Outline

Contents

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
/etc/timezone
/etc/localtime
/etc/ntp.conf
/etc/ntp.drift
date
hwclock
ntpd
ntpdate
```

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

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
```

RTC vs. System Clock

This is the hardware clock and is located on the motherboard of the system. This is what keeps track of the time when the system is not powered up.

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

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

- 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

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.

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

NTP - Network Time Protocol

For anyone new to NTP, here's a quick guide to installing & setting up NTP.

- Install NTP package (`rpm -Uvh ntp-4.1.0-4.rpm`) or `apt-get install ntp`

- Modify /etc/ntp.conf to reflect time servers

- Start the service: `service ntpd start`

- Confirm operation using ntpq (command pe)

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

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`

`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 RTC drift.

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

Debian :$ `/etc/init.d/ntp {start|stop|restart|force-reload}` ↵

RedHat : $ `service ntp start` ↵

`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.

```
# 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
```

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 on using it.

- 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)

- ntp.saard.net (203.21.37.18)

- ntp.iprolink.co.nz (36.50.59.6)

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
#
```

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