

– LPI 102 –

# Maintain system time [3]

(Linux Professional Institute Certification)

a

```
.~.  
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@._.>@
```

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## Maintain system time [4]

### Objective

Candidate should be able to properly maintain the system time and synchronise 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
- Configuring the system to correct clock drift to match NTP clock.

# Maintain system time [4]

## Key files, terms, and utilities

date

hwclock

ntpd

ntpdate

/usr/share/zoneinfo

/etc/timezone

/etc/localtime

/etc/ntp.conf

/etc/ntp.drift

# Maintain system time [4]

## Resources of interest

**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**

## 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 ↵
```

```
Tue May 21 09:57:51 EST 2002
```

**date**

## Options to the Date command

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

```
$ date -I ↵
```

```
2002-05-21
```

# date

## Options to the Date command

- 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 Offset)

```
$ date -R ↵
```

```
Tue, 21 May 2002 10:14:09 +1000
```

# date

## Options to the Date command

**-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 Offset)

```
$ 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**

## Options to the Date command

**-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
```

# date

## Options to the Date command

**-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**

## Options to the Date command

**-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
```

# date

## Options to the Date command

**-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

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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.

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## The *system clock*

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

**hwclock**

**RTC vs. System clock**



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

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

```
hwclock -r (or hwclock --show)
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```
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- To adjust the RTC for clock drift, use this option:

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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.

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- 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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## The suite of tools

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- `ntptime` - read kernel time variables
- `ntp-genkeys` - generate public and private keys

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or

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apt-get install ntp
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- Start the service: `service ntpd start`

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- Modify `/etc/ntp.conf` to reflect time servers
- Start the service: `service ntpd start`
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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).



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- 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
```

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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**

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- For Windows machines, automachron is available.



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- 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:

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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

# 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)

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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.

## 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
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.

### 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)



# NTP - Network Time Protocol

## Testing NTP

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
murgon.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
```

```
#
```