

# LPI 108.1 - Maintain System Time

Curs 2021 - 2022

ASIX M01-ISO 108 Essential System Services

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# Maintain system time

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## Description

### Key concepts:

- ☐ Set the system date and time.
- ☐ Set the hardware clock to the correct time in UTC.
- ☐ Configure the correct timezone.
- ☐ Basic NTP configuration using ntpd and chrony.
- ☐ Knowledge of using the pool.ntp.org service.
- ☐ Awareness of the ntpq command.

### Commands and files:

- ☐ /usr/share/zoneinfo/
- ☐ /etc/timezone
- ☐ /etc/localtime
- ☐ /etc/ntp.conf
- ☐ /etc/chrony.conf
- ☐ date
- ☐ hwclock
- ☐ timedatectl
- ☐ ntpd
- ☐ ntpdate
- ☐ chronyc
- ☐ pool.ntp.org

## System Time

Linux-based systems have two types of clocks:

- System clock
- Hardware clock

### System Clock

This is a clock maintained by the kernel and is interrupt-driven. The value of this clock is initialized from the hardware clock at boot time. The system time is calculated as the number of seconds since January 1st 1970 00:00:00. (This reference time is known as epoch time or sometimes [UNIX time](#).) The system clock contains the current time as well as time zone information.

Main purpose: used by the kernel.

## Hardware Clock

This is a battery-powered clock that keeps time even when the system is shut down. When the system boots, the system clock is set using the value of the hardware clock. When the system is shut down, the hardware clock is set to the value of the system clock. This ensures that both the clocks are [synchronized](#). The hardware clock is also known as the [real time clock \(RTC\)](#) or the CMOS/BIOS clock. The hardware clock stores the following values: [year](#), [month](#), [day](#), [hour](#), [minute](#), and [seconds](#).

Main purpose: maintain the time when the system is off.

## Time Standards and concepts

- UTC Coordinated Universal Time
- GMT Greenwich Mean Time
- Daylight Saving

## UTC (Coordinated Universal Time)

Is the standard time used globally. The various time zones are expressed in terms of positive or negative offsets with regards to UTC. The local time is set to the current time zone and has to be adjusted by individual software programs to the UTC time accordingly.

## GMT (Greenwich Mean Time)

Is often confused with UTC, is a time zone that coincides with UTC. Neither GMT nor UTC changes with Daylight Saving Time, although some places that use GMT do.

## Daylight Saving

Changes to time depending on the part of the year. Changes of daylight saving affect the system clock but not the hardware clock.

## adjust

It is normal for the clocks to slowly diverge as time passes because of the way that time is calculated differently for the hardware clock and the system clock.

## drift

The hardware clock drift is how much time the hardware clock gains or loses at a regular rate.

# Hardware Clock

## [hwclock](#)

Command to maintain the hardware clock (root). Is an administration tool for the time clocks. It can: display the Hardware Clock time; set the Hardware Clock to a specified time; set the Hardware Clock from the System Clock; set the System Clock from the Hardware Clock; compensate for Hardware Clock drift; correct the System

Clock timescale; set the kernel's timezone, NTP timescale, and epoch (Alpha only); and predict future Hardware Clock values based on its drift rate.

Commands and files:

- `hwclock`
- `hwclock --set --date "01/01/2022 15:00"`
- `hwclock --systohc | hwclock -w`
- `hwclock --hctosys | hwclock -s`
- `hwclock -r | --show | --get`
- `hwclock --utc`
- `hwclock --localtime`
- `hwclock --adjust`
  
- `/etc/adjtime`
- `/etc/localtime`

Concepts:

- Establishes the hardware or RTC clock.
- It is preferable to be in UTC.
- It is normal for the clocks to slowly diverge as time passes because of the way that time is calculated differently for the hardware clock and the system clock. So it may be necessary to synchronize manually on systems permanently on.
- The `hwclock` is copied to the system clock on startup, and on poweroff the system clock is copied to the `hwclock`.

```
#1
# hwclock
2021-10-31 13:05:41.341243+01:00

# date
Sun 31 Oct 2021 01:06:15 PM CET
```

```
#2
# hwclock --set --date "01/01/2022 15:00"

# hwclock
2022-01-01 15:00:05.263048+01:00

# date
Sun 31 Oct 2021 01:09:06 PM CET
```

```
# hwclock --systohc

# hwclock
2021-10-31 13:10:12.356884+01:00

# date
Sun 31 Oct 2021 01:10:15 PM CET

# hwclock -r
2021-10-31 13:15:54.919341+01:00
```

Adjust / drift / times

- UTC
- localtime
- /etc/localtime
- /etc/adjtime
- if not specified hwclock uses the type of time established in /etc/adjtime (UTC or LOCAL).
- this file contains information about past times and the drift. How does the hardware clock differ to the time.
- contains the last type of time used in the last order and the default to use in commands if the type of time (utc or local) is not specified).

```
#3
# ls -l /etc/localtime
lrwxrwxrwx. 1 root root 35 Apr  7 2021 /etc/localtime ->
../usr/share/zoneinfo/Europe/Madrid

# file /etc/localtime
/etc/localtime: symbolic link to ../usr/share/zoneinfo/Europe/Madrid

# cat /etc/adjtime
0.000000 1635682209 0.000000
1635682209
UTC
```

```
#4
# hwclock --set --utc --date "12/25/2021"

# hwclock
2021-12-25 00:00:03.622497+01:00

# hwclock --set --localtime --date "12/31/2021"

# hwclock
2021-12-31 00:00:02.059910+01:00

# cat /etc/adjtime
0.000000 1640905200 0.000000
1640905200
LOCAL
```

## System Clock

The `date` command is used to display and set the system date and time. In addition to displaying and setting the date, the date command is regularly used in scripts for assigning filenames with timestamps suffixed to them.

Should not be used to attempt to update the system clock if the NTP (Network Time Protocol) service, which syncs the software clock with internet time servers, has been set up on the server.

date commands:

- date
- date +%d-%m-%y
- date +"%d/%m/%Y"
- date --set "01/01/2022 12:00"
- date +%s

date format:

%d	Day of month (e.g., 30)
%H	Hour (0-23)
%I	Hour (1-12)
%m	Month (1-12)
%M	Minute (0-59)
%S	Seconds (0-60)
%T	Time (%H:%M:%S)
%u	Day of week (1-7, 1=Monday)
%Y	Year
%F	Full date; same as %Y-%m-%d
%a	day of week (name)
%b	month (name)

```
#5
$ date
Sun 31 Oct 2021 01:43:15 PM CET

$ date +%d-%m-%y
31-10-21

$ date +"%d/%m/%Y"
31/10/2021

$ date +%F
2021-10-31

$ date +%D
10/31/21

$ date +%b
Oct

$ date +"%u %b"
7 Oct

$ date +"%H:%M"
13:10

$ date +"The time is: %H:%M"
The time is: 13:10

$ date +%s
1635688488

$ date -d +"3 month 12 days"

$ date %m/%d/%Y -d -"2 weeks"
```

```
#6
# date --set "01/25/2022 12:05"
Tue 25 Jan 2022 12:05:00 PM CET

# hwclock
2021-10-31 12:47:55.918840+01:00
```

```
# hwclock --hctosys

# date
Sun 31 Oct 2021 12:48:32 PM CET

#!!! attention: setting wrong time may cause the host not able to connect to internet

# date +%Y%m%d -s "20111125"

# date +%T -s "13:11:00"
```



## Your clock is ahead

A private connection to [www.google.com](http://www.google.com) can't be established because your computer's date and time (Tuesday, January 25, 2022 at 12:07:07 PM) are incorrect.

NET::ERR\_CERT\_DATE\_INVALID

💡 To get Chrome's highest level of security, [turn on enhanced protection](#)

Advanced

Update date and time

```
#7
$ touch file-$(date +%Y%m%d)

$ ls file-20211031
file-20211031
```

## Time Zones

- /etc/localtime
- /usr/share/zoneinfo
- Debian: /etc/timezone
- TZ variable (export TZ=America/New\_York)

The file /etc/localtime is a symbolic link to the appropriate timezone file in /usr/share/zoneinfo. Changing the link manually is a way to change the timezone.

```
#8
$ ls -l /etc/localtime
lrwxrwxrwx. 1 root root 35 Apr  7 2021 /etc/localtime ->
../usr/share/zoneinfo/Europe/Madrid

$ ls /usr/share/zoneinfo/
Africa      Australia  Cuba      Etc        GMT+0      Iceland   Japan      MST
Poland      right      UCT       zone1970.tab
America     Brazil    EET       Europe     GMT-0      Indian    Kwajalein  MST7MDT
Portugal    ROC       Universal zone.tab
Antarctica  Canada    Egypt     Factory    GMT0       Iran      leapseconds Navajo
posix       ROK       US        Zulu
Arctic      CET       Eire      GB          Greenwich iso3166.tab Libya      NZ
posixrules  Singapore UTC
Asia        Chile     EST       GB-Eire     Hongkong   Israel     MET        NZ-CHAT
PRC         Turkey    WET
Atlantic    CST6CDT   EST5EDT   GMT         HST        Jamaica    Mexico     Pacific
PST8PDT     tzdata.zi W-SU

$ ls -l /usr/share/zoneinfo/Europe/Madrid
-rw-r--r--. 1 root root 2628 Jan 26 2021 /usr/share/zoneinfo/Europe/Madrid

$ file /usr/share/zoneinfo/Europe/Madrid
/usr/share/zoneinfo/Europe/Madrid: timezone data, version 2, 11 gmt time flags, 11 std
time flags, no leap seconds, 163 transition times, 11 abbreviation chars
```

```
#9
$ tzselect
Please identify a location so that time zone rules can be set correctly.
Please select a continent, ocean, "coord", or "TZ".
1) Africa                                     7) Europe
2) Americas                                  8) Indian Ocean
3) Antarctica                               9) Pacific Ocean
4) Asia                                     10) coord - I want to use
geographical coordinates.
5) Atlantic Ocean                           11) TZ - I want to specify
the timezone using the Posix TZ format.
6) Australia
```

## Command timedatectl

Timedatectl may be used to query and change the system clock and its settings, and enable or disable time synchronization services. May be used to show the current status of time synchronization services, for example `systemd-timesyncd.service(8)`.

```
#10
$ timedatectl
          Local time: Sun 2021-10-31 14:09:54 CET
          Universal time: Sun 2021-10-31 13:09:54 UTC
              RTC time: Sun 2021-10-31 13:09:54
          Time zone: Europe/Madrid (CET, +0100)
System clock synchronized: yes
              NTP service: active
          RTC in local TZ: no
```

```
$ timedatectl show
Timezone=Europe/Madrid
LocalRTC=no
CanNTP=yes
```



```
NTP=yes
NTPSynchronized=yes
TimeUSec=Sun 2021-10-31 14:13:04 CET
RTCTimeUSec=Sun 2021-10-31 14:13:04 CET
```

From the previous command observe:

- local time is 1h after UTC (14h)
- RTC time, hardware clock is in UTC and not in TZ.
- Time zone is Madrid with +1h of daylight time saving.
- NTP is active

Commands:

**show | --status**

Show time and time zone information

**set-time**

Set the system clock to the specified time. This will also update the RTC time accordingly.

**set-timezone**

Set the system time zone to the specified value. Available time zones can be listed with list-timezones. If the RTC is configured to be the local time, this will also update the RTC time. This call will alter the /etc/localtime symlink.

**list-timezones**

List available time zones,

**timesync-status**

Show the current status of synchronization to the current Network Time Protocol (NTP).

**set-ntp yes/no**

Controls whether network time synchronization is active and enabled.

```
#11
$ timedatectl list-timezones
Africa/Abidjan
Africa/Accra
Africa/Algiers
Africa/Bissau
Africa/Cairo

# timedatectl timesync-status
Failed to query server: Could not activate remote peer.
```

```
#12
# timedatectl set-timezone Europe/Andorra

# timedatectl
    Local time: Sun 2021-10-31 14:21:02 CET
    Universal time: Sun 2021-10-31 13:21:02 UTC
    RTC time: Sun 2021-10-31 13:21:02
    Time zone: Europe/Andorra (CET, +0100)
System clock synchronized: yes
    NTP service: active
    RTC in local TZ: no

# timedatectl show
Timezone=Europe/Andorra
LocalRTC=no
CanNTP=yes
NTP=yes
NTPSynchronized=yes
```

```
TimeUsec=Sun 2021-10-31 14:21:16 CET
RTCTimeUsec=Sun 2021-10-31 14:21:16 CET
```

```
# timedatectl timesync-status
    Server: 103.106.65.219 (0.debian.pool.ntp.org)
Poll interval: 8min 32s (min: 32s; max 34min 8s)
    Leap: normal
    Version: 4
    Stratum: 2
    Reference: CA2EB312
    Precision: 1us (-21)
Root distance: 16.501ms (max: 5s)
    Offset: +24.313ms
    Delay: 337.529ms
    Jitter: 185.720ms
    Packet count: 19
    Frequency: -73.732ppm

# timedatectl show-timesync
FallbackNTPServers=0.debian.pool.ntp.org 1.debian.pool.ntp.org 2.debian.pool.ntp.org
3.debian.pool.ntp.org
ServerName=0.debian.pool.ntp.org
ServerAddress=103.106.65.219
RootDistanceMaxUsec=5s
PollIntervalMinUsec=32s
PollIntervalMaxUsec=34min 8s
PollIntervalUsec=17min 4s
NTPMessage={ Leap=0, Version=4, Mode=4, Stratum=2, Precision=-21, RootDelay=32.180ms,
RootDispersion=930us, Reference=CA2EB312, OriginateTimestamp=Tue 2021-11-02 09:24:57
CET, ReceiveTimestamp=Tue 2021-11-02 09:24:57 CET, TransmitTimestamp=Tue 2021-11-02
09:24:57 CET, DestinationTimestamp=Tue 2021-11-02 09:24:58 CET, Ignored=no
PacketCount=20, Jitter=204.222ms }
Frequency=-3684168
```

```
#13
# timedatectl set-time '2021-11-31 14:00:00'
```

## Win trick

Dual boot systems with Linux and Windows can be off by the difference between the timezone in which they are set and UTC every time the user switches operating systems.

```
$ sudo timedatectl set-local-rtc 1 --adjust-system-clock
```

## NTP Network Time Protocol

The NTP daemon, `ntpd`, sets and updates the system time in synchronization with one or more reference time servers. This daemon sends messages to and receives messages from pre configured servers at certain intervals. The `ntpd` daemon can also be configured to act as a server, so other clients may query this server to synchronize their system time.

- `/etc/ntpd.conf`
- `ntpq` (client tool to query)
- `ntptrace`
- `ntpd -q` | `ntpdate` | `ntpdate -q`

```
#14
#List of public NTP servers to be queried
server 0.pool.ntp.org iburst
server 1.pool.ntp.org iburst
server 2.pool.ntp.org iburst

restrict default ignore

restrict 127.0.0.1

driftfile /var/lib/ntp/ntp.drift
logfile /var/log/ntpser.log
```

## Description of /etc/ntp.conf

### server

The server lines indicate the NTP servers to synchronize with.

### iburst

indicates that if the server is unreachable, then send a burst of eight requests instead of the usual one.

### restrict

restrict access to other computers. This means that this computer will not act as an NTP server for other machines.

### restrict

that the localhost (127.0.0.1) will be able to monitor the ntpd daemon.

### driftfile

indicates the file that is used to store the drift time. This file contains a value that is an average over time of how much the local time “drifts” from the NTP server time.

### logfile

the location where the NTP log file is stored.

```
#15
$ ntpq -pn

$ ntptrace
```

A reference clock should have the most accurate possible time (for example, an atomic clock). A reference clock is referred to as a Stratum-0 clock. An NTP server that updates its time to a reference clock is referred to as a Stratum-1 clock...

NTP uses a hierarchical structure to disseminate time. Reference clocks are connected to servers at the top of the hierarchy. These servers are Stratum 1 machines and typically are not accessible to the public. Stratum 1 machines are however accessible to Stratum 2 machines, which are accessible to Stratum 3 machines and so on. Stratum 2 servers are accessible to the public, as are any machines lower in the hierarchy.

```
#16
# ntpd -q
31 Oct 14:37:18 ntpd[18305]: ntpd 4.2.8p15@1.3728-o Tue Jun 23 00:00:00 UTC 2020 (1):
Starting
31 Oct 14:37:18 ntpd[18305]: Command line: ntpd -q
31 Oct 14:37:18 ntpd[18305]: -----
31 Oct 14:37:18 ntpd[18305]: ntp-4 is maintained by Network Time Foundation,
31 Oct 14:37:18 ntpd[18305]: Inc. (NTF), a non-profit 501(c)(3) public-benefit
```

```

31 Oct 14:37:18 ntpd[18305]: corporation. Support and training for ntp-4 are
31 Oct 14:37:18 ntpd[18305]: available at https://www.nwtime.org/support
31 Oct 14:37:18 ntpd[18305]: -----
31 Oct 14:37:18 ntpd[18305]: proto: precision = 0.042 usec (-24)
31 Oct 14:37:18 ntpd[18305]: basedate set to 2020-06-11
31 Oct 14:37:18 ntpd[18305]: gps base set to 2020-06-14 (week 2110)
31 Oct 14:37:18 ntpd[18305]: Listen and drop on 0 v6wildcard [::]:123
31 Oct 14:37:18 ntpd[18305]: Listen and drop on 1 v4wildcard 0.0.0.0:123
31 Oct 14:37:18 ntpd[18305]: Listen normally on 2 lo 127.0.0.1:123
31 Oct 14:37:18 ntpd[18305]: Listen normally on 3 wlp0s20f3 192.168.1.113:123
31 Oct 14:37:18 ntpd[18305]: Listen normally on 4 lo [::1]:123
31 Oct 14:37:18 ntpd[18305]: Listen normally on 5 wlp0s20f3
[fe80::908a:2e01:c206:c081%3]:123
31 Oct 14:37:18 ntpd[18305]: Listening on routing socket on fd #22 for interface updates
31 Oct 14:37:19 ntpd[18305]: Soliciting pool server 51.68.44.27
31 Oct 14:37:20 ntpd[18305]: Soliciting pool server 213.110.203.168
31 Oct 14:37:21 ntpd[18305]: Soliciting pool server 5.39.184.5
31 Oct 14:37:22 ntpd[18305]: Soliciting pool server 80.151.186.5
31 Oct 14:37:23 ntpd[18305]: Soliciting pool server
2604:ed40:1000:1711:d862:f5ff:fe4e:41c4
31 Oct 14:37:28 ntpd[18305]: ntpd: time slew -0.000453 s
ntpd: time slew -0.000453s

```

The [pool.ntp.org](https://www.pool.ntp.org) domain is a virtual cluster of time servers providing NTP service to systems across the globe.

## Service chronyd

chrony lends itself to working well in environments with intermittent network connectivity, such as on a laptop or virtual system that may be created through an automated process. Chrony is a set of programs that are used to ensure that the clock on a system is accurate.

The daemon portion of chrony is the command chronyd. The daemon synchronizes the system with time retrieved from NTP servers. Along with synchronizing time on the system it is running, chronyd can also operate as an NTP server providing time service to other systems that are allowed network access.

- chronyd (daemon)
- chronyc (client)
- /etc/chrony.conf
- chronyc sources
- chronyc activity
- chronyc tracking
- chronyc settime

```

#17
# chronyc
accheck          cmdallow          exit              maxdelaydevratio offline          reselect          smoothing
waitsync
activity         cmddeny           help             maxdelayratio    online          reselectdist      smoothtime
writertc
add              cyclelogs         keygen           maxpoll          onoffline       retries            sources
allow            delete            local            maxupdateskew    polltarget      rtcddata           sourcestats
burst            deny              makestep         minpoll          quit            serverstats        timeout
clients          dns               manual           minstratum       refresh         settime            tracking

```

```
#18
# chronyc tracking
Reference ID      : D95B2C11 (www.kashra.com)
Stratum          : 3
Ref time (UTC)   : Sun Oct 31 13:45:41 2021
System time      : 0.001218522 seconds slow of NTP time
Last offset      : -0.001224374 seconds
RMS offset       : 0.000762375 seconds
Frequency        : 3.952 ppm slow
Residual freq    : -0.048 ppm
Skew             : 0.422 ppm
Root delay       : 0.047982555 seconds
Root dispersion  : 0.003313234 seconds
Update interval  : 385.7 seconds
Leap status      : Normal

# chronyc activity
200 OK
4 sources online
0 sources offline
0 sources doing burst (return to online)
0 sources doing burst (return to offline)
0 sources with unknown address

# chronyc sources
210 Number of sources = 4
MS Name/IP address      Stratum Poll Reach LastRx Last sample
=====
^- tick.chil.ntfo.org    3    9   377    50  -1291us[-1408us] +/- 126ms
^- ntp5.doctor.com       2    8   377   234   +786us[ -512us] +/-  83ms
^* www.kashra.com        2    7   373    47  -1144us[-1261us] +/-  24ms
^+ clock.nyc.he.net      1    9   377   242   +309us[ -986us] +/-  47ms
```

```
#19
systemctl status chronyd
● chronyd.service - NTP client/server
   Loaded: loaded (/usr/lib/systemd/system/chronyd.service; enabled; vendor preset:
   enabled)
   Active: active (running) since Sun 2021-10-31 12:45:43 CET; 2h 3min ago
     Docs: man:chronyd(8)
           man:chrony.conf(5)
   Main PID: 844 (chronyd)
    Tasks: 1 (limit: 8916)
   Memory: 1.6M
      CPU: 103ms
   CGroup: /system.slice/chronyd.service
           └─844 /usr/sbin/chronyd

Oct 31 12:45:56 localhost.localdomain chronyd[844]: System clock TAI offset set to 37
seconds
Jan 25 12:05:51 localhost.localdomain chronyd[844]: Forward time jump detected!
Jan 25 12:05:51 localhost.localdomain chronyd[844]: Can't synchronise: no selectable
sources
Oct 31 12:48:32 localhost.localdomain chronyd[844]: Backward time jump detected!
Oct 31 13:50:42 localhost.localdomain chronyd[844]: Forward time jump detected!
Oct 31 13:52:51 localhost.localdomain chronyd[844]: Selected source 204.93.207.12
Oct 31 13:52:54 localhost.localdomain chronyd[844]: Selected source 50.205.244.24
Oct 31 13:53:58 localhost.localdomain chronyd[844]: Source 38.229.59.9 replaced with
217.91.44.17
Oct 31 13:55:03 localhost.localdomain chronyd[844]: Selected source 209.51.161.238
Oct 31 14:01:32 localhost.localdomain chronyd[844]: Selected source 217.91.44.17
```

```
#20
# head -n20 /etc/chrony.conf
# Use public servers from the pool.ntp.org project.
# Please consider joining the pool (http://www.pool.ntp.org/join.html).
pool 2.fedora.pool.ntp.org iburst
```

```
# Record the rate at which the system clock gains/losses time.
driftfile /var/lib/chrony/drift

# Allow the system clock to be stepped in the first three updates
# if its offset is larger than 1 second.
makestep 1.0 3

# Enable kernel synchronization of the real-time clock (RTC).
rtcsync

# Enable hardware timestamping on all interfaces that support it.
#hwtimestamp *

# Increase the minimum number of selectable sources required to adjust
# the system clock.
#minsources 2
```

Some definitions:

**provider**

A computer that will share network time with you

**stratum**

Distance from a reference clock, in hops or steps

**offset**

Difference between system time and network time

**jitter**

Difference between system time and network time since the last NTP poll

**pool**

Group of servers that provide network time and share the load between them

## systemd-timesyncd.service

systemd-timesyncd is a system service that may be used to synchronize the local system clock with a remote Network Time Protocol (NTP) server. It also saves the local time to disk every time the clock has been synchronized and uses this to possibly advance the system realtime clock on subsequent reboots to ensure it (roughly) monotonically advances even if the system lacks a battery-buffered RTC chip.

The systemd-timesyncd service implements SNTP only. This minimalistic service will step the system clock for large offsets or slowly adjust it for smaller deltas. Complex use cases that require full NTP support (and where SNTP is not sufficient) are not covered by systemd-timesyncd. The NTP servers contacted are determined from the global settings in timesyncd.conf(5).

timedatectl(1)'s set-ntp command may be used to enable and start, or disable and stop this service.

timedatectl(1)'s timesync-status or show-timesync command can be used to show the current status of this service.

```
#21
# systemctl status systemd-timesyncd.service
● systemd-timesyncd.service - Network Time Synchronization
   Loaded: loaded (/lib/systemd/system/systemd-timesyncd.service; enabled; vendor
   preset: enabled)
   Active: active (running) since Tue 2021-11-02 08:03:19 CET; 1h 24min ago
     Docs: man:systemd-timesyncd.service(8)
   Main PID: 454 (systemd-timesyn)
   Status: "Initial synchronization to time server 103.106.65.219:123
(0.debian.pool.ntp.org)."
```

```
   Tasks: 2 (limit: 9362)
   Memory: 1.8M
    CPU: 71ms
   CGroup: /system.slice/systemd-timesyncd.service
           └─454 /lib/systemd/systemd-timesyncd
```

```
Nov 02 08:03:18 profen2C systemd[1]: Starting Network Time Synchronization...
Nov 02 08:03:19 profen2C systemd[1]: Started Network Time Synchronization.
Nov 02 08:03:54 profen2C systemd-timesyncd[454]: Initial synchronization to time server 212.183.232.77:1>
Nov 02 08:04:41 profen2C systemd-timesyncd[454]: Initial synchronization to time server 185.132.136.116:>
Nov 02 08:52:19 profen2C systemd-timesyncd[454]: Initial synchronization to time server 103.106.65.219:1>
lines 1-17/17 (END)
```

```
#22
# timedatectl timesync-status
   Server: 103.106.65.219 (0.debian.pool.ntp.org)
 Poll interval: 8min 32s (min: 32s; max 34min 8s)
   Leap: normal
   Version: 4
   Stratum: 2
   Reference: CA2EB312
   Precision: 1us (-21)
Root distance: 16.501ms (max: 5s)
   Offset: +24.313ms
   Delay: 337.529ms
   Jitter: 185.720ms
 Packet count: 19
  Frequency: -73.732ppm

# timedatectl show-timesync
FallbackNTPServers=0.debian.pool.ntp.org 1.debian.pool.ntp.org 2.debian.pool.ntp.org
3.debian.pool.ntp.org
ServerName=0.debian.pool.ntp.org
ServerAddress=103.106.65.219
RootDistanceMaxUsec=5s
PollIntervalMinUsec=32s
PollIntervalMaxUsec=34min 8s
PollIntervalUsec=17min 4s
NTPMessage={ Leap=0, Version=4, Mode=4, Stratum=2, Precision=-21, RootDelay=32.180ms,
RootDispersion=930us, Reference=CA2EB312, OriginateTimestamp=Tue 2021-11-02 09:24:57
CET, ReceiveTimestamp=Tue 2021-11-02 09:24:57 CET, TransmitTimestamp=Tue 2021-11-02
09:24:57 CET, DestinationTimestamp=Tue 2021-11-02 09:24:58 CET, Ignored=no
PacketCount=20, Jitter=204.222ms }
Frequency=-3684168
```

```
#23
# cat /etc/systemd/timesyncd.conf
# This file is part of systemd.
#
# systemd is free software; you can redistribute it and/or modify it
# under the terms of the GNU Lesser General Public License as published by
# the Free Software Foundation; either version 2.1 of the License, or
# (at your option) any later version.
#
# Entries in this file show the compile time defaults.
# You can change settings by editing this file.
# Defaults can be restored by simply deleting this file.
#
# See timesyncd.conf(5) for details.

[Time]
#NTP=
#FallbackNTP=0.debian.pool.ntp.org 1.debian.pool.ntp.org 2.debian.pool.ntp.org
3.debian.pool.ntp.org
```

```
#RootDistanceMaxSec=5
#PollIntervalMinSec=32
#PollIntervalMaxSec=2048
```

## Example Exercises

### [ Software clock]

1. Show the date and time.
2. Show the Date in the format YYYY-MM-DD HH:mm
3. Set the software clock to the date 06-06-2022.
4. Set the system clock (increment) two month and four days from now.
5. Decrement the system clock 60 days.
6. Copy the hardware clock to the system clock.

### [Hardware clock]

7. Show the RTC or hardware clock.
8. Set the hardware clock to 25-12-2022.
9. Copy the system clock to the hardware clock

### [timedatectl]

10. Show the timedatectl information.
11. Show the timedatectl status.
12. Answer the following questions:
  - a. Is the local time and UTC time the same?
  - b. Is the RTC in local time?
  - c. Is the NTP active and synchronized?
  - d. Which is the time zone?
  - e. Is your time zone using daylight saving time?
13. List the time zones
14. Change your time zone to Europe/Andorra

### [NTP / chrony]

15. Show the chronyc activity.
16. Show the chronyc sources
17. Show the chronyc tracking

### [global]

18. Do the command: `dmesg | grep -i RTC`
19. Do the command: `journalctl -b 0 | grep -i RTC`
20. Realitza els exercicis indicats a: [108.1 Maintain system time](#)
21. Realitza els exercicis del Question-Topics 108.1.