Managing Clock Synchronization in Oracle® Solaris 11.4

Part No: E61003
January 2019

ORACLE

Managing Clock Synchronization in Oracle Solaris 11.4

Part No: E61003

Référence: E61003

Accès aux services de support Oracle

Les clients Oracle qui ont souscrit un contrat de support ont accès au support électronique via My Oracle Support. Pour plus d'informations, visitez le site `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info` ou le site `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs` si vous êtes malentendant.

Contents

Using This Documentation

- **Overview** – Describes how to use the clock synchronization and web caching services to enhance system performance.
- **Audience** – Technicians, system administrators, and authorized service providers
- **Required knowledge** – Basic and some advanced network administration skills.

Product Documentation Library

Documentation and resources for this product and related products are available at http://www.oracle.com/pls/topic/lookup?ctx=E37838-01.

Feedback

Provide feedback about this documentation at http://www.oracle.com/goto/docfeedback.

♦ ♦ ♦ CHAPTER 1

Introduction to Clock Synchronization

This chapter provides an overview about clock synchronization in Oracle Solaris.

Overview of Clock Synchronization

Clock synchronization software synchronizes time across multiple systems in a network. Oracle Solaris uses the Network Time Protocol (NTP) and the Precision Time Protocol (PTP) to synchronize the system clock. You can also use the `rdate` command while using the `cron` utility to synchronize system clocks.

You must not run NTP and PTP on the same system simultaneously. Also, you must configure only a single instance of the NTP or PTP service on a system.

Note - Do not use the `rdate`, `ntpdate`, or `date` command to set the date and time while NTP is running. However, you can run the `ntpdate` command with the `-q` and `-d` options as it does not set the time.

Network Time Protocol Overview

NTP is open source software from the University of Delaware that is included in the Oracle Solaris software. The `ntpd` daemon sets and maintains the system time of day. The `ntpd` daemon is a complete implementation of the version 4 standard as defined by RFC 5905. You can use the `svc:/network/ntp:default` service to start the `ntpd` daemon.

The `ntpd` daemon reads the `/etc/inet/ntp.conf` file at system startup. See the `ntp.conf`(5) man page for information about configuration options. Sample `ntp.conf` files are available at `/etc/inet/ntp.server` and `/etc/inet/ntp.client` on a system.

Note the following when using NTP in your network:

- The `ntpd` daemon uses minimal system resources.
- An NTP client synchronizes automatically with an NTP server when it boots. If the client becomes unsynchronized, the client resynchronizes again when the client contacts a time server.
- If you use the NTP service on a virtualized SPARC system, you must run the NTP service in the global zone, logical domain, control domain, and kernel zone.
- You cannot run the NTP service on both global zone and non-global zone at the same time.
- By default, you cannot run the NTP service on a non-global zone because a non-global zone does not have sufficient privileges. However, if the NTP service is not running on the global zone, you can configure a non-global zone with the privileges required to run the NTP service.
- Avoid configuring exactly two NTP servers as this might lead to clock hopping.
- You must use only one NTP server to set the system time and keep it correct. However, for setting system time accurately, you can use a minimum of four NTP servers.
- Use local reference clock only when necessary.

Additional documentation for the NTP service is available at `/usr/share/doc/ntp/index.html` on a system running the Oracle Solaris 11 release.

For information about procedures for administering NTP, see "Managing the Network Time Protocol" on page 13.

Required Files for NTP

The NTP service requires the following files:

`/etc/inet/ntp.client`	Sample configuration file for NTP clients and servers.
`/etc/inet/ntp.conf`	Lists configuration options for NTP.
`/etc/inet/ntp.keys`	Contains the NTP authentication keys.

Note - This is an optional file and is not delivered by the NTP package.

`/etc/inet/ntp.leap`	Leap seconds configuration file. This is an optional file and is not delivered by the NTP package.

Note - This is an optional file and is not delivered by the NTP package.

`/etc/inet/ntp.server`	Contains additional configuration instructions for some NTP servers.
`/usr/lib/inet/ntpd`	NTP daemon. For more information, see the `ntpd`(8) man page.
`/usr/sbin/ntpdate`	Utility to set the local date and time, based on NTP. For more information, see the `ntpdate`(8) man page.
`/usr/sbin/ntpdc`	NTP query program for the `ntpd` daemon.
`/usr/sbin/ntpq`	NTP query program. For more information, see the `ntpq`(8) man page.
`/usr/sbin/ntptime`	Program to display or set the kernel time variables. For more information, see the `ntptime`(8) man page.
`/usr/sbin/ntptrace`	Program to trace NTP hosts back to the master NTP server. For more information, see the `ntptrace`(8) man page.
`/usr/sbin/ntp-keygen`	Program used to generate public and private keys for NTP. For more information, see the `ntp-keygen`(8) man page.
`/var/ntp/ntpstats`	Directory for holding NTP statistics.
`/var/ntp/ntp.drift`	Sets the initial frequency offset on NTP servers.

Precision Time Protocol Overview

The PTP software synchronizes system time across multiple systems in a broadcast domain, such as a local area network (LAN). Oracle Solaris 11.4 PTP software is implemented as the `ptpd` daemon, which is based on the public domain software available at `https://github.com/ptpd/ptpd`. It implements PTP Version 2 as defined in the IEEE standard 1588-2008.

The `ptpd` daemon can use the hardware assistance capability provided by any compatible Network Interface Card (NIC) and its driver to timestamp the PTP packets.

You can use the `svc:/network/ptp:default` service to start the `ptpd` daemon. You can configure a system as a PTP slave or a PTP master.

- **PTP slave** – Runs the `ptpd` daemon in slave mode. A PTP slave synchronizes the system clock to a master clock present in the subnet.
- **PTP master** – Runs the `ptpd` daemon in master mode. Other systems in the slave mode can synchronize their clock to the PTP master.

The state of the `ptpd` daemon can be `slave`, `master`, or `initializing`.

By default, the service management facility starts the PTP service as a slave and binds the PTP service to the first interface that is up and running. For more information about the Service Management Facility, see the `smf`(7) man page.

The `ptpd` daemon uses the `/var/log/ptp.log` file to record the following information:

- Timestamp of the PTP log entry
- State of the `ptpd` daemon
- Clock ID

For task information, refer to "Managing the Precision Time Protocol" on page 15.

♦ ♦ ♦ CHAPTER 2

Managing Clock Synchronization

Many databases and authentication services require system clocks to be kept synchronized within a network. This chapter covers the following related topics:

Managing the Network Time Protocol

The procedures in this section describe how to set up and use the NTP service. You can set up a Oracle Solaris system as an NTP server or an NTP client.

▼ How to Set Up NTP on a Oracle Solaris System

1. **Become an administrator.**

   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.

2. **Copy the `ntp.client` file to use as a template for the `ntp.conf` file.**

```
# cd /etc/inet
# cp ntp.client ntp.conf
```

   The `ntp.client` and `ntp.server` files give examples of many configuration options for `ntpd`. More information is available in the `ntp.conf(5)` man page.

Note - You must use the `pfedit` command to edit the `ntp.conf` file.

---

3. **Make site-specific changes to the `ntp.conf` file as needed.**

4. **(Server-only) Add information from the `ntp.server` file to the `ntp.conf` file.**

5. **Start the `ntpd` daemon.**

```
# svcadm enable ntp
```

How to Enable NTP Logging

1. **Become an administrator.**

   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.

2. **Enable logging.**

```
# svccfg -s svc:/network/ntp:default setprop config/verbose_logging = true
```

   See the `svccfg`(8) man page for more information.

3. **Update the SMF repository and restart the service.**

```
# svcadm refresh svc:/network/ntp:default
# svcadm restart svc:/network/ntp:default
```

4. **Verify that logging has been enabled.**

```
# svcprop -p config/verbose_logging svc:/network/ntp:default
true
```

How to Display the SMF Properties Associated With the NTP Service

- **List the SMF properties by using the `svcprop` command.**

  - To list all of the properties associated with the NTP service:

```
# svcprop svc:/network/ntp:default
```

  - To list all of the properties in the `config` property group:

```
# svcprop -p config svc:/network/ntp:default
```

Managing the Precision Time Protocol

You can use the PTP service, `svc:/network/ptp:default`, to set up an interface as a PTP master or a PTP slave. The procedures in this section describe how to set up the PTP service for clock synchronization.

▼ How to Install PTP

1. **Become an administrator.**
   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.
2. **Verify whether the PTP package is installed.**

   ```
   # pkg info ptp
   ```
3. **Install the PTP package if it is not installed.**

   ```
   # pkg install ptp
   ```

▼ How to Set Up an Interface as a PTP Master

1. **Become an administrator.**
   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.
2. **Assign a system as the PTP master.**

   ```
   # svccfg -s svc:/network/ptp:default setprop config/node_type=master
   ```
3. **Enable an interface to listen to the PTP packets.**

   ```
   # svccfg -s svc:/network/ptp:default setprop config/listen_ifname=interface-name
   ```
4. **Determine whether the PTP service is enabled by using the `svcs` command.**

- If the PTP service is not enabled on the master system, enable it.

  ```
  # svcadm enable svc:/network/ptp:default
  ```

- If the PTP service is already enabled, restart the PTP service.

  ```
  # svcadm restart svc:/network/ptp:default
  ```

How to Set Up an Interface as a PTP Slave

1. **Become an administrator.**

   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.

2. **Enable an interface to listen to the PTP packets.**

   ```
   # svccfg -s svc:/network/ptp:default setprop config/listen_ifname=interface-name
   ```

3. **Assign the interface as a PTP slave.**

   ```
   # svccfg -s svc:/network/ptp:default setprop config/node_type=slave
   ```

4. **Enable the PTP service on the slave system.**

   ```
   # svcadm enable svc:/network/ptp:default
   ```

How to Enable PTP Logging

1. **Become an administrator.**

   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.

2. **Enable PTP logging.**

   ```
   # svccfg -s svc:/network/ptp:default setprop config/enable_logging=true
   ```

   For more information, see the `svccfg`(8) man page.

3. **Restart the PTP service.**

   ```
   # svcadm restart svc:/network/ptp:default
   ```

Identifying Whether a NIC Provides PTP Hardware Assistance

PTP can use the hardware assistance capability provided by any compatible NIC to improve the clock synchronization accuracy.

To determine whether a NIC provides hardware assistance to the `ptpd` daemon, issue the following command:

```
# dladm show-linkprop -p ptp
```

If the `ptp` property value that is displayed in the `VALUE` field of the output is `1` (one), then the corresponding NIC provides hardware assistance to the `ptpd` daemon.

You can configure the `ptpd` daemon to use the hardware assistance that is provided by a NIC. For more information, see "How to Enable the PTP Service to Use the PTP Hardware in a NIC" on page 17.

EXAMPLE 1 Displaying the PTP Property of NICs in a System

```
# dladm show-linkprop -p ptp
LINK  PROPERTY PERM VALUE EFFECTIVE DEFAULT POSSIBLE
net1  ptp      r-   0     0         0       --
net2  ptp      r-   0     0         0       --
net0  ptp      r-   0     0         0       --
net3  ptp      r-   0     0         0       --
net6  ptp      r-   0     0         0       --
net7  ptp      r-   0     0         0       --
net4  ptp      r-   1     1         0       --
net5  ptp      r-   0     0         0       --
```

This example displays the `ptp` property value for the interface cards in the system. The integer 1 in the `VALUE` field for `net4` indicates that `net4` can provide hardware assistance to the `ptpd` daemon. Currently, NICs using the `i40e` driver support hardware assisted PTP.

▼ How to Enable the PTP Service to Use the PTP Hardware in a NIC

1. **Become an administrator.**

For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.

2. **Ensure that the PTP service is enabled.**

```
# svcs -l  svc:/network/ptp:default
```

3. **Check whether any of the NICs support PTP.**

```
# dladm show-linkprop -p ptp
```

4. **If a NIC is found, configure the PTP service to use the PTP hardware.**

```
# svccfg -s svc:/network/ptp:default setprop config/use_hw=true
```

5. **Restart the PTP service.**

```
# svcadm restart svc:/network/ptp:default
```

Synchronizing the Date and Time From Another System

The following procedure describes how to update the current time without having to set up NTP.

▼ How to Synchronize the Date and Time From Another System

1. **Become an administrator.**

   For more information, see "Using Your Assigned Administrative Rights" in *Securing Users and Processes in Oracle Solaris 11.4*.

2. **Reset the date and time to synchronize with another system.**

```
# rdate other-system-name
```

3. **Verify that you have reset your system's date correctly by using the `date` command.**

   The output should show a date and time that matches that of the other system.

Example 2 Synchronizing Date and Time From Another System

This example shows how to use `rdate` to synchronize the date and time of one system with another. In this example, the system `earth`, running several hours behind, is reset to match the date and time of the server `mars`.

```
earth# date
Tue Jun  3 11:08:27 MDT 2014
earth# rdate mars
Tue Jun  3 14:06:37 2014
earth# date
Tue Jun  3 14:06:40 MDT 2014
```

Index

R

S

T

U

V