

Capstone Task – IoT Sensor Data Logger on Raspberry pi

Day1 – phase1: System Update & Directory Setup

First, update and upgrade

`sudo -y` → y used to automatically answer “yes” to every question

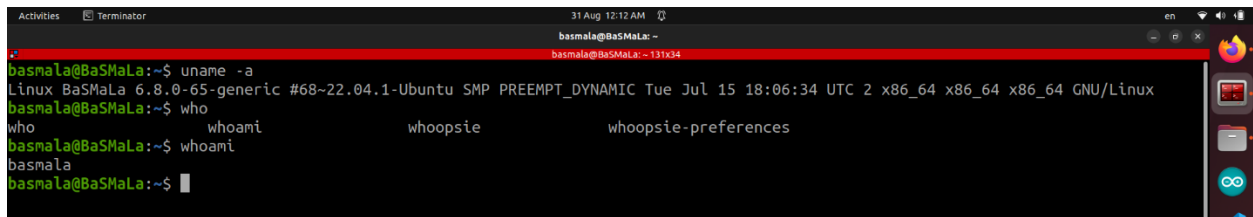
Activities Terminator 31 Aug 12:06 AM

basmala@BaSMaLa: -
basmala@BaSMaLa: ~112x28

```
basmala@BaSMaLa:~$ sudo apt update
[sudo] password for basmala:
Hit:1 http://eg.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://eg.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://eg.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
28 packages can be upgraded. Run 'apt list --upgradable' to see them.
basmala@BaSMaLa:~$ sudo apt upgrade -y
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:
  comerr-dev cython3 fonts-lyx gazebo11 gazebo11-common gazebo11-plugin-base gdal-data gir1.2-gtk-2.0
  hdftest hdf5-helpers ignition-tools krb5-multidev libaec-dev libaom-dev libarmadillo-dev libarmadillo10
  libarmadillo9 libarpack2 libarpack2-dev libassimp-dev libatk1.0-dev libavcodec-dev libavdevice-dev
  libavfilter-dev libavformat-dev libavutil-dev libblas-dev libblosc-dev libblosc1
  libboost-iostreams1.71.0 libboost-python1.71.0 libbrotli-dev libbsd-dev libbullet2.88 libcairo2-dev
  libcc2 libcfitsio-dev libcfitsio8 libcfitsio9 libcharls-dev libcharls2 libclang1-14
  libcurl4-openssl-dev libdap25 libdap27 libdapclient6v5 libdart6 libdart6-collision-bullet
  libdart6-external-odesolver libdart6-utils libdatrie-dev libdavid-dev libdcd1394-22 libdcd1394-dev
  libde265-0 libde265-dev libdraco-dev libegl-dev libepsilon1 libexif-dev libfcl0.5 libflann-dev
  libflann1.9 libfltk-cairo1.3 libfltk-forms1.3 libfltk-gtk1.3 libfltk-images1.3 libfltk1.3 libfltk1.3-dev
  libfontconfig-dev libfreetype-dev libfreexl-dev libfreexl1 libfribidi-dev libfyba-dev libfyba0
  libgazebo11 libgdal-dev libgdal26 libgdal30 libgdcn-dev libgdcn3.0 libgdk-pixbuf2.0-0 libgeos-c1v5
```

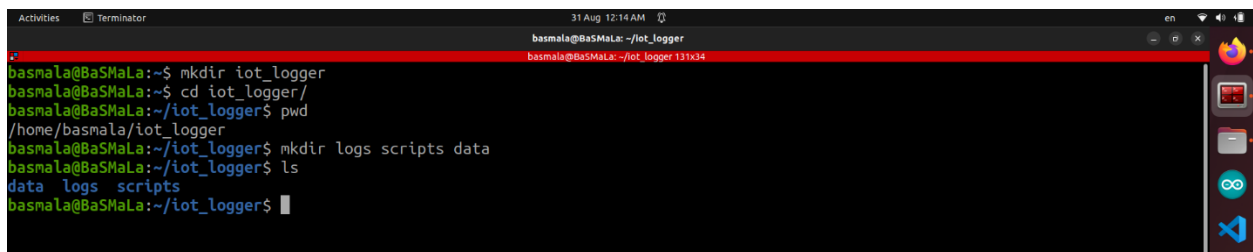
```
Activities Terminator 31 Aug 12:11 AM en
basma@basMaLa:~$ sudo apt-get install linux-image-5.15.0-153-generic
Preparing to unpack .../15-linux-image-5.15.0-153-generic_5.15.0-153.163_amd64.deb ...
Unpacking linux-image-5.15.0-153-generic (5.15.0-153.163) ...
Selecting previously unselected package linux-modules-extra-5.15.0-153-generic.
Preparing to unpack .../16-linux-modules-extra-5.15.0-153-generic_5.15.0-153.163_amd64.deb ...
Unpacking linux-modules-extra-5.15.0-153-generic (5.15.0-153.163) ...
Preparing to unpack .../17-linux-generic_5.15.0.153.153_amd64.deb ...
Unpacking linux-generic (5.15.0.153.153) over (5.15.0.152.152) ...
Preparing to unpack .../18-linux-image-generic_5.15.0.153.153_amd64.deb ...
Unpacking linux-image-generic (5.15.0.153.153) over (5.15.0.152.152) ...
Selecting previously unselected package linux-headers-5.15.0-153.
Preparing to unpack .../19-linux-headers-5.15.0-153.153_all.deb ...
Unpacking linux-headers-5.15.0-153 (5.15.0-153.163) ...
Progress: [ 27%]
Progress: [ 27%] [#####.....]
```

Verifying system details: kernel version, hostname, time and the user

A terminal window titled 'Terminator' showing system verification commands and their output. The user 'basmla' is at the 'basmla@BaSMaLa' host. The commands and output are as follows:

```
basmla@BaSMaLa:~$ uname -a
Linux BaSMaLa 6.8.0-65-generic #68~22.04.1-Ubuntu SMP PREEMPT_DYNAMIC Tue Jul 15 18:06:34 UTC 2 x86_64 x86_64 x86_64 GNU/Linux
basmla@BaSMaLa:~$ who
who          whoami      whoopsie    whoopsie-preferences
basmla@BaSMaLa:~$ whoami
basmla
basmla@BaSMaLa:~$
```

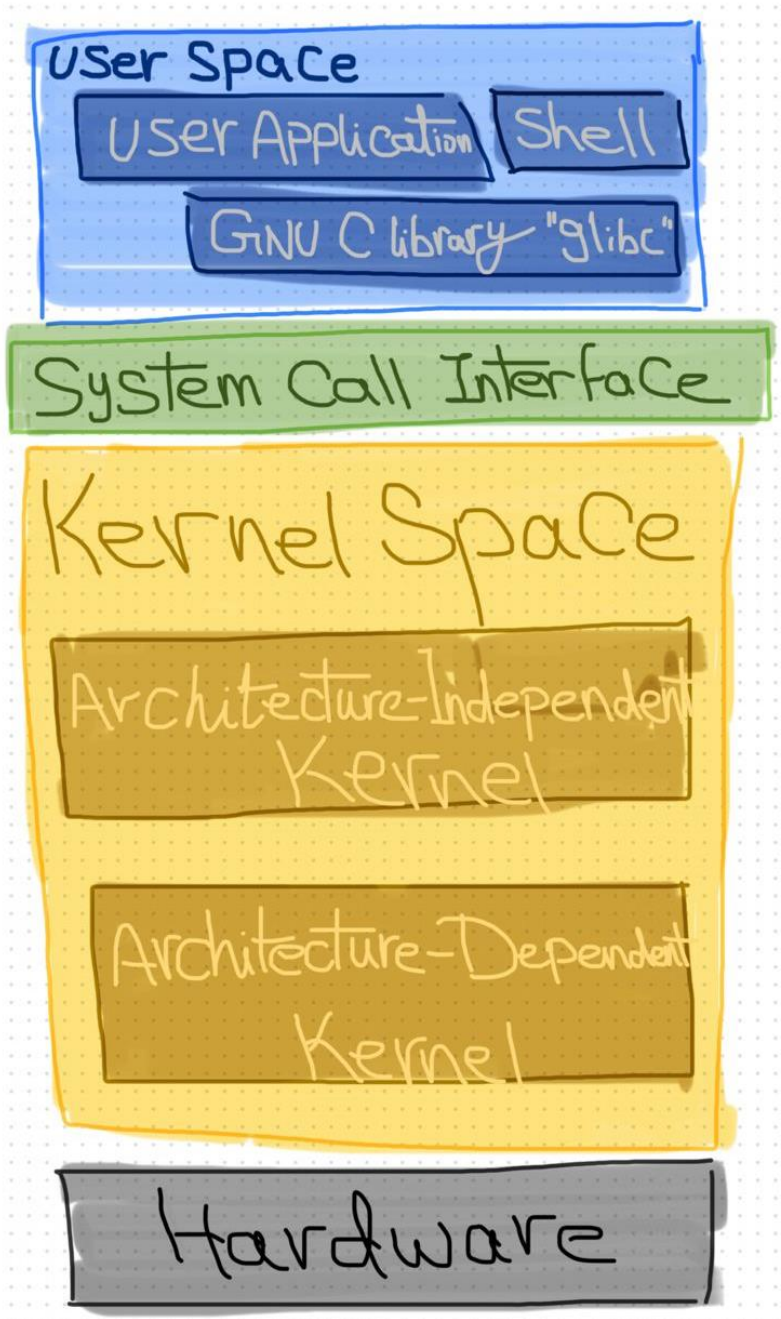
Creating the Directories

A terminal window titled 'Terminator' showing directory creation commands and their output. The user 'basmla' is at the 'basmla@BaSMaLa' host. The commands and output are as follows:

```
basmla@BaSMaLa:~$ mkdir iot_logger
basmla@BaSMaLa:~$ cd iot_logger/
basmla@BaSMaLa:~/iot_logger$ pwd
/home/basmla/iot_logger
basmla@BaSMaLa:~/iot_logger$ mkdir logs scripts data
basmla@BaSMaLa:~/iot_logger$ ls
data  logs  scripts
basmla@BaSMaLa:~/iot_logger$
```

Open-Ended Questions:

Linux Architecture layers



User Space: the area where all the applications and processes run.

System Call Interface: functions that act as a bridge between the shell and the kernel, translating user commands into instructions the kernel can execute.

Kernel Space: The part of the system that communicates directly with the hardware, often through assembly language.

Architecture-Independent Kernel: Kernel components that perform general tasks as file management on a hard disk, without depending on the specific type or brand of hardware.

Architecture-Dependent Kernel: Kernel components written in assembly code that interact directly with hardware features, such as registers and the hardware.

Hardware: the CPU, Screen, Keyboard, etc.

Explain the purpose of these directories:

/ → root directory where all other files and directories branch out from it

/bin → Contains essential user commands as ls, cp, cat...

/sbin → Contains essential system administration binaries

/usr → includes the main executable library files and header files

/etc → Stores system configuration files as passwd and network

/var → Contains files that change frequently during system operation

Why does Linux treat everything as a file?

Everything in Linux is treated as a file to keep the system simple and standardized. Instead of creating separate commands for each type of resource, the same system calls (open, read, write, close) can be used for all. This means a developer doesn't need to worry whether they are working with a disk file, a hardware device, or a network connection, all behave the same. Because of this design, tools can be easily combined using pipes (|) and redirection (>/<).

Program → file containing a set of instructions

Process → program in execution