

Keeping the system time on your Linux box correct.

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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, Utilities

- /etc/timezone
- /usr/share/zoneinfo
- /etc/localtime
- /etc/ntp.conf
- /etc/ntp.drift
- **date**
- **hwclock**
- **ntpd**
- **ntpdate**

Options to date

```
[ecorrado@ecorrado ~]$ date --help
```

```
Usage: date [OPTION]... [+FORMAT]
```

```
or: date [-u|--utc|--universal] [MMDDhhmm[[CC]YY][.ss]]
```

```
Display the current time in the given FORMAT, or set the system date.
```

```
-d, --date=STRING          display time described by STRING, not
`now'
-f, --file=DATEFILE       like --date once for each line of DATEFILE
-I, --iso-8601[=TIMESPEC] output date/time in ISO 8601
format.
                           TIMESPEC=`date' for date only,
                           `hours', `minutes', or `seconds' for date
and
                           time to the indicated precision.
                           --iso-8601 without TIMESPEC defaults to
`date'.
-r, --reference=FILE      display the last modification time of FILE
-R, --rfc-2822            output RFC-2822 compliant date string
-s, --set=STRING          set time described by STRING
-u, --utc, --universal    print or set Coordinated Universal Time
--help                    display this help and exit
--version                 output version information and exit
```

`/etc/timezone`

This is a text file that lists the time zone for the machine. An example would be:

`Pacific/Aukland`

or

`US/Eastern`

/usr/share/zoneinfo/* /etc/localtime

`/usr/share/zoneinfo/` is a directory that has all of the time zones in it. To setup your timezone, you want to link `/etc/localtime` to it. For example.

```
livecd / # ls /usr/share/zoneinfo/US
Alaska Arizona East-Indiana Hawaii
Michigan Pacific Aleutian Central
Eastern Indiana-Starke Mountain Samoa
livecd / # ln -sf
/usr/share/zoneinfo/US/Pacific
/etc/localtime
```

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.
-
- [lug@ip]\$ date
- Fri Mar 4 19:57:51 EST 2004

hwclock

- Hwclock queries and sets the hardware clock
- The Real Time Clock (RTC) is the hardware clock and is located on the motherboard. This is what keeps track of the time when the system is not powered up. The system clock is maintained in the Linux kernel and is used while the system is running.

Setting the system clock to the hardware clock

- To set the system time from the RTC, use the following option: **hwclock -s** (or **hwclock -hctosys**)
- To set the RTC from the system time, use this option: **hwclock -w** (or **hwclock -systohc**)
- 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

NTP is a time protocol used to synchronize 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 synchronize my system to that time source by sending a request to the CSIRO's ntp server.

Features 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 unprivileged port (1024:65535)
- Can operate in both client & server modes
- There are 3 versions of the protocol (ntp1, ntp2 & ntp3)
- Available for Linux, Unix & Windows machines.

NTP normally includes 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

ntpdate - Set system time & date

- 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

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 initialization scripts.

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.

Sample ntp.conf file

```
# A simple ntp.conf
server 127.127.1.0 # local clock
fudge 127.127.1.0 stratum 10
driftfile /etc/ntp/drift
restrict default ignore
restrict 127.0.0.0 mask 255.0.0.0
authenticate no
server ntp5.someserver.etc
restrict 123.123.123.123 nomodify # ntp5.ss.etc
```