# Q1. Installation of **a guest OS** through a virtualization software:

## Installation of Ubuntu through UTM for m1 mac -

UTM is an open source virtualisation software for Mac and IOS systems, and is the best virtualisation software for the m1 architecture which is actually stable and has some level of graphical acceleration available.

1. Download UTM using the link: <https://mac.getutm.app/> ,then drag the UTM app downloaded to the Applications folder.
2. Once UTM opens, click on Browse UTM gallery for downloading the OS of your choice. This process will deal with the Ubuntu installation. Therefore click on Ubuntu 20.04 for ARM64 and download the **Ubuntu server for ARM.**
3. In UTM, click on Create a new Virtual Machine.
4. Under the information tab, give the OS any name and select Operating System under the style category.
5. Under the System tab, check *ARM64* as the architecture and assign the virtual machine some memory (4gb is enough for regular functioning).
6. Under the Drives tab, click on New Drive. Keep the interface **VirtIO** and allocate some size to it (10gb is enough for light use). Again click on New Drive and this time check the **Removable** option.
7. Click save.
8. Select the listed Ubuntu VM on the sidebar. Near the bottom right of the pane, click on the browse option under the USB interface and select the downloaded Ubuntu server.
9. Start the VM and choose the “Install Ubuntu Server” option.
10. Keep clicking next and give some input whenever some username or password is asked.
11. At the end of the installation, Ubuntu server will be installed without any GUI.
12. Login to the server and run the commands –

sudo apt install tasksel (this step may abruptly end in a failure but keep running this till tasksel is installed)

sudo tasksel install ubuntu-desktop

sudo reboot

1. Boot into the Ubuntu VM, login and now there will be a GUI.
2. Open up the terminal using the application browser and type the following command – sudo apt install spice-vdagent spice-webdavd.
3. Now shut down the VM.
4. Open the settings and under the Sharing tab check both the *Enable Clipboard Sharing* and *Enable Directory Sharing.*
5. Under the display tab, make sure Full graphics is checked and then check the Fit to Screen option as well as the Retina Mode option.
6. Click Save and under the shared directory option click on Browse and select a folder you want to share with your VM for file transfer. When you open the Ubuntu VM the shared directory will be accessible using the host ip and the port 9843 ([**http://127.0.0.1:9843/**](http://127.0.0.1:9843/) ). This can be accessed through any web browser, or by using any WebDAV client of your choice.

This concludes the installation of Ubuntu through UTM.

# **Q2. A brief look on the Android system and the File structure it uses:**

* Introduced in September 2008 with the device HTC Dream, Android is currently the largest mobile Operating System, with a market share of nearly 70%.
* It is a modified version of the Linux kernel, making it free and open source. Anyone can fork the base Android from Android Open Source Project and create a version suited to personal needs.
* The source code is also used to develop variants for a wide range of electronics, from Android TV to Wear OS it can be coded for nearly everything due to the linux kernel being really adaptive.
* Software packages on Android use the APK format. Anyone can create these software packages and distribute them though some proprietary stores like Google Play, or by using any open source platform like Aptoide.
* Unlike IOS which has gatekeeping, Android is lenient in such regards and therefore you can find an application for pretty much any task.

**About the file system –**

* Android originally used the YAFFS2 (Yet Another Flash File System), which changed to ext4 since the 2.3 version.
* Ext4 is a journaling file system for linux, default on most distributions.
* The latest version of Android, 12, uses a new Incremental File System (IncFS).
* IncFS is a special-purpose linux virtual file system, which runs on top of the existing file system, and is essentially able to run application files(a part of them) while they are still downloading.

# Q3. Comparison between NTFS, Ext4 and HFS+ :

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| NTFS | Ext4 | HFS+ |
| * **New Technology File System** is a journaling file system developed by Microsoft. * Has a max volume size of 256 TB (for Windows 10 64bit). * Supports maximum file size of 8 PB. * Every windows since XP uses NTFS. * Works in read-only mode for Mac, can read and write on Linux. * Has multiple file naming restrictions. Eg – backslash(/), asterisk(\*), pipe( | ), question(?) are all forbidden from being in a file name. | * **Fourth extended filesystem** is a linux journaling file system. * Has a max volume size of 1 EB. * Maximum file size of 16 TB. * Used by nearly all Linux distributions, even Android. * Can’t read or write natively on both Windows and Mac. * Name can contain any character except backslash(/) | * Also known as **Mac OS Extended** or **HFS extended,** this is a journaling file system developed by Apple which replaced their *Hierarchical File System (HFS).* * Has a max volume size of 8 EB. * Maximum file size of 8 EB. * Became obsolete since Apple transitioned to Apple File System(APFS). * Works in read-only mode for Linux only. * Cannot use colon(:) , can’t start a file name with a period(.) |