

CLOUD COMPUTING

LAB 05

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Roll no: 2023-BSE-001

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

Goal: Run the java command when it's not installed, follow the system suggestion to install a Java package using apt, verify, then remove and clear shell cache.

Steps (inside the VM terminal)

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

```
abihanaadeem001@abihanaadeem:~$ java
Command 'java' not found, but can be installed with:
sudo apt install openjdk-17-jre-headless # version 17.0.16+0~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
abihanaadeem001@abihanaadeem:~$ _
```

2. Use the suggested apt command (copy the exact package name suggested by the system).

Example (replace with the name shown on your VM):

```
sudo apt install <suggested-package> -y
```

```
Setting up libthai0:amd64 (0.1.29-2build1) ...
Setting up libxtt64:amd64 (1:1.2.1-1.2build1) ...
Setting up libgdk-pixbuf2.0-bin (2.42.10+dfsg-3ubuntu3.2) ...
Setting up libwayland-cursor0:amd64 (1.22.0-2.1build1) ...
Setting up libatk-bridge2.0-0t64:amd64 (2.52.0-1build1) ...
Setting up libxmu6:amd64 (2:1.1.3-3build2) ...
Setting up libglx-mesa0:amd64 (25.0.7-0ubuntu0.24.04.2) ...
Setting up libglx0:amd64 (1.7.0-1build1) ...
Setting up dconf-gsettings-backend:amd64 (0.40.0-4ubuntu0.1) ...
Setting up libpango-1.0-0:amd64 (1.52.1+ds-1build1) ...
Setting up libxau7:amd64 (2:1.0.14-1build2) ...
Setting up libgl1:amd64 (1.7.0-1build1) ...
Setting up x11-utils (7.7+6build2) ...
Setting up libatk-wrapper-java (0.40.0-3build2) ...
Setting up libpangoft2-1.0-0:amd64 (1.52.1+ds-1build1) ...
Setting up libgtk-3-common (3.24.41-4ubuntu1.3) ...
Setting up libpangocaliro-1.0-0:amd64 (1.52.1+ds-1build1) ...
Setting up gsettings-desktop-schemas (46.1-0ubuntu1) ...
Setting up libatk-wrapper-java-jni:amd64 (0.40.0-3build2) ...
Setting up librsvg2-2:amd64 (2.58.0+dfsg-1build1) ...
Setting up librsvg2-common:amd64 (46.0-1) ...
Setting up adwaita-icon-theme (46.0-1) ...
update-alternatives: using /usr/share/icons/Adwaita/cursor.theme to provide /usr/share/icons/default/index.theme (x-cursor-theme) in auto mode
Setting up humanity-icon-theme (0.6.16) ...
Setting up ubuntu-mono (24.04-0ubuntu1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libglib2.0-0t64:amd64 (2.00.0-6ubuntu3.4) ...
Setting up libgtk-3-0t64:amd64 (3.24.41-4ubuntu1.3) ...
Setting up at-spi2-core (2.52.0-1build1) ...
Processing triggers for libc-bin (2.39-ubuntu8.6) ...
Setting up libgtk-3-bin (3.24.41-4ubuntu1.3) ...
Processing triggers for ca-certificates-java (20240118) ...
done.
Setting up openjdk-21-jre:amd64 (21.0.8+9~us1-0ubuntu1~24.04.1) ...
Setting up default-jre-headless (2:1.21-75+exp1) ...
Setting up default-jre (2:1.21-75+exp1) ...
Processing triggers for libgdk-pixbuf2.0-0:amd64 (2.42.10+dfsg-3ubuntu3.2) ...
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.
abihanaadeem001@abihanaadeem:~$ _
```

3. Verify Java is installed and check version:

```
java --version
```

```
abihanaadeem001@abihanaadeem:~$ java -version
openjdk version "21.0.8" 2025-07-15
OpenJDK Runtime Environment (build 21.0.8+9-Ubuntu-0ubuntu124.04.1)
OpenJDK 64-Bit Server VM (build 21.0.8+9-Ubuntu-0ubuntu124.04.1, mixed mode, sharing)
abihanaadeem001@abihanaadeem:~$ _
```

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

```
sudo apt remove <suggested-package> -y
```

```
abihanaadeem001@abihanaadeem:~$ sudo apt remove default-jre
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Package 'default-jre' is not installed, so not removed
The following packages were automatically installed and are no longer required:
  adwaita-icon-theme alsa-topology-conf alsu-ucm-conf at-spi2-common at-spi2-core ca-certificates-java dconf-gsettings-backend dconf-service
  default-jre-headless fontconfig fonts-dejavu-extra gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme humanity-icon-theme java-common
  libasound2-data libatk-bridge2.0-0 libatk-wrapper-java libatk1.0-0 libatspi2.0-0 libavahi-client3
  libavahi-common-data libavahi-common3 libcairo-gobject2 libcairo2 libcolor2 libcups2t64 libdatrie1 libdrm-amdgpu libdrm-intel1 libepoxy0 libgbm1
  libgd2-data libgd2-xpm libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-common libgif7 libgl1 libgl1-mesa-dri libglvnd libglx-mesa0 libglx0 libgraphite2-3 libgtk-3-0t64
  libgtk-3-bin libgtk-3-common libharfbuzz0 libice6 liblcms2-2 liblvm20 libpango-1.0-0 libpangoft2-1.0-0 libpangocalro-1.0-0 libpangocairo-1.0-0 libpangocss-1.0-0
  libpixman-1-0 librsvg2-common libsm6 libthai-data libthai0 libvulkan1 libwayland-client0 libwayland-cursor0 libwayland-eGL1 libwayland-server0
  libxcb1-xcb libxau7 libxcb-dri3-0 libxcb-glx0 libxcb-presente libxcb-randr0 libxcb-render0 libxcb-shape0 libxcb-shm0 libxcb-sync1 libxcb-xfixes0
  libcomposite1 libcursoron1 libdamage1 libfixes3 libftf2 libxi6 libxinerama1 libXkbfile1 libXmu6 libXrandr2 libXrender1 libXshmfence1 libxt6t64 libxtst6
  libxx1 libxxxf86gai libxxxf86vml mesa-libgalium mesa-vulkan-drivers openjdk-21-jre openjdk-21-jre-headless session-migration ubuntu-mono x11-common
  x11-utils
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 30 not upgraded.
abihanaadeem001@abihanaadeem:~$
```

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

```
java
```

```
abihanaadeem001@abihanaadeem:~$ java
-bash: /usr/bin/java: No such file or directory
abihanaadeem001@abihanaadeem:~$ _
```

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

```
hash -r
```

```
java
```

```
abihanaadeem001@abihanaadeem:~$ hash -r
abihanaadeem001@abihanaadeem:~$ 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-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
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
abihanaadeem001@abihanaadeem:~$
```

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

Goal: Repeat install/remove using the apt-get tool to show both package managers.

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):

```
sudo apt-get update
```

```
sudo apt-get install default-jre -y
```

- Save screenshot(s) as: task2_aptget_install.png

```
Replacing debian:SSL.com_EV_Root_Certification_Authority_ECC.pem
Replacing debian:SSL.com_EV_Root_Certification_Authority_RSA_R2.pem
Replacing debian:SSL.com_Root_Certification_Authority_ECC.pem
Replacing debian:SSL.com_Root_Certification_Authority_RSA.pem
Replacing debian:SSL.com_TLS_ECC_Root_CA_2022.pem
Replacing debian:SSL.com_TLS_RSA_Root_CA_2022.pem
Replacing debian:Starfield_Class_2_CA.pem
Replacing debian:Starfield_Root_Certificate_Authority_-_G2.pem
Replacing debian:Starfield_Services_Root_Certificate_Authority_-_G2.pem
Replacing debian:SwissSign_Gold_CA_-_G2.pem
Replacing debian:SwissSign_Silver_CA_-_G2.pem
Replacing debian:SZAFIR_ROOT_CA2.pem
Replacing debian:Telia_Root_CA_v2.pem
Replacing debian:TeliaSonera_Root_CA_v1.pem
Replacing debian:TrustAsia_Global_Root_CA_G3.pem
Replacing debian:TrustAsia_Global_Root_CA_G4.pem
Replacing debian:Trustwave_Global_Certification_Authority.pem
Replacing debian:Trustwave_Global_ECC_P256_Certification_Authority.pem
Replacing debian:Trustwave_Global_ECC_P384_Certification_Authority.pem
Replacing debian:T-TeleSec_GlobalRoot_Class_2.pem
Replacing debian:T-TeleSec_GlobalRoot_Class_3.pem
Replacing debian:TUBITAK_Kamu_SM_SSL_Kok_Sertifikasi_-_Surum_1.pem
Replacing debian:TunTrust_Root_CA.pem
Replacing debian:TWCA_Global_Root_CA.pem
Replacing debian:TWCA_Root_Certification_Authority.pem
Replacing debian:UCA_Extended_Validation_Root.pem
Replacing debian:UCA_Global_G2_Root.pem
Replacing debian:USERTrust_ECC_Certification_Authority.pem
Replacing debian:USERTrust_RSA_Certification_Authority.pem
Replacing debian:vTrus_ECC_Root_CA.pem
Replacing debian:vTrus_Root_CA.pem
Replacing debian:XRamp_Global_CA_Root.pem
done.
Setting up openjdk-21-jre:amd64 (21.0.8+9~us1-0ubuntu1~24.04.1) ...
Setting up default-jre-headless (2:1.21-75+exp1) ...
Setting up default-jre (2:1.21-75+exp1) ...
Processing triggers for libgdk-pixbuf-2.0-0:amd64 (2.42.10+dfsg-3ubuntu3.2) ...
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.
abihanadeem001@abihanadeem:~$ _
```

2. Verify Java version again:

java --version

- Save screenshot as: task2_java_version_after_aptget.png

```
abihanadeem001@abihanadeem:~$ java -version
openjdk version "21.0.8" 2025-07-15
OpenJDK Runtime Environment (build 21.0.8+9-Ubuntu-0ubuntu124.04.1)
OpenJDK 64-Bit Server VM (build 21.0.8+9-Ubuntu-0ubuntu124.04.1, mixed mode, sharing)
abihanadeem001@abihanadeem:~$ _
```

3. Remove Java using apt-get remove:

sudo apt-get remove default-jre -y

- Save screenshot as: task2_aptget_remove.png

```
abihanadeem001@abihanadeem:~$ sudo apt-get remove default-jre -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 alsamixer-conf alsamixer-common at-spi2-common ca-certificates-java dconf-gsettings-backend dconf-service
default-jre-headless fontconfig fonts-dejavu-extra gsettings-desktop-schemas gtk-update-icon-cache hicolor-icon-theme humanity-icon-theme java-common
libasound2-data libasound2t64 libatk-bridge2.0-0t64 libatk-wrapper-java-jni libatk1.0-0t64 libatspi2.0-0t64 libavahi-client3
libavahi-common-data libavahi-common3 libcairo-gobject2 libcaliro2 libccord2 libcurl5t64 libdatrie libdconfi libdrm-amdgpu libdrm-intel libepoxy libgbm
libgdk-pixbuf2.0-0 libgdk-pixbuf2.0-bin libgdk-pixbuf2.0-common libgl1 libgl1-mesa-dri libglvnd libglx-mesa0 libglx0 libgraphite2-3 libgtk-3-0t64
libgtk-3-bin libgtk-3-common libharfbuzz0b libicem2-2 liblomm20 libpango-1.0-0 libpangocaliro-1.0-0 libpangoft2-1.0-0 libpiciaccess0 libpcsc-lite1
libpixman-1-0 librsvg2-common libsm6 libthai-data libthai0 libvulkan1 libwayland-client0 libwayland-cursor0 libwayland-egl1 libwayland-server0
libxcb1-xcb libxau7 libxcb-dri3-0 libxcb-glx0 libxcb-present0 libxcb-randr0 libxcb-render0 libxcb-shm0 libxcb-sync1 libxcb-xfixes0
libxcomposite1 libxcursor1 libxdamage1 libxfixes3 libxft2 libxi6 libxinerama1 libxbfile1 libxmu6 libxrandr2 libxrender1 libxshmfence1 libxt6t64 libxtst6
libxv1 libxxf86dga1 libxxf86vm1 mesa-libgallium mesa-vulkan-drivers openjdk-21-jre openjdk-21-jre-headless session-migration ubuntu-mono x11-common
x11-utils
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
default-jre
0 upgraded, 0 newly installed, 1 to remove and 30 not upgraded.
After this operation, 6,144 B disk space will be freed.
(Reading database ... 139596 files and directories currently installed.)
Removing default-jre (2:1.21-75+exp1) ...
abihanadeem001@abihanadeem:~$ _
```

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

hash -r

java

- Save screenshot as: task2_hash_after_remove.png

```
abihanadeem001@abihanadeem:~$ hash -r
abihanadeem001@abihanadeem:~$ 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-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
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
abihanadeem001@abihanadeem:~$ _
```

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

Goal: Run the commands and document the difference.

Steps (inside VM terminal)

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

```
sudo apt update
```

- Save screenshot as: task3_apt_update.png

```
abihanaadeem001@abihanaadeem:~$ sudo apt update
Hit:1 http://archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Hit:3 http://security.ubuntu.com/ubuntu noble-security InRelease
Get:4 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:5 http://archive.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [175 kB]
Get:7 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:8 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [377 kB]
Get:9 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:10 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7,136 B]
Get:11 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [212 B]
Get:12 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [11.0 kB]
Get:13 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:14 http://archive.ubuntu.com/ubuntu noble-security/main amd64 Components [21.5 kB]
Get:15 http://archive.ubuntu.com/ubuntu noble-security/restricted amd64 Components [208 B]
Get:16 http://archive.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.2 kB]
Get:17 http://archive.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Fetched 1,024 kB in 3s (393 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
30 packages can be upgraded. Run 'apt list --upgradable' to see them.
abihanaadeem001@abihanaadeem:~$
```

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

```
sudo apt upgrade
```

- Save screenshot as: task3_apt_upgrade.png

```

abihanaadeem001@abihanaadeem:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages will be upgraded:
  cloud-init coreutils distro-info-data firmware-sof-signed fwupd landscape-common libfwupd2 libnss-systemd libpam-systemd libsystemd-shared
  libudev1 linux-firmware openssh-client openssh-server openssh-sftp-server powermgmt-base python3-software-properties snapd software-properties
  soseport systemd-systemd-dev systemd-hwe-hwdb systemd-resolved systemd-sysv systemd-timesyncd tcpdump ubuntu-drivers-common udev
30 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
Need to get 597 MB of archives.
After this operation, 5,782 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:1 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 coreutils amd64 9.4-3ubuntu6.1 [1,413 kB]
Get:2 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libnss-systemd amd64 255.4-1ubuntu8.11 [159 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 systemd-dev all 255.4-1ubuntu8.11 [106 kB]
Get:4 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 systemd-timesyncd amd64 255.4-1ubuntu8.11 [35.3 kB]
Get:5 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 systemd-resolved amd64 255.4-1ubuntu8.11 [296 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libsystemd-shared amd64 255.4-1ubuntu8.11 [2,076 kB]
Get:7 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libsystemd0 amd64 255.4-1ubuntu8.11 [434 kB]
Get:8 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 systemd-sysv amd64 255.4-1ubuntu8.11 [11.9 kB]
Get:9 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libpam-systemd amd64 255.4-1ubuntu8.11 [235 kB]
Get:10 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 systemd amd64 255.4-1ubuntu8.11 [3,475 kB]
Get:11 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 udev amd64 255.4-1ubuntu8.11 [1,874 kB]
Get:12 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 libudev1 amd64 255.4-1ubuntu8.11 [176 kB]
Get:13 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-sftp-server amd64 1:9.6p1-3ubuntu13.14 [37.3 kB]
Get:14 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-server amd64 1:9.6p1-3ubuntu13.14 [510 kB]
Get:15 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 openssh-client amd64 1:9.6p1-3ubuntu13.14 [906 kB]
Get:16 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 ubuntu-drivers-common amd64 1:0.9.7.6ubuntu3.4 [65.8 kB]
Get:17 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 distro-info-data all 0.60ubuntu0.5 [6,934 kB]
Get:18 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 systemd-hue-hwdb all 255.1.6 [3,684 kB]
Get:19 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 powermgmt-base all 1.37ubuntu0.1 [7,658 kB]
Get:20 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 tcpdump amd64 4.39.4-3ubuntu4.24.04.1 [479 kB]
Get:21 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 firmware-sof-signed all 2023.12.1-1ubuntu1.10 [7,382 kB]
16% [21 firmware-sof-signed 4,035 kB/7,382 kB 55%]

```

```

Setting up software-properties-common (0.99.49.3) ...
Setting up systemd-timesyncd (255.4-1ubuntu8.11) ...
Setting up udev (255.4-1ubuntu8.11) ...
Setting up systemd-hue-hwdb (255.1.6) ...
Setting up fwupd (1.9.31-0ubuntu1~24.04.1) ...
fwupd-offline-update.service is a disabled or a static unit not running, not starting it.
fwupd-refresh.service is a disabled or a static unit not running, not starting it.
fwupd.service is a disabled or a static unit not running, not starting it.
Setting up systemd-resolved (255.4-1ubuntu8.11) ...
Setting up snapd (2.71+ubuntu24.04) ...
Installing new version of config file /etc/apparmor.d/usr.lib.snapd.snap-confine.real ...
snapd.failure.service is a disabled or a static unit not running, not starting it.
snapd.gpio-chardev-setup.target is a disabled or a static unit not running, not starting it.
snapd.snap-repair.service is a disabled or a static unit not running, not starting it.
Setting up systemd-sysv (255.4-1ubuntu8.11) ...
Setting up ubuntu-drivers-common (1:0.9.7.6ubuntu3.4) ...
Setting up libnss-systemd:amd64 (255.4-1ubuntu8.11) ...
Setting up libpam-systemd:amd64 (255.4-1ubuntu8.11) ...
Processing triggers for initramfs-tools (0.142ubuntu25.5) ...
update-initramfs: Generating /boot/initrd.img-6.8.0-86-generic
Processing triggers for libc-bin (2.39-0ubuntu8.6) ...
Processing triggers for rsyslog (8.2312.0-3ubuntu9.1) ...
Processing triggers for ufw (0.36.2-6) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for dbus (1.14.10-4ubuntu4.1) ...
Processing triggers for install-info (7.1-3build2) ...
Scanning processes...
Scanning candidates...
Scanning linux images...

Running kernel seems to be up-to-date.

Restarting services...
  systemctl restart multipathd.service open-vm-tools.service polkit.service udisks2.service upower.service

Service restarts being deferred:
  systemctl restart ModemManager.service
  /etc/needrestart/restart.d/dbus.service
  systemctl restart systemd-logind.service
  systemctl restart unattended-upgrades.service

No containers need to be restarted.

User sessions running outdated binaries:
  abihanaadeem001 @ session #1: apt[6651], login[1057]
  abihanaadeem001 @ session #3: sshd[1358]
  abihanaadeem001 @ user manager service: systemd[1279]

No VM guests are running outdated hypervisor (qemu) binaries on this host.
abihanaadeem001@abihanaadeem:~$ 

```

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):

```
nano ~/apt_update_vs_upgrade.md
```

```
# write 3-5 sentences, save and exit
```

- Open the file or show it on screen and save screenshot as: task3_explanation.png

```
abihadeem001@abihadeem:~$ cat ~/apt_update_vs_upgrade.md
The command apt update downloads the latest information about available packages from the configured repositories. It does not install or upgrade any packages it only updates the package index.
The command apt upgrade actually installs the newest versions of the packages already installed on your system. You should always run apt upgrade to make sure your system installs the most recent versions.
Together these commands keep your Ubuntu system current and secure.
abihadeem001@abihadeem:~$
```

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

Goal: Install a snap package (example: VS Code) on a CLI-only server and verify installation using commands that work without a GUI. Keep Code installed for later GUI tasks.

Steps (inside VM terminal)

1. Install VS Code via snap (snap may require sudo):

```
sudo snap install --classic code
```

- Save screenshot as: task4_snap_install.png

```
abihadeem001@abihadeem:~$ cat ~/apt_update_vs_upgrade.md
The command apt update downloads the latest information about available packages from the configured repositories. It does not install or upgrade any packages it only updates the package index.
The command apt upgrade actually installs the newest versions of the packages already installed on your system. You should always run apt upgrade to make sure your system installs the most recent versions.
Together these commands keep your Ubuntu system current and secure.
abihadeem001@abihadeem:~$ sudo snap install --classic code
[sudo] password for abihadeem001:
2025-10-24T07:49:47Z INFO Waiting for automatic snapd restart...
code 7d842fb8 from Visual Studio Code (vscode*) Installed
abihadeem001@abihadeem:~$
```

2. Verify snap shows the package is installed:

```
snap list code
```

- Save screenshot as: task4_snap_list.png

```
abihadeem001@abihadeem:~$ snap list code
Name    Version   Rev  Tracking      Publisher  Notes
code    7d842fb8 211  latest/stable  vscode*    classic
abihadeem001@abihadeem:~$
```

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

```
code --version
```

- Save screenshot(s) as: task4_code_version_or_info.png

```
abihanaadeem001@abihanaadeem:~$ code --version
1.105.1
7d842fb85a0275a4a8e4d7e040d2625abbf7f084
x64
abihanaadeem001@abihanaadeem:~$ _
```

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

ls -l /snap/bin | grep code

- Save screenshot as: task4_snap_bin_location.png

```
abihanaadeem001@abihanaadeem:~$ ls -l /snap/bin | grep code
lrwxrwxrwx 1 root root 13 Oct 24 07:49 code -> /usr/bin/snap
lrwxrwxrwx 1 root root 13 Oct 24 07:49 code.url-handler -> /usr/bin/snap
abihanaadeem001@abihanaadeem:~$ _
```

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

Goal: Install a lightweight GUI (XFCE), enable XRDP for remote desktop access, and learn how to control whether the GUI login screen appears at boot. After starting the GUI, launch the VS Code installed in Task 4 to verify GUI app launch. This task is for this lab.

Warning: Installing a GUI on a server consumes additional disk space and memory. Perform on a VM with sufficient resources.

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:

ssh student@<vm-ip-address>

```
abihanaadeem001@abihanaadeem: ~
Last login: Fri Oct 24 08:06:11 2025 from 192.168.174.141
abihanaadeem001@abihanaadeem:~$ _
```

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

sudo apt update && sudo apt upgrade -y

- Save screenshot as: task5_update.png

```
abihanadeem001@abihanadeem:~$ sudo apt update && sudo apt upgrade -y
[sudo] password for abihanadeem001:
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:3 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:4 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:5 http://archive.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
Get more security updates through Ubuntu Pro with 'esm-apps' enabled:
  libzvbi-common libavcodec60 libzvbi0t64 libavutil58 libswresample4 7zip
Learn more about Ubuntu Pro at https://ubuntu.com/pro
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
abihanadeem001@abihanadeem:~$
```

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

```
sudo apt install xfce4 xfce4-goodies -y
```

- Save screenshot as: task5_xfce_install.png

```
abihanadeem001@abihanadeem:~$ sudo apt install xfce4 xfce4-goodies -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
xfce4 is already the newest version (4.18).
xfce4-goodies is already the newest version (4.18.2build1).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
abihanadeem001@abihanadeem:~$
```

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

```
sudo apt install xrdp -y
```

```
sudo systemctl enable --now xrdp
```

- Save screenshot as: task5_xrdp_enable.png

```
abihanaadeem001@abihanaadeem:~$ sudo apt install xrdp -y
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://archive.ubuntu.com/ubuntu noble/universe amd64 libfuse2t64 amd64 2.9.9-8.1build1 [89.9 kB]
Get:2 http://archive.ubuntu.com/ubuntu noble/universe amd64 xrdp amd64 0.9.24-4 [536 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble/universe amd64 libpipewire-0.3-modules-xrdp amd64 0.2-2 [20.6 kB]
Get:4 http://archive.ubuntu.com/ubuntu noble/universe amd64 pipewire-module-xrdp all 0.2-2 [3,800 B]
Get:5 http://archive.ubuntu.com/ubuntu noble/universe amd64 xorgxrdp amd64 1:0.9.19-1 [65.3 kB]
Fetched 715 kB in 4s (201 kB/s)
Selecting previously unselected package libfuse2t64:amd64.
(Reading database ... 175675 files and directories currently installed.)
Preparing to unpack .../libfuse2t64_2.9.9-8.1build1_amd64.deb ...
Unpacking libfuse2t64:amd64 (2.9.9-8.1build1) ...
Selecting previously unselected package xrdp.
Preparing to unpack .../xrdp_0.9.24-4_amd64.deb ...
Unpacking xrdp (0.9.24-4) ...
Selecting previously unselected package libpipewire-0.3-modules-xrdp:amd64.
Preparing to unpack .../libpipewire-0.3-modules-xrdp_0.2-2_amd64.deb ...
Unpacking libpipewire-0.3-modules-xrdp:amd64 (0.2-2) ...
Selecting previously unselected package pipewire-module-xrdp.
```

```
abihanaadeem001@abihanaadeem:~$
Created symlink /etc/systemd/system/multi-user.target.wants/xrdp.service → /usr/lib/systemd/system/xrdp.service
Setting up pipewire-module-xrdp (0.2-2) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.6) ...
Scanning processes...
Scanning candidates...
Scanning linux images...

Running kernel seems to be up-to-date.

Restarting services...

Service restarts being deferred:
/etc/needrestart/restart.d/dbus.service
systemctl restart systemd-logind.service
systemctl restart unattended-upgrades.service

No containers need to be restarted.

User sessions running outdated binaries:
abihanaadeem001 @ session #1: login[1057]
abihanaadeem001 @ session #3: sshd[1358]
abihanaadeem001 @ user manager service: systemd[1279]

No VM guests are running outdated hypervisor (qemu) binaries on this host.
abihanaadeem001@abihanaadeem:~$ sudo systemctl enable --now xrdp
Synchronizing state of xrdp.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable xrdp
abihanaadeem001@abihanaadeem:~$
```

5. Verify XRDП status:

sudo systemctl status xrdp

- Save screenshot as: task5_xrdp_status.png

```
abihanaadeem001@abihanaadeem:~$ sudo systemctl status xrdp
● xrdp.service - xrdp daemon
   Loaded: loaded (/usr/lib/systemd/system/xrdp.service; enabled; preset: enabled)
   Active: active (running) since Sat 2025-10-25 10:13:03 UTC; 5min ago
     Docs: man:xrdp(8)
           man:xrdp.ini(5)
 Main PID: 25167 (xrdp)
    Tasks: 1 (limit: 2210)
   Memory: 868.0K (peak: 1.5M)
      CPU: 51ms
     CGroup: /system.slice/xrdp.service
             └─25167 /usr/sbin/xrdp

Oct 25 10:13:02 abihanaadeem systemd[1]: Starting xrdp.service - xrdp daemon...
Oct 25 10:13:02 abihanaadeem xrdp[25165]: [INFO ] address [0.0.0.0] port [3389] mode 1
Oct 25 10:13:02 abihanaadeem xrdp[25165]: [INFO ] listening to port 3389 on 0.0.0.0
Oct 25 10:13:02 abihanaadeem xrdp[25165]: [INFO ] xrdp_listen_pp done
Oct 25 10:13:02 abihanaadeem systemd[1]: xrdp.service: Can't open PID file /run/xrdp/xrdp.pid (yet?) after start: No such file or directory
Oct 25 10:13:03 abihanaadeem systemd[1]: Started xrdp.service - xrdp daemon.
Oct 25 10:13:04 abihanaadeem xrdp[25167]: [INFO ] starting xrdp with pid 25167
Oct 25 10:13:04 abihanaadeem xrdp[25167]: [INFO ] address [0.0.0.0] port [3389] mode 1
Oct 25 10:13:04 abihanaadeem xrdp[25167]: [INFO ] listening to port 3389 on 0.0.0.0
Oct 25 10:13:04 abihanaadeem xrdp[25167]: [INFO ] xrdp_listen_pp done
lines 1-22/22 (END)
```

6. Configure XRDP to use XFCE session:

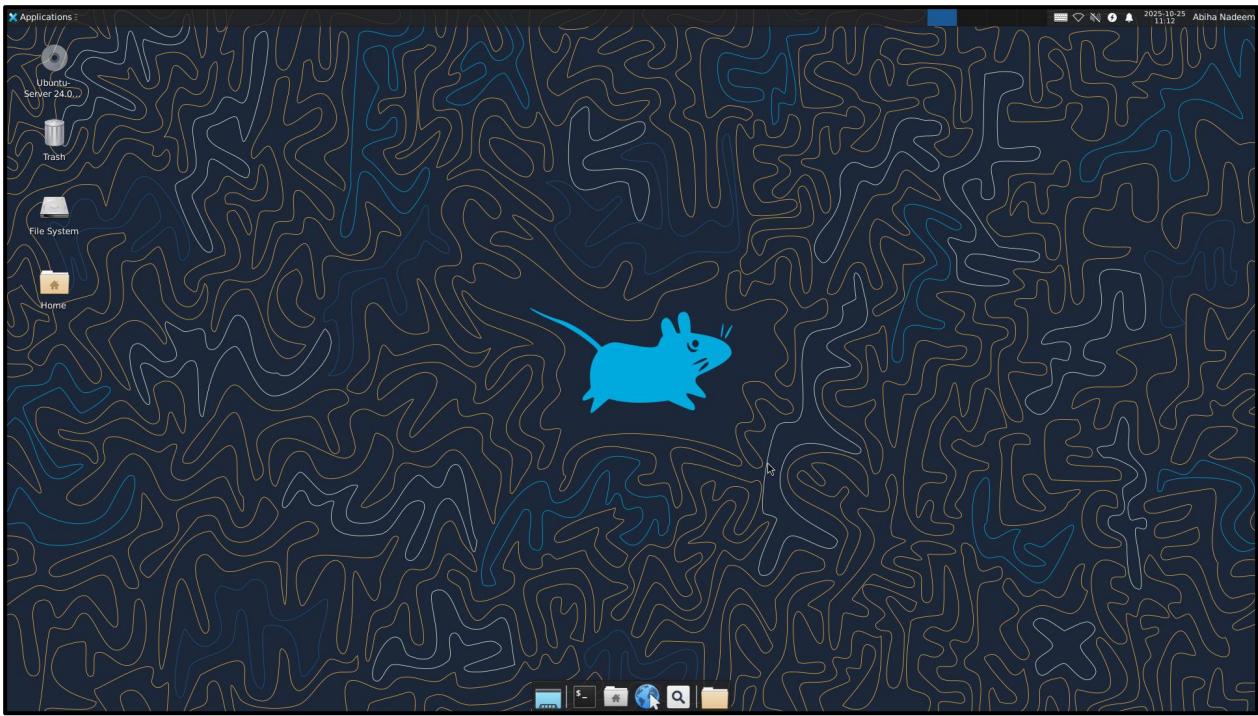
```
echo xfce4-session > ~/.xsession
```

- Save screenshot as: task5_xsессion.png

```
abihanaadeem001@abihanaadeem:~$ echo xfce4-session > ~/.xsession
abihanaadeem001@abihanaadeem:~$
```

7. 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 as: task5_rdp_connect.png

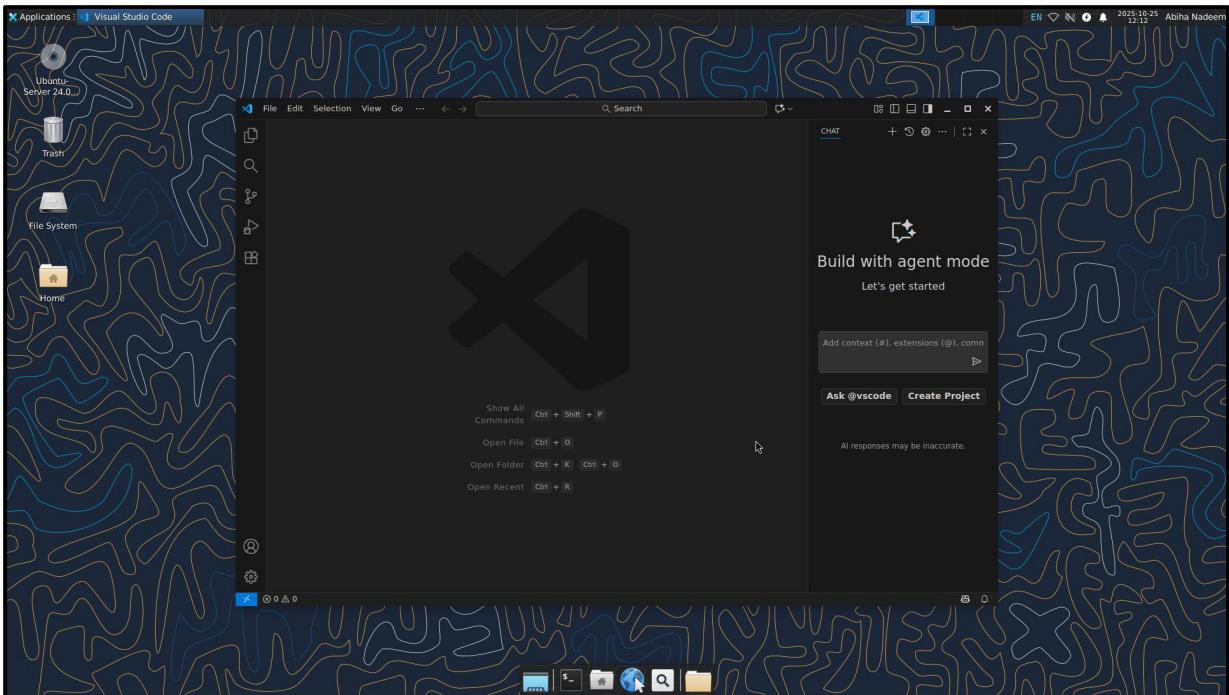
If you cannot capture a screenshot from the client, show ss -ltnp or ps evidence that the session was established and save as an alternative.



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:

code

- Save a screenshot of VS Code running in the GUI as: task5_vscode_launch.png



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)

- Install LightDM and greeter using Host Terminal:

```
sudo apt install lightdm lightdm-gtk-greeter -y
```

- Save screenshot as: task6_lightdm_install.png

```
abihanadeem001@abihanadeem: ~$ sudo apt install lightdm lightdm-gtk-greeter -y
[sudo] password for abihanadeem001:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
lightdm is already the newest version (1.30.0-0ubuntu14).
lightdm-gtk-greeter is already the newest version (2.0.9-0ubuntu3).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
abihanadeem001@abihanadeem: ~$
```

- Create LightDM config to use XFCE:

```
sudo mkdir -p /etc/lightdm/lightdm.conf.d
```

```
echo -e "[Seat:*]\ngreeter-session=lightdm-gtk-greeter\nuser-session=xfce\nautologin-user-timeout=0" | sudo tee /etc/lightdm/lightdm.conf.d/99-xfce.conf
```

- Save screenshot as: task6_lightdm_config.png

```
abihanadeem001@abihanadeem: ~$ sudo mkdir -p /etc/lightdm/lightdm.conf.d
abihanadeem001@abihanadeem: ~$ echo -e "[Seat:*]\ngreeter-session=lightdm-gtk-greeter\nuser-session=xfce\nautologin-user-timeout=0" | sudo tee /etc/lightdm/lightdm.conf.d/99-xfce.conf
[Seat:*]
greeter-session=lightdm-gtk-greeter
user-session=xfce
autologin-user-timeout=0
abihanadeem001@abihanadeem: ~$
```

- Clean up problematic session files and permissions:

```
sudo rm -f /var/lib/lightdm/.Xauthority
```

```
sudo rm -f ~/.Xauthority
```

```
sudo rm -rf ~/.cache/sessions
```

```
sudo chown -R $USER:$USER /home/$USER
```

- Save screenshot as: task6_lightdm_cleanup.png

```
abihanadeem001@abihanadeem:~$ sudo rm -f /var/lib/lightdm/.Xauthority
abihanadeem001@abihanadeem:~$ sudo rm -f ~/.Xauthority
abihanadeem001@abihanadeem:~$ sudo rm -rf ~/.cache/sessions
abihanadeem001@abihanadeem:~$ sudo chown -R $USER:$USER /home/$USER
abihanadeem001@abihanadeem:~$
```

- Restart LightDM:

```
sudo systemctl restart lightdm
```

- Save screenshot as: task6_lightdm_restart.png

```
abihanadeem001@abihanadeem:~$ sudo systemctl restart lightdm
abihanadeem001@abihanadeem:~$
```

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:

```
sudo systemctl enable lightdm
```

```
sudo systemctl set-default graphical.target
```

- Save a screenshot immediately after running the commands as: task6_gui_enable_boot.png

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ sudo systemctl enable lightdm
Synchronizing state of lightdm.service with SysV service script with /usr/lib/systemd/systemd-sysv-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 DefaultInstances= 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.
abihanaadeem001@abihanaadeem:~$ sudo systemctl set-default graphical.target
Removed "/etc/systemd/system/default.target".
Created symlink /etc/systemd/system/default.target → /usr/lib/systemd/system/graphical.target.
abihanaadeem001@abihanaadeem:~$
```

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

sudo reboot

- After the VM boots, capture a screenshot of the GUI login screen (or remote desktop showing the greeter) and save it as: task6_after_reboot_gui.png

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ sudo reboot

Broadcast message from root@abihanaadeem on pts/3 (Sat 2025-10-25 15:18:57 UTC):
The system will reboot now!
```

```
Ubuntu 24.04.3 LTS abihanadeem tty1

abinadeem login: abihanadeem001
Password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

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

System information as of Sun Oct 26 01:14:58 AM UTC 2025

System load: 1.49          Processes:           254
Usage of /:   75.6% of 9.75GB  Users logged in:      0
Memory usage: 15%           IPv4 address for ens33: 192.168.174.141
Swap usage:   0%           

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

6 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm
```

- 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:

```
sudo systemctl set-default multi-user.target
```

```
sudo systemctl disable lightdm
```

- Save a screenshot immediately after running the commands as: task6_gui_disable_boot.png

```
ca abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ sudo systemctl set-default multi-user.target
[sudo] password for abihanadeem001:
Removed "/etc/systemd/system/default.target".
Created symlink /etc/systemd/system/default.target → /usr/lib/systemd/system/multi-user.target.
abihanadeem001@abihanadeem:~$ sudo systemctl disable lightdm
Synchronizing state of lightdm.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install disable 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.
abihanadeem001@abihanadeem:~$
```

- Reboot the VM to observe that it boots to the terminal (CLI):

sudo reboot

- After the VM boots, capture a screenshot of the login prompt or terminal session showing CLI-only behavior and save it as: task6_after_reboot_cli.png

```
ca abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ sudo reboot

Broadcast message from root@abihanadeem on pts/1 (Sat 2025-10-25 15:32:51 UTC):

The system will reboot now!
```

```
Ubuntu 24.04.3 LTS abihanadeem tty1
abinadeem login: abihanadeem001
Password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.8.0-86-generic x86_64)

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

System information as of Sun Oct 26 03:33:17 AM UTC 2025

System load: 1.66           Processes:          253
Usage of /: 76.2% of 9.75GB Users logged in:      0
Memory usage: 15%           IPv4 address for ens33: 192.168.174.141
Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

6 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

abinadeem001@abinadeem:~$
```

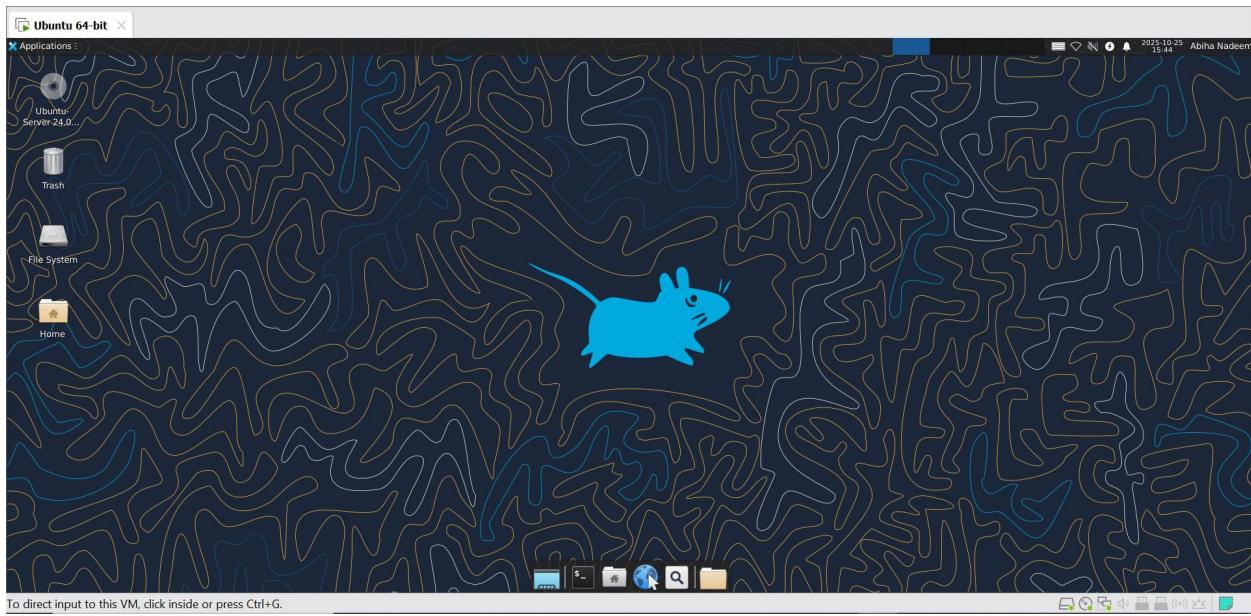
- Start/Stop GUI manually (no reboot)
 - You can start the GUI session without changing the boot target. This is useful if you want to keep the boot target as CLI but run GUI temporarily:
 - Save screenshot(s) showing the start commands and any immediate status output as: task6_gui_start.png

```
sudo systemctl start lightdm # start GUI now
```

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

```
abinadeem001@abinadeem: ~
```

```
abinadeem001@abinadeem:~$ sudo systemctl start lightdm
abinadeem001@abinadeem:~$
```



```
sudo systemctl stop lightdm # stop GUI now
```

- Save screenshot(s) showing the start/stop commands and any immediate status output as: task6_gui_stop.png

```
C:\ Command Prompt  
abihanadeem001@abihanadeem:~$ sudo systemctl stop lightdm  
[sudo] password for abihanadeem001:  
abihanadeem001@abihanadeem:~$ client_loop: send disconnect: Connection reset  
C:\Users\MOHSIN>
```

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

```
sudo systemctl start lightdm
```

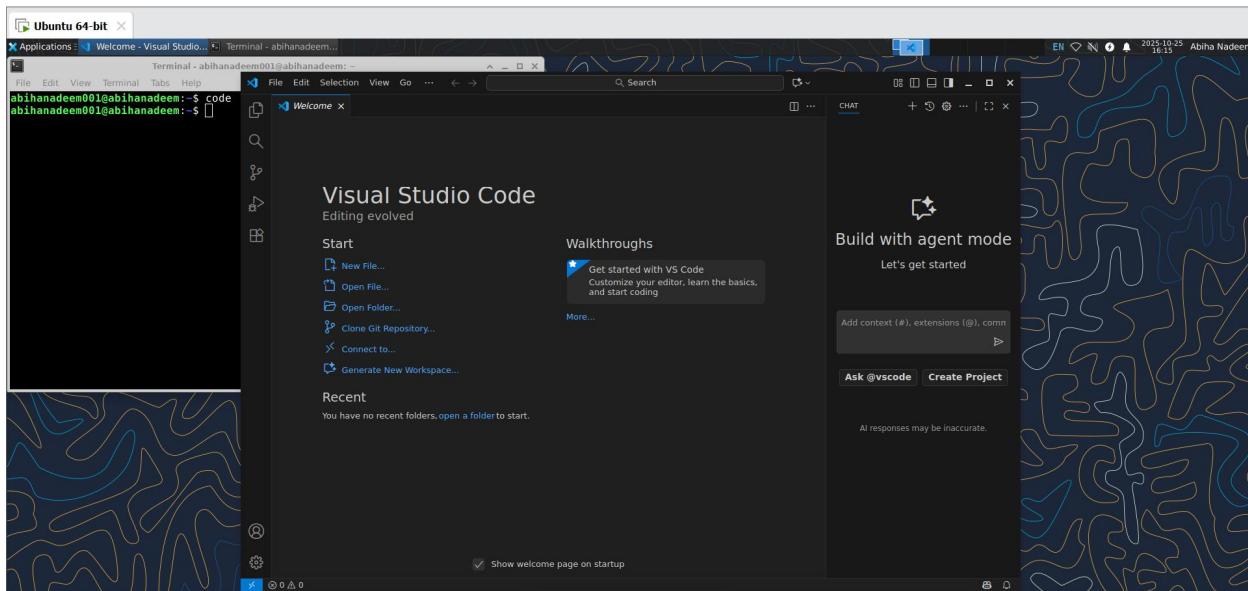
- Save a screenshot immediately after running the command as: task6_gui_start_command.png

```
C:\ abihanadeem001@abihanadeem: ~  
abihanadeem001@abihanadeem:~$ sudo systemctl start lightdm  
[sudo] password for abihanadeem001:  
abihanadeem001@abihanadeem:~$
```

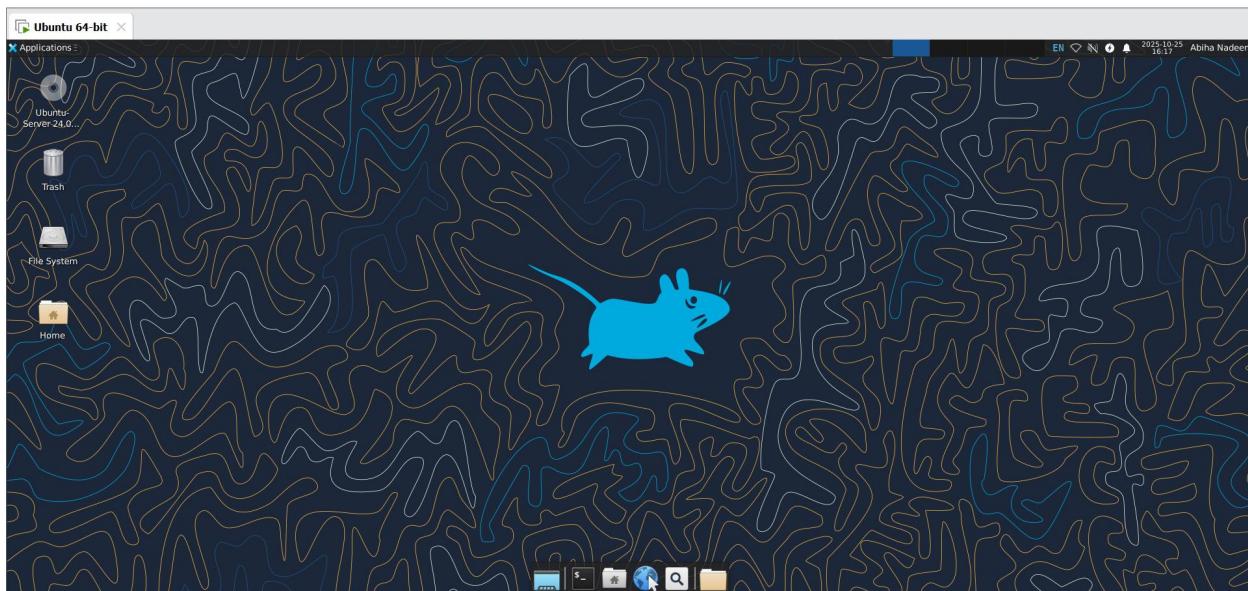
4. In the GUI session launch Visual Studio Code (installed earlier in Task 4). From a GUI terminal inside the desktop, run:

code

- Save a screenshot of VS Code running in the GUI as: task6_vscode_launch.png



5. Close VS Code using the GUI window controls. Task 6 ends here.



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

Goal: Add Google's apt source and signing key so that sudo apt install google-chrome-stable succeeds. This task intentionally begins by attempting to install Chrome directly (the install will fail if the repository/key are not yet configured) — capture that failure as evidence, then proceed to add the repository/key and install successfully. Also includes an alternate (preferred) one-line list method.

IMPORTANT: Third-party repositories require trusted signing keys. Only add keys from official vendor URLs. Some systems require /etc/apt/keyrings to exist — create it if missing with sudo mkdir -p /etc/apt/keyrings.

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:

```
sudo apt install google-chrome-stable -y
```

- Expected: this will typically fail with "Unable to locate package google-chrome-stable" or similar because the Google repo/key are not yet configured.
- Save a screenshot of the error output as: task7_install_chrome_error.png

```
abihanadeem001@abihanadeem: ~$ sudo apt install google-chrome-stable -y
[sudo] password for abihanadeem001:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package google-chrome-stable
abihanadeem001@abihanadeem: ~$
```

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

```
ls -la /etc/apt
```

- Save screenshot as: task7_ls_etc_apt.png

```
abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ ls -la /etc/apt
total 48
drwxr-xr-x  9 root root  4096 Oct 25  08:25 .
drwxr-xr-x 143 root root 12288 Oct 25  2025 ..
drwxr-xr-x  2 root root  4096 Oct 25  09:38 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 Sep 26 18:41 sources.list
drwxr-xr-x  2 root root  4096 Oct 25  08:26 sources.list.d
drwxr-xr-x  2 root root  4096 Aug  5  17:01 trusted.gpg.d
abihanadeem001@abihanadeem:~$
```

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

```
cat /etc/apt/sources.list
```

- Save screenshot as: task7_cat_sources_list.png

```
abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ cat /etc/apt/sources.list
# Ubuntu sources have moved to /etc/apt/sources.list.d/ubuntu.sources
abihanadeem001@abihanadeem:~$
```

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

```
ls -la /etc/apt/sources.list.d/
```

- Save screenshot as: task7_ls_sources_list_d.png

```
abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ ls -la /etc/apt/sources.list.d/
total 16
drwxr-xr-x  2 root root  4096 Oct 25  08:26 .
drwxr-xr-x  9 root root  4096 Oct 25  08:25 ..
-rw-r--r--  1 root root   419 Oct 25  08:26 ubuntu.sources
-rw-r--r--  1 root root 2552 Aug  5  17:02 ubuntu.sources.curtin.orig
abihanadeem001@abihanadeem:~$
```

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

```
cat /etc/apt/sources.list.d/ubuntu.sources
```

- Save screenshot as: task7_cat_ubuntu_sources.png

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ cat /etc/apt/sources.list.d/ubuntu.sources
Types: deb
URIs: http://archive.ubuntu.com/ubuntu/
Suites: noble noble-updates noble-backports noble-security
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg
Architectures: amd64

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
abihanaadeem001@abihanaadeem:~$
```

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):

```
sudo nano /etc/apt/sources.list.d/ubuntu.sources
```

- Append these exact lines at the end of the file:

```
Types: deb
```

```
URIs: http://dl.google.com/linux/chrome/deb/
```

```
Suites: stable
```

```
Components: main
```

```
Architectures: amd64
```

```
Signed-By: /etc/apt/keyrings/google.gpg
```

- Save the file (Ctrl+O → Enter) and exit (Ctrl+X).
- Save a screenshot after editing (or show the file contents with cat) as: task7_edit_ubuntu_sources.png

```
abihanadeem001@abihanadeem: ~$ sudo nano /etc/apt/sources.list.d/ubuntu.sources
abihanadeem001@abihanadeem: ~$ cat /etc/apt/sources.list.d/ubuntu.sources
Types: deb
URIs: http://archive.ubuntu.com/ubuntu/
Suites: noble noble-updates noble-backports noble-security
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg
Architectures: amd64

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: http://dl.google.com/linux/chrome/deb/
Suites: stable
Components: main
Architectures: amd64
Signed-By: /etc/apt/keyrings/google.gpg
abihanadeem001@abihanadeem:~$
```

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

```
curl -fsSL https://dl.google.com/linux/linux_signing_key.pub | sudo gpg --dearmor -o
/etc/apt/keyrings/google.gpg
```

- Save screenshot as: task7_add_key.png

```
abihanadeem001@abihanadeem: ~$ curl -fsSL https://dl.google.com/linux/linux_signing_key.pub | sudo gpg --dearmor -o /etc/ apt/keyrings/google.gpg
abihanadeem001@abihanadeem:~$
```

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

```
sudo apt update
```

```
sudo apt install google-chrome-stable -y
```

- Save screenshots as: task7_apt_update.png and task7_install_chrome.png

```
abihanadeem001@abihanadeem:~$ sudo apt update
Get:1 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:2 http://dl.google.com/linux/chrome/deb stable InRelease [1,825 B]
Hit:3 http://archive.ubuntu.com/ubuntu noble InRelease
Get:4 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:5 http://dl.google.com/linux/chrome/deb stable/main amd64 Packages [1,215 B]
Get:6 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [21.5 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [208 kB]
Get:8 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.2 kB]
Get:9 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:10 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Get:11 http://archive.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:12 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [1,541 kB]
Get:13 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [175 kB]
Get:14 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:15 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [377 kB]
Get:16 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:17 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [7,124 B]
Get:18 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [212 B]
Get:19 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [11.0 kB]
Get:20 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Get:21 http://archive.ubuntu.com/ubuntu noble-security/main amd64 Components [21.5 kB]
Get:22 http://archive.ubuntu.com/ubuntu noble-security/restricted amd64 Components [208 B]
Get:23 http://archive.ubuntu.com/ubuntu noble-security/universe amd64 Components [52.2 kB]
Get:24 http://archive.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Fetched 2,769 kB in 12s (229 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
abihanadeem001@abihanadeem:~$
```

```
abihanadeem001@abihanadeem:~$ 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://dl.google.com/linux/chrome/deb stable/main amd64 google-chrome-stable amd64 141.0.7390.122-1 [120 MB]
Get:2 http://archive.ubuntu.com/ubuntu noble/main amd64 fonts-liberation all 1:2.1.5-3 [1,603 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble/main amd64 fonts-liberation-sans-narrow all 1:1.07.6-4 [197 kB]
Fetched 122 MB in 4min 18s (472 kB/s)
Selecting previously unselected package fonts-liberation.
(Reading database ... 179855 files and directories currently installed.)
Preparing to unpack .../fonts-liberation_1%3a2.1.5-3_all.deb ...
Unpacking fonts-liberation (1:2.1.5-3) ...
Selecting previously unselected package google-chrome-stable.
Preparing to unpack .../google-chrome-stable_141.0.7390.122-1_amd64.deb ...
Unpacking google-chrome-stable (141.0.7390.122-1) ...
Selecting previously unselected package fonts-liberation-sans-narrow.
Preparing to unpack .../fonts-liberation-sans-narrow_1%3a1.07.6-4_all.deb ...
Unpacking fonts-liberation-sans-narrow (1:1.07.6-4) ...
Setting up fonts-liberation (1:2.1.5-3) ...
Setting up fonts-liberation-sans-narrow (1:1.07.6-4) ...
Setting up google-chrome-stable (141.0.7390.122-1) ...
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/x-www-browser (x-www-browser) in auto mode
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/gnome-www-browser (gnome-www-browser) in auto mode
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/google-chrome (google-chrome) in auto mode
Processing triggers for gnome-menus (3.36.0-1.lubuntu3) ...
```

```
abihanadeem001@abihanadeem: ~
Unpacking fonts-liberation-sans-narrow (1:1.07.6-4) ...
Setting up fonts-liberation (1:2.1.5-3) ...
Setting up fonts-liberation-sans-narrow (1:1.07.6-4) ...
Setting up google-chrome-stable (141.0.7390.122-1) ...
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/x-www-browser (x-www-browser) in auto mode
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/gnome-www-browser (gnome-www-browser) in auto mode
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/google-chrome (google-chrome) in auto mode
Processing triggers for gnome-menus (3.36.0-1.1ubuntu3) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for fontconfig (2.15.0-1.lubuntu2) ...
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) ...
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.
abihanadeem001@abihanadeem:~$
```

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

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

```
sudo apt remove google-chrome-stable -y
```

```
sudo nano /etc/apt/sources.list.d/ubuntu.sources # remove the chrome stanza you added earlier,
save and exit
```

```
sudo rm -f /etc/apt/keyrings/google.gpg
```

- Save screenshots as: task7_alternate_remove.png, task7_alternate_edit.png, and task7_remove_key.png

```
abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ sudo apt remove google-chrome-stable -y
Reading package lists... Done
Building dependency tree... Done
Processing triggers for desktop-file-utils (0.27-2build1) ...#####
Processing triggers for gnome-menus (3.36.0-1.1ubuntu3) ...
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...eed.
```

```
abihadeem001@abihadeem: ~
abihadeem001@abihadeem:~$ sudo nano /etc/apt/sources.list.d/ubuntu.sources
abihadeem001@abihadeem:~$ cat /etc/apt/sources.list.d/ubuntu.sources
Types: deb
URIs: http://archive.ubuntu.com/ubuntu/
Suites: noble noble-updates noble-backports noble-security
Components: main restricted universe multiverse
Signed-By: /usr/share/keyrings/ubuntu-archive-keyring.gpg
Architectures: amd64

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

abihadeem001@abihadeem:~$
```

```
abihadeem001@abihadeem: ~
abihadeem001@abihadeem:~$ sudo rm -f /etc/apt/keyrings/google.gpg
abihadeem001@abihadeem:~$
```

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

```
echo "deb [arch=amd64 signed-by=/etc/apt/keyrings/google.gpg]
http://dl.google.com/linux/chrome/deb/ stable main" | sudo tee /etc/apt/sources.list.d/google-chrome.list > /dev/null
```

- Save screenshot as: task7_create_google_chrome_list.png

```
abihadeem001@abihadeem: ~
abihadeem001@abihadeem:~$ echo "deb [arch=amd64 signed-by=/etc/apt/keyrings/google.gpg] http://dl.google.com/linux/chrome/deb/ stable main" | sudo tee /etc/apt/sources.list.d/google-chrome.list > /dev/null
abihadeem001@abihadeem:~$
```

12. Verify the new file exists:

```
ls -la /etc/apt/sources.list.d/
```

- Save screenshot as: task7_list_sources_after_create.png

```
abihadeem001@abihadeem: ~
abihadeem001@abihadeem:~$ ls -la /etc/apt/sources.list.d/
total 20
drwxr-xr-x 2 root root 4096 Oct 25 17:06 .
drwxr-xr-x 9 root root 4096 Oct 25 08:25 ..
-rw-r--r-- 1 root root 107 Oct 25 17:09 google-chrome.list
-rw-r--r-- 1 root root 421 Oct 25 17:02 ubuntu.sources
-rw-r--r-- 1 root root 2552 Aug 5 17:02 ubuntu.sources.curtin.orig
abihadeem001@abihadeem:~$
```

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

```
sudo mkdir -p /etc/apt/keyrings
```

```
curl -fsSL https://dl.google.com/linux/linux_signing_key.pub | sudo gpg --dearmor -o /etc/apt/keyrings/google.gpg
```

- Save screenshot as: task7_add_key_alt.png



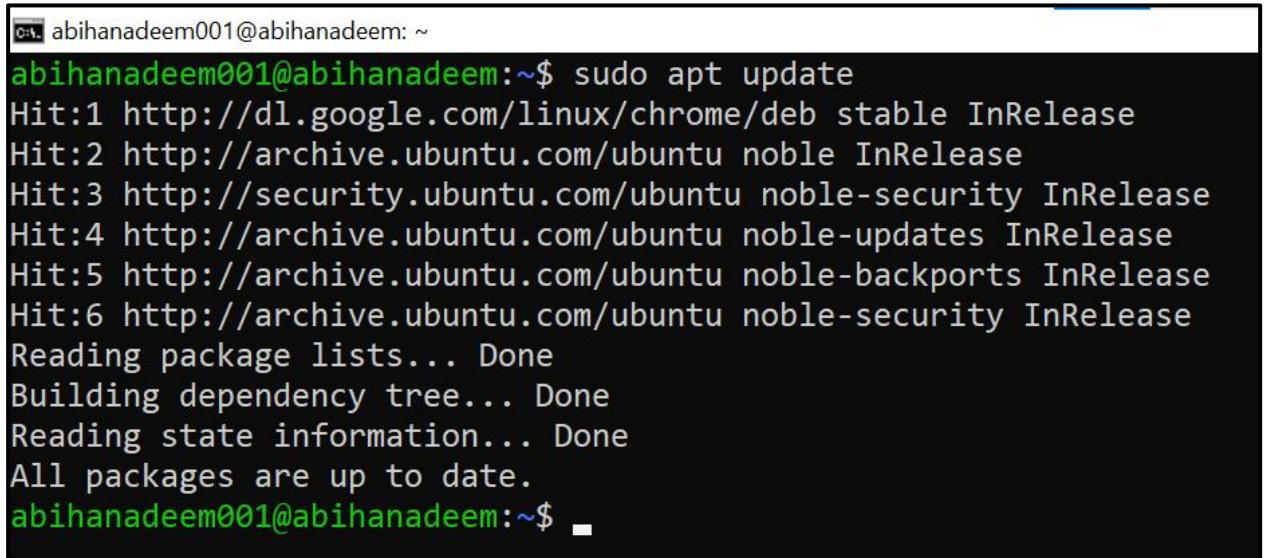
```
abihanadeem001@abihanadeem:~$ sudo mkdir -p /etc/apt/keyrings
abihanadeem001@abihanadeem:~$ curl -fsSL https://dl.google.com/linux/linux_signing_key.pub | sudo gpg --dearmor -o /etc/apt/keyrings/google.gpg
abihanadeem001@abihanadeem:~$
```

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

```
sudo apt update
```

```
sudo apt install google-chrome-stable -y
```

- Save screenshots as: task7_apt_update_alt.png and task7_install_chrome_alt.png



```
abihanadeem001@abihanadeem:~$ sudo apt update
Hit:1 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:3 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:4 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:6 http://archive.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
abihanadeem001@abihanadeem:~$
```

```
abihanadeem001@abihanadeem: ~
abihanadeem001@abihanadeem:~$ 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 141.0.7390.122-1 [120 MB]
Fetched 120 MB in 4min 19s (464 kB/s)
Selecting previously unselected package google-chrome-stable.
(Reading database ... 179884 files and directories currently installed.)
Preparing to unpack .../google-chrome-stable_141.0.7390.122-1_amd64.deb ...
Unpacking google-chrome-stable (141.0.7390.122-1) ...
Setting up google-chrome-stable (141.0.7390.122-1) ...
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/x-www-browser (x-www-browser) in auto mode
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/gnome-www-browser (gnome-www-browser) in auto mode
update-alternatives: using /usr/bin/google-chrome-stable to provide /usr/bin/google-chrome (google-chrome) in auto mode
Processing triggers for gnome-menus (3.36.0-1.1ubuntu3) ...
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...
Processing triggers for desktop-file-utils (0.27-2build1) ...
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.
abihanadeem001@abihanadeem:~$
```

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

Goal: Add PPAs for Audacity and OBS Studio, update apt, install the packages, and launch them (or verify installation) from the CLI/GUI. Capture screenshots for each step.

NOTE: Performing these steps will add third-party PPAs to the system. Only add PPAs from trusted sources (these are common community PPAs). If your VM environment restricts PPAs, document any errors.

Steps (inside the VM terminal or GUI terminal)

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

```
sudo add-apt-repository ppa:ubuntuhandbook1/audacity -y
```

```
sudo apt update
```

```
sudo apt install audacity -y
```

- Save screenshots as:
 - task8_add_ppa_audacity.png (output of add-apt-repository)

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ sudo add-apt-repository ppa:ubuntuhandbook1/audacity -y
[sudo] password for abihanaadeem001:
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.
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:2 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:3 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:4 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Get:5 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InRelease [18.1 kB]
Get:6 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble/main amd64 Packages [1,064 B]
Hit:7 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Get:8 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble/main Translation-en [492 B]
Hit:9 http://archive.ubuntu.com/ubuntu noble-security InRelease
Fetched 19.6 kB in 2s (10.0 kB/s)
Reading package lists... Done
abihanaadeem001@abihanaadeem:~$
```

- o task8_apt_update_audacity.png (apt update after adding PPA)

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ sudo apt update
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:2 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:3 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:4 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:5 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:6 http://archive.ubuntu.com/ubuntu noble-security InRelease
Hit:7 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
abihanaadeem001@abihanaadeem:~$
```

- o task8_install_audacity.png (apt install output)

```
abihanaadeem001@abihanaadeem:~$ sudo apt install audacity -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  audacity-data libdouble-conversion3 libflac++10 libid3tag0 liblilv-0-0 libmd4c0 libopusfile0 libpcre2-16-0 libpcre2-32-0
  libportaudio2 libporttmidi0 libportsmf0t64 libqt5core5t64 libqt5dbus5t64 libqt5gui5t64 libqt5network5t64 libqt5qml15 libqt5qmlmodels5
  libqt5quick5 libqt5svg5 libqt5waylandclient5 libqt5waylandcompositor5 libqt5widgets5t64 libqt5x11extras5 libsbms10 libserd-0-0
  libsord-0-0 libsoundtouch1 libratom-0-0 libssl-0-0 libvamp-hostsdk3v5 libwxbase3.2-1t64 libwxgtk3.2-1t64 libxcb-icccm4
  libxcb-image0 libxcb-keysyms1 libxcb-render-util0 libxcb-xinerama0 libxcb-xinput0 libxcb-xkb1 libxcbcommon-x11-0 libzix-0-0
  qt5-gtk-platformtheme qttranslations5-l10n qtwayland5
Suggested packages:
  ladspa-plugin qgnomeplatform-qt5 qt5-image-formats-plugins qt5-qmltooling-plugins serdi sordi
The following NEW packages will be installed:
  audacity audacity-data libdouble-conversion3 libflac++10 libid3tag0 liblilv-0-0 libmd4c0 libopusfile0 libpcre2-16-0 libpcre2-32-0
  libportaudio2 libporttmidi0 libportsmf0t64 libqt5core5t64 libqt5dbus5t64 libqt5gui5t64 libqt5network5t64 libqt5qml15 libqt5qmlmodels5
  libqt5quick5 libqt5svg5 libqt5waylandclient5 libqt5waylandcompositor5 libqt5widgets5t64 libqt5x11extras5 libsbms10 libserd-0-0
  libsord-0-0 libsoundtouch1 libratom-0-0 libssl-0-0 libvamp-hostsdk3v5 libwxbase3.2-1t64 libwxgtk3.2-1t64 libxcb-icccm4
  libxcb-image0 libxcb-keysyms1 libxcb-render-util0 libxcb-xinerama0 libxcb-xinput0 libxcb-xkb1 libxcbcommon-x11-0 libzix-0-0
  qt5-gtk-platformtheme qttranslations5-l10n qtwayland5
0 upgraded, 46 newly installed, 0 to remove and 0 not upgraded.
Need to get 33.0 MB of archives.
After this operation, 131 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu noble/main amd64 libflac++10 amd64 1.4.3+ds-2.1ubuntu2 [30.8 kB]
Get:2 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble/main amd64 audacity-data all 3.7.5-0build1~ubuntu24.04 [2,671 kB]
Get:3 http://archive.ubuntu.com/ubuntu noble/universe amd64 libid3tag0 amd64 0.15.1b-14build1 [33.6 kB]
Get:4 http://archive.ubuntu.com/ubuntu noble/universe amd64 libserd-0-0 amd64 0.32.2-1 [43.6 kB]
Get:5 http://archive.ubuntu.com/ubuntu noble/universe amd64 libzix-0-0 amd64 0.4.2-2build1 [23.6 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble/universe amd64 libsord-0-0 amd64 0.16.16-2build1 [15.8 kB]
Get:7 http://archive.ubuntu.com/ubuntu noble/universe amd64 libratom-0-0 amd64 0.6.16-1build1 [17.3 kB]
Get:8 http://archive.ubuntu.com/ubuntu noble/universe amd64 liblilv-0-0 amd64 0.24.22-1build1 [41.0 kB]
```

```
abihanaadeem001@abihanaadeem:~$ 
Setting up libqt5waylandclient5:amd64 (5.15.13-1) ...
Setting up libqt5quick5:amd64 (5.15.13+dfsg-1ubuntu0.1) ...
Setting up libqt5waylandcompositor5:amd64 (5.15.13-1) ...
Setting up qtwayland5:amd64 (5.15.13-1) ...
Processing triggers for man-db (2.12.0-4build2) ...
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 gnome-menus (3.36.0-1.1ubuntu3) ...
Processing triggers for libc-bin (2.39-0ubuntu8.6) ...
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.
abihanaadeem001@abihanaadeem:~$
```

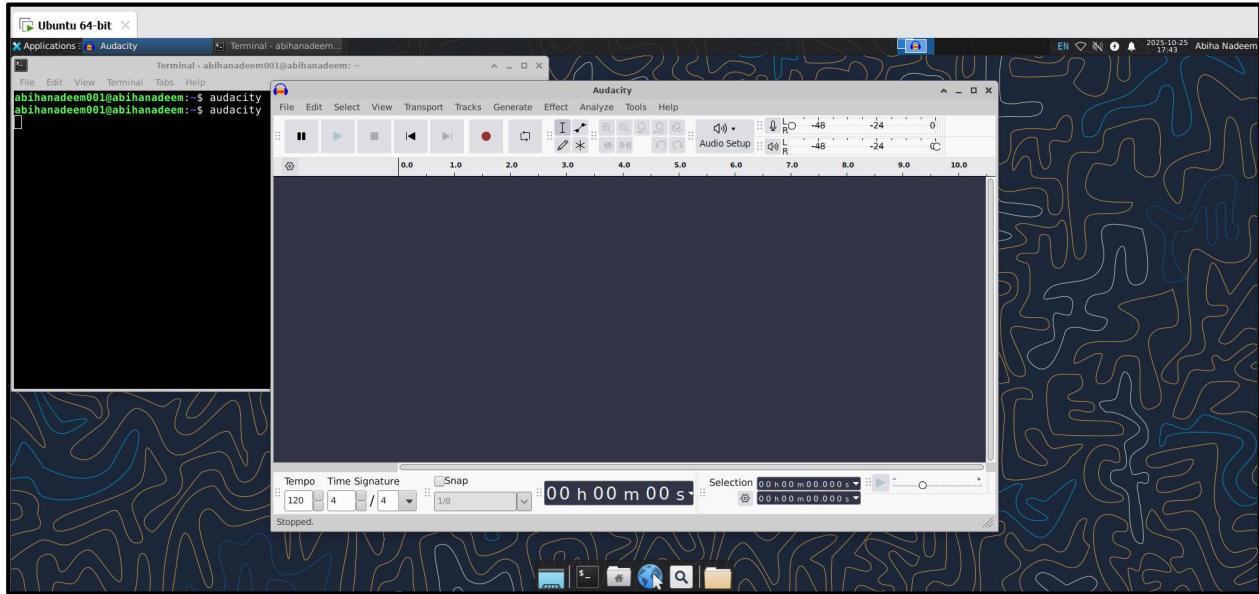
2. Launch Audacity (from GUI or CLI). On a headless server you may not get a GUI window — if you are using the XFCE GUI session, launch from a GUI terminal or run check for binary:

```
audacity --version
```

```
audacity
```

- Save screenshots as:

- task8_audacity_launch.png (GUI launch screenshot if possible)
or task8_audacity_version.png (CLI verification)



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

```
sudo add-apt-repository ppa:obsproject/obs-studio -y
```

```
sudo apt update
```

```
sudo apt install obs-studio -y
```

- Save screenshots as:

- task8_add_ppa_obs.png (output of add-apt-repository)

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ 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.
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:2 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:3 http://archive.ubuntu.com/ubuntu noble InRelease
Get:4 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble InRelease [17.8 kB]
Hit:5 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:6 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InRelease
Get:7 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble/main amd64 Packages [1,172 B]
Get:8 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble/main Translation-en [160 B]
Hit:9 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:10 http://archive.ubuntu.com/ubuntu noble-security InRelease
Fetched 19.1 kB in 2s (9,414 B/s)
Reading package lists... Done
abihanaadeem001@abihanaadeem:~$
```

- o task8_apt_update_obs.png (apt update after adding PPA)

```
abihanaadeem001@abihanaadeem: ~
abihanaadeem001@abihanaadeem:~$ sudo apt update
Hit:1 http://dl.google.com/linux/chrome/deb stable InRelease
Hit:2 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:3 https://ppa.launchpadcontent.net/obsproject/obs-studio/ubuntu noble InRelease
Hit:4 https://ppa.launchpadcontent.net/ubuntuhandbook1/audacity/ubuntu noble InRelease
Hit:5 http://archive.ubuntu.com/ubuntu noble InRelease
Hit:6 http://archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:7 http://archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:8 http://archive.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
All packages are up to date.
abihanaadeem001@abihanaadeem:~$
```

- o task8_install_obs.png (apt install output)

```
[abihanadeem001@abihanadeem: ~]
Setting up qt6-gtk-platformtheme:amd64 (6.4.2+dfsg-21.1build5) ...
Setting up libqt6quick6:amd64 (6.4.2+dfsg-4build3) ...
Setting up libmbedtls14t64:amd64 (2.28.8-1) ...
Setting up libqt6wlshellintegration6:amd64 (6.4.2-5build3) ...
Setting up libqt6waylandcompositor6:amd64 (6.4.2-5build3) ...
Setting up libqt6waylandeglcompositorhwintegration6:amd64 (6.4.2-5build3) ...
Setting up libqt6waylandeglclienthwintegration6:amd64 (6.4.2-5build3) ...
Setting up libpocketsphinx3:amd64 (0.8.0+real5prealpha1-15ubuntu5) ...
Setting up qt6-wayland:amd64 (6.4.2-5build3) ...
Setting up libavfilter9:amd64 (7:6.1.1-3ubuntu5) ...
Setting up libavdevice60:amd64 (7:6.1.1-3ubuntu5) ...
Setting up obs-studio (32.0.0-0obsproject1~noble) ...
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 gnome-menus (3.36.0-1.1ubuntu3) ...
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.

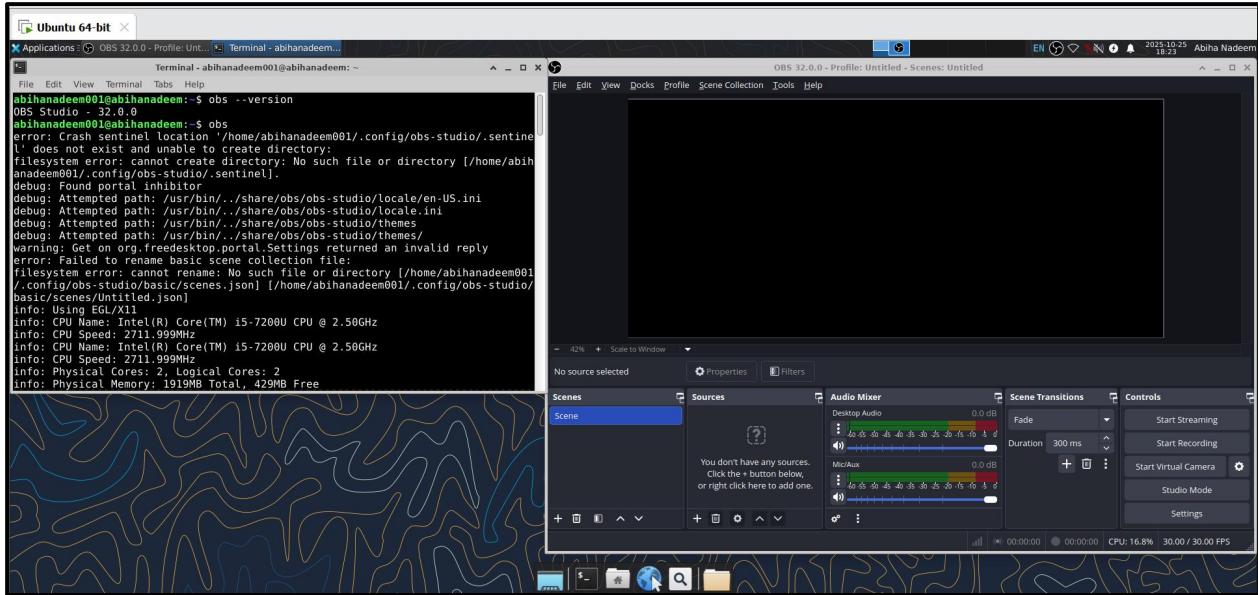
No VM guests are running outdated hypervisor (qemu) binaries on this host.
abihanadeem001@abihanadeem:~$
```

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

obs --version

obs

- Save screenshots as:
 - task8_obs_launch.png (GUI launch screenshot if possible)
or task8_obs_version.png (CLI verification)



Task 9 - Create a Kubernetes sample YAML using vim

Goal: Confirm vim availability, create a working directory for Lab5, and use vim to create and save a Kubernetes Pod manifest named k8s-sample.yaml.

NOTE: The first command in Task 9 is to run vim to confirm whether vim is installed.

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

1. Check whether vim is installed by running:

Vi

- If vim opens, you will see the vim interface; if not installed you will see a command-not-found error.
- Save a screenshot of the result (either the vim splash screen or the error) as: task9_vim_check.png

```
VIM - Vi IMproved  
version 9.1.697  
by Bram Moolenaar et al.  
Modified by team+vim@tracker.debian.org  
Vim is open source and freely distributable  
  
      Help poor children in Uganda!  
type :help icccf<Enter>      for information  
  
type :q<Enter>                to exit  
type :help<Enter> or <F1>    for on-line help  
type :help version9<Enter>    for version info
```

- If vim is not installed, install it:

```
sudo apt update
```

```
sudo apt install vim -y
```

- Save screenshot of the installation as: task9_vim_install.png (only if you installed it).

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

```
mkdir -p ~/Lab5
```

```
cd ~/Lab5
```

- Save screenshot showing mkdir and cd or pwd output as: task9_mkdir_cd.png

```
[root@abihanadeem001 abihanadeem] ~$ mkdir -p ~/Lab5  
[root@abihanadeem001 abihanadeem] ~$ cd ~/Lab5  
[root@abihanadeem001 abihanadeem] ~$
```

3. Create the Kubernetes sample file using vim:

```
vim k8s-sample.yaml
```

- Once vim opens, enable insert mode by pressing i, then paste the following YAML exactly:

```
apiVersion: v1
```

```

kind: Pod
metadata:
  name: nginx-pod
spec:
  containers:
    - name: nginx
      image: nginx:1.19
      ports:
        - containerPort: 80
  restartPolicy: Always

```

- Save a screenshot of the vim editor showing the file contents before saving as task9_vim_edit.png

```

abihadeem001@abihadeem: ~/Lab5
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
spec:
  containers:
    - name: nginx
      image: nginx:1.19
      ports:
        - containerPort: 80
      restartPolicy: Always
```
-- INSERT --
11,56 All

```

- Exit insert mode by pressing Esc, then save and quit vim with:

:wq

- Save a screenshot of the ls -la output showing the file exists task9\_k8s\_saved.png

```
[abihadeem001@abihadeem:~/Lab5]$ vim k8s-sample.yaml
[abihadeem001@abihadeem:~/Lab5]$ abihadeem001@abihadeem:~/Lab5$ ls -la
total 12
drwxrwxr-x 2 abihadeem001 abihadeem001 4096 Oct 26 09:19 .
drwxr-x--- 25 abihadeem001 abihadeem001 4096 Oct 26 09:19 ..
-rw-rw-r-- 1 abihadeem001 abihadeem001 284 Oct 26 09:19 k8s-sample.yaml
[abihadeem001@abihadeem:~/Lab5$]
```

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

Goal: Practice vim edits: add a permanent annotation under metadata, verify it, then open the file again, make a temporary edit and discard it (no save). This demonstrates saving and discarding changes in vim.

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

1. Open the manifest with vim:

```
cd ~/Lab5
```

```
vim k8s-sample.yaml
```

- When vim opens, ensure you are in command mode (press Esc) then press i to enter insert mode.
2. Add the annotation under the metadata section (indentation must match YAML).  
Example (insert these lines under metadata:):

annotations:

```
lab: lesson11
```

- After adding the lines, press Esc to return to command mode and save & quit:

```
:wq
```

- Save a screenshot showing the saved file contents (using cat)  
as: task10\_verify\_annotation.png

Example verify command:

```
cat k8s-sample.yaml
```

```
[abihadeem001@abihadeem ~]$ abihadeem001@abihadeem:~/Lab5$ cd ~/Lab5
[abihadeem001@abihadeem ~]$ vim k8s-sample.yaml
[abihadeem001@abihadeem ~]$ cat k8s-sample.yaml

apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
 spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
[abihadeem001@abihadeem ~]$
```

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

- Open the file again:

## vim k8s-sample.yaml

- Enter insert mode (i) and add a temporary comment line anywhere, for example:

# temp: do-not-keep

- Save a screenshot showing vim editor having temp data as: task10\_verify\_entering\_temp\_data.png

- Do NOT save. Press Esc to go back to command mode, then force quit without saving:

:q!

- Verify the file does NOT contain the temporary comment:

cat k8s-sample.yaml

- Save a screenshot of the cat output proving the temporary comment is not present as: task10\_verify\_no\_temp\_comment.png

```
ca: abihanadeem001@abihanadeem: ~/Lab5
abihanadeem001@abihanadeem:~/Lab5$ vim k8s-sample.yaml
abihanadeem001@abihanadeem:~/Lab5$ cat vim k8s-sample.yaml
cat: vim: No such file or directory
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
 spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
abihanadeem001@abihanadeem:~/Lab5$
```

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

Goal: Practice common vim commands: delete a single line with dd, undo with u, delete multiple lines with a numeric prefix, undo again, and practice basic navigation commands (1G, G, \$, 0). Capture verification screenshots showing the file before/after where appropriate.

NOTE: Perform these steps in the ~/Lab5 directory on the previously created k8s-sample.yaml.

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

1. Open the file with vim:

cd ~/Lab5

vim k8s-sample.yaml

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

- Ensure you are in command mode (press Esc), move the cursor to the line with image: nginx:1.19, then delete that line with:

dd

- Immediately undo the deletion with:

u

- Capture a screenshot showing the file after the undo (or a cat output after saving) as: task11\_dd\_delete\_and\_undo.png

```
[abihanadeem001@abihanadeem:~/Lab5] abihanadeem001@abihanadeem:~/Lab5$ cd ~/Lab5
[abihanadeem001@abihanadeem:~/Lab5] abihanadeem001@abihanadeem:~/Lab5$ vim k8s-sample.yaml
[abihanadeem001@abihanadeem:~/Lab5] abihanadeem001@abihanadeem:~/Lab5$ cat k8s-sample.yaml
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
 spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
[abihanadeem001@abihanadeem:~/Lab5]$
```

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

- In command mode, position the cursor on the first line of the three you want to delete (for example start at the image: line again), then run:

d3d

(or 3dd or d3<enter> — either numeric prefix form is acceptable; document which you used)

- Immediately undo the deletion with:

u

- Capture a screenshot showing the file after the undo (or a cat output) as: task11\_delete3\_and\_undo.png

```
abihadeem001@abihadeem:~/Lab5$ vim k8s-sample.yaml
abihadeem001@abihadeem:~/Lab5$ cat k8s-sample.yaml
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
abihadeem001@abihadeem:~/Lab5$
```

#### 4. Navigation practice (from command mode)

- Jump to the first line:

1G

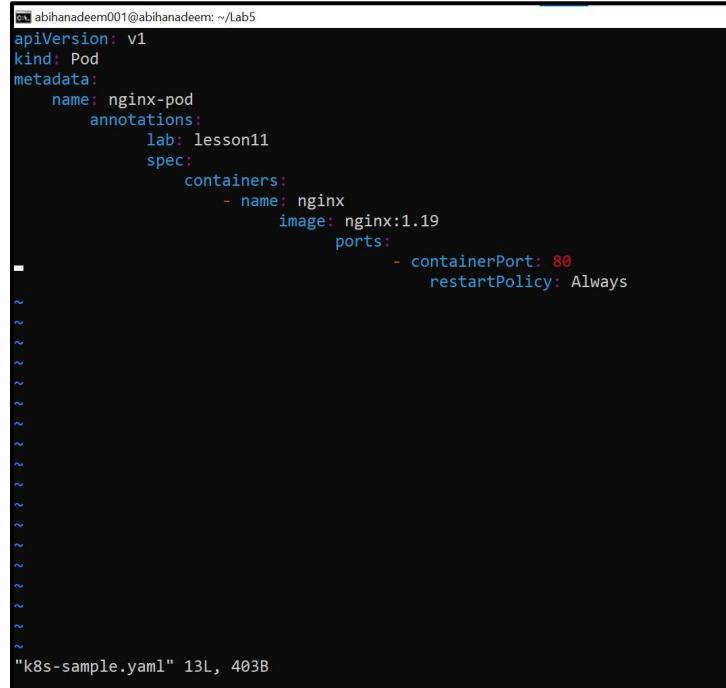
```
abihadeem001@abihadeem:~/Lab5$ vim k8s-sample.yaml
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
~
```

- Note the line contents capture a screenshot saved as: task11\_line1.png
- Jump to the last line:

G

```
abihadeem001@abihadeem:~/Lab5$ vim k8s-sample.yaml
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
~
```

- On the line containing containerPort: 80 press \$ to move to end of line, then 0 to move back to the start of the line. Capture a brief terminal screenshot showing you on the line and the commands capture the screenshot as: task11\_navigation.png



```

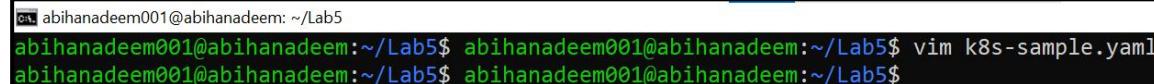
abihanaadeem001@abihanaadeem: ~/Lab5
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
 spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always

```

"k8s-sample.yaml" 13L, 403B

- Exit vim (no changes should remain if you undid properly):

```
:q
```



```

abihanaadeem001@abihanaadeem: ~/Lab5
abihanaadeem001@abihanaadeem:~/Lab5$ abihanaadeem001@abihanaadeem:~/Lab5$ vim k8s-sample.yaml
abihanaadeem001@abihanaadeem:~/Lab5$ abihanaadeem001@abihanaadeem:~/Lab5$
```

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

Goal: Practice searching in vim with /, navigate matches with n and N, add additional matches, substitute across the file, undo, and exit without saving. Capture screenshots to show each verification step.

NOTE: Perform these steps in the ~/Lab5 directory on the previously created k8s-sample.yaml.

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

- Open the file with vim:

```
cd ~/Lab5
```

```
vim k8s-sample.yaml
```

2. Search for the string nginx using the forward search command:

- From command mode type:

/nginx

and press Enter.

- Note the first match is highlighted and the cursor is placed on it. Save a screenshot showing the first match in vim as: task12\_search\_nginx.png

3. Move to the next match and previous match:

- Press n to jump to the next match (capture screenshot if desired) and press N to jump back to the previous match. Save a screenshot showing navigation between matches as: task12\_n\_and\_N\_navigation.png

4. Add two more occurrences of the word nginx in the file:
    - Enter insert mode (i) at an appropriate place (for example add two new comment lines or add them under metadata as comments), type two new occurrences of nginx, then press Esc to return to command mode and save the file with :w.
    - Save a screenshot showing the added occurrences (or cat output) as: task12\_added\_occurrences.png

5. Demonstrate that n cycles forward through all matches:

  - In vim command mode press /nginx Enter, then repeatedly press n to cycle forward through each match. Capture a short sequence (or a terminal screenshot showing the cursor on a later match) as: task12\_cycle\_matches.png

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

- From command mode execute the substitute command:

:%s/nginx/webapp

- This will replace all occurrences in the file (note: this changes the buffer). Save a screenshot showing the substitution result (or cat k8s-sample.yaml) as: task12\_substitute\_result.png

```
abihanadeem001@abihanadeem: ~/Lab5
apiVersion: v1
kind: Pod
metadata:
 name: webapp-pod
 annotations:
 lab: lesson11
 # webapp test line 1
 # webapp test line 2
 spec:
 containers:
 - name: webapp
 image: webapp:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
~
~
~
~
~
~
~
~
~
~
~
~
~
5 substitutions on 5 lines
```

7. Immediately undo the substitution using u:

- Press u in command mode to undo the last change. Save a screenshot showing the file restored to the previous state as: task12\_undo\_and\_quit.png

```
abihanaadeem001@abihanaadeem: ~/Lab5
apiVersion: v1
kind: Pod
metadata:
 name: nginx-pod
 annotations:
 lab: lesson11
 # nginx test line 1
 # nginx test line 2
 spec:
 containers:
 - name: nginx
 image: nginx:1.19
 ports:
 - containerPort: 80
 restartPolicy: Always
~
~
~
~
~
~
~
~
~
~
5 changes; before #36 90 seconds ago
```

8. Quit vim without saving any accidental changes (if you didn't already save after substitution and want to discard):

- If you want to ensure no changes were written, exit with:

:q!

- If you intentionally saved the substitution and then undid it and wish to quit normally, use :q.

```
abihanaadeem001@abihanaadeem: ~/Lab5
abihanaadeem001@abihanaadeem:~/Lab5$ cd ~/Lab5
abihanaadeem001@abihanaadeem:~/Lab5$ vim k8s-sample.yaml
abihanaadeem001@abihanaadeem:~/Lab5$ abihanaadeem001@abihanaadeem:~/Lab5$
```

## Exam Evaluation Question

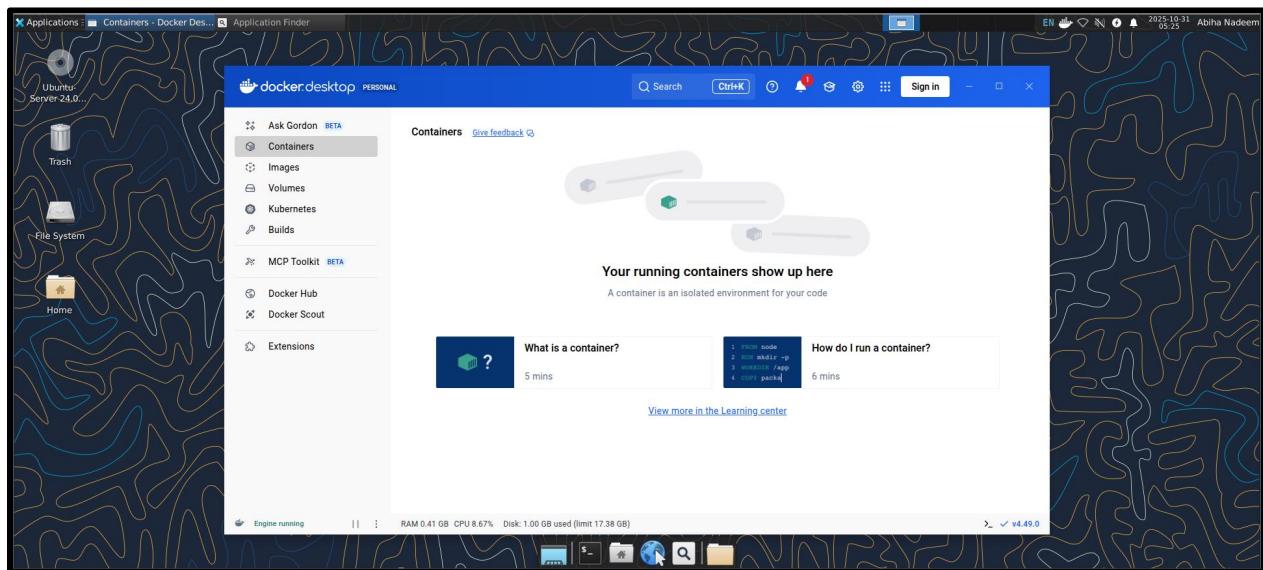
Goal: This is an exam-style evaluation prompt. Students are asked to install Docker Desktop as part of the evaluation exercise on VM. No commands, solutions, hints, or step-by-step instructions are provided here — install Docker Desktop using your own knowledge and research.

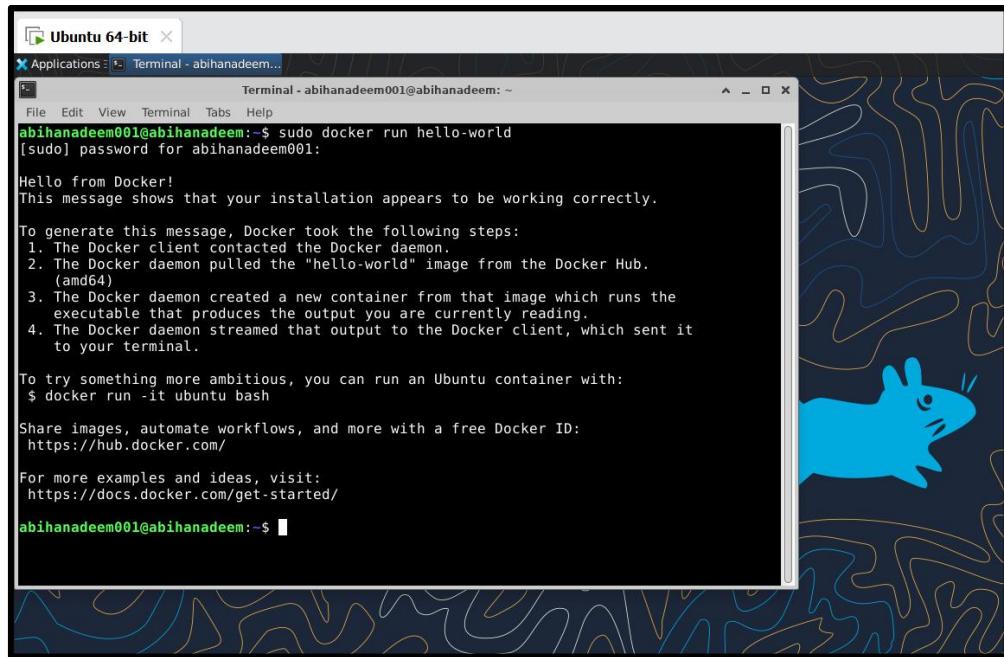
Instructions for students:

- Install Docker Desktop on your VMWare Workstation Ubuntu Server. No commands or solutions are provided in this lab — treat this as an evaluation/exam question.
- Verify Docker Desktop is installed by launching the Docker Desktop application and confirming it runs.
- Capture a screenshot of Docker Desktop running (or other clear evidence that Docker Desktop is installed and started) and save it as: exam\_evaluation\_docker\_desktop.png

Notes:

- This task intentionally provides no commands, package names, or step-by-step instructions. You must research and determine the correct installation steps for your OS/environment.





\*\*\*\*\*