Lab 8 - Installation and Configuration of CUPS & NTP

Exercise 1 –Installation and Configuration a CUPS Server

CUPS Server installation

Exercise 1.1: Tasks to be perform on AlmaLinux:

1. Verify if the **CUPS** package is installed.

```
[lmohammed@server12 ~]$ dnf list cups
AlmaLinux 9 - AppStream                          2.9 MB/s |  15 MB     00:05
AlmaLinux 9 - BaseOS                             3.7 MB/s |  17 MB     00:04
AlmaLinux 9 - Extras                              36 kB/s |  13 kB     00:00
Extra Packages for Enterprise Linux 9 - x86_64   3.0 MB/s |  23 MB     00:07
Extra Packages for Enterprise Linux 9 openh264   1.5 kB/s | 2.5 kB     00:01
Installed Packages
cups.x86_64                    1:2.3.3op2-31.el9_5                    @AppStream
[lmohammed@server12 ~]$
```

2. Verify if the **CUPS** service is started and enabled, if not start it.

```
[lmohammed@server12 ~]$ systemctl status cups
● cups.service - CUPS Scheduler
     Loaded: loaded (/usr/lib/systemd/system/cups.service; enabled; preset: ena>
    Drop-In: /usr/lib/systemd/system/cups.service.d
             └─server.conf
     Active: active (running) since Mon 2025-04-07 13:26:24 EDT; 4min 32s ago
TriggeredBy: ● cups.path
             ● cups.socket
       Docs: man:cupsd(8)
   Main PID: 1078 (cupsd)
     Status: "Scheduler is running..."
      Tasks: 1 (limit: 22831)
     Memory: 3.9M
        CPU: 52ms
     CGroup: /system.slice/cups.service
             └─1078 /usr/sbin/cupsd -l

Apr 07 13:26:24 server12 systemd[1]: Starting CUPS Scheduler...
Apr 07 13:26:24 server12 systemd[1]: Started CUPS Scheduler.
Apr 07 13:26:30 server12 cupsd[1078]: REQUEST localhost - - "POST / HTTP/1.1" 2>
Apr 07 13:29:08 server12 cupsd[1078]: REQUEST localhost - - "POST / HTTP/1.1" 2>
lines 1-20/20 (END)
```

3. Authorise in the **firewall** the port used to access the CUPS Service Admin web page.

```
[root@server12 ~]# firewall-cmd --permanent --add-port=631/tcp --zone=nm-shared
success
[root@server12 ~]# firewall-cmd --permanent --add-port=631/tcp --zone=external
success
```

4. Check that the port is added and authorised in the firewall.

```
[root@server12 ~]# firewall-cmd --reload
success
[root@server12 ~]# firewall-cmd --list-ports --zone=nm-shared
631/tcp
[root@server12 ~]# firewall-cmd --list-ports --zone=external
631/tcp
[root@server12 ~]#
```

5. List all **tcp** and **udp** ports that are listening on the server.

```
[root@server12 ~]# netstat -tunap
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:20048           0.0.0.0:*               LISTEN      1346/rpc.mountd
tcp        0      0 0.0.0.0:139             0.0.0.0:*               LISTEN      1328/smbd
tcp        0      0 0.0.0.0:43235           0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:2049            0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN      1083/sshd: /usr/sbi
tcp        0      0 0.0.0.0:111             0.0.0.0:*               LISTEN      1/systemd
tcp        0      0 0.0.0.0:53643           0.0.0.0:*               LISTEN      1330/rpc.statd
tcp        0      0 0.0.0.0:445             0.0.0.0:*               LISTEN      1328/smbd
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN      1078/cupsd
tcp        0      0 192.168.207.128:37496   138.199.57.100:443      TIME_WAIT   -
tcp6       0      0 :::38213                :::*                    LISTEN      1330/rpc.statd
tcp6       0      0 :::20048                :::*                    LISTEN      1346/rpc.mountd
tcp6       0      0 ::1:631                 :::*                    LISTEN      1078/cupsd
tcp6       0      0 :::139                  :::*                    LISTEN      1328/smbd
tcp6       0      0 :::2049                 :::*                    LISTEN      -
tcp6       0      0 :::22                   :::*                    LISTEN      1083/sshd: /usr/sbi
tcp6       0      0 :::111                  :::*                    LISTEN      1/systemd
tcp6       0      0 :::445                  :::*                    LISTEN      1328/smbd
tcp6       0      0 :::43655                :::*                    LISTEN      -
udp        0      0 0.0.0.0:5353            0.0.0.0:*                           798/avahi-daemon: r
udp        0      0 0.0.0.0:20048           0.0.0.0:*                           1346/rpc.mountd
udp        0      0 192.168.207.128:68      192.168.207.254:67      ESTABLISHED 1040/NetworkManager
udp        0      0 0.0.0.0:55366           0.0.0.0:*                           1330/rpc.statd
udp        0      0 0.0.0.0:111             0.0.0.0:*                           1/systemd
udp        0      0 127.0.0.1:323           0.0.0.0:*                           817/chronyd
udp        0      0 127.0.0.1:659           0.0.0.0:*                           1330/rpc.statd
udp        0      0 0.0.0.0:41750           0.0.0.0:*                           -
```

6. What is the **tcp port number** used by the cups service?

631

```
0 127.0.0.1:[redacted]
0 ::1:[redacted]
```

7. What is the name of the CUPS service main configuration file?

Cupsd.conf

CUPS Server Configuration

Exercise 1.2: Tasks to be perform on AlmaLinux:

1. Modify the **CUPS** service **main configuration file**, to allow the use of the CUPS server Web Admin interface, from any machine on the network.

```
# Restrict access to the server...
<Location />
  Allow all
  Order allow,deny
</Location>

# Restrict access to the admin pages...
<Location /admin>
  Allow all
  Order allow,deny
</Location>

# Restrict access to configuration files...
<Location /admin/conf>
  Allow all
  AuthType Default
  Require user @SYSTEM
  Order allow,deny
</Location>

# Restrict access to log files...
<Location /admin/log>
  Allow all
  AuthType Default
  Require user @SYSTEM
  Order allow,deny
</Location>
```

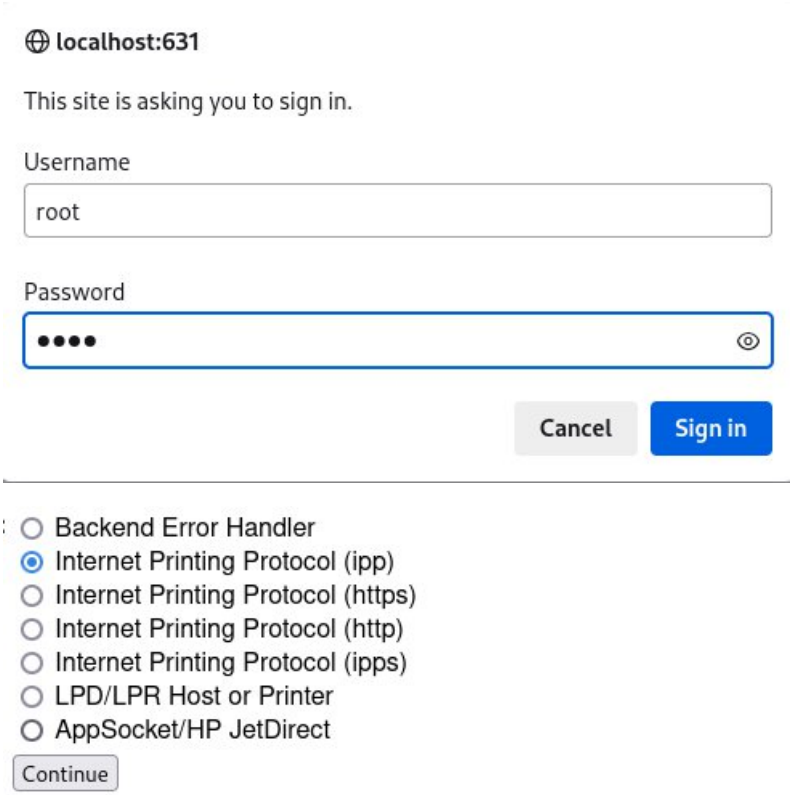
2. Restart the **CUPS** service to apply your configuration.

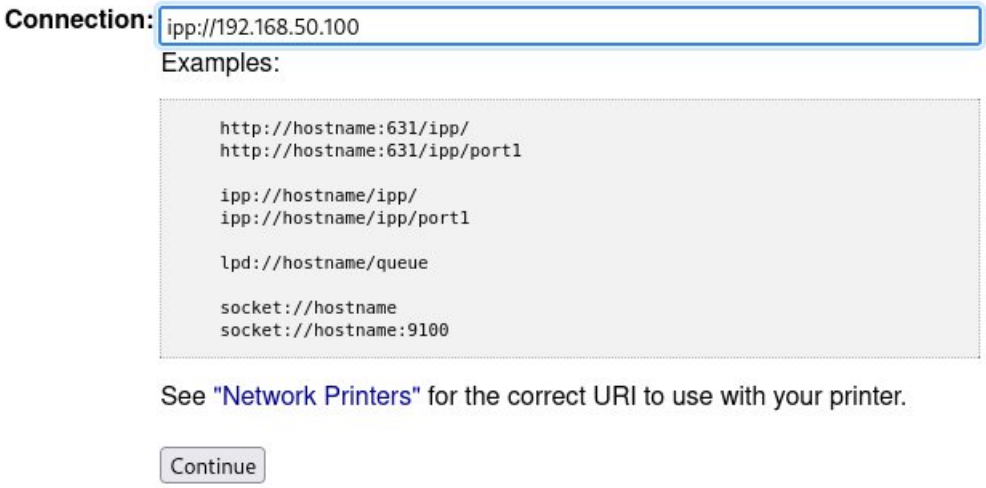
```
[root@server12 ~]# systemctl restart cups
[root@server12 ~]#
```

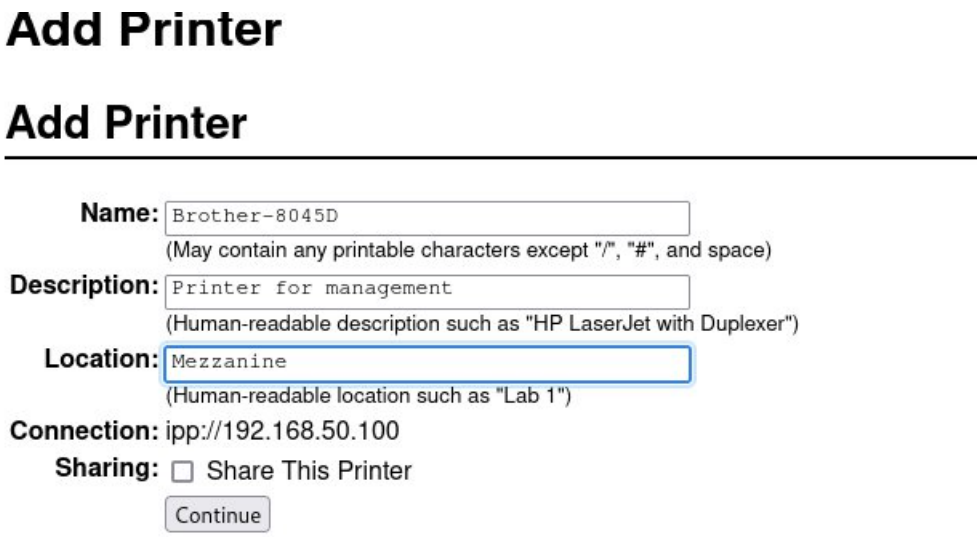
Installing and Sharing a Network Printer

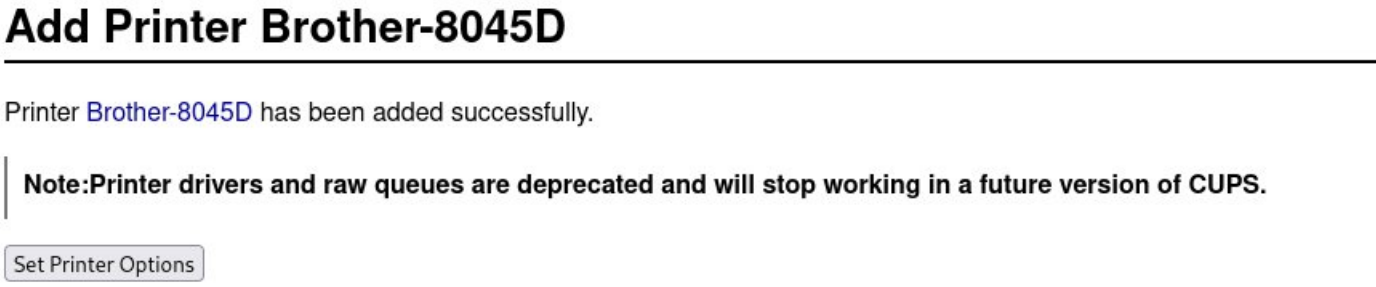
Exercise 1.3: Tasks to be perform on AlmaLinux:

1. Using the cups web interface, **install** and **share** the following network printer:
   - Model: Brother DCP-8045D
   - IP Adress: 192.168.50.100
   - Name: Brother-8045D
   - Description: Printer for management.
   - Location: Mezzanine.









Exercise 1.4: Tasks to be perform on Ubuntu and Windows 11:

1. On the **Ubuntu** and **Windows 11** clients, install the shared network printer from the AlmaLinux server.

```
lmohammed@client12:~$ systemctl status cups
● cups.service - CUPS Scheduler
     Loaded: loaded (/lib/systemd/system/cups.service; enabled; vendor preset: >
     Active: active (running) since Tue 2025-04-08 13:29:04 EDT; 48s ago
TriggeredBy: ● cups.socket
             ● cups.path
       Docs: man:cupsd(8)
   Main PID: 737 (cupsd)
     Status: "Scheduler is running..."
      Tasks: 1 (limit: 2211)
     Memory: 2.5M
        CPU: 46ms
     CGroup: /system.slice/cups.service
             └─737 /usr/sbin/cupsd -l

Apr 08 13:29:04 client12 systemd[1]: Starting CUPS Scheduler...
Apr 08 13:29:04 client12 systemd[1]: Started CUPS Scheduler.
lines 1-16/16 (END)
```

Add Printer

Local Printers:
- ○ CUPS-BRF (Virtual Braille BRF Printer)
- ○ HP Printer (HPLIP)
- ○ HP Fax (HPLIP)

Discovered Network Printers:
- ◉ Printer for management @ server12 (Brother Brother DCP-8045D)

Other Network Printers:
- ○ Internet Printing Protocol (http)
- ○ AppSocket/HP JetDirect
- ○ Internet Printing Protocol (ipp)
- ○ Internet Printing Protocol (ipps)
- ○ LPD/LPR Host or Printer
- ○ Backend Error Handler
- ○ Internet Printing Protocol (https)
- ○ Windows Printer via SAMBA

Continue

Brother_Brother_DCP-8045D

Brother_Brother_DCP-8045D (Idle, Accepting Jobs, Not Shared)

Maintenance | Administration

Description: Brother Brother DCP-8045D
Location: Mezzanine
Driver: Brother DCP-8045D BR-Script3 (grayscale, 2-sided printing)
Connection: dnssd://Printer%20for%20management%20%40%20server12._ipp._tcp.local/cups?uuid=5310d9fd-5a8a-3663-791e-c47e941e9961
Defaults: job-sheets=none, none media=na_letter_8.5x11in sides=one-sided

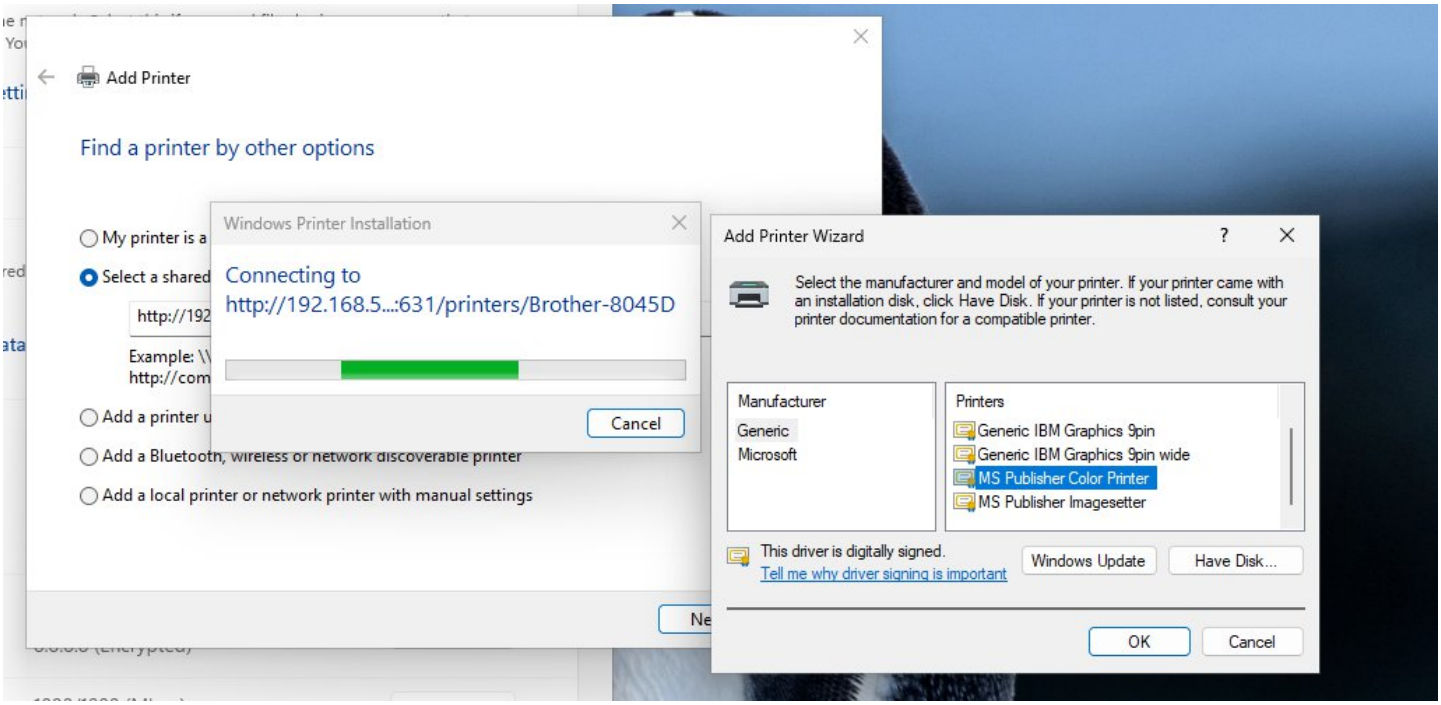
Jobs

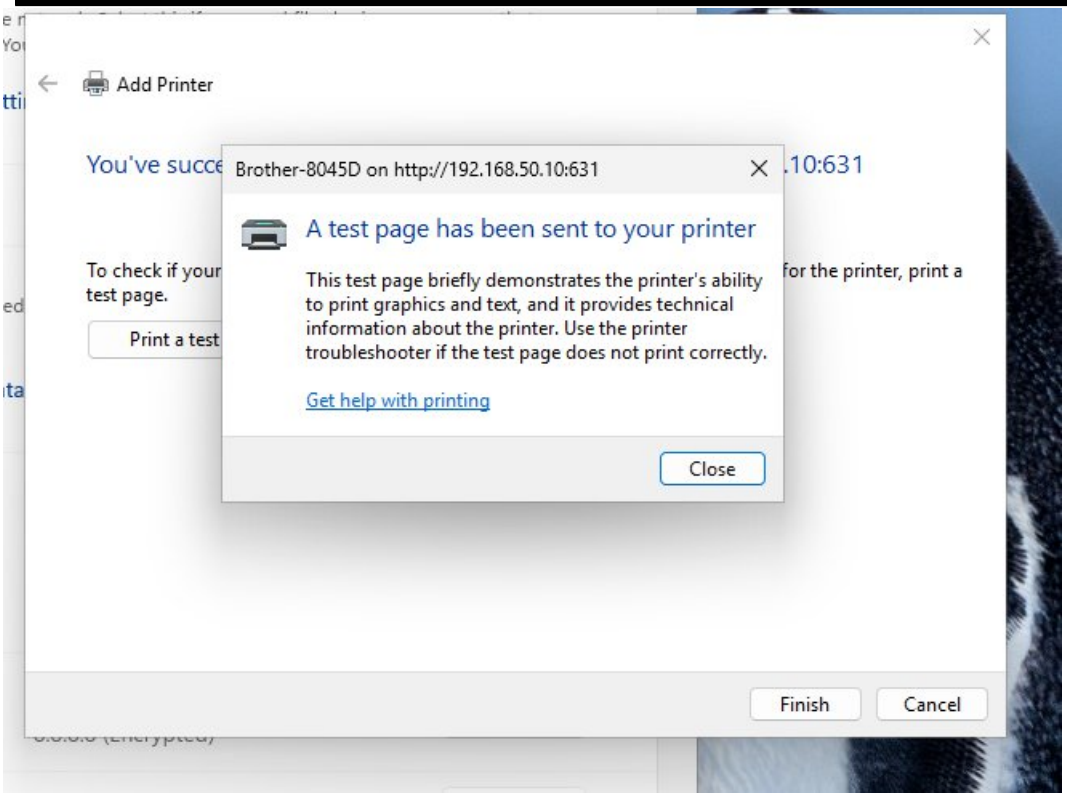
Search in Brother_Brother_DCP-8045D: Search Clear

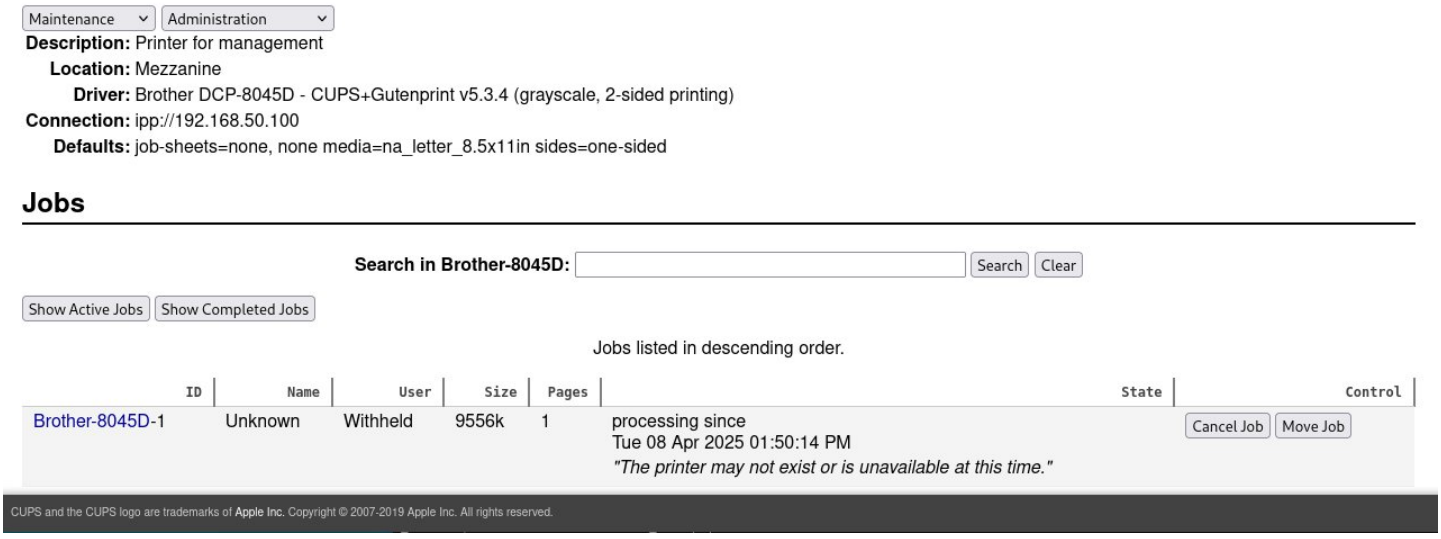
Show Completed Jobs | Show All Jobs

Active jobs listed in processing order▼; held jobs appear first.

Windows:







Exercise 2 – Installing and Configuring a NTP Server

NTP Server Installation

Lab 8 - Installation and Configuration of CHRONY & NTP

Exercise 2.1: Tasks to be perform on AlmaLinux:

1. Verify that the **chrony** application is installed correctly.

```
[root@server12 ~]# dnf list chrony
Last metadata expiration check: 3:37:39 ago on Tue 08 Apr 2025 10:15:09 AM.
Installed Packages
chrony.x86_64                          4.5-3.el9                          @anaconda
[root@server12 ~]#
```

2. Verify that the **chronyd** service is started and enabled, if not start it.

```
[root@server12 ~]# systemctl status chronyd
● chronyd.service - NTP client/server
     Loaded: loaded (/usr/lib/systemd/system/chronyd.service; enabled; preset:>
     Active: active (running) since Tue 2025-04-08 09:13:42 EDT; 4h 39min ago
       Docs: man:chronyd(8)
             man:chrony.conf(5)
    Process: 799 ExecStart=/usr/sbin/chronyd $OPTIONS (code=exited, status=0/S>
   Main PID: 817 (chronyd)
      Tasks: 1 (limit: 22830)
     Memory: 4.0M
        CPU: 970ms
     CGroup: /system.slice/chronyd.service
             └─817 /usr/sbin/chronyd -F 2

Apr 08 09:16:04 server12 chronyd[817]: Selected source 54.39.196.172 (2.almali>
Apr 08 09:21:28 server12 chronyd[817]: Selected source 51.222.111.13 (2.almali>
Apr 08 09:24:17 server12 chronyd[817]: Forward time jump detected!
Apr 08 09:24:17 server12 chronyd[817]: Can't synchronise: no selectable sources
Apr 08 09:26:26 server12 chronyd[817]: Selected source 51.222.111.13 (2.almali>
Apr 08 09:30:46 server12 chronyd[817]: Selected source 54.39.196.172 (2.almali>
Apr 08 09:36:57 server12 chronyd[817]: Forward time jump detected!
Apr 08 09:36:57 server12 chronyd[817]: Can't synchronise: no selectable sources
Apr 08 09:37:47 server12 chronyd[817]: Forward time jump detected!
```

3. What is the name of the main configuration file of the **chronyd** service?

   /etc/chrony.conf

4. Run a command to list the source of the NTP time.

```
[root@server12 ~]# chronyc sources
MS Name/IP address         Stratum Poll Reach LastRx Last sample
===============================================================================
^- b.8bitbyte.ca                 2  10   377   204  +4611us[+4822us] +/-   30ms
^- s173-183-146-26.ab.hsia.>     2  10   377   524    +41ms[  +41ms] +/-   78ms
^- ip253.ip-142-4-192.net        2  10   377   333    +14ms[  +14ms] +/-   90ms
^* ntp.netlinkify.com            2  10   377   105    +40ms[  +40ms] +/-   41ms
[root@server12 ~]#
```

5. View the **exact time** of your server.

```
[root@server12 ~]# timedatectl
               Local time: Tue 2025-04-08 [redacted]
           Universal time: Tue 2025-04-08 17:56:05 UTC
                 RTC time: Tue 2025-04-08 17:56:06
                Time zone: America/Toronto (EDT, -0400)
System clock synchronized: yes
              NTP service: active
          RTC in local TZ: no
[root@server12 ~]#
```

6. Stop the **chronyd** service and verify that the NTP service is inactive.

```
[root@server12 ~]# systemctl stop chronyd
[root@server12 ~]# timedatectl
               Local time: Tue 2025-04-08 13:57:29 EDT
           Universal time: Tue 2025-04-08 17:57:29 UTC
                 RTC time: Tue 2025-04-08 17:57:29
                Time zone: America/Toronto (EDT, -0400)
System clock synchronized: yes
              NTP service: [redacted]
          RTC in local TZ: no
[root@server12 ~]#
```

7. Set up your server time **manually**.

```
[root@server12 ~]# timedatectl set-time 13:58:00
[root@server12 ~]#
```

```
[root@server12 ~]# timedatectl
               Local time: Tue 2025-04-08 13:58:21 EDT
           Universal time: Tue 2025-04-08 17:58:21 UTC
                 RTC time: Tue 2025-04-08 17:58:21
                Time zone: America/Toronto (EDT, -0400)
System clock synchronized: no
              NTP service: inactive
          RTC in local TZ: no
```

NTP Server Configuration

Exercise 2.2: Tasks to be perform on AlmaLinux:

1. Modify the **chronyd** service configuration file, to allow your internal subnet **192.168.50.0/24** to use this server as an NTP server.

```
# Allow NTP client access from local network.
allow 192.168.50.0/24

# Serve time even if not synchronized to a time source.
#local stratum 10
```

1. Restart the **chronyd** service to apply your configuration.

```
[root@server12 ~]# systemctl restart chronyd
[root@server12 ~]#
```

2. Configure the **firewall** to authorise the usage of the **NTP** service.

```
[root@server12 ~]# firewall-cmd --permanent --add-service=ntp --zone=nm-shared
success
[root@server12 ~]# firewall-cmd --reload
success
[root@server12 ~]# firewall-cmd --list-services --zone=nm-shared
dhcp dns mountd nfs ntp rpc-bind samba ssh
[root@server12 ~]#
```

3. Verify that the **NTP** service is added and authorised in the firewall.

```
[root@server12 ~]# firewall-cmd --permanent --add-service=ntp --zone=nm-shared
success
[root@server12 ~]# firewall-cmd --reload
success
[root@server12 ~]# firewall-cmd --list-services --zone=nm-shared
dhcp dns mountd nfs ntp rpc-bind samba ssh
[root@server12 ~]#
```

4. List the **chronyd** service **udp** port that is listening on the server.

```
[root@server12 ~]# netstat -tunap | grep chronyd
udp        0      0 0.0.0.0:123             0.0.0.0:*                           4932/chronyd
```

5. What is the **udp port number** used by the **chronyd** service?

   UDP port 123

Client Configuration

Exercise 2.3: Tasks to be perform on Ubuntu:

1. Go to the **Ubuntu** client and install the **chrony** package.

```
root@client12:~# apt install chrony
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages will be REMOVED:
  systemd-timesyncd
The following NEW packages will be installed:
  chrony
0 upgraded, 1 newly installed, 1 to remove and 124 not upgraded.
Need to get 290 kB of archives.
After this operation, 360 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ca.archive.ubuntu.com/ubuntu jammy/main amd64 chrony amd64 4.2-2ubuntu2 [290 kB]
Fetched 290 kB in 1s (266 kB/s)
(Reading database ... 201425 files and directories currently installed.)
Removing systemd-timesyncd (249.11-0ubuntu3.12) ...
(Reading database ... 201411 files and directories currently installed.)
Preparing to unpack .../chrony_4.2-2ubuntu2_amd64.deb ...
Unpacking chrony (4.2-2ubuntu2) ...
Setting up chrony (4.2-2ubuntu2) ...

Creating config file /etc/chrony/chrony.conf with new version.....................]
 [.....................................................................................]
Creating config file /etc/chrony/chrony.keys with new version
dpkg-statoverride: warning: --update given but /var/log/chrony does not exist.............]
Created symlink /etc/systemd/system/chronyd.service → /lib/systemd/system/chrony.service.............]
Created symlink /etc/systemd/system/multi-user.target.wants/chrony.service → /lib/systemd/system/chrony.service
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for man-db (2.10.2-1) ...
```

2. Verify that the **chronyd** service is started and enabled.

```
root@client12:~# systemctl status chronyd
● chrony.service - chrony, an NTP client/server
     Loaded: loaded (/lib/systemd/system/chrony.service; enabled; vendor preset: enabled)
     Active: active (running) since Tue 2025-04-08 14:09:55 EDT; 45s ago
       Docs: man:chronyd(8)
             man:chronyc(1)
             man:chrony.conf(5)
    Process: 1973 ExecStart=/usr/lib/systemd/scripts/chronyd-starter.sh $DAEMON_OPTS (code=
   Main PID: 1982 (chronyd)
      Tasks: 2 (limit: 2211)
     Memory: 2.0M
        CPU: 69ms
     CGroup: /system.slice/chrony.service
             ├─1982 /usr/sbin/chronyd -F 1
             └─1983 /usr/sbin/chronyd -F 1

Apr 08 14:09:55 client12 systemd[1]: Starting chrony, an NTP client/server...
Apr 08 14:09:55 client12 chronyd[1982]: chronyd version 4.2 starting (+CMDMON +NTP +REFCLOC
Apr 08 14:09:55 client12 chronyd[1982]: Using right/UTC timezone to obtain leap second data
Apr 08 14:09:55 client12 chronyd[1982]: Loaded seccomp filter (level 1)
Apr 08 14:09:55 client12 systemd[1]: Started chrony, an NTP client/server.
Apr 08 14:10:02 client12 chronyd[1982]: Selected source 91.189.91.157 (ntp.ubuntu.com)
Apr 08 14:10:02 client12 chronyd[1982]: System clock TAI offset set to 37 seconds
Apr 08 14:10:03 client12 chronyd[1982]: Source 216.128.178.20 replaced with 149.56.19.163 (
Apr 08 14:10:04 client12 chronyd[1982]: Selected source 185.125.190.58 (ntp.ubuntu.com)
lines 1-24/24 (END)
```

3. View the **exact time** of your server.

```
root@client12:~# timedatectl
               Local time: Tue 2025-04-08 14:11:18 EDT
           Universal time: Tue 2025-04-08 18:11:18 UTC
                 RTC time: Tue 2025-04-08 18:11:17
                Time zone: America/Toronto (EDT, -0400)
System clock synchronized: yes
              NTP service: active
          RTC in local TZ: no
root@client12:~#
```

4. Run a command to list the **source** of the **NTP** time.

```
root@client12:~# chronyc sources
MS Name/IP address         Stratum Poll Reach LastRx Last sample
===============================================================================
^- alphyn.canonical.com          2   6    37    32  +7367us[+7367us] +/-   40ms
^- prod-ntp-5.ntp4.ps5.cano>     2   6    37    33  +5089us[+5089us] +/-   51ms
^- prod-ntp-4.ntp4.ps5.cano>     2   6    37    33  +9822us[+9822us] +/-   52ms
^- prod-ntp-3.ntp4.ps5.cano>     2   6    37    32  +7405us[+7405us] +/-   52ms
^- s216-232-132-95.bc.hsia.>     2   6    37    34  +6421us[+6421us] +/-   92ms
^? archer.fsck.ca                2   6     1    35  +9153us[  -56ms] +/-   17ms
^* s216-232-132-102.bc.hsia>     1   6    37    35   +186us[  -65ms] +/-  249ms
^+ s173-183-146-26.ab.hsia.>     2   6    37    34  +6875us[+6875us] +/-   39ms
root@client12:~#
```

5. Configure **chronyd** to use the **AlamLinux** server as the NTP server.

```
# About using servers from the NTP Pool Project in general see (LP: #104525).
# Approved by Ubuntu Technical Board on 2011-02-08.
# See http://www.pool.ntp.org/join.html for more information.
pool ntp.ubuntu.com        iburst maxsources 4
pool 0.ubuntu.pool.ntp.org iburst maxsources 1
pool 1.ubuntu.pool.ntp.org iburst maxsources 1
pool 2.ubuntu.pool.ntp.org iburst maxsources 2
server 192.168.50.10
# Use time sources from DHCP.
```

6. Restart the **chronyd** service to apply your configuration.

```
root@client12:~# systemctl restart chronyd
root@client12:~#
```

7. Wait a few minutes, then check if the **source** of the **NTP** time is the AlamLinux server.

```
root@client12:~# chronyc sources
MS Name/IP address         Stratum Poll Reach LastRx Last sample
===============================================================================
^- prod-ntp-3.ntp1.ps5.cano>     2   6    77    18    +46ms[  +46ms] +/-  111ms
^- alphyn.canonical.com          2   6    77    19    +34ms[  +34ms] +/-   75ms
^- prod-ntp-4.ntp4.ps5.cano>     2   6    77    18    +22ms[  +22ms] +/-   76ms
^- prod-ntp-5.ntp4.ps5.cano>     2   6    77    17    +29ms[  +29ms] +/-   76ms
^? 23.133.168.247                4   7    44   144    +42ms[+5397us] +/-   84ms
^- time.cloudflare.com           3   6    77    21  -2829us[-2829us] +/-   31ms
^? ntp6.omdc.pl                  2   6     3    22    +34ms[  +34ms] +/-  135ms
^- ntp1.torix.ca                 1   6    77    22    +60ms[  +60ms] +/-   76ms
[redacted]                       3   6     7    29    +96us[  -56ms] +/-   16ms
root@client12:~#
```

8. Go back to the **AlmaLinux** server, and check if the server has NTP clients.

```
[root@server12 ~]# chronyc clients
Hostname                      NTP   Drop Int IntL Last     Cmd   Drop Int  Last
===============================================================================
192.168.50.20                   4      0   6   -    11       0      0   -     -
[root@server12 ~]#
```