1.111.6 Maintain system time Weight 4

Linux Professional Institute Certification — 102

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2005 September

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Hardware Clock and System Clock

nwclock

NTP — Network Time

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Topic 111 Administrative Tasks [21] Where we are up to

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1.111.1 Manage users and group accounts and related system files [4]

- 1.111.2 Tune the user environment and system environment variables [3]
- 1.111.3 Configure and use system log files to meet administrative and security needs [3]
- 1.111.4 Automate system administration tasks by scheduling jobs to run in the future [4]
- 1.111.5 Maintain an effective data backup strategy [3]
- 1.111.6 Maintain system time [4]

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.

```
/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
```

Maintain system time [4]

Resources of interest

web http://www.ntp.org

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

LPIC 1 Certification Bible: Angie Nash and Jason Nash Hungry Minds 1.111.6 Maintain system time Weight 4

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TP — Network Time

date Display or Set System Date & Time

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 \hookleftarrow

Tue May 21 09:57:51 EST 2002

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

\$ **date -I** ← 2002-05-21

 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

-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

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

date -s "Tue May 21 10:03:06 EST 2002" NTP-Network Time

 \leftarrow

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

Hardware Clock and System Clock

Protocol

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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.

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- 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

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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:

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hwclock -a (or hwclock -adjust)
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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.

- 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.

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- 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

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Quick install guide

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.

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- 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

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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 ←
```

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ntpd usage & configuration

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- ▶ /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.

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Sample ntp.conf file

```
# 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
                              # 130.155.98.1
server ntp.nml.csiro.au
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
```

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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)

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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				
Ś				

Or more simply:

\$ ntpq -p

remote	refid	 delay	offset	jitter
localhost.local	0.0.0.0	 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	.MOTA.	 149.988	-24.328	6.761
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