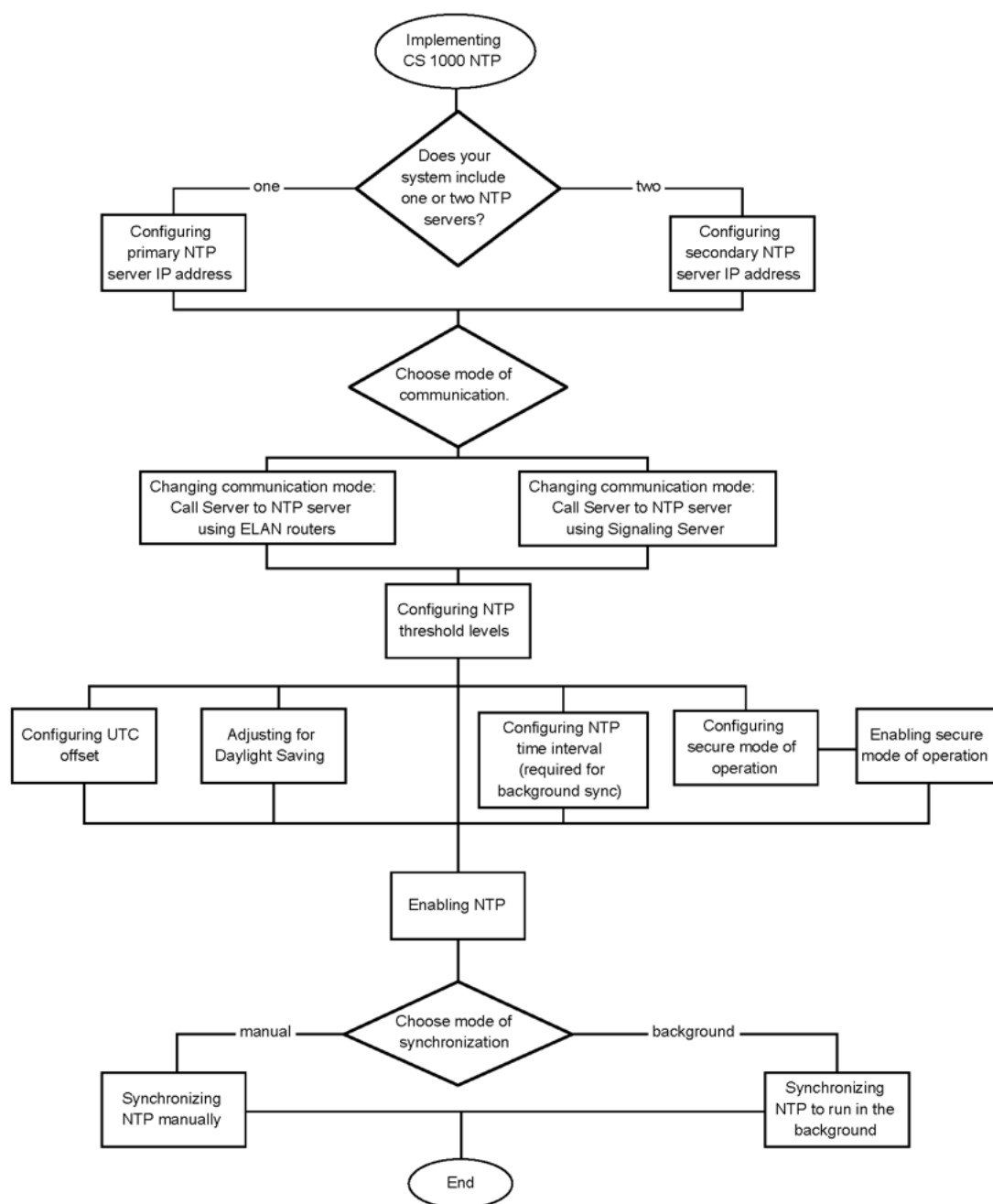
**Prerequisites for implementing NTP using LD 117**

- You must have at least one NTP server available to the system.
- For full access to NTP maintenance commands in LD 117, login with Admin2 (PWD2) status. If you login without PWD2, some commands do not run.
- Before you start, obtain the IP addresses for your primary and (if included on the system) secondary NTP servers.
- To configure any NTP parameter from LD 117, NTP must be disabled. ["Disabling Network Time Protocol \(NTP\)" \(page 120\)](#).
- Configure a valid IP address for your NTP server before configuring any other NTP parameter. Failure to do so results in an error message.

### **Procedures for implementing NTP using LD 117**

This task flow shows the sequence of procedures to implement the CS 1000 Network Time Protocol. To link to any procedure, see "[Procedures for implementing NTP using LD 117](#)" (page 114)

**Figure 1**  
**Implementing NTP procedures using LD 117**



**Procedures for implementing NTP using LD 117**

- "Configuring primary NTP server address" (page 114)
- "Changing communication mode: Call Server to NTP server over ELAN subnet" (page 115)
- "Changing communication mode: Call Server to NTP server using Signaling Server" (page 115)
- "Configuring NTP threshold levels" (page 116)
- "Configuring NTP Time interval" (page 116)
- "Configuring secure mode of operation" (page 117)
- "Enabling secure mode of operation" (page 118)
- "Disabling secure mode of operation" (page 118)
- "Configuring UTC offset for local time zone" (page 119)
- "Adjusting for Daylight Saving Time" (page 119)
- "Enabling NTP" (page 119)
- "Disabling NTP" (page 120)
- "Synchronizing NTP to run in the background" (page 121)
- "Synchronizing NTP manually" (page 121)
- "Checking NTP status" (page 122)
- "Printing NTP parameters" (page 122)

**Configuring primary NTP server address**

Use this procedure to enter the IP address of the primary NTP server.

**Procedure steps**

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**Step    Action**

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- |   |  |
|---|--|
| 1 | Login to LD 117.   |
| 2 | Input the IP address of the primary NTP server<br><code>CHG NTP &lt;primary NTP server IP address&gt;</code> |
- 

—End—

---

**Configuring secondary NTP server IP address (optional)**

Use this procedure to enter the IP address of the secondary NTP server.



**Procedure steps****Step Action**

- 1 Login to LD 117.
- 2 Enter the IP address of both the primary and secondary NTP servers.  
`CHG NTP <primary NTP server IP address> <secondary NTP server IP address>`

**ATTENTION**

When configuring the secondary IP address, enter both primary and secondary addresses together at the prompt.

—End—

**Changing communication mode: Call Server to NTP server over ELAN subnet**

Use this procedure to change the mode of communication to: Call Server to NTP server over ELAN subnet.

**Procedure steps****Step Action**

- 1 Login to LD 117.
- 2 Use the following command to change the mode of communication to: Call Server to NTP using router.  
`CHG NTP MODE CS`

—End—

**Changing communication mode: Call Server to NTP server using Signaling Server**

Use this procedure to change the mode of communication to: Call Server to NTP server using Signaling Server.

**Procedure steps****Step Action**

- 1 Login to LD 117.

- 2 Use the following command to change the mode of communication to: Call Server to NTP using Signaling Server.

```
CHG NTP MODE SS
```

---

—End—

---

### Configuring NTP threshold levels

Use this procedure to configure the three NTP threshold levels: Minimum, Warning, and Maximum.

#### Procedure steps

Step	Action
1	Login to LD 117.
2	Enter desired values for the three threshold levels. Do not use leading zeroes. For example, to enter a value of seven minutes, type 7 not 00:07.

- 1 Login to LD 117.

- 2 Enter desired values for the three threshold levels. Do not use leading zeroes. For example, to enter a value of seven minutes, type 7 not 00:07.

```
CHG NTP THRESH <minimum> <warning> <maximum>
```

#### ATTENTION

Enter values for all three threshold levels whenever you use the CHG NTP THRESH <minimum> <warning> <maximum> command.

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—End—

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### Configuring NTP Time interval

Use this procedure to configure both the time interval for background synchronization and the offset from other background routines.

#### ATTENTION

Configure the NTP time interval before you attempt to enable background synchronization.

#### Procedure steps

Step	Action
1	Login to LD 117.

- 1 Login to LD 117.

- 2 Enter the time interval and offset value for background synchronization. Do not use leading zeroes. For example, to enter a value of six minutes type 6 not 00:06.

```
CHG NTP TIMEINT <time interval in minutes> <offset in minutes>
```

---

—End—

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### Procedure job aid

Field	Description
<time interval in minutes> <offset in minutes>	<p>To change the time interval for background synchronization, enter one of the following standard values (in minutes): 1, 2, 6, 12, (24), and 30. Default time interval is 24 minutes between background synchronizations.</p> <p>To change the offset value from which synchronization avoids other background routines, enter any of the following standard values (in minutes): 15, (30), and 45. Default offset value is 30 minutes.</p>

### Configuring secure mode of operation

Use this procedure to configure the parameters used by either the primary or secondary NTP server in secure mode of operation.

#### Procedure steps

Step	Action
------	--------

- |   |  |
|---|--|
| 1 | Login to LD 117.   |
| 2 | Enter the IP address(es) of the connected NTP server(s) as well as the Key ID.<br><br><pre>CHG NTP SECURE PRIMARY/SECONDARY &lt;key id&gt;</pre> The system prompts for the private key. |
| 3 | Enter the private key.   |
| 4 | Confirm the private key.   |

#### ATTENTION

For security reasons, the private key does not show in the command line as you enter it.

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—End—

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### Procedure job aid

Field	Description
PRIMARY/SECONDARY <key id>	Enter the server whose secure mode parameters you want to configure: Primary or Secondary.  Enter the four digit Key ID. The default unassigned Key ID is 0.

### Enabling secure mode of operation

Use this procedure to configure the mode of NTP operation to secure.

#### Prerequisites

- Configure the parameters for secure mode *before* enabling the mode of operation. See "[Configuring secure mode of operation](#)" (page 117).
- For both primary and secondary servers to operate in secure mode, configure both servers for secure mode, then select **ALL** in this procedure.

#### Procedure steps

Step	Action
------	--------

- |   |   |
|---|---|
| 1 | Login to LD 117.  |
| 2 | Change NTP security mode of operation to secure.<br><br>CHG NTP AUTHMODE SECURE <PRIMARY/SECONDARY/ALL> |

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—End—

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### Disabling secure mode of operation

Use this procedure to set the NTP security mode of operation to insecure.

#### Procedure steps

Step	Action
------	--------

- |   |   |
|---|---|
| 1 | Login to LD 117.  |
| 2 | Change NTP security mode of operation to insecure.<br><br>CHG NTP AUTHMODE INSECURE <PRIMARY/SECONDARY/ALL> |

---

—End—

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### Configuring UTC offset for local time zone

Use this procedure to set the offset value (from UTC) for the local time zone.

#### Procedure steps

Step	Action
------	--------

- |   |   |
|---|---|
| 1 | Login to LD 117.  |
| 2 | Enter the offset value for the local time zone.<br><br>CHG UTCOFFSET <+/-hh:mm> |

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—End—

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#### Job aid

Field	Description
<+/-hh:mm>	Enter the number of hours and minutes by which the local time zone differs from the UTC. The default offset value is +00:00.

### Adjusting for Daylight Saving Time

Use LD 02 to configure the date and time you want the system clock to move forward for Daylight Saving Time, or backward to return to standard time. You can also enable automatic change to Daylight Saving Time. For more information about adjusting for Daylight Saving Time in LD 02, see *Software Input Output Reference — Administration (NN43001-611)*.

### Enabling Network Time Protocol (NTP)

Use this procedure to enable Network Time Protocol (NTP).

#### Prerequisites

- Before you enable Network Time Protocol, configure the IP addresses of the primary and, if necessary, secondary NTP servers. Failure to do so results in an error message.
- You can enable Network Time Protocol with the following parameters configured to their default values:
  - mode of communication
  - threshold level

- secure mode of operation
- time interval
- UTC offset

However, to change these default values, you must do so before enabling NTP. Once enabled, you cannot change any NTP parameters.

- You cannot enable Network Time Protocol (NTP) with the Network Time Synchronization (NTS) feature enabled. Disable NTS before enabling NTP. Failure to do so results in an error message.

#### Procedure steps

---

Step	Action
------	--------

---

- |   |  |
|---|--|
| 1 | Login to LD 117.   |
| 2 | To enable Network Time Protocol, Enter the following command:<br><br>ENL NTP |
- 

—End—

---

### Disabling Network Time Protocol (NTP)

Use this procedure to disable Network Time Protocol (NTP).

#### Prerequisites

- You cannot disable NTP with automatic synchronization running in the background. To disable Network Time Protocol (NTP), first stop the background synchronization. See "[Stopping background synchronization](#)" (page 121).

#### Procedure steps

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Step	Action
------	--------

---

- |   |   |
|---|---|
| 1 | Login to LD 117.  |
| 2 | To disable Network Time Protocol (NTP), Enter the following command:<br><br>DIS NTP |
- 

—End—

---

## Synchronizing NTP to run in the background

Use this procedure to begin querying the NTP server in background mode.

### Procedure steps

Step	Action
1	Login to LD 117.
2	Set synchronization to: background.  SYNC NTP BKGD
—End—	

## Synchronizing NTP manually

Use this procedure to query the NTP server manually.

### Procedure steps

Step	Action
1	Login to LD 117.
2	Set synchronization to: manual.  SYNC NTP MANUAL

### ATTENTION

Manual synchronization places LD 117 on hold for 15 seconds. During that time, you cannot abort from the overlay.

—End—

## Stopping background synchronization

Use this procedure to stop background synchronization from running. NTP remains enabled.

### Prerequisites

- You cannot stop a background synchronization if no background routine is running. Attempts to do so result in an error message.

### Procedure steps

Step	Action
1	Login to LD 117.
2	To stop the background routine, enter the following command:  <code>STOP NTP BKGD</code>  The system generates the following message asking you to confirm the operation: NTP Query is being processed Do you want to proceed (y/n)?
3	Enter y.
—End—	

### Checking NTP status

Use this procedure to verify the current NTP status.

#### Procedure steps

Step	Action
1	Login to LD 117.
2	To view NTP status, enter the following command:  <code>STAT NTP</code>
—End—	

### Printing NTP parameters

Use this procedure to display the current configuration of NTP.

#### Procedure steps

Step	Action
1	Login to LD 117.
2	To display current configuration, enter the following command:  <code>PRT NTP</code>
—End—	



## Feature implementation using Element Manager

Use these procedures to implement CS 1000 Network Time Protocol in Element Manager.

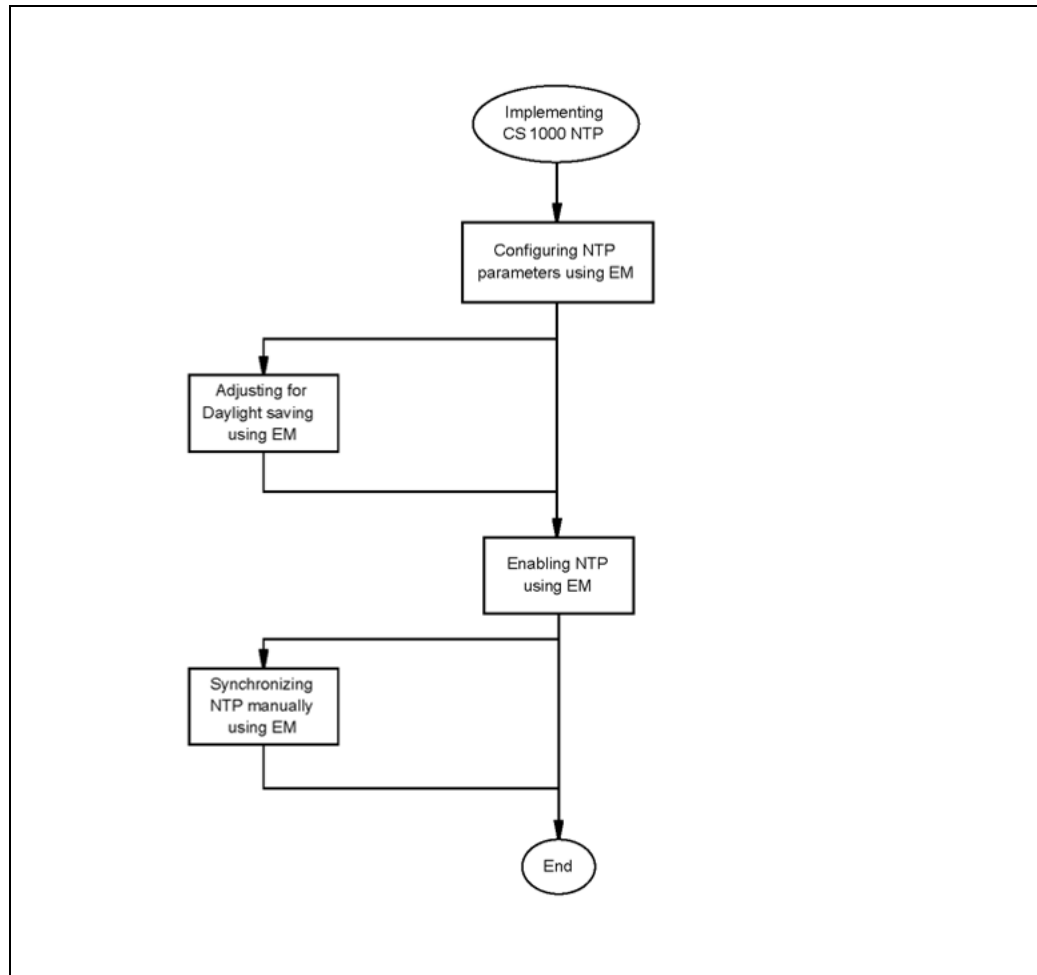
### Prerequisites for implementing NTP using Element Manager

- You must have at least one NTP server available to the system.
- For full access to NTP configuration from Element Manager, login with Level 2 user status. If you login without Level 2 status, Element Manager displays an error message.
- Before you start, obtain the IP addresses for your primary and (if included on the system) secondary NTP servers.

### Procedures for implementing NTP using Element Manager

This task flow shows the sequence of procedures performed to implement Network Time Protocol with Element Manager. To link to any procedure, see "[Procedures for implementing NTP using EM](#)" (page 124).

**Figure 2**  
**Implementing CS 1000 NTP using Element Manager**



### Procedures for implementing NTP using EM

- "Configuring NTP parameters using EM" (page 124)
- "Adjusting for Daylight saving using EM" (page 125)
- "Enabling NTP using Element Manager" (page 126)
- "Disabling NTP using Element Manager" (page 126)
- "Synchronizing NTP manually using Element Manager" (page 127)

### Configuring NTP parameters using EM

Use this procedure to configure NTP parameters.

### Procedure steps

Step	Action
1	Login to Element Manager.
2	Click <b>Tools &gt; Date and Time</b> .
3	Click <b>Configure</b> .
4	Select mode of communication: <b>Call Server</b> or <b>Signaling Server</b> .
5	Select security mode: <b>Secure</b> or <b>Insecure</b> .
6	Enter the IP address of the primary NTP server.
7	If in secure mode, enter the <b>Key ID</b> and <b>Private Key</b> for the primary NTP server.
8	If the system includes a secondary NTP server, enter the IP address for that server.
9	If in secure mode, enter the <b>Key ID</b> and <b>Private Key</b> for the secondary NTP server.
10	To run NTP as a background process, check <b>Automatic Background Synchronization</b> .
11	If running NTP in the background, enter values for the <b>Polling Interval</b> and <b>Query Offset</b> .
12	Select the local time zone from the drop-down list.
13	Select values for the three threshold levels: <b>Normal</b> , <b>Warning</b> , and <b>Critical</b> (mandatory).
14	To complete the configuration, click <b>Save</b> .

#### ATTENTION

If NTP is already enabled, clicking **Save** disables NTP. To implement the feature, you must subsequently enable NTP. See ["Enabling NTP using Element Manager" \(page 126\)](#)

—End—

### Adjusting for Daylight Saving Time using EM

Use this procedure to change the Daylight Saving Time parameters.

**Procedure steps**

Step	Action
1	Login to Element Manager.
2	Click <b>Tools &gt; Date and Time</b> .
3	Check <b>Adjust for Daylight Savings</b> .
4	Use the drop-down menus to specify the date and time you want to move the clock forward one hour for Daylight Saving Time.
5	Use the drop-down menus to specify the date and time you want to move the clock backward one hour to return to regular time.
6	To complete the adjustment, click <b>Save</b> .

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—End—

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**Enabling NTP using Element Manager**

Use this procedure to enable NTP using Element Manager.

**Prerequisites**

- Configure NTP parameters before enabling NTP. See "[Configuring NTP parameters using EM](#)" (page 124).
- If you select Automatic Background Synchronization during NTP configuration, enabling NTP launches regular NTP time updates, according to the configured polling interval.

**Procedure steps**

Step	Action
1	Login to Element Manager as a Level 2 user.
2	Click <b>Tools &gt; Date and Time</b> .
3	Click <b>Enable</b> .

---

—End—

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**Disabling NTP using Element Manager**

Use this procedure to disable NTP.

---

**Procedure steps**

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**Step Action**

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- 1 Login to Element Manager as a Level 2 user.
  - 2 Click **Tools > Date and Time**.
  - 3 Click **Disable**.
- 

—End—

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**Synchronizing NTP manually using Element Manager**

Use this procedure to manually synchronize with the NTP server. Manual synchronization does not interfere with automatic background synchronizations (background synchronization still takes place, at the configured time interval).

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**Procedure steps**

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**Step Action**

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- 1 Login to Element Manager as a Level 2 user.
  - 2 Click **Tools > Date and Time**.
  - 3 Click **Sync Now**.
- 

—End—

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