



HPE Simple Network Time Protocol Clock Synchronization Client Guide

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Hewlett Packard
Enterprise

Notices

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Preface

About this guide

This manual presents installation and configuration information for the *SNTP Clock Synchronization Client*.

Audience

The manual is intended for persons who install, configure, and monitor the operation of the *SNTP Clock Synchronization Client*.

New and changed information

No content changes are made to this guide for this release. Only the version number is revised.

Document history

The following table contains the list of published releases and the publishing dates.

Release	Published
05.01.00	September 2009
05.01.02	September 2013
06.00.00	September 2016

Where to get more information

The SNTP Clock Synchronization Client is configured to run under the HPE Intelligent Network Server Platform (INS-P) node.

See the following INS-P manuals for information on configuring processes to run under the node:

- *HPE INS Configuration Planning Guide*
- *HPE INS Configuration Procedures Guide*
- *HPE INS ERAD Database Utility User's Guide*

Conventions

This document uses the following symbolic conventions:

Convention	Description
Fixed width text	Used for file paths, file names, file contents, computer inputs or outputs, and program code.
Bold text	Indicates emphasized text and navigation options in user interfaces. Multi-level menu paths also contain the → sign; for example, Start → Settings → Control Panel .
Green text	Indicates internal cross-references to sections, table or figure titles, or external references to web resources.
<angle brackets>	Indicates generic variable names that must be substituted by real values or strings.
<i>Italicized text</i>	Used for book or document titles, parameters, terms, and replaceable text.
 IMPORTANT:	Indicates essential information to explain a concept or to complete a task.
 NOTE:	Indicates additional information to emphasize or supplement important points of the main text.
 TIP:	Provides helpful hints for completing a task. A tip might provide an alternative method for completing the task that precedes it.

This document uses the following style conventions for procedures:

Subsection title	Description
<i>Before you begin</i>	Describes prerequisites of the procedure.
<i>About this task</i>	Provides background information on the procedure.
<i>Procedure</i>	Lists the procedure steps in sequence. A paragraph after a procedure step in the <i>Procedure</i> section states either of the following information: <ul style="list-style-type: none"> • Additional information on the procedure step. • Example on how to operate the procedure step. • Results after the procedure step is performed.
<i>Results</i>	Result to achieve after the steps in the <i>Procedure</i> section are completed.
<i>What to do next</i>	What to do after the procedure is completed.
<i>Example</i>	Provides an example, or use case reference on the procedure.

This document uses the following style conventions for related information at the end of sections:

Subsection title	Description
<i>Related tasks</i>	Contains links to related procedures of the document.
<i>Related concepts</i>	Contains links to related sections with conceptual information.
<i>Related references</i>	Contains links to related sections with reference information.
<i>Related information</i>	Provides external references to web resources.

Abbreviations

ER	Event Report
ERAD	Exception Reporting and Alarms Distribution
INS	HPE Intelligent Network Server
INS-P	Intelligent Network Server Platform, the core component of the HPE Intelligent Network Server product
IP	Internet Protocol
NSDB	Node Specification Database
NSM	Node Subsystem Manager
VNFD	VNF Descriptor
OSM	HPE NonStop Open System Management Interface
SNTP	Simple Network Time Protocol
TACL	Tandem Advanced Command Language
TCP/IP	Transmission Control Protocol/Internet Protocol
UTC	Coordinated Universal Time

Chapter 1

Introduction to the SNTP clock synchronization client

The SNTP Clock Synchronization Client is a component of the HPE Intelligent Network Server product that provides precise time synchronization for applications on the INS Platform (INS-P).

The client uses Simple Network Time Protocol (SNTP) to monitor an external NTP time server and the internal system clock on the HPE NonStop server. If the client process detects a difference between the NTP server time and the system clock on the NonStop server, it adjusts the system clock to minimize the differential.

1.1 Startup

The client process runs under the INS-P node, which starts it and also restarts it automatically if it goes down.

The following events occur at startup:

- The process is initialized; node-based subsystems for event reporting and message transport are accessed.
- Runtime parameters are verified.
- The process is opened and bound to the NTP port of the defined TCP/IP process.
- An ER is issued when contact is established with the external time server.

1.2 Processing

At configurable intervals, the client process opens a UDP socket and contacts the time server to collect time samples. When the samples are received, the process closes the socket.

The client eliminates bad samples, if any, from the collected set of samples using the Standard Deviation Algorithm and then calculates the average system clock correction from the remaining good samples. If the correction is within the allowed adjustment range, then the correction is applied to the system clock. If the correction is not within the allowed adjustment range set by the *TIME-MAX-ADJUST* and *TIME-MIN-ADJUST* parameters, then the correction is ignored or discarded with an ERAD.

Example

Using the standard deviation algorithm

The following example describes the use of Standard Deviation Algorithm in SNTP.

- Consider 15 samples that contain the following set of time corrections:
(15, 14, 18, 19, 14, 13, 4, 13, 14, 40, 18, 14, 15, 14, 15)
- The average of these corrections is 16.
- The differences between 16, and each time correction are as follows:
(1, 2, -2, -3, 2, 3, 12, 3, 2, -24, -2, 2, 1, 2, 1)
- The square of these difference values is
(1, 4, 4, 9, 4, 9, 144, 9, 4, 576, 4, 4, 1, 4, 1)
- The average of the squares is 51.86667, and the square root of the average is 7.201852.
- Any time correction value that deviates more than 7.201852 from the average time correction value is eliminated from the samples. For example, 4 and 40.
- This results in a set of 13 samples (15, 14, 18, 19, 14, 13, 13, 14, 18, 14, 15, 14, 15) with an average of 15.07692.

- Thus, the average 15.07692 is applied to the system clock, if it is within the allowed adjustment range.

Chapter 2

Installation

The SNTP Clock Synchronization Client is installed on the NonStop server and is preconfigured to run under the INS-P node. This section explains how to install the client on the NonStop server by restoring the software from a PAK file. The client software is provided on a CD-ROM.

2.1 System requirements

Ensure that the following prerequisites are satisfied before installing the client software, and check the release notes for additional hardware and software requirements.

Before you begin

Release notes are issued with each release of the client software. These notes also contain exceptions and additions to the procedures contained in this guide. Read the release notes that came with this release before planning the installation.

Procedure

1. Ensure that the following hardware is installed and operational:
 - NonStop server appropriate for the current release of the client software
 - One of the following types of workstations:
 - A system console installed with the HPE NonStop Open System Management Interface (OSM) client.
 - A workstation that can connect via telnet to the NonStop server where the client software will be installed.
2. Ensure that the following software is installed:
 - HPE NonStop operating system specified in the release notes.
 - HPE Intelligent Network Server release specified in the release notes.

2.2 Installation planning

You will need the following information to complete the installation:

- The system name of the NonStop server where the client software will be installed.
- The name of the volume on which the client software will be installed. The client must be installed on the same volume as the INS-P software. The name of the client PAK file
- The logon and password for the node manager.
- The logon (super ID) and password for the system administrator.

2.3 Client installation

The client installation consists of two procedures.

- [Copy the PAK file to the server from the CD](#) on page 11
- [Install the client software](#) on page 12



NOTE: Only one copy of the client should be installed on the NonStop server.

2.3.1 Copy the PAK file to the server from the CD

Perform this procedure to copy the installation PAK file to the installation subvolume.

Before you begin

This procedure uses the FTP command-line interface available on most Windows NT or Unix workstations. Other tools for transferring files to the NonStop server may be available for use on your workstation. Use these tools at your own discretion.

Procedure

To copy the PAK file from CD

Assumptions:

You are logged on to a workstation with a LAN connection to the NonStop server where the client software is to be installed. The workstation must be able to copy files from the installation CD to an installation subvolume on the NonStop server.

1. Insert the installation CD into the CD drive.
2. Copy the PAK file from the CD to the workstation's hard drive, using Windows Explorer or another file manager, .
3. Open a command-line interface (such as an MS-DOS window or Unix Korn shell).

4. Start the FTP session:

```
> FTP
```

An `ftp>` prompt is displayed.

5. Connect to the NonStop server:

```
ftp> OPEN host
```

where *host* is the system name of the NonStop server. If the connection is successful, a confirmation message is displayed followed by a prompt for a user name.

6. Log on as the node manager.

Enter the password when prompted.

```
: NODE.MGR
```

```
: password
```

An FTP prompt is displayed and you are now logged into the NonStop server. The login message that is displayed indicates the default API (OSS or Guardian) that is enabled for the user account.

7. If the login message says the OSS API is enabled, type the following command:

```
ftp> QUOTE GUARDIAN
```

The Guardian API is now enabled.

8. Navigate to the installation subvolume where you want to place the installation PAK file:

```
ftp> CD installation-volume.subvolume
```

where `installation-volume.subvolume` is the full pathname to the volume and subvolume to which the PAK file will be copied.

9. Navigate to the hard drive and source folder where the installation files are located:

```
ftp> LCD DRIVE drive:[\path]
```

where *drive* is the disk drive and *path* is the full path to the folder containing the installation files. If the CD does not contain folders, just specify the drive.

10. Ensure that FTP understands the type of files being copied by entering the BINARY command:

```
ftp> BINARY
```

11. Copy the installation PAK file to the installation subvolume:

```
ftp> PUT PAK-file PAK-file,100
```

where `PAK-file` is the name of the PAK file and `100` instructs the FTP server to transfer the file as an executable file (file code 100). The name of the PAK file is in the format *SNTversion* (for installation on the NonStop S-series server) or *ENTversion* (for installation on the NonStop NS-series server), where *version* is the client software release version.



NOTE: Do not put a space between the comma and the 100. If a space precedes the 100, the command will ignore the file code number.

Example:

```
ftp> PUT ENT40001 ENT40001,100
```

12. Quit FTP:

```
ftp> QUIT
```

13. Close the command-line interface window if desired, and continue with the procedure [Install the client software](#) on page 12.

2.3.2 Install the client software

You are now ready to install the client software by extracting the release files from the PAK file to the specified disk volume and then running the installation script.

Procedure

To install the client software

1. Log on as the node manager from a TACL prompt, if you have not already done so.

Enter the password when prompted.

```
> LOGON NODE.MGR
```

```
> Password: password
```

2. Unpack the client PAK file:

```
> UNPAK PAK-file, *.*.*, MYID, LISTALL, VOL $ntp-volume
```

where `PAK-file` is the name of the client PAK file and `$ntp-volume` is the name of the volume where the client software is to be installed.

Example:

```
> UNPAK NTP40001, *.*.*, MYID, LISTALL, VOL $NTP
```

3. From the `$ntp-volume`, run the installation script:

```
> RUN NTPINST.INSTNTP
```

An introductory installation message is displayed.

4. Enter the super user password when prompted:

```
Enter SUPER.SUPER's password.. -> password
```

Most of the installation is performed silently. When the client Process Descriptions and Process Input Parameters records are loaded into the NSDB, the following message is displayed:

```
Performing INSCOM load - process process-name
```

When the installation script is complete, the following message is displayed:

```
INSTALLATION COMPLETE
```

2.4 Post-installation configuration

When the software installation is complete, you must perform the following configuration tasks:

Procedure

1. Load the Event Reports (ERs) into the Exception Reporting and Alarms Distribution (ERAD) database. See [Event reports](#) on page 19.
2. Configure the client start-up parameters. See [Node configuration](#) on page 14.

Chapter 3

Node configuration

During installation, a preconfigured Process Description record and multiple preconfigured Process Input Parameter records for the SNTP Clock Synchronization Client are loaded into the NSDB. The Process Description record defines the client process to the INS-P Node Subsystem Manager (NSM), which initializes the process and restarts it if it goes down.

The Process Description record points to Parameter records that define the parameters passed to the client process at startup.

[Table 1: SNTP Clock Synchronization Client Process Description Record #7504](#) on page 14 shows the default values for fields in the Process Description record and indicates which fields should be changed after installation. [Table 2: SNTP Clock Synchronization Process Input Parameter Records](#) on page 15 shows the default values and allowed range of values for each Parameter record.

For an explanation of all fields in Process Description and Parameter records, see the *INS-P Configuration Planning Guide*. For instructions on changing values in these records and applying the changes to the node configuration, see the *INS-P Configuration Procedures Guide*.

Table 1: SNTP Clock Synchronization Client Process Description Record #7504

Item	Default
Record Number	6999
Start-up Group	101
Schedule Group	0
Name	\$TIME
Member of App	NODE-APP
Task ID	45
Server Class	4
Loop Timer	300
Node or App	A
Process Desc	SNTP Time Client Process
Object File Name	\$node_volume.NTPOBJ.TIMEX
Library File Name	\$node_volume.CSSLIB.NLIBRARY
Primary CPUs	0 <Change if needed; must be an INS-P admin CPU>
Backup CPUs	1 <Change if needed; must be an INS-P admin CPU>
Data Pages	0
Priority	140
Inspect	N
Minimum Copies	0 <change to 1 after installation>
Maximum Copies	0 <change to 1 after installation>

Item	Default
Create Delay	10
Network Addressability	CCS: N X.25: N BX.25: N Expand: N
Startup Message: In	<change to \$ZHOME after installation>
Out	<change to \$ZHOME after installation>
Term	\$ZHOME
Default	NTPGNDAT
Swapsubvol	No default
Text	No default
Assign Message Indexes	No defaults
Assign Param Indexes	7170, 7171, 7172, 7173, 7174, 7175, 7176, 7177, 7178, 7179, 7185, 7186. See Table 2: SNTP Clock Synchronization Process Input Parameter Records on page 15.

Table 2: SNTP Clock Synchronization Process Input Parameter Records

Record #	Name, Default Text, Range, and Description
7170	<p>Name <i>TIME-ADJUST-INTERVAL</i></p> <p>Default 60</p> <p>Range 1 - 1440 minutes</p> <p>Description The amount of time between Time Synchronization execution cycles. If the setting is outside the allowed range, the default is used.</p>
7171	<p>Name <i>TIME-ADJUST-MODE</i></p> <p>Default REPORT</p> <p>Range SETCLOCK REPORT</p> <p>Description Operational mode of the time client for diagnostics. SETCLOCK actually sets the clock, REPORT does not.</p> <p>If the setting is something other than SETCLOCK or REPORT, the default is used.</p>

Record #	Name, Default Text, Range, and Description
7172	<p>Name <i>TIME-ADJUST-MODE-THRESHOLD</i></p> <p>Default 10000</p> <p>Range 10000 - 400000 microseconds</p> <p>Description Corrections less than this value will cause the clock to be adjusted. Greater corrections will cause the clock to be set. If the setting is outside the allowed range, the default is used.</p> <p>NOTE: The value of the <i>TIME-ADJUST-MODE-THRESHOLD</i> parameter must be greater than the value of the <i>TIME-MIN-ADJUST</i> parameter.</p>
7173	<p>Name <i>TIME-BACKUP-TCPIP-PROCESS-NAME</i></p> <p>Default \$ZTC0</p> <p>Description TCPIP process name used by the client process to access the time server defined by <i>TIME-SERVER-BACKUP-IP</i>.</p>
7174	<p>Name <i>TIME-MAX-ADJUST</i></p> <p>Default 120</p> <p>Range 1 - 500 seconds</p> <p>Description The maximum allowed time adjustment that will be made per time adjustment cycle. If the setting is outside the allowed range, the default is used.</p>
7175	<p>Name <i>TIME-MIN-ADJUST</i></p> <p>Default 10000</p> <p>Range 10000 - 100000 microseconds</p> <p>Description The minimum adjustment that will be made per time adjustment cycle. If the setting is outside the allowed range, the default is used.</p>
7176	<p>Name <i>TIME-PORT</i></p> <p>Default 123</p> <p>Range 1 - 65535</p> <p>Description The IP port to be used by the time client to contact the time server during a time adjustment cycle. Do not change this port value.</p>
7177	<p>Name <i>TIME-SAMPLE-SIZE</i></p> <p>Default 20</p> <p>Range 1 - 999</p> <p>Description The number of time query responses that are used to compute the correction in a time adjustment cycle. If the setting is outside the allowed range, the default is used.</p>

Record #	Name, Default Text, Range, and Description
7178	<p>Name <i>TIME-SERVER-BACKUP-IP</i></p> <p>Default <none></p> <p>Description The IP address of the time server that the client process is to access during a time adjustment cycle.</p>
7179	<p>Name <i>TIME-SERVER-IP</i></p> <p>Default <none></p> <p>Description The IP address of the time server that the client process is to access during a time adjustment cycle.</p>
7185	<p>Name <i>TIME-TCPIP-PROCESS-NAME</i></p> <p>Default \$ZTC0</p> <p>Description TCPIP process name used by the client process to access the time server defined by <i>TIME-SERVER-IP</i>.</p>
7186	<p>Name <i>TIME-VERBOSE-MODE</i></p> <p>Default ON</p> <p>Range ON OFF MODE2</p> <p>Description ON - SNTP client reports time corrections via Event Reports (ERs) (See Event reports on page 19)</p> <p>OFF - Disables reporting of time corrections.</p> <p>MODE2 - SNTP client reports certain detailed informational events along with all the time correction events (See Event reports on page 19).</p>
7187	<p>Name <i>TIME-AUTHENTICATOR</i></p> <p>Default N</p> <p>Range N Y</p> <p>Description N - The authenticator field is an optional field in the SNTP client request message to the server. By default, this field is not included in the message.</p> <p>Y - Adds the authenticator field to the client request message. In future, the authenticator field may be used by the time server to authenticate the client request.</p>

Record #	Name, Default Text, Range, and Description
7188	<p>Name <i>SEND-ORIG-TS</i></p> <p>Default Y</p> <p>Range N Y</p> <p>Description Y - The SNTP client populates the origination timestamp field in the request message to the time server.</p> <p> N - The origination timestamp field is not populated.</p>

Chapter 4

Event reports

After the SNTP Clock Synchronization Client is installed, its Event Reports (ERs) must be loaded into the INS-P ERAD database.

Client ERs are provided in the following load file:

```
$ntp-volume.NTPGNDAT.TIMELOAD
```

Refer to the *ERAD Database Utility User's Guide* for instructions on installing the ERs from the load file.

4.1 SNTP client event reports

SNTP Client ERs are listed in numerical order on the following pages.

All ERs are generated as Category 10 APP2 Application Software Events. The information below is listed for each ER:

- ER
- Brief description
- Full description
- Alarm status
 - C = Critical alarm

Indicates severe trouble that is affecting service, where immediate corrective action is imperative, regardless of time of day or day of week.
 - ** = Major alarm

Indicates trouble that is seriously disrupting service or the malfunction of an important device, where immediate attention is required to restore or maintain system capability.
 - * _ = Minor alarm

Indicates trouble that does not have a serious effect on service or the malfunction of a device that is not essential to overall function of the system.
- Repair information, if applicable

ER Number	2400
Brief description	Time Synchronization Process I/O Subsystem Failure
Full Description	An I/O error has occurred. This typically is associated with the TCP/IP subsystem used by the time process and indicates an internal socket creation and/or binding error. In most instances, the TIME process will <i>ABEND</i> and will be restarted by the INS Node Subsystem Manager (NSM). The <i>TIME</i> process will pass a constructed text-string indicating the nature of the I/O failure. The user is directed to provide this information to HPE customer support.
Alarm Status	Not applicable
Repair Information	None available
MODE	Additional informational event with Same ER number will be reported only when the <i>TIME-VERBOSE-MODE (PIP 7186)</i> is set to <i>MODE2</i> .
ER Number	2401
Brief description	Time Synchronization Process Information Message

Full Description	Time informational message. Produced by the <i>TIME</i> process only for certain instances of internal system communication. Typically associated with the amount of deviation between the system clock and the UTC reported time value.
Alarm Status	Not applicable
Repair Information	None available
MODE	Additional informational event with Same ER number will be reported only when the <i>TIME-VERBOSE-MODE (PIP 7186)</i> is set to <i>MODE2</i> .
ER Number	2402
Brief description	Time Synchronization Process Parameter Missing
Full Description	The <i>TIME</i> process encountered an unrecoverable run-time error because a required parameter is absent from the Node Specification Database. The <i>TIME</i> process will exit and be restarted by the INS Node Subsystem Manager (NSM). The user must add the stated missing parameter.
Alarm Status	Not applicable
Repair Information	None available
ER Number	2403
Brief description	Time Synchronization Process Parameter is Invalid. Parameter out of Range.
Full Description	The <i>TIME</i> process encountered an unrecoverable run-time error because of an invalid parameter value in the Node Specification Database. The <i>TIME</i> process will exit and be restarted by the INS Node Subsystem Manager (NSM). The user must correct the stated missing parameter.
Alarm Status	Not applicable
Repair Information	None available
ER Number	2404
Brief description	Time Synchronization Process - Primary Server Unavailable
Full Description	Time Server is unavailable. Contact with the primary Time Server cannot be established. The <i>TIME</i> process will continue to attempt connection with the provided IP address. The user should examine the IP address passed as a parameter to the <i>TIME</i> process and determine whether or not it is correct. If not, the user must alter the parameter to a valid NTP source and restart the <i>TIME</i> process under change control.
Alarm Status	On
Repair Information	Verify proper operation of the specified External Time Reference. Also, confirm that the TCP/IP process is in a valid state, and verify the configuration parameter records for the Time Synchronization Process.
ER Number	2405
Brief description	Time Synchronization Process - Primary Server Available Time Server is available.
Full Description	Contact with the Primary Time Server has been established. The <i>TIME</i> process has established a connection with the NTP source provided by IP address as a startup parameter for the <i>TIME</i> process. This is a notification exception and indicates that the <i>TIME</i> process is now capable of performing time synchronization between the local system time and the NTP server time.
Alarm Status	2404 Off
Repair Information	None available

ER Number	2406
Brief description	Time Synchronization Process - Time Sync Info System Time is ~1~ seconds ~2~ Time Server Time
Full Description	Time informational message. This is the periodic report of the time synchronization process. It reflects whether the NonStop system time is inside or outside of tolerance with the referenced NTP server time. This exception only reflects the variance and does not necessarily indicate a system time correction has occurred. Time corrections are governed by the user as a parameter to the <i>TIME</i> process. If the variance exceeds that parameter, the <i>TIME</i> process will perform a <i>SETTIME</i> correction.
Alarm Status	Not applicable
Repair Information	None available
ER Number	2408
Brief description	Time Synchronization Process - Backup Server Unavailable ~1~ Time Server is unavailable
Full Description	Contact with the Backup Time Server cannot be established. The <i>TIME</i> process will continue to attempt connection with the provided IP address. The user should examine the IP address passed as a parameter to the <i>TIME</i> process and determine whether or not it is correct. If not, the user must alter the parameter to a valid NTP source and restart the <i>TIME</i> process under change control.
Alarm Status	*C On
Repair Information	Verify proper operation of the specified External Time Reference. Also, confirm that the TCP/IP process is in a valid state, and verify the configuration parameter records for the Time Synchronization Process.
ER Number	2409
Brief description	Time Synchronization Process - Backup Server Available
Full Description	Contact with the Time Server has been established. The <i>TIME</i> process has established a connection with the NTP source provided by IP address as a startup parameter for the <i>TIME</i> process. This is a notification exception and indicates that the <i>TIME</i> process is now capable of performing time synchronization between the local system time and the NTP server time.
Alarm Status	8548 Off
Repair Information	None available
ER Number	2410
Brief description	Time Synchronization Info - ~1~ Discarding adjustment. If needed, adjust time to ~2~.
Full Description	The <i>TIME</i> process has encountered a variance that exceeds the maximum allowable correction established by the user. Therefore, the sample average gets discarded. The user is directed to recheck the NTP source for their reported NTP setting and determine if the calculated variance is within tolerable limits. If so, the maximum tolerance parameter can be altered.
Alarm Status	Not applicable
Repair Information	None available
ER Number	2411
Brief description	Time Synchronization Info - ~1~ Clock synchronized within ~2~ usecs of time source. Adjustment ignored.
Full Description	The <i>TIME</i> process has encountered a variance that is less than the allowable correction established by the user. Therefore, the sample average gets ignored.

Alarm Status	Not applicable
Repair Information	None available
ER Number	2412
Brief description	Time Synchronization Process - Standard Deviation Algorithm Discards Discarding sample with Variance = ~1~
Full Description	The <i>TIME</i> process has encountered a variance that is not within the limit of correction calculated using the Standard Deviation algorithm. Therefore, the samples get discarded.
Alarm Status	Not applicable
Repair Information	None available
MODE	This information event will be reported only when <i>TIME-VERBOSE-MODE (PIP 7186)</i> is set to <i>MODE2</i> .