

Refresh package lists and upgrade the system.

Verify system details: kernel version, user, time.

Create /home/<username>/iot\_logger with subdirectories: logs, scripts, data.

```
noor@NOOR:~$ sudo apt update
[sudo] password for noor:
Get:1 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]
Hit:2 http://eg.archive.ubuntu.com/ubuntu jammy InRelease
Get:3 http://eg.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Get:4 http://security.ubuntu.com/ubuntu jammy-security/main amd64 DEP-11 Metadata [54.5 kB]
Get:5 http://eg.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]
Get:6 http://security.ubuntu.com/ubuntu jammy-security/restricted amd64 DEP-11 Metadata [208 B]
Get:7 http://security.ubuntu.com/ubuntu jammy-security/universe amd64 DEP-11 Metadata [125 kB]
Get:8 http://security.ubuntu.com/ubuntu jammy-security/multiverse amd64 DEP-11 Metadata [208 B]
Get:9 http://eg.archive.ubuntu.com/ubuntu jammy-updates/main i386 Packages [870 kB]
Get:10 http://eg.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2,881 kB]
Get:11 http://eg.archive.ubuntu.com/ubuntu jammy-updates/main amd64 DEP-11 Metadata [112 kB]
Get:12 http://eg.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 DEP-11 Metadata [212 B]
Get:13 http://eg.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1,227 kB]
Get:14 http://eg.archive.ubuntu.com/ubuntu jammy-updates/universe i386 Packages [782 kB]
Get:15 http://eg.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 DEP-11 Metadata [359 kB]
Get:16 http://eg.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 DEP-11 Metadata [940 B]
Get:17 http://eg.archive.ubuntu.com/ubuntu jammy-backports/main amd64 DEP-11 Metadata [7,060 B]
Get:18 http://eg.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 DEP-11 Metadata [212 B]
Get:19 http://eg.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 DEP-11 Metadata [25.8 kB]
Get:20 http://eg.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 DEP-11 Metadata [212 B]
Fetched 6,830 kB in 3s (2,191 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
noor@NOOR:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
```

```
Get:18 http://eg.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 DEP-11 Metadata [212 B]
Get:19 http://eg.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 DEP-11 Metadata [25.8 kB]
Get:20 http://eg.archive.ubuntu.com/ubuntu jammy-backports/multiverse amd64 DEP-11 Metadata [212 B]
Fetched 6,830 kB in 3s (2,191 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
1 package can be upgraded. Run 'apt list --upgradable' to see it.
noor@NOOR:~$ sudo apt upgrade
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  linux-headers-6.8.0-40-generic linux-hwe-6.8-headers-6.8.0-40
  linux-hwe-6.8-tools-6.8.0-40 linux-image-6.8.0-40-generic
  linux-modules-6.8.0-40-generic linux-modules-extra-6.8.0-40-generic
  linux-tools-6.8.0-40-generic
Use 'sudo apt autoremove' to remove them.
Get more security updates through Ubuntu Pro with 'esm-apps' enabled:
  libzvt-common libpostproc55 libavcodec58 libgstreamer-plugins-bad1.0-0
  libavutil56 libswscale5 libswresample3 libavformat58 libzvt0 libavfilter7
Learn more about Ubuntu Pro at https://ubuntu.com/pro
The following packages have been kept back:
  libpam-ssss
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
noor@NOOR:~$ uname -r
6.8.0-65-generic
noor@NOOR:~$ whoami
noor
noor@NOOR:~$ date
30 2025 ١٤٤٧ EEST 01:25:56 م
noor@NOOR:~$
```

```
noor@NOOR: ~$ pwd
/home/noor
noor@NOOR: ~$ mkdir iot_logger
noor@NOOR: ~$ cd iot_logger
noor@NOOR: ~/iot_logger$ mkdir logs
noor@NOOR: ~/iot_logger$ mkdir scripts
noor@NOOR: ~/iot_logger$ mkdir data
noor@NOOR: ~/iot_logger$ ls
data logs scripts
noor@NOOR: ~/iot_logger$
```

## Linux architecture layers (hardware → kernel → shell → user)

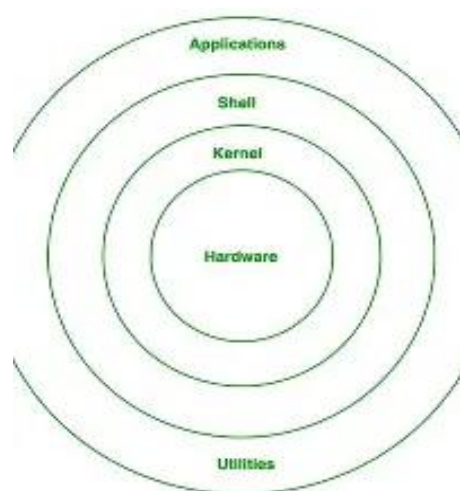
**Hardware layer:** the lowest layer of the Linux architecture. It includes the CPU, RAM, and terminal controller. The kernel interacts directly with the hardware to manage resources and perform operations

**Kernel:** core of Linux and is the software responsible for process, memory, file, device management

It interacts with the hardware directly and controls all the functions in the computer

**Shell (user interface):** interact with the kernel through the system call and it sends the commands to the kernel

**User:** application, libraries and it runs in top of the shell layer



## Where do system calls fit?

Between the user and the kernel as it act as an interface between the user and operating system enabling program to perform tasks

**Explain the purpose of these directories: /, /bin, /sbin, /usr, /etc, /var**

/ (root) : it's the parent of all other directories

/bin (essential user binaries): contain essential commands like ls,cat,cp that are needed to run the system

/sbin (system binaries): for system administration

/usr: for user files and contain read only applications data

/etc:system wide configuration files like /etc/passwd

/var : contain variable data that grow over time

**Why does Linux treat everything as a file?**

It's a unified interface in Linux that you can read and write everything the same way which make it easier and more simple

**Explain the difference between a program and a process.**

Program: a file containing code and its passive

Process: it's a running instance of the program and its active