Lab 5

Lab Title: Java, apt vs apt-get, snap, GUI, Vim on Ubuntu Server

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Course Title: Cloud Computing Lab

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Reg#No: 2023-BSE-008

Task 1 - Discover missing command & install Java using apt suggestion

Steps (inside the VM terminal)

1. **Run the java command to see what the system suggests:**

```
anara@ubuntu:~$ java
Command 'java' not found, but can be installed with:
sudo apt install openjdk-17-jre-headless  # version 17.0.16+8~us1-0ubuntu1~24.04.1, or
sudo apt install openjdk-21-jre-headless  # version 21.0.8+9~us1-0ubuntu1~24.04.1
sudo apt install default-jre              # version 2:1.17-75
sudo apt install openjdk-19-jre-headless  # version 19.0.2+7-4
sudo apt install openjdk-20-jre-headless  # version 20.0.2+9-1
sudo apt install openjdk-22-jre-headless  # version 22~22ea-1
sudo apt install openjdk-11-jre-headless  # version 11.0.28+6-1ubuntu1~24.04.1
sudo apt install openjdk-25-jre-headless  # version 25+36-1~24.04.2
sudo apt install openjdk-8-jre-headless   # version 8u462-ga~us1-0ubuntu2~24.04.2
anara@ubuntu:~$
```

2. **Use the suggested apt command (copy the exact package name suggested by the system). Example (replace with the name shown on your VM):**

```
anara@ubuntu:~$ sudo apt install openjdk-8-jdk -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-common at-spi2-core ca-certificates
  fonts-dejavu-extra gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme humanity-
  libasyncns0 libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni libatk1.0-0t64 li
  libavahi-common3 libcairo-gobject2 libcairo2 libcups2t64 libdatrie1 libdconf1 libdrm-amdgpu1 li
  libgail-common libgail18t64 libgdk-pixbuf-2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common li
  libglvnd0 libglx-mesa0 libglx0 libgraphite2-3 libgtk2.0-0t64 libgtk2.0-bin libgtk2.0-common lib
  libmp3lame0 libmpg123-0t64 libogg0 libopus0 libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-
```

3. **Verify Java is installed and check version:**

```
anara@ubuntu:~$ java -version
openjdk version "1.8.0_462"
OpenJDK Runtime Environment (build 1.8.0_462-8u462-ga~us1-0ubuntu2~24.04.2-b08)
OpenJDK 64-Bit Server VM (build 25.462-b08, mixed mode)
```

4. **Remove the Java package using apt remove (use the same package name you installed):**

```
anara@ubuntu:~$ sudo apt remove openjdk-8-jdk -y
[sudo] password for anara:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-common at-spi2-core ca-certificates-j
  fonts-dejavu-extra gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme humanity-ic
  libasyncns0 libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni libatk1.0-0t64 liba
  libavahi-common3 libcairo-gobject2 libcairo2 libcups2t64 libdatrie1 libdconf1 libdrm-amdgpu1 libd
  libgail-common libgail18t64 libgdk-pixbuf-2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libg
  libglvnd0 libglx-mesa0 libglx0 libgraphite2-3 libgtk2.0-0t64 libgtk2.0-bin libgtk2.0-common libha
  libmp3lame0 libmpg123-0t64 libogg0 libopus0 libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0
  libpthread-stubs0-dev libpulse0 librsvg2-2 librsvg2-common libsm-dev libsm6 libsndfile1 libthai-d
  libwayland-client0 libx11-dev libx11-xcb1 libxau-dev libxaw7 libxcb-dri2-0 libxcb-dri3-0 libxcb-g
  libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-xfixes0 libxcb1-dev libxcomposite1 libxcursor1 libx
  libxkbfile1 libxmu6 libxrandr2 libxrender1 libxshmfence1 libxt-dev libxt6t64 libxtst6 libxv1 libx
  openjdk-8-jdk-headless openjdk-8-jre openjdk-8-jre-headless session-migration ubuntu-mono x11-com
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
  openjdk-8-jdk
0 upgraded, 0 newly installed, 1 to remove and 38 not upgraded.
After this operation, 4,385 kB disk space will be freed.
(Reading database ... 102243 files and directories currently installed.)
Removing openjdk-8-jdk:amd64 (8u462-ga~us1-0ubuntu2~24.04.2) ...
```

5. **Confirm java is no longer available (run java again) — it should again indicate "not found" or suggest installation:**

```
-bash: /usr/bin/java: No such file or directory
anara@ubuntu:~$ java
-bash: /usr/bin/java: No such file or directory
```

6. **Clear the shell's command hash cache so the shell forgets cached command locations (run as your regular user — no sudo required):**

```
anara@ubuntu:~$ hash -r
anara@ubuntu:~$ java
Command 'java' not found, but can be installed with:
sudo apt install openjdk-17-jre-headless  # version 17.0.16+8~us1-0ubuntu1~24.04.1, or
sudo apt install openjdk-21-jre-headless  # version 21.0.8+9~us1-0ubuntu1~24.04.1
sudo apt install default-jre              # version 2:1.17-75
sudo apt install openjdk-19-jre-headless  # version 19.0.2+7-4
sudo apt install openjdk-20-jre-headless  # version 20.0.2+9-1
sudo apt install openjdk-22-jre-headless  # version 22~22ea-1
sudo apt install openjdk-11-jre-headless  # version 11.0.28+6-1ubuntu1~24.04.1
sudo apt install openjdk-25-jre-headless  # version 25+36-1~24.04.2
sudo apt install openjdk-8-jre-headless   # version 8u462-ga~us1-0ubuntu2~24.04.2
```

Task 2 - Install & remove Java using apt-get (explicitly)

Steps (inside VM terminal)

1. **Install Java using apt-get (choose a common package, e.g., default-jre — or the same package you used in Task 1):**

```
anara@ubuntu:~$ sudo apt-get update
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
```

```
anara@ubuntu:~$ sudo apt-get install openjdk-8-jdk -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-common at-spi2-core ca-certi
  fonts-dejavu-extra gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme hu
  libasyncns0 libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni libatk1.0-
```

2. Verify Java version again:

```
anara@ubuntu:~$ java -version
openjdk version "1.8.0_462"
OpenJDK Runtime Environment (build 1.8.0_462-8u462-ga~us1-0ubuntu2~24.04.2-b08)
OpenJDK 64-Bit Server VM (build 25.462-b08, mixed mode)
```

3. Remove Java using apt-get remove:

```
anara@ubuntu:~$ sudo apt-get remove openjdk-8-jdk -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-common at-spi2-core ca-certificates-j
  fonts-dejavu-extra gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme humanity-ic
  libasyncns0 libatk-bridge2.0-0t64 libatk-wrapper-java libatk-wrapper-java-jni libatk1.0-0t64 liba
  libavahi-common3 libcairo-gobject2 libcairo2 libcups2t64 libdatrie1 libdconf1 libdrm-amdgpu1 libd
  libgail-common libgail18t64 libgdk-pixbuf-2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libg
  libglvnd0 libglx-mesa0 libglx0 libgraphite2-3 libgtk2.0-0t64 libgtk2.0-bin libgtk2.0-common libha
  libmp3lame0 libmpg123-0t64 libogg0 libopus0 libpango-1.0-0 libpangocairo-1.0-0 libpangoft2-1.0-0
  libpthread-stubs0-dev libpulse0 librsvg2-2 librsvg2-common libsm-dev libsm6 libsndfile1 libthai-d
  libwayland-client0 libx11-dev libx11-xcb1 libxau-dev libxaw7 libxcb-dri2-0 libxcb-dri3-0 libxcb-g
  libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-xfixes0 libxcb1-dev libxcomposite1 libxcursor1 libx
  libxkbfile1 libxmu6 libxrandr2 libxrender1 libxshmfence1 libxt-dev libxt6t64 libxtst6 libxv1 libx
  openjdk-8-jdk-headless openjdk-8-jre openjdk-8-jre-headless session-migration ubuntu-mono x11-com
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
```

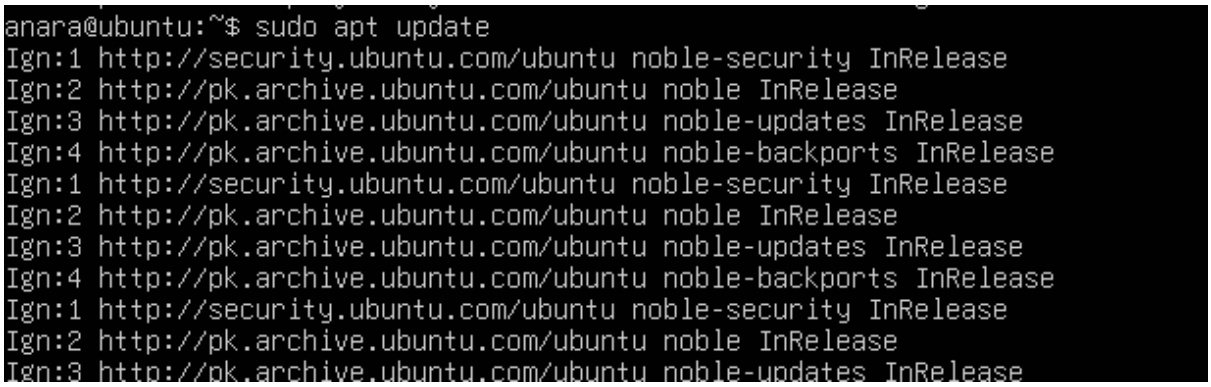
4. Clear the terminal hash cache and confirm java is missing:

```
anara@ubuntu:~$ hash -r
anara@ubuntu:~$ java
Command 'java' not found, but can be installed with:
sudo apt install openjdk-17-jre-headless  # version 17.0.16+8~us1-0ubuntu1~24.04.1, or
sudo apt install openjdk-21-jre-headless  # version 21.0.8+9~us1-0ubuntu1~24.04.1
sudo apt install default-jre              # version 2:1.17-75
sudo apt install openjdk-19-jre-headless  # version 19.0.2+7-4
sudo apt install openjdk-20-jre-headless  # version 20.0.2+9-1
sudo apt install openjdk-22-jre-headless  # version 22~22ea-1
sudo apt install openjdk-11-jre-headless  # version 11.0.28+6-1ubuntu1~24.04.1
sudo apt install openjdk-25-jre-headless  # version 25+36-1~24.04.2
sudo apt install openjdk-8-jre-headless   # version 8u462-ga~us1-0ubuntu2~24.04.2
```

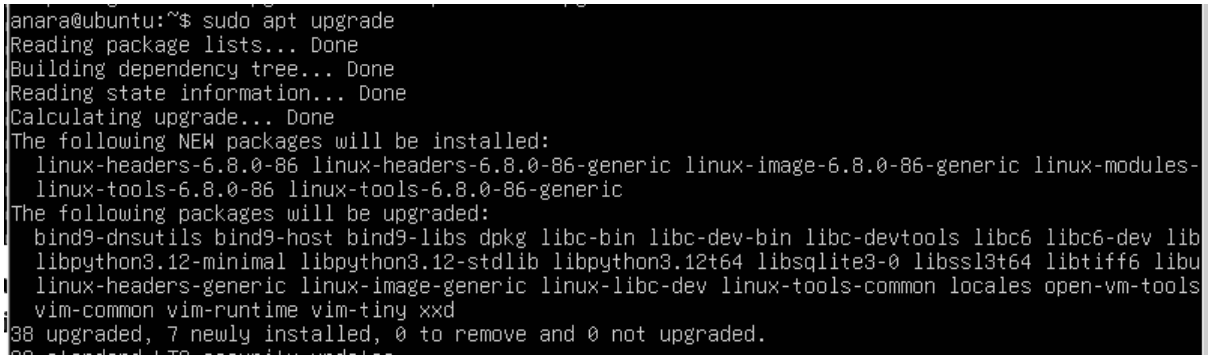
Task 3 - apt update vs apt upgrade - run & explain

Steps (inside VM terminal)

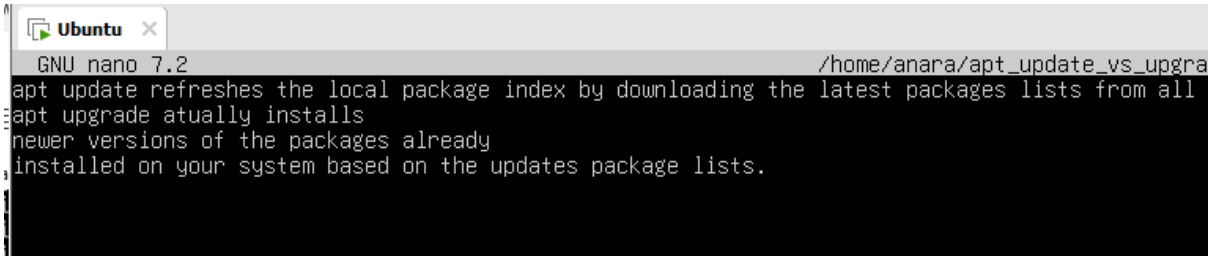
1. **Update the package index (this downloads the latest lists of available packages):**



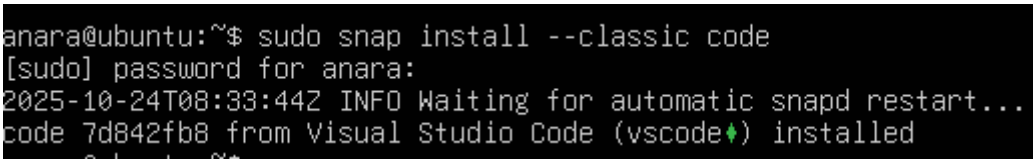
2. **Upgrade installed packages (this installs available updates for currently installed packages):**



3. **Write a short 3–5 sentence explanation describing the difference between apt update and apt upgrade. Put your text into a small file and capture it as a screenshot (do not upload the text file; provide the screenshot):**



Task 4 - Install Visual Studio Code via snap on CLI and verify (DO NOT remove Code)



2. **Verify snap shows the package is installed:**

```
anara@ubuntu:~$ snap list code
Name  Version   Rev  Tracking       Publisher  Notes
code  7d842fb8  211  latest/stable  vscode✓    classic
```

3. **Check the installed application's version. On some systems code --version is available; also check snap info:**

```
anara@ubuntu:~$ code --version
1.105.1
7d842fb85a0275a4a8e4d7e040d2625abbf7f084
x64
```

4. **If the code binary is not in PATH, show where the snap placed it:**

```
anara@ubuntu:~$ ls -l /snap/bin | grep code
lrwxrwxrwx 1 root root 13 Oct 24 08:38 code -> /usr/bin/snap
lrwxrwxrwx 1 root root 13 Oct 24 08:38 code.url-handler -> /usr/bin/snap
```

Task 5 - Install XFCE GUI + XRDP - minimal desktop and remote access (GUI) and launch VS Code

Steps (inside the host terminal / via SSH)

1. **From your host, open your preferred terminal (for example: Windows Command Prompt, PowerShell, macOS Terminal, or Linux Terminal) and connect to the VM using SSH. Example:**

```
C:\Users\anara>ssh anara@192.168.111.128
The authenticity of host '192.168.111.128 (192.168.111.128)' can't be established.
ED25519 key fingerprint is SHA256:qtQKrWqPkeXr3mH/xuBEU5qh73DvzRSPAP4v74hscC0.
This host key is known by the following other names/addresses:
    C:\Users\anara/.ssh/known_hosts:1: 192.168.111.129
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.111.128' (ED25519) to the list of known hosts.
anara@192.168.111.128's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-71-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

 System information as of Fri Oct 24 09:53:36 AM UTC 2025

  System load:  0.05              Processes:             225
  Usage of /:   57.3% of 9.75GB   Users logged in:       1
  Memory usage: 25%               IPv4 address for ens33: 192.168.111.128
  Swap usage:   0%
```

2. **Update the server (download package lists and apply upgrades):**

```
anara@ubuntu:~$ sudo apt update && sudo apt upgrade -y
[sudo] password for anara:
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
70% [Working]
```

3. **Install XFCE and XFCE goodies (lightweight desktop):**

   sudo apt install xfce4 xfce4-goodies -y

```
Get:7 http://pk.archive.ubuntu.com/ubuntu noble/main amd64 glib-networking amd64 2.80.0-1buil
Get:8 http://security.ubuntu.com/ubuntu noble-security/main amd64 libsoup-3.0-0 amd64 3.4.4-5
Get:9 http://pk.archive.ubuntu.com/ubuntu noble/main amd64 libsnapd-glib-2-1 amd64 1.64-0ubun
Get:10 http://security.ubuntu.com/ubuntu noble-security/main amd64 cups-daemon amd64 2.4.7-1.
Get:11 http://security.ubuntu.com/ubuntu noble-security/main amd64 libgomp1 amd64 14.2.0-4ubu
Get:12 http://security.ubuntu.com/ubuntu noble-security/main amd64 libgstreamer-plugins-base1
Get:13 http://pk.archive.ubuntu.com/ubuntu noble/main amd64 fonts-droid-fallback all 1:6.0.1r
Get:14 http://security.ubuntu.com/ubuntu noble-security/universe amd64 libjxl0.7 amd64 0.7.0-
Get:15 http://security.ubuntu.com/ubuntu noble-security/main amd64 libopenjp2-7 amd64 2.5.0-2
Get:16 http://security.ubuntu.com/ubuntu noble-security/main amd64 libvpx9 amd64 1.14.0-1ubun
Get:17 http://security.ubuntu.com/ubuntu noble-security/main amd64 gcc-13-base amd64 13.3.0-6
Get:18 http://security.ubuntu.com/ubuntu noble-security/main amd64 cpp-13-x86-64-linux-gnu am
Get:19 http://security.ubuntu.com/ubuntu noble-security/main amd64 cpp-13 amd64 13.3.0-6ubunt
Get:20 http://security.ubuntu.com/ubuntu noble-security/main amd64 gir1.2-gdkpixbuf-2.0 amd64
Get:21 http://security.ubuntu.com/ubuntu noble-security/main amd64 gir1.2-gstreamer-1.0 amd64
Get:22 http://security.ubuntu.com/ubuntu noble-security/main amd64 libgstreamer-plugins-good1
Get:23 http://security.ubuntu.com/ubuntu noble-security/main amd64 gstreamer1.0-plugins-base
Get:24 http://security.ubuntu.com/ubuntu noble-security/main amd64 gstreamer1.0-plugins-good
Get:25 http://security.ubuntu.com/ubuntu noble-security/main amd64 bubblewrap amd64 0.9.0-1ub
Get:26 http://security.ubuntu.com/ubuntu noble-security/main amd64 cups-common all 2.4.7-1.2u
Get:27 http://security.ubuntu.com/ubuntu noble-security/main amd64 cups-client amd64 2.4.7-1.
Get:28 http://security.ubuntu.com/ubuntu noble-security/main amd64 cups-ipp-utils amd64 2.4.7
20% [13 fonts-droid-fallback 229 kB/1,805 kB 13%] [28 cups-ipp-utils 1,582 B/233 kB 1%]
```

4. **Install and enable XRDP (Remote Desktop Protocol server):**

```
anara@ubuntu:~$ sudo apt install xrdp -y
[sudo] password for anara:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libfuse2t64 libpipewire-0.3-modules-xrdp pipewire-module-xrdp xorgxrdp
Suggested packages:
  pipewire-bin guacamole
The following NEW packages will be installed:
  libfuse2t64 libpipewire-0.3-modules-xrdp pipewire-module-xrdp xorgxrdp xrdp
0 upgraded, 5 newly installed, 0 to remove and 0 not upgraded.
Need to get 715 kB of archives.
After this operation, 3,895 kB of additional disk space will be used.
Get:1 http://pk.archive.ubuntu.com/ubuntu noble/universe amd64 libfuse2t64 amd64 2.9.9-8.1build
[89.9 kB]
Get:2 http://pk.archive.ubuntu.com/ubuntu noble/universe amd64 xrdp amd64 0.9.24-4 [536 kB]
No VM guests are running outdated hypervisor (qemu) binaries on this host.
anara@ubuntu:~$ sudo systemctl enable --now xrdp
Synchronizing state of xrdp.service with SysV service script with /usr/lib/systemd/systemd-sysv
nstall.
Executing: /usr/lib/systemd/systemd-sysv-install enable xrdp
```

5. **Verify XRDP status:**

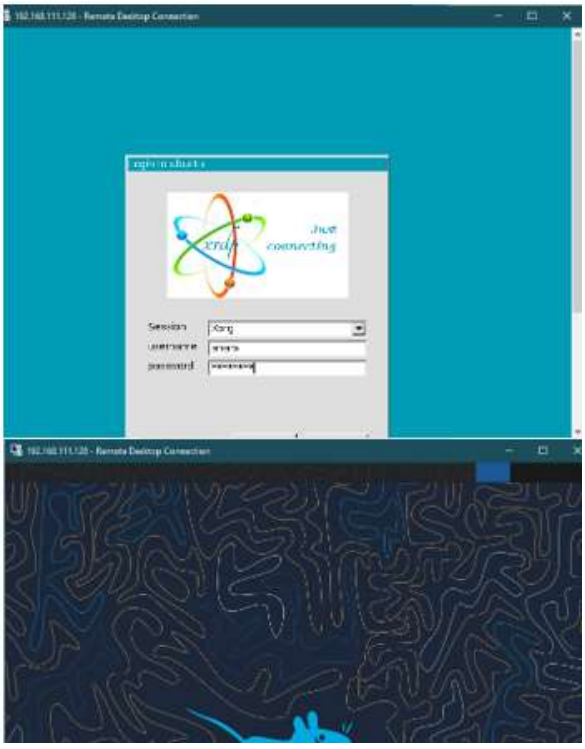
```
anara@ubuntu:~$ sudo systemctl status xrdp
● xrdp.service - xrdp daemon
     Loaded: loaded (/usr/lib/systemd/system/xrdp.service; enabled; preset: enabled)
     Active: active (running) since Fri 2025-10-24 17:37:50 UTC; 3min 23s ago
       Docs: man:xrdp(8)
             man:xrdp.ini(5)
   Main PID: 7582 (xrdp)
      Tasks: 1 (limit: 2210)
     Memory: 868.0K (peak: 1.5M)
        CPU: 59ms
     CGroup: /system.slice/xrdp.service
             └─7582 /usr/sbin/xrdp

Oct 24 17:37:49 ubuntu systemd[1]: Starting xrdp.service - xrdp daemon...
Oct 24 17:37:49 ubuntu xrdp[7580]: [INFO ] address [0.0.0.0] port [3389] mode 1
Oct 24 17:37:49 ubuntu xrdp[7580]: [INFO ] listening to port 3389 on 0.0.0.0
Oct 24 17:37:49 ubuntu xrdp[7580]: [INFO ] xrdp_listen_pp done
Oct 24 17:37:49 ubuntu systemd[1]: xrdp.service: Can't open PID file /run/xrdp/xrdp.pid (yet?)
Oct 24 17:37:50 ubuntu systemd[1]: Started xrdp.service - xrdp daemon.
Oct 24 17:37:51 ubuntu xrdp[7582]: [INFO ] starting xrdp with pid 7582
Oct 24 17:37:51 ubuntu xrdp[7582]: [INFO ] address [0.0.0.0] port [3389] mode 1
Oct 24 17:37:51 ubuntu xrdp[7582]: [INFO ] listening to port 3389 on 0.0.0.0
Oct 24 17:37:51 ubuntu xrdp[7582]: [INFO ] xrdp_listen_pp done
```

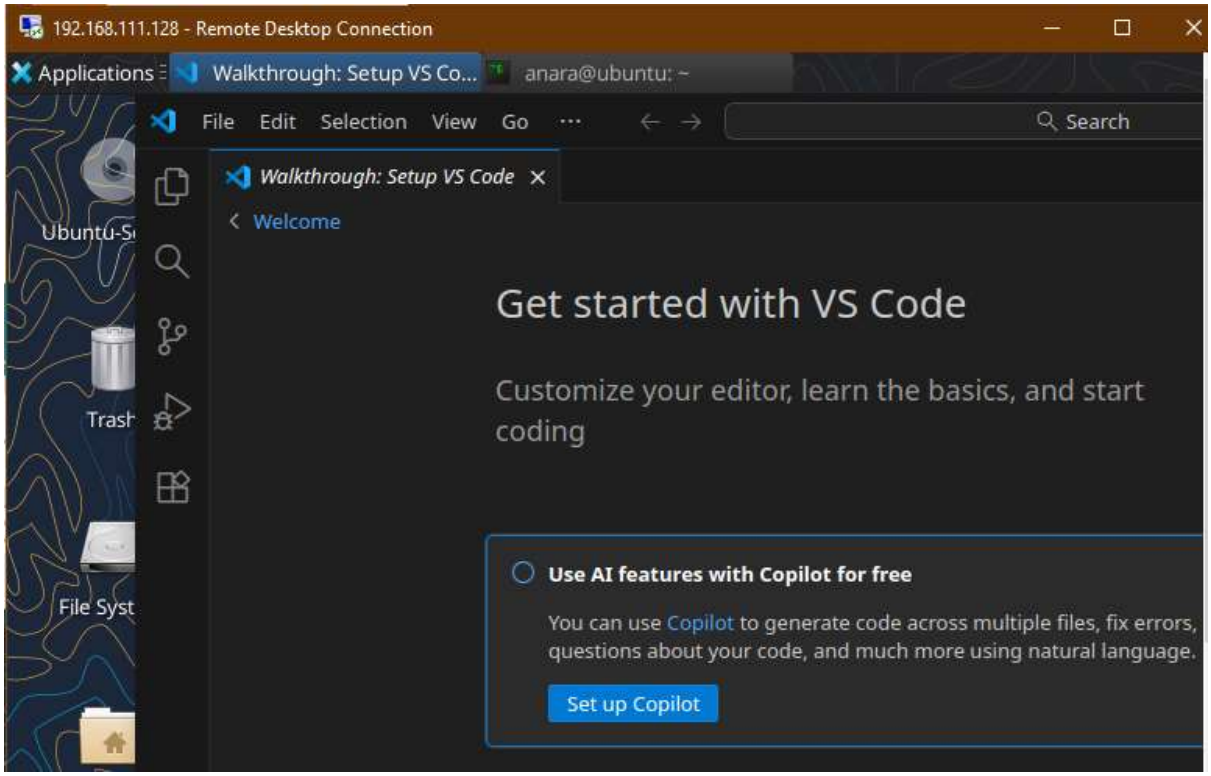
6. Configure XRDP to use XFCE session:

```
anara@ubuntu:~$ echo xfce4-session > ~/.xsession
anara@ubuntu:~$ cat .xsession
xfce4-session
anara@ubuntu:~$
```

From a Windows host or RDP client, connect with Remote Desktop (mstsc) to your server IP and login using your Ubuntu username/password. Capture a screenshot of the remote desktop or the RDP session window (if allowed by your environment) and save it



8. **After you are in the GUI (local console or RDP session), launch Visual Studio Code (installed in Task 4) from the GUI menu or a terminal inside the GUI. Example command from a GUI terminal:**



Task 6 - Install lightdm-gtk-greeter and GUI verification - start GUI, open VS Code, take snapshot, then end (GUI)

Steps (inside the host terminal / via SSH)

1. **Fix GUI login screen issues (if lightdm / greeter problems appear)**

```
anara@ubuntu:~$ sudo apt install lightdm lightdm-gtk-greeter -y
[sudo] password for anara:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
lightdm is already the newest version (1.30.0-0ubuntu14).
lightdm set to manually installed.
The following additional packages will be installed:
  gnome-accessibility-themes gnome-themes-extra gnome-themes-extra-data gtk2-engines-pixbuf
Recommended packages:
```

- **Create LightDM config to use XFCE:**

```
anara@ubuntu:~$ sudo mkdir -p /etc/lightdm/lightdm.conf.d
anara@ubuntu:~$ echo -e "[Seat:*]\ngreeter-session=lightdm-gtk-g
> hello
> ^C
```

- **Clean up problematic session files and permissions:**

```
anara@ubuntu:~$ sudo rm -f /var/lib/lightdm/.Xauthority
anara@ubuntu:~$ sudo rm -f ~/.Xauthority
anara@ubuntu:~$ sudo rm -rf ~/.cache/sessions
anara@ubuntu:~$ sudo chown -R $USER:$USER /home/$USER
anara@ubuntu:~$ ls
analysis         apt_update_vs_upgrade.md  Downloads  Pictures  Templates
analysis_backup  Desktop                   lab4       Public    thinclient_drives
answers.md       Documents                 Music      snap      Videos
anara@ubuntu:~$ ls /etc/lightdm
lightdm.conf.d  lightdm-gtk-greeter.conf  users.conf
```

- **Restart LightDM:**

```
anara@ubuntu:~$ sudo systemctl restart lightdm
Warning: The unit file, source configuration file or drop-ins of lightdm.service changed on disk.
 Run 'systemctl daemon-reload' to reload units.
anara@ubuntu:~$ sudo systemctl daemon-reload
anara@ubuntu:~$ sudo systemctl restart lightdm
anara@ubuntu:~$ sudo sytemctl status lightdm
sudo: sytemctl: command not found
anara@ubuntu:~$ sudo systemctl status lightdm
● lightdm.service - Light Display Manager
     Loaded: loaded (/usr/lib/systemd/system/lightdm.service; indirect; preset: enabled)
     Active: active (running) since Fri 2025-10-24 18:40:35 UTC; 23s ago
       Docs: man:lightdm(1)
    Process: 9855 ExecStartPre=/bin/sh -c [ "$(basename $(cat /etc/X11/default-display-manager 2>
   Main PID: 9858 (lightdm)
      Tasks: 7 (limit: 2210)
     Memory: 25.5M (peak: 29.0M)
        CPU: 1.497s
     CGroup: /system.slice/lightdm.service
             ├─ 9858 /usr/sbin/lightdm
             ├─ 9866 /usr/lib/xorg/Xorg -core :0 -seat seat0 -auth /var/run/lightdm/root/:0 -nol>
             └─10005 lightdm --session-child 13 20

Oct 24 18:40:35 ubuntu systemd[1]: Starting lightdm.service - Light Display Manager...
Oct 24 18:40:35 ubuntu systemd[1]: Started lightdm.service - Light Display Manager.
```

2. **Control GUI login at boot — ENABLE first, then DISABLE (observe and understand terminal/GUI behavior after each reboot)**

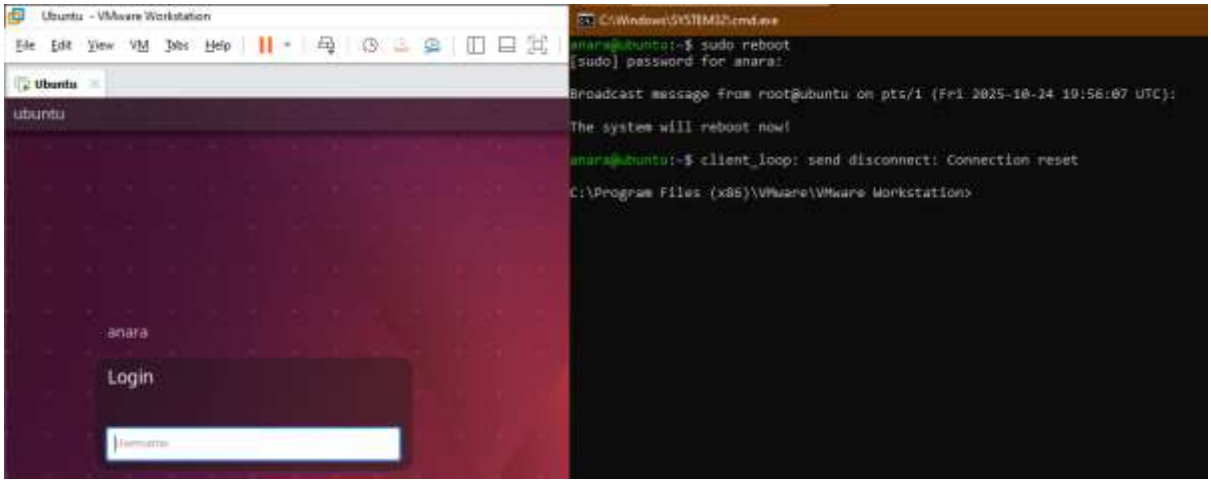
Important: students MUST perform the reboot after each target change to observe the boot-time behavior. The sequence below has been adjusted so you ENABLE the GUI boot target first, reboot and observe GUI, then DISABLE the GUI boot target, reboot and observe the CLI.

- **Enable GUI Login Screen (Boot to GUI)**
    - **Re-enable LightDM and set the graphical target as default:**

```
anara@ubuntu:~$ sudo systemctl enable lightdm
Synchronizing state of lightdm.service with SysV service script with /usr/lib/systemd/systemd-s
v-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable lightdm
The unit files have no installation config (WantedBy=, RequiredBy=, UpheldBy=,
Also=, or Alias= settings in the [Install] section, and DefaultInstance= for
template units). This means they are not meant to be enabled or disabled using systemctl.

Possible reasons for having these kinds of units are:
• A unit may be statically enabled by being symlinked from another unit's
  .wants/, .requires/, or .upholds/ directory.
• A unit's purpose may be to act as a helper for some other unit which has
  a requirement dependency on it.
• A unit may be started when needed via activation (socket, path, timer,
  D-Bus, udev, scripted systemctl call, ...).
• In case of template units, the unit is meant to be enabled with some
  instance name specified.
anara@ubuntu:~$ sudo systemctl set-default graphical.target
Created symlink /etc/systemd/system/default.target → /usr/lib/systemd/system/graphical.target.
anara@ubuntu:~$ systemctl get-default
graphical.target
```

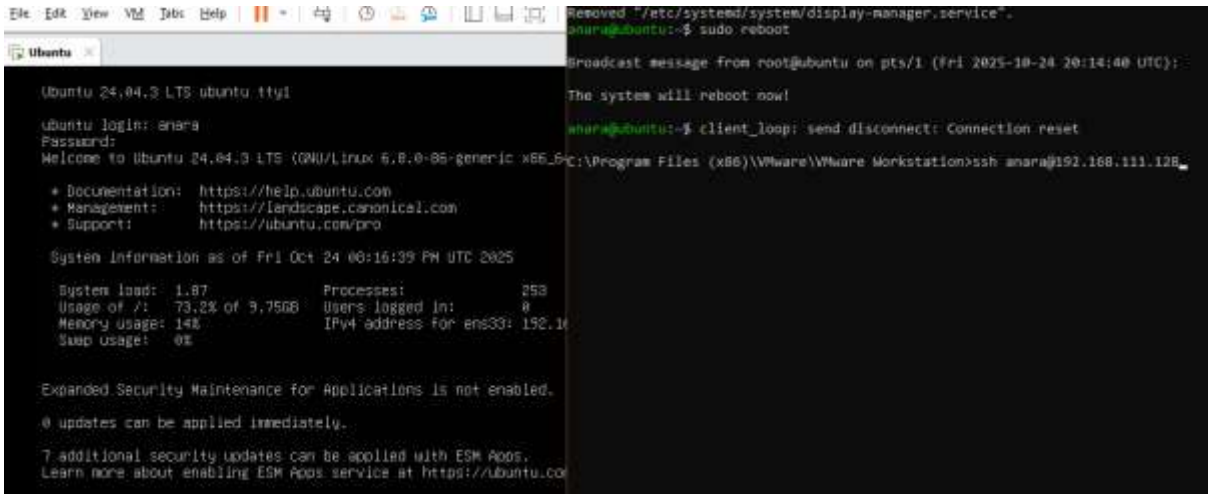
- **Reboot the VM to observe that it boots to the GUI login screen:**



- **Disable GUI Login Screen (Boot to CLI)**
    - **Set the default boot target to multi-user (text mode) and disable LightDM so the system boots to the terminal:**

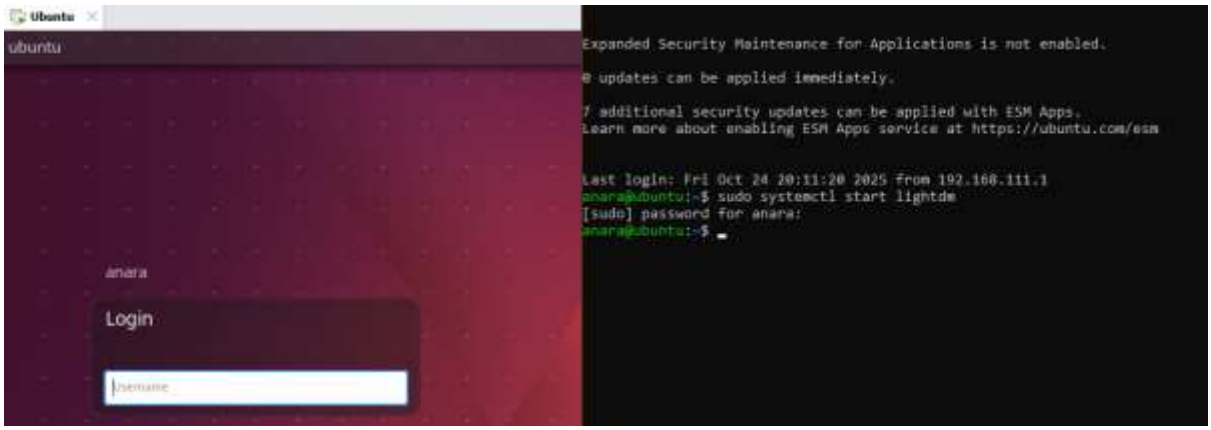
```
anara@ubuntu:~$ sudo systemctl set-default multi-user.target
Removed "/etc/systemd/system/default.target".
Created symlink /etc/systemd/system/default.target → /usr/lib/systemd/system/multi-user.target.
anara@ubuntu:~$ sudo systemctl disable lightdm
Synchronizing state of lightdm.service with SysV service script with /usr/lib/systemd/systemd-sys
v-install.
Executing: /usr/lib/systemd/systemd-sysv-install disable lightdm
Removed "/etc/systemd/system/display-manager.service".
anara@ubuntu:~$
```

- **After the VM boots, capture a screenshot of the login prompt or terminal session showing CLI-only behavior**



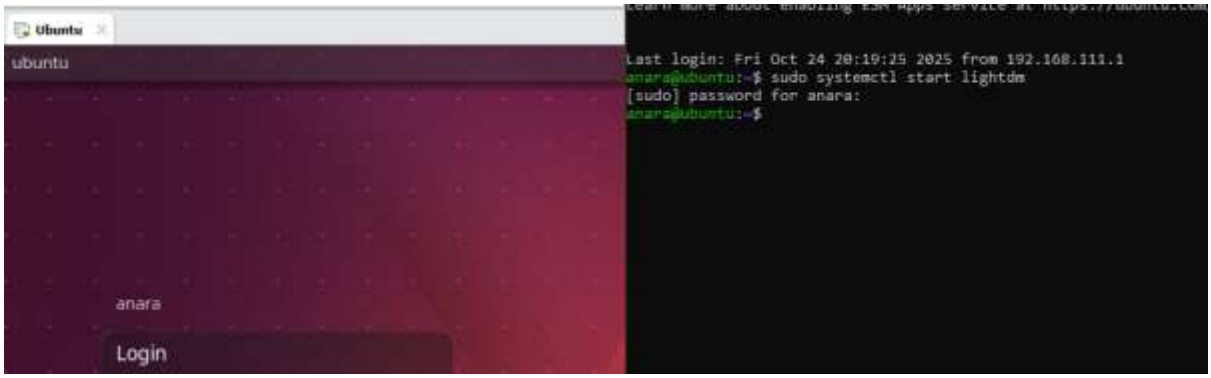
Start/Stop GUI manually (no reboot)

- **You can start the GUI session without changing the boot target. This is useful if you want to keep the boot target as CLI but run GUI temporarily:**
- **Save screenshot(s) showing the start commands and any immediate status output**

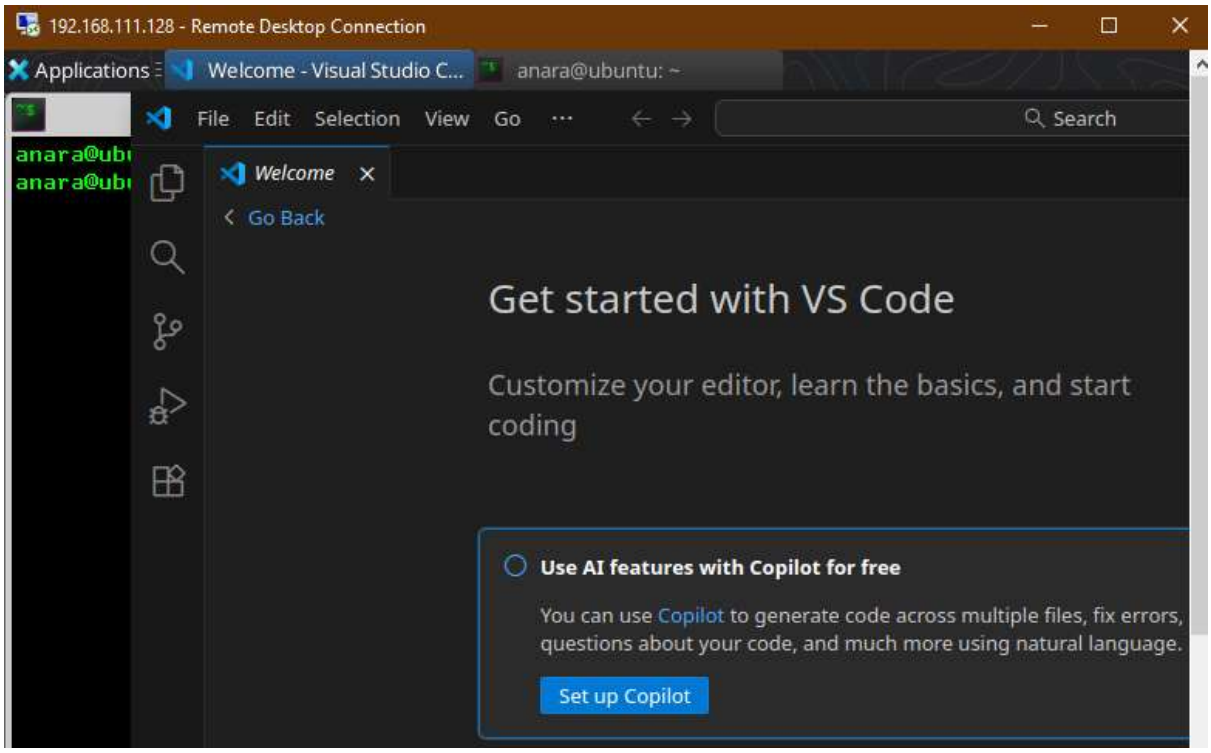


- **Press Ctrl + Alt + F3 to switch back to TTY. You can stop the GUI session without changing the boot target.**

3. **Start the GUI (if the system is currently set to CLI or the GUI is not running):**



4. **In the GUI session launch Visual Studio Code (installed earlier in Task 4). From a GUI terminal inside the desktop, run:**



Task 7 - Install Google Chrome by adding its apt source & key (Chrome)

Steps (inside the VM terminal or GUI terminal or host terminal / via SSH)

1. **(Learning step — first command must be the install attempt) Attempt to install Google Chrome directly to see the failure when the repo/key are missing**

```
anara@ubuntu:~$ sudo apt install google-chrome-stable -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package google-chrome-stable
```

2. **Inspect apt configuration so you understand why install failed. List the /etc/apt directory:**

```
anara@ubuntu:~$ ls -la /etc/apt
total 48
drwxr-xr-x   9 root root  4096 Oct 24 07:12 .
drwxr-xr-x 141 root root 12288 Oct 24 17:37 ..
drwxr-xr-x   2 root root  4096 Aug  5 17:14 apt.conf.d
drwxr-xr-x   2 root root  4096 Mar 31  2024 auth.conf.d
drwxr-xr-x   2 root root  4096 Mar 31  2024 keyrings
drwxr-xr-x   2 root root  4096 Aug  5 17:14 preferences.d
drwxr-xr-x   2 root root  4096 Aug  5 17:14 preferences.d.save
-rw-r--r--   1 root root    70 Oct 24 07:12 sources.list
drwxr-xr-x   2 root root  4096 Sep 27 09:56 sources.list.d
drwxr-xr-x   2 root root  4096 Aug  5 17:01 trusted.gpg.d
```

3. **View the main /etc/apt/sources.list:**

```
anara@ubuntu:~$ cat /etc/apt/sources.list
# Ubuntu sources have moved to /etc/apt/sources.list.d/ubuntu.sources
anara@ubuntu:~$
```

4. **List files under /etc/apt/sources.list.d:**

```
anara@ubuntu:~$ ls -la /etc/apt/sources.list.d/
total 16
drwxr-xr-x 2 root root 4096 Sep 27 09:56 .
drwxr-xr-x 9 root root 4096 Oct 24 07:12 ..
-rw-r--r-- 1 root root  386 Sep 27 09:56 ubuntu.sources
-rw-r--r-- 1 root root 2552 Aug  5 17:02 ubuntu.sources.curtin.orig
```

5. **If there is a file named ubuntu.sources (or similarly named source file), display it to see whether Chrome's repo is present:**

```
anara@ubuntu:~$ cat /etc/apt/sources.list.d/ubuntu.sources
Types: deb
URIs: http://pk.archive.ubuntu.com/ubuntu/
Suites: noble noble-updates noble-backports
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg

Types: deb
URIs: http://security.ubuntu.com/ubuntu/
Suites: noble-security
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg
```

6. **Add Chrome repository metadata to a sources file (method A — using ubuntu.sources). Open or create the file and append the stanza (you can alternatively use the preferred one-line method in step 11):**

```
anara@ubuntu:~$ sudo nano /etc/apt/sources.list.d/ubuntu.sources
anara@ubuntu:~$ cat /etc/apt/sources.list.d/ubuntu.sources
Types: deb
URIs: http://pk.archive.ubuntu.com/ubuntu/
Suites: noble noble-updates noble-backports
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg

Types: deb
URIs: http://security.ubuntu.com/ubuntu/
Suites: noble-security
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg
Types: deb
URIs: https://dl.google.com/linux/chrome/deb
Suites:stable
Components: main
Architectures: amd64
Signed-By: /etc/apt/keyrings/google.gpg
```

7. **Ensure the keyrings directory exists and import Google's signing key:**

```
anara@ubuntu:~$ curl -fsSL https://dl.google.com/linux/linux_signing_key.pub | sudo gpg --dearmor
 -o /etc/apt/keyrings/google.gpg
File '/etc/apt/keyrings/google.gpg' exists. Overwrite? (y/N) y
```

8. **Update apt and attempt to install Chrome again (now that repo + key are added):**

```
anara@ubuntu:~$ sudo apt update
Get:1 https://dl.google.com/linux/chrome/deb stable InRelease [1,825 B]
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:4 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Get:5 https://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,214 B]
Fetched 3,039 B in 2s (1,556 B/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
```

```
anara@ubuntu:~$ sudo apt install google-chrome-stable -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  fonts-liberation fonts-liberation-sans-narrow
The following NEW packages will be installed:
  fonts-liberation fonts-liberation-sans-narrow google-chrome-stable
0 upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 122 MB of archives.
After this operation, 401 MB of additional disk space will be used.
Get:1 http://pk.archive.ubuntu.com/ubuntu noble/main amd64 fonts-liberation all 1:2.1.5-3 [1,603
kB]
```

9. **Alternate (preferred, cleaner) method — create a single google-chrome.list entry**

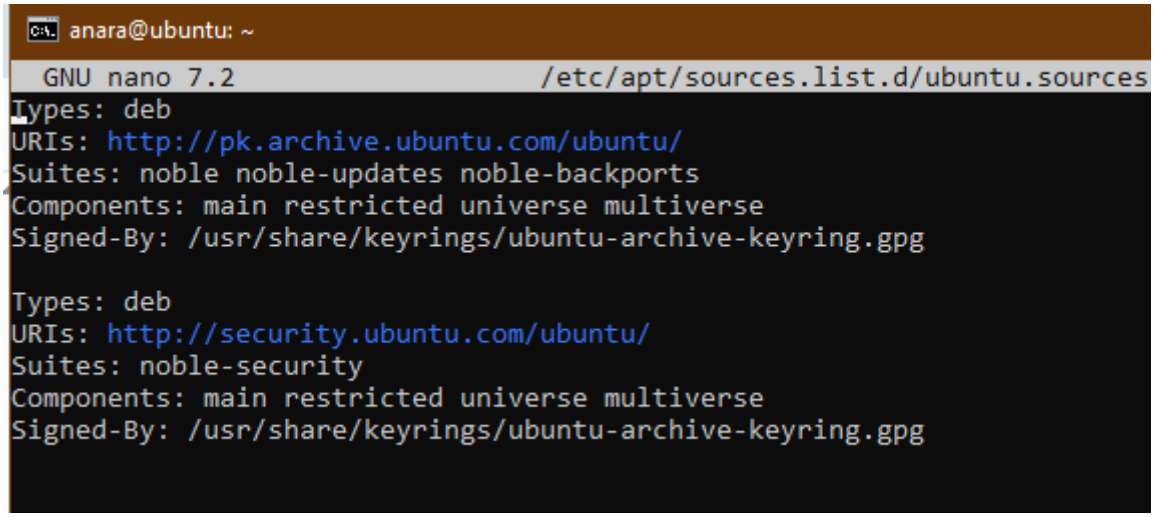
```
anara@ubuntu:~$ sudo rm -f /etc/apt/sources.list.d/google-chrome.list
[sudo] password for anara:
anara@ubuntu:~$ sudo rm -f /etc/apt/sources.list.d/google-chrome-stable.list
anara@ubuntu:~$ sudo rm -f /etc/apt/keyrings/google.gpg
anara@ubuntu:~$ sudo rm -f /etc/apt/trusted.gpg.d/google-chrome.gpg
anara@ubuntu:~$ sudo mkdir -p /etc/apt/keyrings
anara@ubuntu:~$ wget -q -O - https://dl.google.com/linux/linux_signing_key.pub | gpg --dearmor | su
o tee /etc/apt/keyrings/google.gpg > /dev/null
anara@ubuntu:~$ echo "deb [arch=amd64 signed-by=/etc/apt/keyrings/google.gpg] https://dl.google.com
linux/chrome/deb/ stable main" | sudo tee /etc/apt/sources.list.d/google-chrome.list > /dev/null
anara@ubuntu:~$ sudo apt update
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 https://dl.google.com/linux/chrome/deb stable InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
W: Target Packages (main/binary-amd64/Packages) is configured multiple times in /etc/apt/sources.li
```

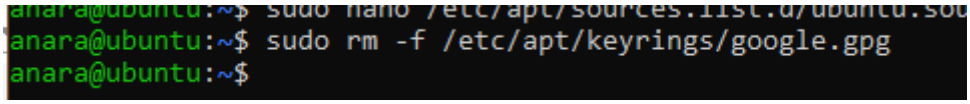
```
anara@ubuntu:~$ sudo apt install google-chrome-stable
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
google-chrome-stable is already the newest version (141.0.7390.122-1).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

10. **Cleanup before alternate method you added the chrome earlier and want to switch to the preferred method:**

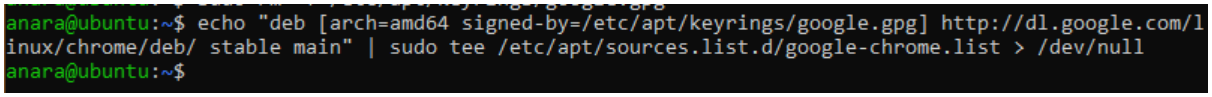
```
anara@ubuntu:~$ sudo apt remove google-chrome-stable -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages will be REMOVED:
  google-chrome-stable
0 upgraded, 0 newly installed, 1 to remove and 0 not upgraded.
After this operation, 396 MB disk space will be freed.
(Reading database ... 192854 files and directories currently installed.)
Removing google-chrome-stable (141.0.7390.122-1) ...
Processing triggers for desktop-file-utils (0.27-2build1) ...
Processing triggers for mate-menus (1.26.1-1build3) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for bamfdaemon (0.5.6+22.04.20220217-0ubuntu5) ...
Rebuilding /usr/share/applications/bamf-2.index...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date
```

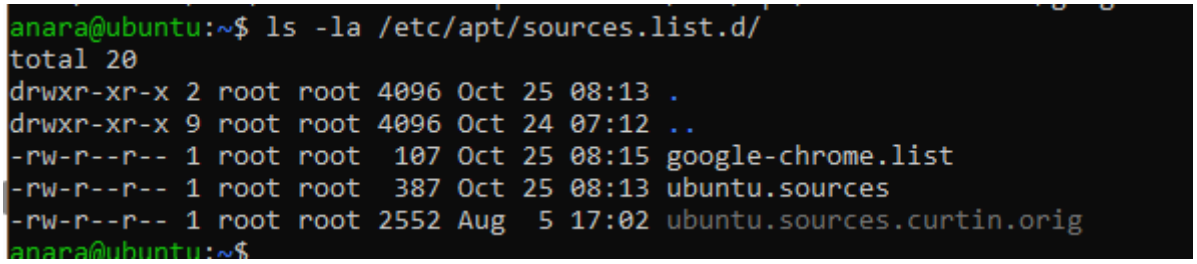




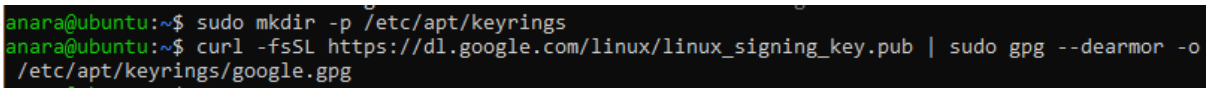
11. Create a dedicated one-line list file for Google Chrome (preferred):



12. Verify the new file exists:



13. Re-add the Google signing key (if removed previously or not present):



14. Update apt and install Chrome (preferred flow):

```
anara@ubuntu:~$ sudo apt update
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Ign:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Err:5 http://security.ubuntu.com/ubuntu noble-security Release
  Cannot initiate the connection to security.ubuntu.com:80 (2620:2d:4000:1::102). - connect (101: Ne
twork is unreachable) Cannot initiate the connection to security.ubuntu.com:80 (2620:2d:4002:1::102)
. - connect (101: Network is unreachable) Cannot initiate the connection to security.ubuntu.com:80 (
2620:2d:4002:1::101). - connect (101: Network is unreachable) Cannot initiate the connection to secu
rity.ubuntu.com:80 (2620:2d:4000:1::101). - connect (101: Network is unreachable) Cannot initiate th
e connection to security.ubuntu.com:80 (2620:2d:4002:1::103). - connect (101: Network is unreachable
) Cannot initiate the connection to security.ubuntu.com:80 (2620:2d:4000:1::103). - connect (101: Ne
twork is unreachable)
Hit:6 http://dl.google.com/linux/chrome/deb stable InRelease
Reading package lists... Done
```

```
anara@ubuntu:~$ sudo apt install google-chrome-stable -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  google-chrome-stable
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 120 MB of archives.
After this operation, 396 MB of additional disk space will be used.
Get:1 http://dl.google.com/linux/chrome/deb stable/main amd64 google-chrome-stable amd64 14
122-1 [120 MB]
1% [1 google-chrome-stable 1,229 kB/120 MB 1%]
```

Task 8 - Install applications via PPA (Audacity & OBS) and launch

Steps (inside the VM terminal or GUI terminal)

1. **Add the Audacity PPA, update apt and install audacity:**

```
anara@ubuntu:~$ sudo add-apt-repository ppa:ubuntuhandbook1/audacity -y
[sudo] password for anara:
Repository: 'Types: deb
URIs: https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu/
Suites: noble
Components: main
'
Description:
Unofficial build of Audacity audio editor

For help, please use Audacity forum: http://forum.audacityteam.org/

If the packages here are helpful, you may buy me a coffee:

         https://ko-fi.com/ubuntuhandbook1
More info: https://launchpad.net/~ubuntuhandbook1/+archive/ubuntu/audacity
Adding repository.
```

```
anara@ubuntu:~$ sudo apt update
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:5 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:6 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InR
elease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
```

```
Setting up libsratom-0-0:amd64 (0.6.16-1build1) ...
Setting up liblilv-0-0:amd64 (0.24.22-1build1) ...
Setting up audacity (3.7.5-0build1~ubuntu24.04) ...
Processing triggers for shared-mime-info (2.4-4) ...
Processing triggers for bamfdaemon (0.5.6+22.04.20220217-0ubuntu5) ...
Rebuilding /usr/share/applications/bamf-2.index...
Processing triggers for desktop-file-utils (0.27-2build1) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for mate-menus (1.26.1-1build3) ...
Processing triggers for libc-bin (2.39-0ubuntu8.6) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
```

2. **Launch Audacity (from GUI or CLI). On a headless server you may not get a GUI window — if you are using the XFCE GUI session, launch from a GUI terminal or run check for binary:**

3. **Add the OBS Studio PPA, update apt and install obs-studio:**

```
anara@ubuntu:~$ sudo add-apt-repository ppa:obsproject/obs-studio -y
Repository: 'Types: deb
URIs: https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu/
Suites: noble
Components: main
'
Description:
Latest stable release of OBS Studio
More info: https://launchpad.net/~obsproject/+archive/ubuntu/obs-studio
Adding repository.
```

```
anara@ubuntu:~$ sudo apt update
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:5 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:6 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble InRel
Hit:7 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble In
```

```
  libbluray-bdj libfftw3-bin libfftw3-dev qt6-qmltooling-plugins sndi
The following NEW packages will be installed:
  libaacs0 libass9 libavdevice60 libavfilter9 libavformat60 libb2-1 l
  libbluray2 libbs2b0 libchromaprint1 libcjson1 libdc1394-25 libdecor
  libdecor-0-plugin-1-gtk libfdk-aac2 libfftw3-double3 libflite1 libg
  libluajit-5.1-2 libluajit-5.1-common libmbedcrypto7t64 libmbedtls14
  libmbedx509-1t64 libmysofa1 libnorm1t64 libopenal-data libopenal1
  libopenmpt0t64 libpgm-5.3-0t64 libplacebo338 libpocketsphinx3 libpo
  libqrcodegencpp1 libqt6core6t64 libqt6dbus6t64 libqt6gui6t64 libqt6
  libqt6opengl6t64 libqt6qml6 libqt6qmlmodels6 libqt6quick6 libqt6svg
  libqt6waylandclient6 libqt6waylandcompositor6
  libqt6waylandeglclienthwintegration6 libqt6waylandeglcompositorhwin
  libqt6widgets6t64 libqt6wlshellintegration6 libqt6xml6t64 librabbit
  librubberband2 libsdl2-2.0-0 libsndio7.0 libsphinxbase3t64 libsrt1.
  libsrt1.5-openssl libssh-gcrypt-4 libswscale7 libts0t64 libudfread0
  libunibreak5 libvidstab1.1 libxcb-composite0 libzimg2 libzmq5 obs-s
  pocketsphinx-en-us qt6-gtk-platformtheme qt6-qpa-plugins qt6-transl
  qt6-wayland
0 upgraded, 72 newly installed, 0 to remove and 0 not upgraded.
Need to get 178 MB of archives.
After this operation, 523 MB of additional disk space will be used.
```

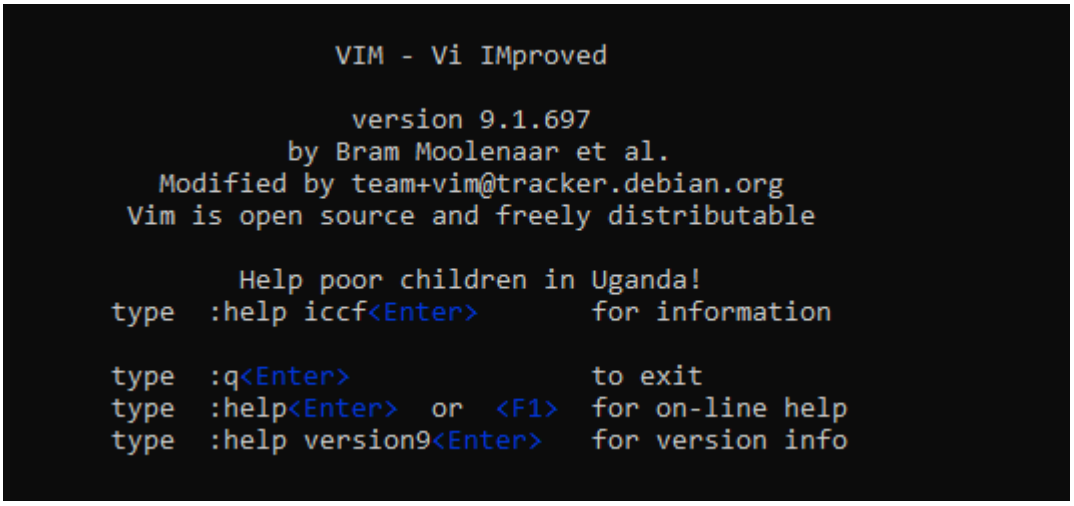
4. **Launch OBS Studio (from GUI or verify binary presence):**

```
anara@ubuntu:~$ obs --version
OBS Studio - 32.0.0
```

Task 9 - Create a Kubernetes sample YAML using vim

Steps (inside the VM terminal or host terminal / via SSH)

1. **Check whether vim is installed by running:**



2. **Create the Lab5 working directory in your home and change into it:**

```
anara@ubuntu:~$ mkdir -p ~/Lab5
anara@ubuntu:~$ cd ~/Labs
-bash: cd: /home/anara/Labs: No such file or directory
anara@ubuntu:~$ cd ~/Lab5
anara@ubuntu:~/Lab5$ pwd
/home/anara/Lab5
```

3. **Create the Kubernetes sample file using vim:**

anara@ubuntu: ~

```
apiVersion: v1
kind : Pod
metadata:
  name: nginx-pod
spec:
  containers:
    - name: nginx
      image: nginx:1.19
      port:
    - containerPort: 80
  restartPolicy: Always
~
~
~
```

4. **Exit insert mode by pressing Esc, then save and quit vim with:**

```
anara@ubuntu:~$ ls -la
total 117616
drwxr-x--- 24 anara anara      4096 Oct 25 10:24 .
drwxr-xr-x  3 root  root       4096 Oct 17 15:59 ..
drwxrwxr-x  7 anara anara      4096 Oct 17 15:18 analysis
drwxrwxr-x  7 anara anara      4096 Oct 17 15:20 analysis_backup
-rw-rw-r--  1 anara anara       632 Oct 17 09:07 answers.md
-rw-rw-r--  1 anara anara       310 Oct 24 08:31 apt_update_vs_upgrade.md
-rw-------  1 anara anara      4461 Oct 25 07:54 .bash_history
-rw-r--r--  1 anara anara       220 Mar 31  2024 .bash_logout
-rw-r--r--  1 anara anara      3771 Mar 31  2024 .bashrc
drwx------  9 anara anara      4096 Oct 24 20:41 .cache
drwx------  9 anara anara      4096 Oct 25 08:28 .config
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Desktop
-rw-r--r--  1 anara anara        25 Oct 24 17:35 .dmrc
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Documents
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Downloads
drwx------  3 anara anara      4096 Oct 24 17:52 .gnupg
-rw-rw-r--  1 anara anara 120234260 Oct 21 20:35 google-chrome-stable_current_amd64.deb
-rw-------  1 anara anara         0 Oct 24 17:52 .ICEauthority
-rw-rw-r--  1 anara anara       177 Oct 25 10:24 k8s-sample.yaml
drwxrwxr-x  3 anara anara      4096 Oct 17 07:16 lab4
drwxrwxr-x  2 anara anara      4096 Oct 25 10:19 Lab5
drwxrwxr-x  3 anara anara      4096 Oct 17 07:10 .local
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Music
drwx------  2 anara anara      4096 Oct 25 08:22 .pcsc10
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Pictures
drwx------  3 anara anara      4096 Oct 24 18:05 .pki
-rw-r--r--  1 anara anara       807 Mar 31  2024 .profile
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Public
drwx------  3 anara anara      4096 Oct 24 18:05 snap
drwx------  2 anara anara      4096 Oct 17 06:45 .ssh
-rw-r--r--  1 anara anara         0 Oct 17 08:12 .sudo_as_admin_successful
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Templates
drwx------  1 anara anara         0 Oct 25 08:22 thinclient_drives
drwxr-xr-x  2 anara anara      4096 Oct 24 17:53 Videos
```

Task 10 - Edit the Kubernetes YAML - add annotation, verify, then discard temporary change

Steps (inside the VM terminal or host terminal / via SSH)

1. **Open the manifest with vim:**

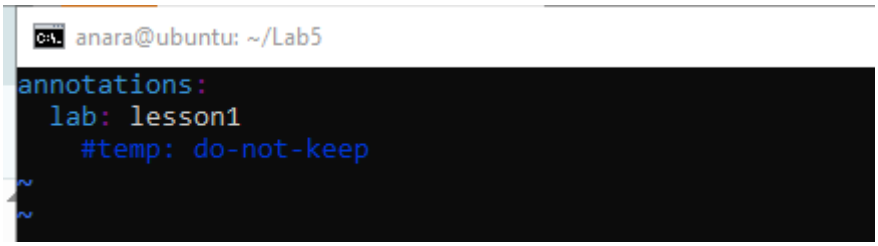
```
-rw-------  1 anara anara     12464 Oct 2
anara@ubuntu:~$ cd ~/Lab5
anara@ubuntu:~/Lab5$ vim k8s-sample.yaml
```

2. **Add the annotation under the metadata section (indentation must match YAML). Example (insert these lines under metadata:):**

anara@ubuntu: ~/Lab5

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
spec:
  containers:
    - name: nginx
      image: ndinx:1.19
      ports:
      - containerPort: 80
  restartPolicy: Always
annotations:
  lab: lesson
```

3. **Discard changes (practice: make a temporary edit and exit without saving)**




```
anara@ubuntu:~/Lab5$ anara@ubuntu:~/Lab5$ cat k8s-sample.yaml
annotations:
  lab: lesson1
anara@ubuntu:~/Lab5$
```

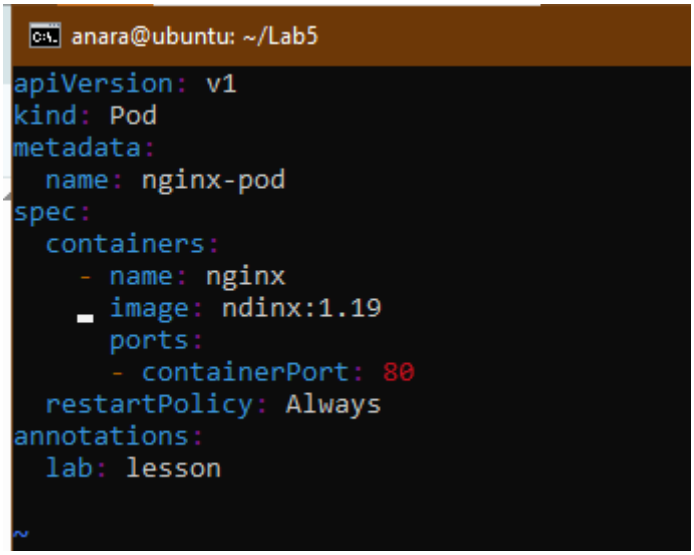
Task 11 - Vim editing practice - delete, undo, numeric deletes, navigation

Steps (inside the VM terminal or host terminal / via SSH)

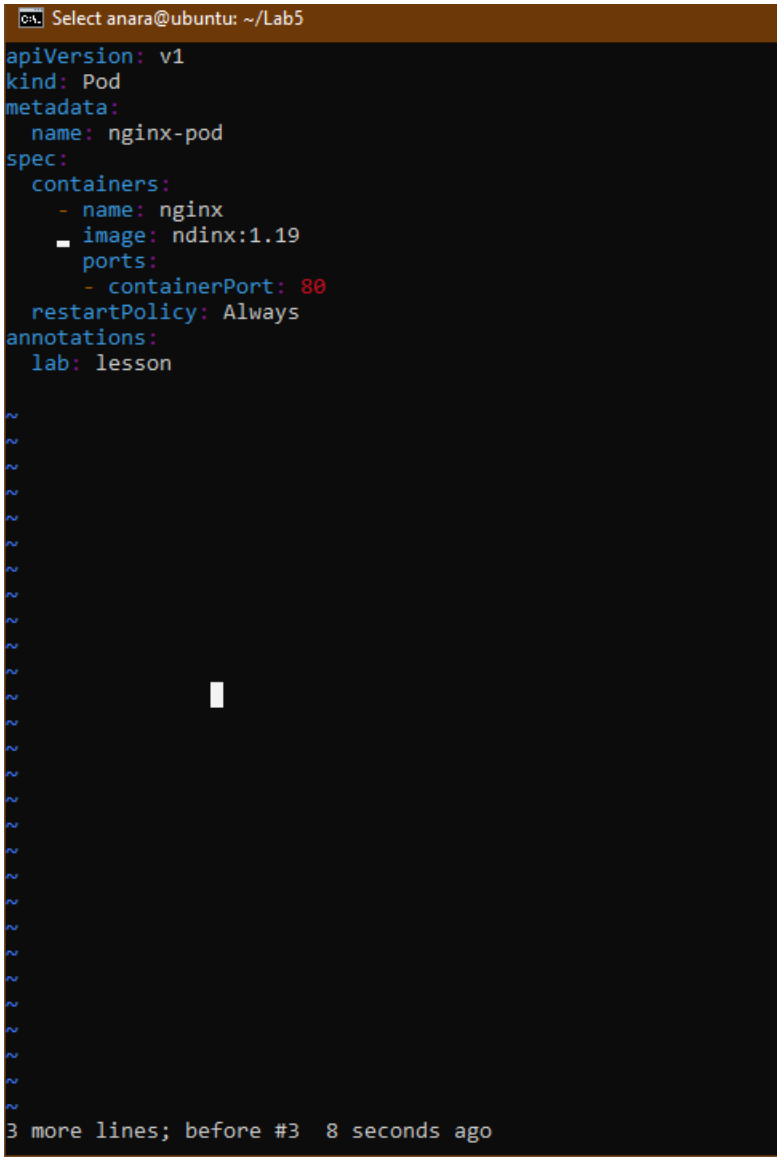
1. **Open the file with vim:**

```
anara@ubuntu:~/Lab5$ vim k8s-sample.yaml
```

2. **Delete the line containing image: nginx:1.19 with a single command:**

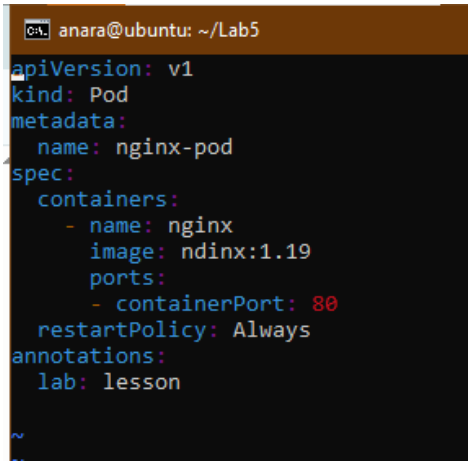


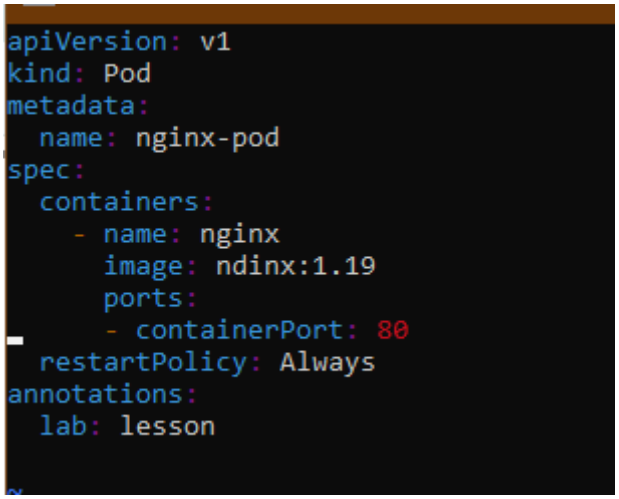
3. **Delete 3 lines at once using the numeric delete command:**



4. Navigation practice (from command mode)

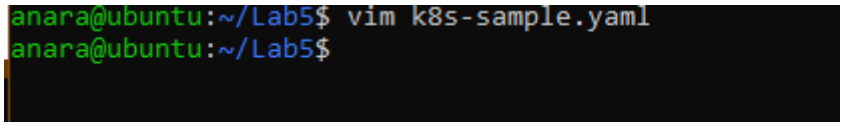
Jump to the first line:





5. **Exit vim (no changes should remain if you undid properly):**

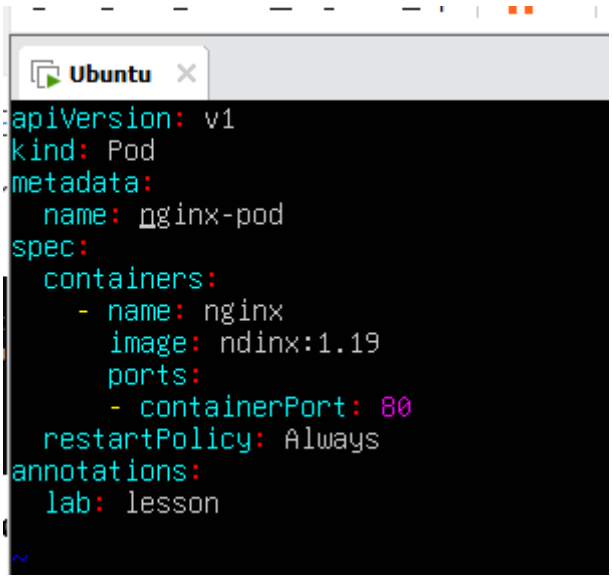
:q



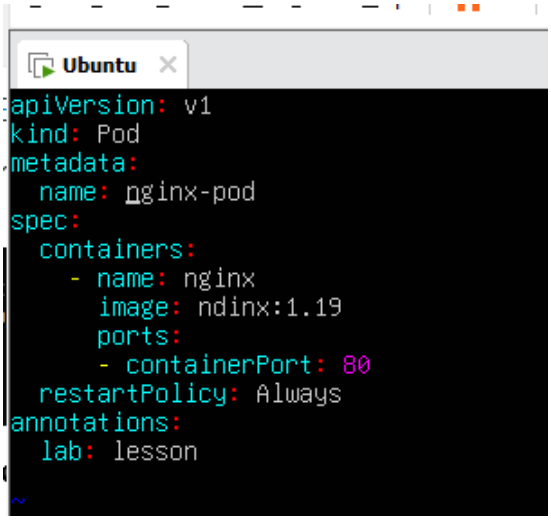
Task 12 - Vim search, add matches, substitute, undo

Steps (inside the VM terminal / in the ~/Lab5 directory)

1. **Open the file with vim:**
2. **Search for the string nginx using the forward search command:**



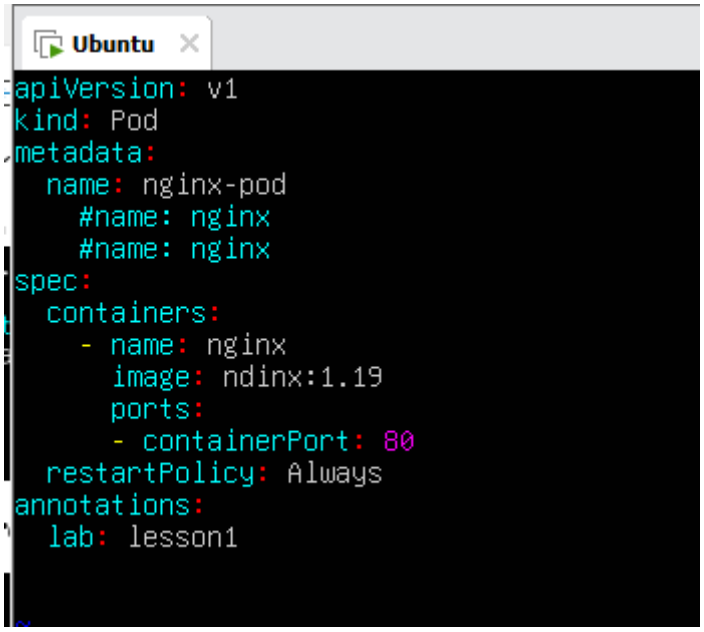
3. **Move to the next match and previous match:**



4. **Add two more occurrences of the word nginx in the file:**

```
anara@ubuntu:~/Lab5$ cat k8s-sample.yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
    #name: nginx
    #name: nginx
spec:
  containers:
    - name: nginx
      image: ndinx:1.19
      ports:
      - containerPort: 80
  restartPolicy: Always
annotations:
  lab: lesson1
```

5. **Demonstrate that n cycles forward through all matches:**



6. **Substitute all occurrences of nginx with webapp:**

```
:%s/nginx/webapp
```

```
k8s-sample.yaml" 17L, 246B written
anara@ubuntu:~/Lab5$ cat k8s-sample.yaml
apiVersion: v1
kind: Pod
metadata:
  name: webapp-pod
    #name: webapp
    #name: webapp
spec:
  containers:
    - name: webapp
      image: ndinx:1.19
      ports:
      - containerPort: 80
  restartPolicy: Always
annotations:
  lab: lesson1
```

7. **Immediately undo the substitution using u:**

```
Ubuntu
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
    #name: nginx
    #name: nginx
spec:
  containers:
    - name: nginx
      image: ndinx:1.19
      ports:
      - containerPort: 80
  restartPolicy: Always
annotations:
  lab: lesson1
```

Exam Evaluation Question

- **Install Docker Desktop on your VMWare Workstation Ubuntu Server.**

```
anara@ubuntu:~/Lab5$ sudo apt update
[sudo] password for anara:
Sorry, try again.
[sudo] password for anara:
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:5 http://dl.google.com/linux/chrome/deb stable InRelease [1,825 B]
Hit:6 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble InRelease
Hit:7 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InRelease
Get:8 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.5 kB]
Get:9 http://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,215 B]
Get:10 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [208 B]
Get:11 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.2 kB]
Get:12 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Fetched 203 kB in 2s (98.2 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
```

```
All packages are up to date.
anara@ubuntu:~/Lab5$ sudo apt install ca-certificates curl gnupg lsb-release
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203).
ca-certificates set to manually installed.
curl is already the newest version (8.5.0-2ubuntu10.6).
curl set to manually installed.
gnupg is already the newest version (2.4.4-2ubuntu17.3).
gnupg set to manually installed.
lsb-release is already the newest version (12.0-2).
lsb-release set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

```
anara@ubuntu:~/Lab5$ cd ~/.
anara@ubuntu:~$ sudo install -m 0755 -d /etc/apt/keyrings
anara@ubuntu:~$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o /
anara@ubuntu:~$ sudo chmod a+r /etc/apt/keyrings/docker.gpg
```

```
anara@ubuntu:~$ sudo apt update
Hit:1 http://pk.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://pk.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://pk.archive.ubuntu.com/ubuntu noble-backports InRelease
Get:4 https://download.docker.com/linux/ubuntu noble InRelease [48.5 kB]
Hit:5 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:6 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:7 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble InRelease
Hit:8 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InRelease
Get:9 https://download.docker.com/linux/ubuntu noble/stable amd64 Packages [33.3 kB]
Fetched 81.7 kB in 2s (37.2 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
```

```
anara@ubuntu:~$ sudo apt install docker-ce docker-ce-cli containerd.io docker-buildx-plugin docke
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  docker-ce-rootless-extras libslirp0 pigz slirp4netns
Suggested packages:
  cgroupfs-mount | cgroup-lite docker-model-plugin
The following NEW packages will be installed:
  containerd.io docker-buildx-plugin docker-ce docker-ce-cli docker-ce-rootless-extras docker-com
0 upgraded, 9 newly installed, 0 to remove and 0 not upgraded.
Need to get 105 MB of archives.
After this operation, 437 MB of additional disk space will be used.
Do you want to continue? [Y/n]
```

- **Verify Docker Desktop is installed by launching the Docker Desktop application and confirming it runs.**

```
anara@ubuntu:~$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
     Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: enabled)
     Active: active (running) since Sat 2025-10-25 11:32:50 UTC; 2min 30s ago
TriggeredBy: ● docker.socket
       Docs: https://docs.docker.com
   Main PID: 9227 (dockerd)
      Tasks: 11
     Memory: 30.8M (peak: 31.9M)
        CPU: 2.661s
     CGroup: /system.slice/docker.service
             └─9227 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.sock

Oct 25 11:32:48 ubuntu dockerd[9227]: time="2025-10-25T11:32:48.775679931Z" level=info msg="Creat
Oct 25 11:32:48 ubuntu dockerd[9227]: time="2025-10-25T11:32:48.884166969Z" level=info msg="Loadi
Oct 25 11:32:50 ubuntu dockerd[9227]: time="2025-10-25T11:32:50.703302845Z" level=info msg="Loadi
Oct 25 11:32:50 ubuntu dockerd[9227]: time="2025-10-25T11:32:50.805207519Z" level=info msg="Docke
Oct 25 11:32:50 ubuntu dockerd[9227]: time="2025-10-25T11:32:50.805437207Z" level=info msg="Initi
Oct 25 11:32:50 ubuntu dockerd[9227]: time="2025-10-25T11:32:50.923638012Z" level=info msg="Compl
Oct 25 11:32:50 ubuntu dockerd[9227]: time="2025-10-25T11:32:50.937003291Z" level=info msg="Daemo
Oct 25 11:32:50 ubuntu dockerd[9227]: time="2025-10-25T11:32:50.937290819Z" level=info msg="API l
Oct 25 11:32:50 ubuntu systemd[1]: Started docker.service - Docker Application Container Engine.
Oct 25 11:33:48 ubuntu dockerd[9227]: time="2025-10-25T11:33:48.913411121Z" level=info msg="ignor
```

Run

```
anara@ubuntu:~$ sudo docker run hello-world
Unable to find image 'hello-world:latest' locally
latest: Pulling from library/hello-world
17eec7bbc9d7: Pull complete
Digest: sha256:56433a6be3fda188089fb548eae3d91df3ed0d6589f7c2656121b911198df065
Status: Downloaded newer image for hello-world:latest

Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
 https://hub.docker.com/

For more examples and ideas, visit:
 https://docs.docker.com/get-started/
```

****