



OPERATING SYSTEMS

CS201.3

Creating an Operating System
Group Assignment

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Introduction

What is an Operating System?

An Operating System is a software program that enables the computer hardware to communicate and operate with the computer software. It basically acts as an interface between the user and the computer hardware and controls the execution of all kinds of programs. Some examples of Operating Systems are Windows, Linux, Mac OS X, Android, IOS and so on.

Given below are some of the important functions of an operating system.

- Memory management
- Processor management
- Device management
- File management
- Security
- Control over system performance
- Error detecting aids

About Linux Architecture

Linux is one of the most popular versions of UNIX operating systems. It is open source as its source code is freely available and is free to use. Linux was designed considering UNIX compatibility. Its functionality list is quite similar to that of UNIX.

How does Linux differ from other operating systems?

In many ways, Linux is similar to other operating systems you may have used before, such as Windows, OS X, or iOS. Like other operating systems, Linux has a graphical interface, and types of software you are accustomed to using on other operating systems, such as word processing applications, have Linux equivalents. In many cases, the software's creator may have made a Linux version of the same program you use on other systems. If you can use a computer or other electronic device, you can use Linux.

But Linux also is different from other operating systems in many important ways. First, and perhaps most importantly, Linux is open source software. The code used to create Linux is free and available to the public to view, edit, and—for users with the appropriate skills—to contribute to.

Linux is also different in that, although the core pieces of the Linux operating system are generally common, there are many distributions of Linux, which include different software options. This means that Linux is incredibly customizable, because not just applications, such as word processors and web browsers, can be swapped out. Linux users also can choose core components, such as which system displays graphics, and other user-interface components.

How to get started using Linux

There's some chance you're using Linux already and don't know it, but if you'd like to install Linux on your home computer to try it out, the easiest way is to pick a popular distribution that is designed for your platform (for example, laptop or tablet device) and give it a shot. Although there are numerous distributions available, most of the older, well-known distributions are good choices for beginners because they have large user communities that can help answer questions if you get stuck or can't figure things out. Popular distributions include Debian, Fedora, Mint, and Ubuntu, but there are many others.

About Ubuntu

Ubuntu was named after a Nguni Bantu term referring to a philosophy that when summed up means "humanity to others". Given Canonical's kindness and work ethics, it is no wonder why the Debian-based Linux distro has grown to be the most popular distro in the world today, owning the largest amount of Linux's market share worldwide.

Ubuntu is this popular because it is efficient and is highly recommended.

Why we used Ubuntu

There are several reasons why we used Ubuntu to customize and create our own operating system. Some of the important reasons are mentioned below.

- Easy to Install

Ideally, the difficulty of installing a thing shouldn't be a factor of how often people use it but in this world, it is. Newbies to the Linux world already probably have a misguided notion of Linux and putting seemingly difficult installation milestones before a task isn't going to help change that fact.

To do a fresh Ubuntu installation requires an ISO image, an external drive, and a system. That's a good start.

- Default Look and Feel

Fresh out of the box Ubuntu looks so pleasing and thanks to Canonical's very own unity desktop, the icons are organized in sizes neither too big nor too small. Its wallpaper is a nice blend of "Ubuntu-ish" color.

The desktop is empty at the dustbin at the bottom of the left-positioned taskbar is empty. You can either like this look or change it. But many people are comfortable with it.

- Easily Customizable

To customize Ubuntu all you need is the knowledge of where to get the themes from and an installed Unity Tweak Tool or Gnome Tool.

- Lots of Themes

Ubuntu is not only easily customizable with themes, it has a tons of themes to choose from. Lots of themes mean lots of options. And lots of options mean better personality-fitting setting.

In this sense, one is able to make his workstation look the way he feels better satisfied while using it and when you use a theme, it works on all the components of the OS's GUIs, so your experience will be stable and smooth.

- An Awesome Community

Linux might own only 2% of all market share in the World but that percentage hasn't stopped its users from getting in contact with themselves.

There are many communities that help people get started with Linux and even train them up to expert level, but Canonical has done a good job of maintaining, arguably, the most appealing.

Ubuntu, in particular, has the most market share of the 2% that Linux holds, so you're definitely going to have easy access to support from others.

- Smooth Learning Curve

By this statement I mean Ubuntu is easy to learn. It is easy to install; it has a simple and nice but serious look and feel when you get it running for the first time, and it has a minimalist-designed dashboard with settings that are intuitive to navigate.

The awesome community also plays a part in this, as it is because it is easy to find effective guides that the learning curve is usually, a swift sail compared to learning Kali Linux.

- Ubuntu is a Standard

Many of the commands you will learn in Ubuntu will work on other distros because there is sort of a standard that all the distros follow in one way or the other.

Automatically learning these standards when you use Ubuntu will allow for a smooth transition into learning the other distros which deviate from the standard in a way.

It's a little like the C programming language. It's easier to learn a programming language if you have learned C before because of its coding standards and functions. That's kind of how Ubuntu is – but among Linux distros.

- Free Open Source Tools

The same way Ubuntu comes straight out of the box with a nice wallpaper and glossy icons is the same way it comes with a suite of tools for both work and recreation. With apps like Firefox for Browsing, Transmission for Torrents, LibreOffice for word processing, presentations, and data analysis, Banshee for music, document viewer for pdf files, amazon for online marketing, etc.

Ultimately, this means that from the very first moment you boot up Ubuntu, it is ready to do work.

- Ubuntu is Flexible

The ability to customize the Unity desktop deserves to be a reason on its own because it is a bit different from just changing the color and shape of things.

For example, you can set the taskbar's position to be the left, right, top, or bottom. You also have auto-hide options, animation options, window snap options, and many other options that control how the whole OS operation feels to you, how to display notifications and when to display them.

Users can also install different desktop environments (such as Mate, Cinnamon, XFC, etc) if they want a different experience from Unity.

- Regular Updates and Support

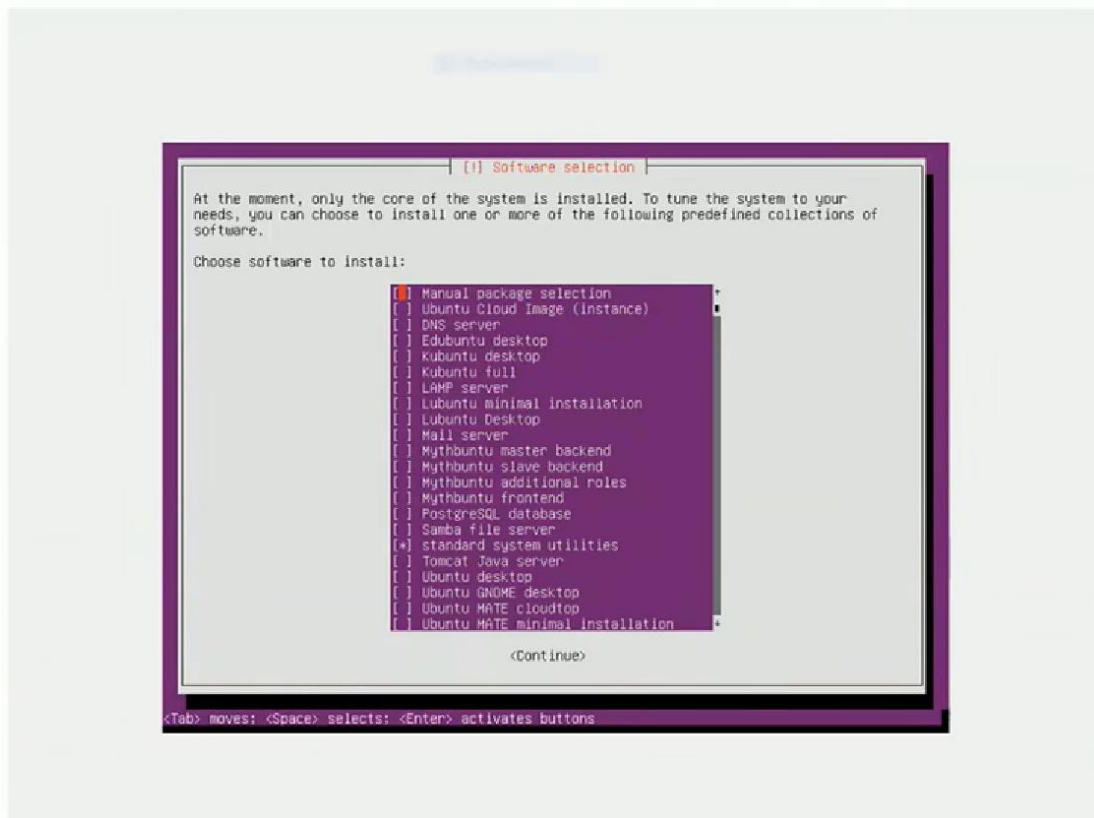
Apart from the major features Ubuntu offers, each release comes with tons of bug fixes that increase performance.

Ubuntu is also known to be compatible with so many devices even as it is a lot less vulnerable to viruses and malware than Windows and Mac (thanks to Linux), and with time Ubuntu gets to receive support for more features and app integrations, making it an ideally versatile workstation.

Steps to Customize

In order to make our own operating system, we thought its best to use Ubuntu 16.04 LTS and customize it according to our requirements. The steps we followed in customizing it are given below.

- Initially, when installing the operating system, select the basics like country, language and so on.
- Then a list of packages will be displayed under manual package selection which is under software selection. From these, only standard system utilities should be selected.



- When we fire up the operating system after that, there won't be a GUI when the operating system is first installed. Just the terminal prompt will be visible and it is needed to login using your username and password.



This is basically how the operating system will look like before it is customized. All the necessary commands that should be followed afterwards are mentioned below, which will result in a customized operating system of our own. (screenshots provided later on)

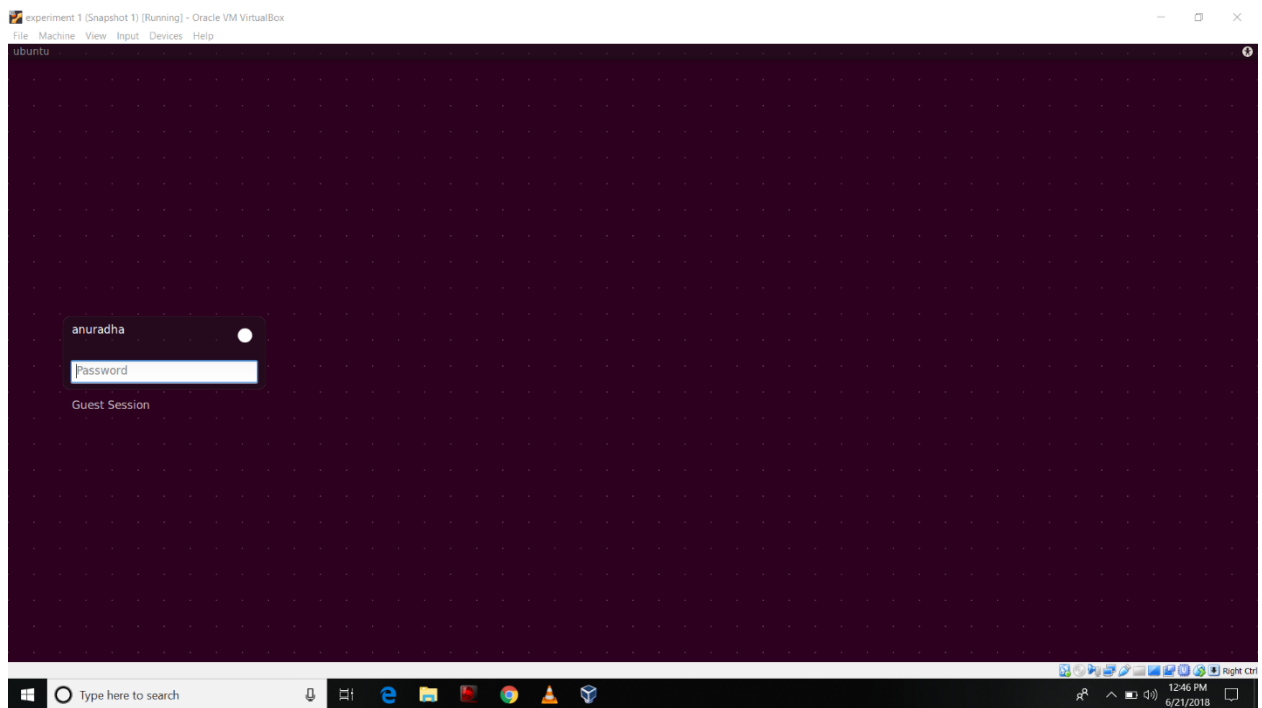
- After logging in by giving a username and a password, **lightDM** should be installed which is a display manager. This installs many packages including graphical server packages which will help you create a lightweight desktop GUI.
- Then **open box**, which is a window manager and **open box gnome session**, which is a session manager should be installed. The login is created with the help of these.
- In order to obtain a graphical terminal to use after the GUI is created, **gnome terminal** should be installed.
- Reboot after doing all the above given basic steps and a graphical login screen will be brought up.
- After the graphical login is brought up, select the button next to the username and select open box from it and login by entering the password.

- As soon as you login for the first time, a plain black desktop will appear with the mouse pointer with nothing to click on. By clicking right click, the graphical terminal can be obtained which was installed earlier. Using this graphical terminal, all the other necessary changes can be made to the operating system.
- Then **OB menu** should be installed which will let you edit the open box menu. Using this, any number of commands that you wish can be added to the list that appears when you right click.
- Next, **tint2** and **docky** should be installed which will provide you with a task bar for the operating system, on which you can include all the relevant software shortcuts that you need to have in your system.
- To put a background for the desktop, **nitrogen** should be installed afterwards. Then install Ubuntu-wallpapers which will provide you with a number of various desktop wallpapers for the operating system.
- Then, in order to obtain a lightweight file manager, install **pcmanfm**.
- Also, to obtain attractive icons to the desktop, install **lxappearance** which will provide you with a variety of icons that you can use to customize the GUI of the operating system.
- To complete customizing, install a web browser (eg : Firefox) and via this, any other software that you wish to have in the system can be installed and the operating system will be ready to use.
- As an example for an application that can run in our operating system, we created it in a way that audios and videos can be played using a media player. For this to happen, **pulseaudio** should be installed and to control this, **pavucontrol** should also be installed.
To adjust the volume of the audio/video that will be played, a package called **volti** should be installed, which will display a small speaker at the bottom of the desktop.
- Finally, in order to view the tasks that are running on the operating system, a task manager should be present. To obtain this, **lxtask** should be installed which will provide you with a task manager.

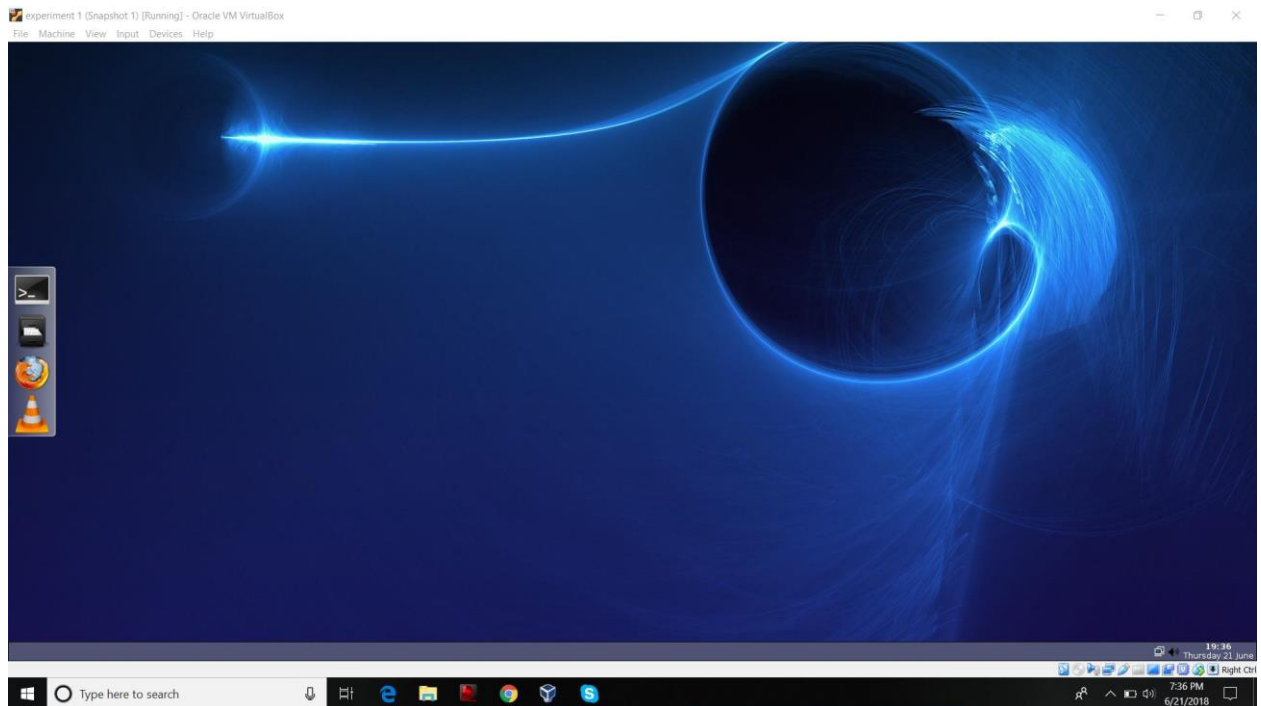
Customized OS

The final output of the operating system we obtained after following the above given steps is as follows.

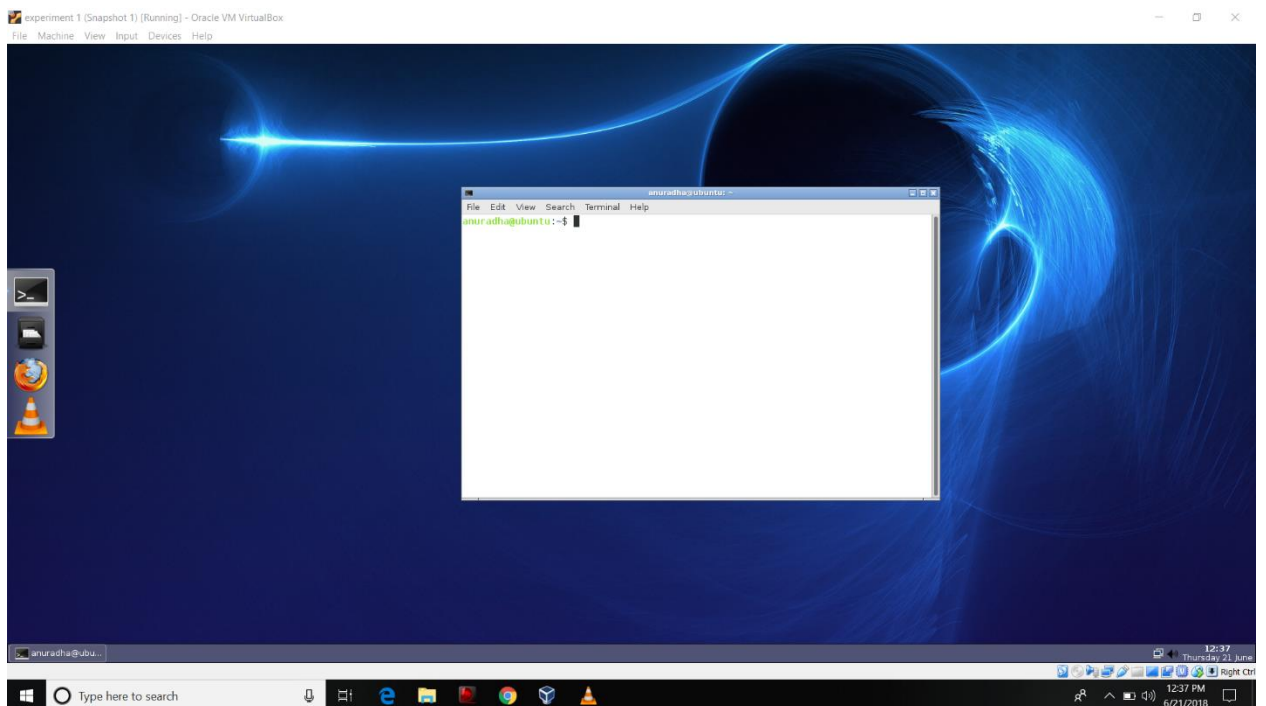
- **Login**



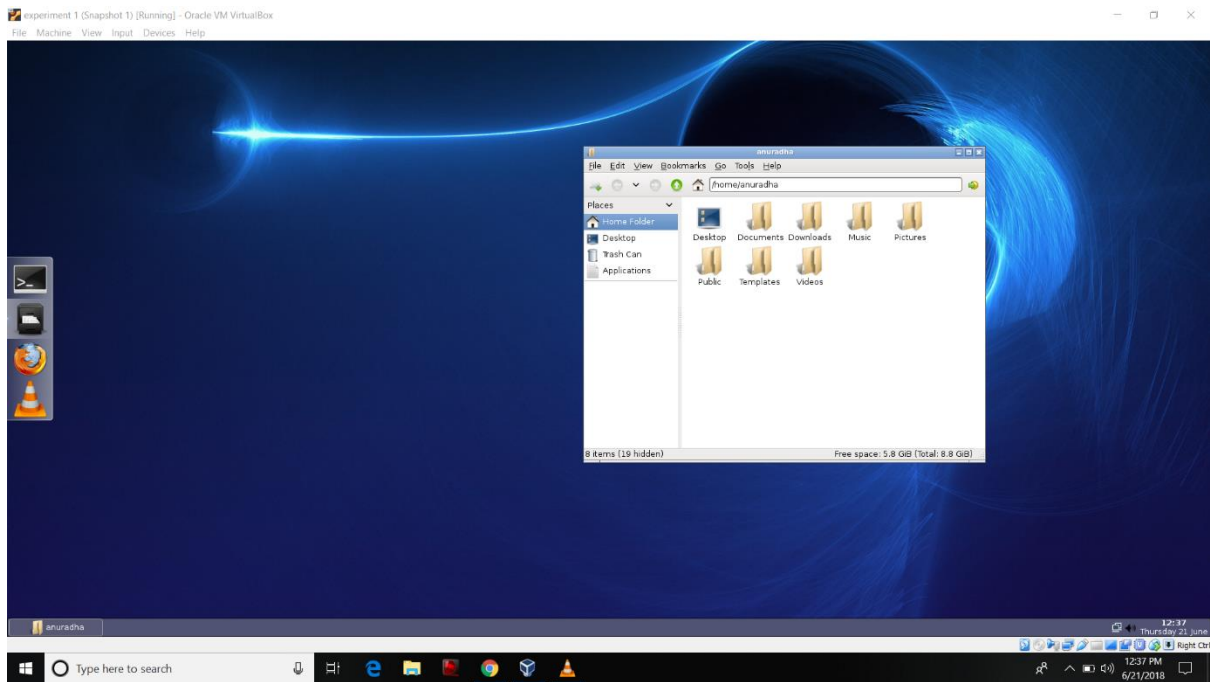
- Desktop after logging in (with task bar and background image)



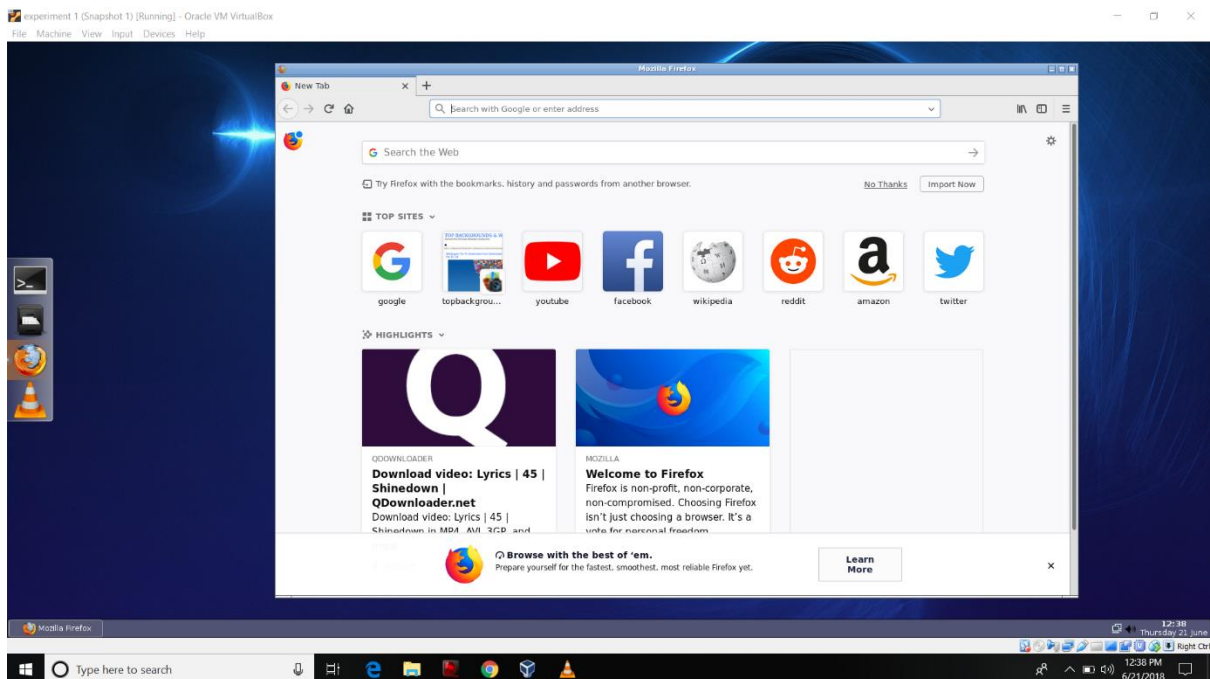
- Terminal



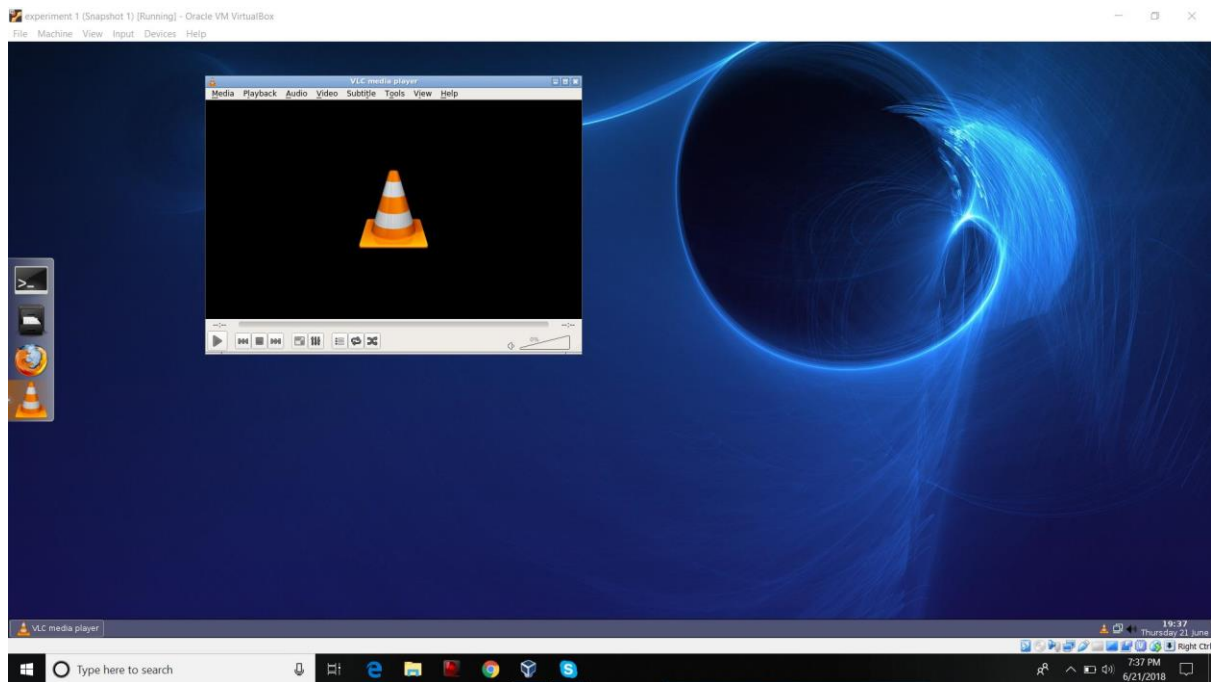
- **File Manager**



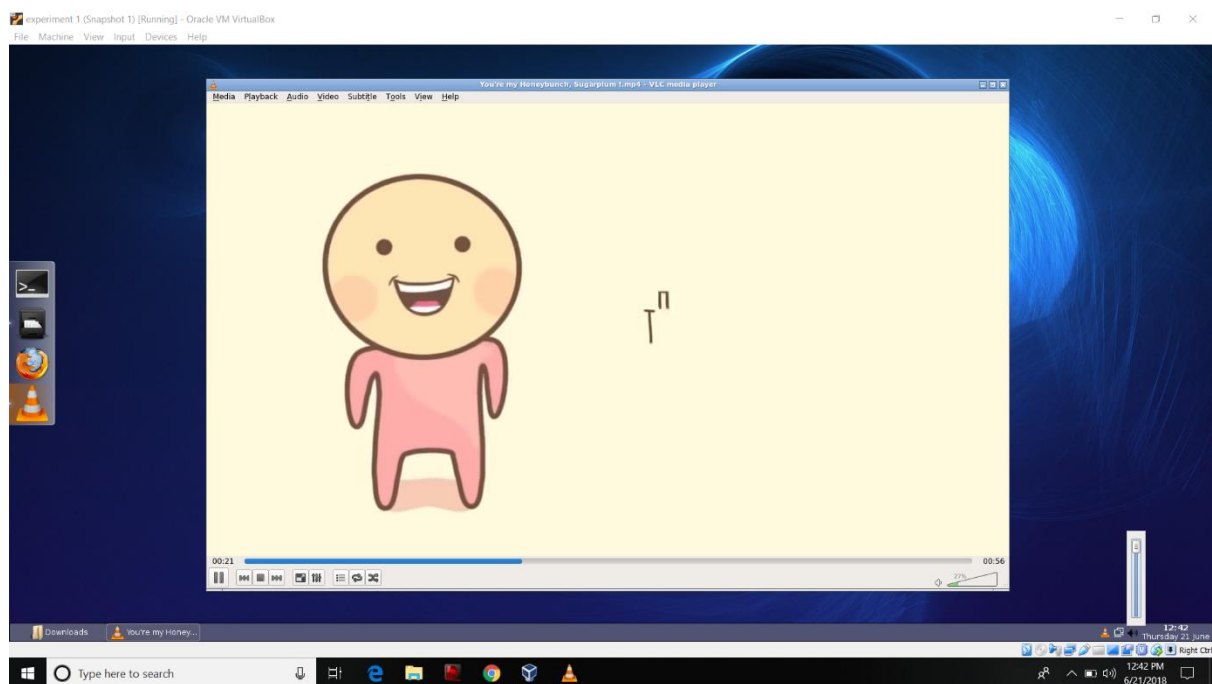
- **Web browser (Firefox)**



- **Media player**

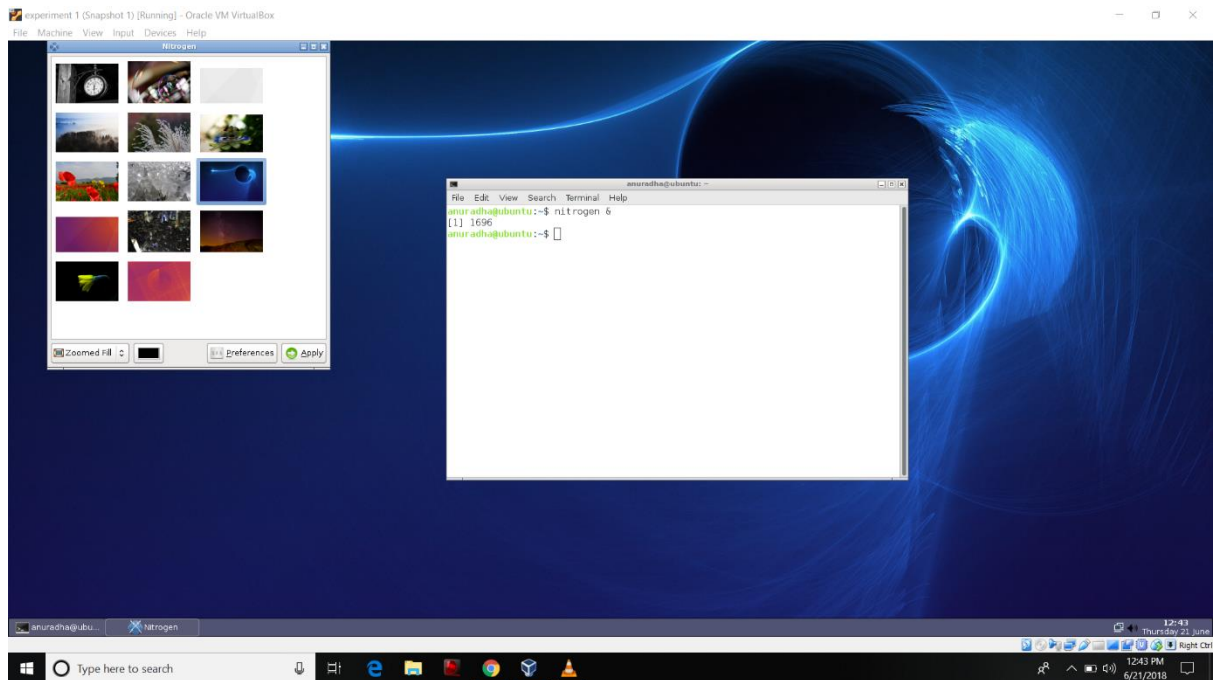


- **A video being played in the media player.**
The sound can be adjusted using the speaker icon at the bottom right corner

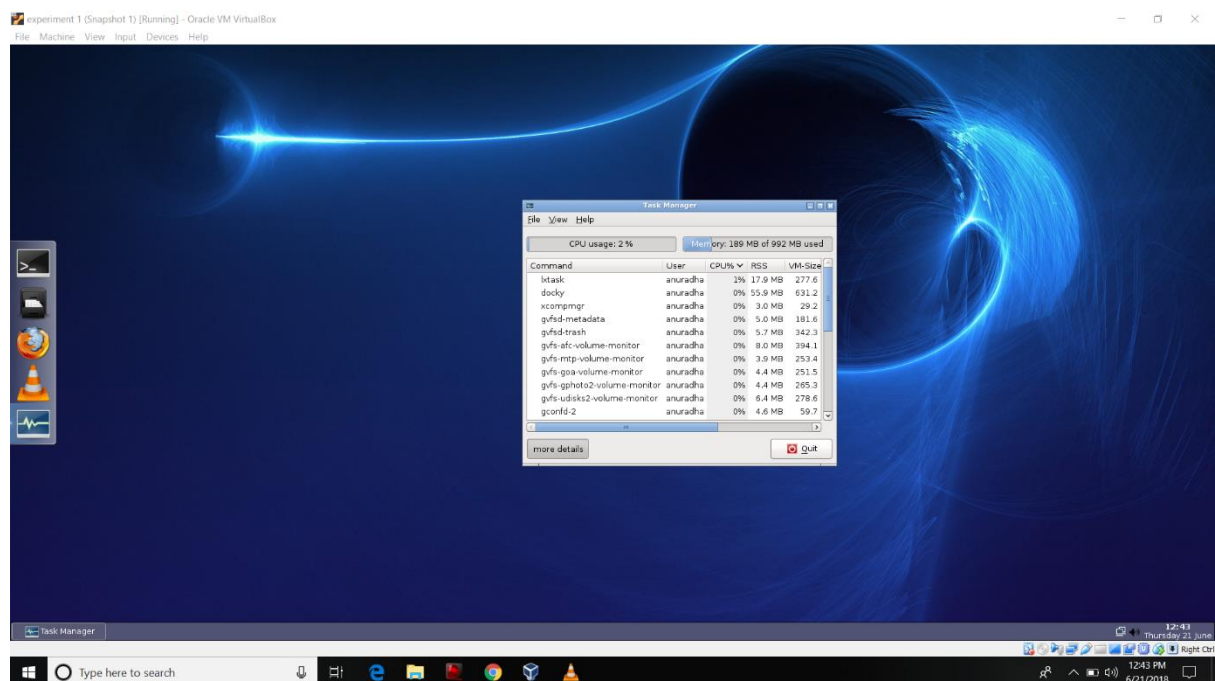


- **Background images**

User can select any wallpaper and use it as the background image

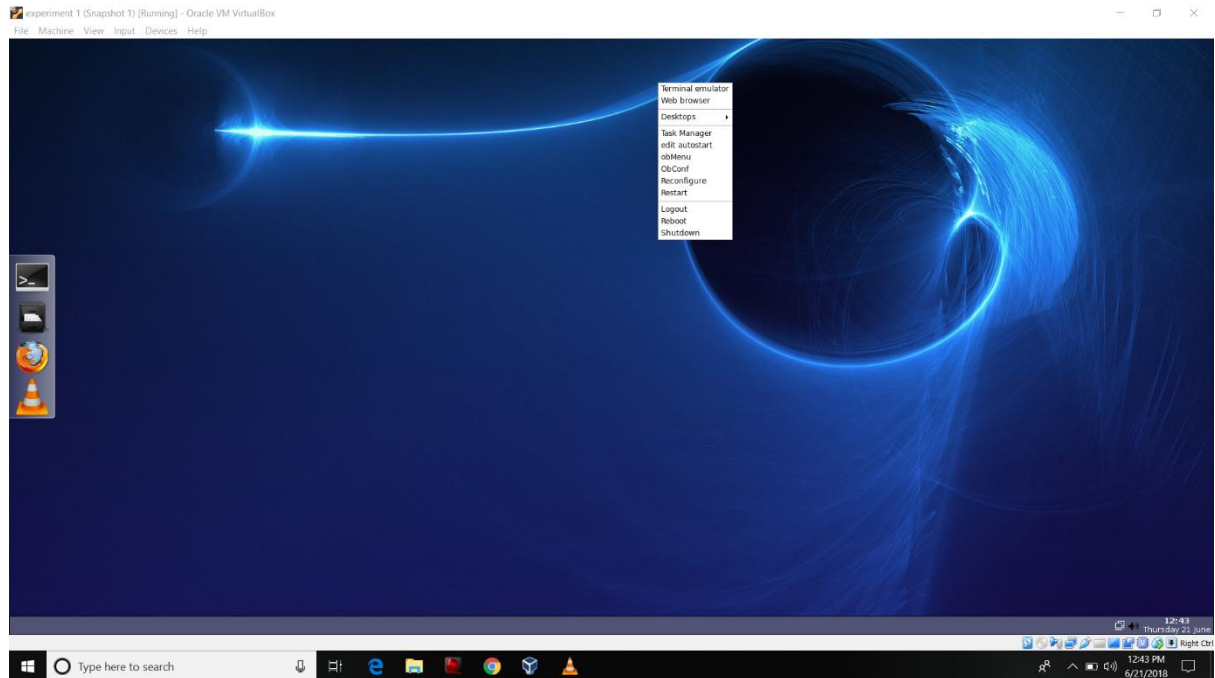


- **Task Manager**



- **Logout / Shut down**

User can right click on the desktop and select whether to logout or to shut down, which are commands added with the aid of the OB menu.



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