1.111.6
Maintain system time
Weight 4

Linux Professional Institute Certification — 102

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2005 September

Outline

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1.111.6 <u>**Maintain system time [4]**</u>

2 Objective

Description of Objective

Candidate should be able to properly maintain the system time and synchronize the clock over NTP. Tasks include:

- setting the system date and time,

- setting the BIOS clock to the correct time in UTC,

- configuring the correct timezone for the system and

- configuring the system to correct clock drift to match NTP clock.

Key files, terms, and utilities include:

/usr/share/zoneinfo — a directory containing time zone information for many different regions

/etc/timezone — On Debian systems, holds the timezone

/etc/localtime — a symbolic link to the correct file in /path/usr/share/zoneinfo/

`/etc/ntp.conf` — configuration file for NTP

`/etc/ntp.drift` — where NTP stores correction for local clock being fast/slow

`date` — command for showing/setting system time

`hwclock` — command for setting hardware clock, or setting system time from hardware clock

`ntpd` — NTP server

`ntpdate` — used to set system time from a remote NTP server

3   Resources

Maintain system time [4]

web `http://www.ntp.org`

Debian ntp-doc `/usr/share/doc/ntp-doc/index.html` on sarg.

LPI Linux Certification in a Nutshell: by Jeffrey Dean O'Reilly

LPIC 1 Certification Bible: *Angie Nash and Jason Nash* Hungry Minds

4   `date`

`date`
    The date command without any options will print the current date and time. The date will be relative to any timezone set for the machine.

```
$ date ↩
Tue May 21 09:57:51 EST 2002
```

`date`

`-I` Output an ISO-8601 compliant date (YYYY-MM-DD)

```
$ date -I ↩
2002-05-21
```

`-R` Output an RFC-822 compliant date (Local time + GMT 0ffset)

```
$ date -R ↩
Tue, 21 May 2002 10:14:09 +1000
```

`-r` **`<file>`** Display the last modification time of file

```
$ date -r ~/ivr/va/src/va.c ↩
Mon May 20 12:55:48 EST 2002
```

`date`

`-d <STRING>` Display date described by string instead of now

```
$ date -d "last Monday 4 years ago" ↩
Mon May 18 00:00:00 EST 1998
```

`-u` Display UTC time & date instead of localtime

```
$ date ↩
Tue May 21 10:55:34 EST 2002
$ date -u ↩
Tue May 21 00:55:34 UTC 2002
```

`date`

`-s <date>` Set the system time (must be superuser)

```
# date -s "Tue May 21 10:03:06 EST 2002" ↩
Tue May 21 10:03:06 EST 2002
```

`+FORMAT` Display date in user defined format

```
$ date +"Today is %A, %d %B, %Y" ↩
Today is Tuesday, 21 May, 2002
```

5   Hardware Clock and System Clock

Hardware ("RTC") vs. System Clock

- The *Hardware, or Real Time Clock (RTC)*

  - hardware clock is located on the motherboard
  - Sometimes (for hysterical reasons) called the Real Time Clock (RTC)
  - keeps track of the time when the system is not powered up.

- The *system clock*

  - maintained in the Linux kernel and
  - is used while the system is running.

6 **hwclock**

hwclock

Hwclock is used to do the following:

- Set the system clock from the Hardware clock
- Set the hardware clock from the system clock
- Show the time/date held by the RTC
- Adjust the RTC to account for clock drift

hwclock

- To set the system time from the RTC, use the following option to hwclock:

  ```
  hwclock -s  (or hwclock -hctosys)
  ```

- To set the RTC from the system time, use this option:

  ```
  hwclock -w  (or hwclock -systohc)
  ```

- To display the contents of the RTC, use this option:

  ```
  hwclock -r  (or hwclock -show)
  ```

- To adjust the RTC for clock drift, use this option:

  ```
  hwclock -a  (or hwclock -adjust)
  ```

Note that the file `/etc/adjtime` is used to hold information about the extent to which (and direction) your RTC drifts

7 NTP — Network Time Protocol

NTP — Network Time Protocol

NTP is a time protocol used to synchronise a systems clock to master time source. For example, the CSIRO maintains a nationwide time source with atomic clock accuracy. As a user I can synchronise my system to that time source by sending a request to the CSIRO's ntp server.

Features and properties of NTP include:

- NTP takes into account the time taken to send/receive NTP packets

- Uses the UDP protocol
- Uses Port 123 plus one other unpriveledged port (1024:65535)
- Can operate in both client & server modes
- There are 3 versions of the protocol (ntp1, ntp2 & ntp3)
- Available for Unix & Windows machines.

7.1 NTP Tools

NTP — Network Time Protocol

NTP normally comes in a package and contains the following binaries:

- `ntpd` — Network Time Protocol (NTP) daemon
- `ntpq` — standard NTP query program
- `ntpdc` — special NTP query program
- `ntpdate` — set the date and time via NTP
- `ntptrace` — trace a chain of NTP servers to the primary source
- `tickadj` — set time-related kernel variables
- `ntptime` — read kernel time variables
- `ntp-genkeys` — generate public and private keys

7.2 NTP — Overview of setup

NTP — Network Time Protocol

A quick guide to installing & setting up NTP:

- Install NTP package (`yum install ntp`) or `apt-get install ntp`
- Modify `/etc/ntp.conf` to reflect time servers
- Start the service: `service ntpd start`
- Ensure service starts at boot with `chkconfig ntp on`
- Confirm operation using `ntpq -p`

That's all there is to it! The hardest part is deciding which public time servers to use.

7.3   `ntpdate`

NTP — Network Time Protocol

- `ntpdate` is a command line utility that will set the local machines time & date from the indicated remote time server(s).

- More than one server can be specified in order for ntp to get a better idea of the transit time and overall server accuracy.

- Running as a cron job is a simple way to maintain system time

Usage: `ntpdate [options] server ...`

```
# ntpdate ntp.nml.csiro.au
21 May 14:01:13 ntpdate[4002]: adjust time server 10.27.1.10
offset -0.000804 sec
```

This will set the local machines system time using server `ntp.nml.csiro.au`

7.4   `ntpd`

`ntpd` — The NTP daemon

- `ntpd` is a better way to maintain the system time on a permanent basis.

- `ntpd` acts as both a client & server (Linux only).

- In server mode, other machines on the local network can use the server to set their own system clocks

- For Windows machines, automachron is available.

- `ntpd` also keeps track of drift in the hardware clock.

The NTP daemon is normally started up by the system initialisation scripts:

Debian or Red Hat : $ **`/etc/init.d/ntp start`** ↵

Red Hat : $ **`service ntp start`** ↵

7.5   NTP configuration files

`ntpd` usage & configuration

Usage: `ntpd [options] &`
(normally done in the `/etc/init.d` scripts)
NTPD is configured using these files:

- `/etc/ntp.conf` — Configuration file

- `/etc/ntp.drift` — RTC drift file

- `/etc/ntp.keys` — Key file (for authentication mode)

The only file of concern to the user is `ntp.conf`. The other files are all written to and read by the ntp applications.

7.6   Sample `ntp.conf`

NTP — Network Time Protocol

```
# Disable authentication mode
disable auth
restrict default ignore        # ignore all requests by default
server   ntp.cs.mu.OZ.AU         # 128.250.36.2
server   apphys16.mst.csiro.au  # 138.194.21.154
server   ntp.nml.csiro.au       # 130.155.98.1
server   127.0.0.1              # localhost
# Lift restrictions on time servers
restrict 128.250.36.2 nomodify  # time service only, no rt mods
restrict 138.194.21.154 nomodify
restrict 130.155.98.1 nomodify
# All local addresses are unrestricted
restrict 127.0.0.1
restrict 10.27.1.0 mask 255.255.255.0
# Set the default drift file
driftfile /etc/ntp/drift
```

7.7   NTP servers in Australia

Public Time Servers

A (partial) list of public time servers is shown below. When using these servers, it is considered polite to advise the administrator of the service that you intend to use it.

- Primary NTP Time Servers

  – ntp.cs.mu.OZ.AU (128.250.36.2)

– apphys16.mst.csiro.au (138.194.21.154)

– ntp.nml.csiro.au (130.155.98.1)

- Secondary NTP Time Servers

    – ntp.saard.net (203.21.37.18)

    – ntp.iprolink.co.nz (36.50.59.6)

7.8 `ntpq` — Testing NTP

NTP — Network Time Protocol

Once you have the NTP daemon up & running, the easiest way of testing it is to use the `ntpq` utility.

```
$ ntpq
ntpq> pe
     remote       refid    ...      delay   offset  jitter
==================================================================
 localhost.local 0.0.0.0   ...      0.000    0.000 4000.00
xmurgon.cs.mu.OZ .GPS.     ...    526.202  -206.43 208.270
+apphys16.mst.cs .ATOM.    ...    169.956   -5.576  87.828
*tictoc.tip.CSIR .ATOM.    ...    149.988  -24.328   6.761
ntpq> q
$
```

Or more simply:

```
$ ntpq -p
     remote       refid    ...      delay   offset  jitter
==================================================================
 localhost.local 0.0.0.0   ...      0.000    0.000 4000.00
xmurgon.cs.mu.OZ .GPS.     ...    526.202  -206.43 208.270
+apphys16.mst.cs .ATOM.    ...    169.956   -5.576  87.828
*tictoc.tip.CSIR .ATOM.    ...    149.988  -24.328   6.761
$
```

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