

Setting up Workspace for EECs 678 Labs

You will have to carry out the labs on a Linux OS. If you already use a Linux OS (like Ubuntu etc.) on your personal machine, you should be fine with that. Your source code and the compiled program should always be tested on the Cycle servers regardless of how you choose to perform the labs. You can perform the labs in any of the following ways:

1. Using a Virtual Machine:

We will setup Ubuntu 20.04 on Virtual Box. Both the Virtual Box software and the Ubuntu 20.04 image are available for free. **You should make sure that you allocate at least 25 GB of hard disk space to Ubuntu during installation.** The steps for the setup are as follows:

Part A (Installing Virtual Box):

1



The screenshot shows the Oracle VM VirtualBox website. The browser's address bar is highlighted with a red circle, containing the URL <https://www.virtualbox.org>. The website content includes the VirtualBox logo, a navigation menu on the left (About, Screenshots, Downloads, Documentation, End-user docs, Technical docs, Contribute, Community), a main heading 'Welcome to VirtualBox.org!', a large blue button for 'Download VirtualBox 6.1', and a 'Hot picks' section with links to developer resources. A 'News Flash' sidebar on the right lists recent releases such as VirtualBox 6.1.12, 6.0.24, 5.2.44, 6.1.10, 6.1.8, 6.0.22, and 5.2.42.

1 Go to <https://www.virtualbox.org>

2

Oracle VM VirtualBox x +
virtualbox.org

VirtualBox

Welcome to VirtualBox.org!

VirtualBox is a powerful x86 and AMD64/Intel64 virtualization product for enterprise as well as home use. Not only is VirtualBox an extremely feature rich, high performance product for enterprise customers, it is also the only professional solution that is freely available as Open Source Software under the terms of the GNU General Public License (GPL) version 2. See "About VirtualBox" for an introduction.

Presently, VirtualBox runs on Windows, Linux, Macintosh, and Solaris hosts and supports a large number of guest operating systems including but not limited to Windows (NT 4.0, 2000, XP, Server 2003, Vista, Windows 7, Windows 8, Windows 10), DOS/Windows 3.x, Linux (2.4, 2.6, 3.x and 4.x), Solaris and OpenSolaris, OS/2, and OpenBSD.

VirtualBox is being actively developed with frequent releases and has an ever growing list of features, supported guest operating systems and platforms it runs on. VirtualBox is a community effort backed by a dedicated company: everyone is encouraged to contribute while Oracle ensures the product always meets professional quality criteria.

Download VirtualBox 6.1

Hot picks:

- Pre-built virtual machines for developers at [Oracle Tech Network](#)
- Hyperbox** Open-source Virtual Infrastructure Manager [project site](#)
- phpVirtualBox** AJAX web interface [project site](#)

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News Flash

- New July 14th, 2020, 20: VirtualBox 6.1.12 release**
Oracle today released a 6.1 maintenance release which i stability and fixes regressor the Changelog for details.
- New July 14th, 2020, 20: VirtualBox 6.0.24 release**
Oracle today released a 6.0 maintenance release which i stability and fixes regressor the Changelog for details.
- New July 14th, 2020 VirtualBox 5.2.44 release**
Oracle today released a 5.2 maintenance release which i stability and fixes regressor the Changelog for details.
- New June 5th, 2020, 202 VirtualBox 6.1.10 release**
Oracle today released a 6.1 maintenance release which i stability and fixes regressor the Changelog for details.
- New May 15th, 2020, 20: VirtualBox 6.1.8 released**
Oracle today released a 6.1 maintenance release which i stability and fixes regressor the Changelog for details.
- New May 15th, 2020, 20: VirtualBox 6.0.22 release**
Oracle today released a 6.0 maintenance release which i stability and fixes regressor the Changelog for details.
- New May 15th, 2020 VirtualBox 5.2.42 release**
Oracle today released a 5.2

2 Click the "Downloads" button from the left navigation pane

3

Downloads - Oracle VM VirtualBox x +
virtualbox.org/wiki/Downloads

VirtualBox

Download VirtualBox

Here you will find links to VirtualBox binaries and its source code.

VirtualBox binaries

By downloading, you agree to the terms and conditions of the respective license.

If you're looking for the latest VirtualBox 6.0 packages, see [VirtualBox 6.0 builds](#). Please also use version 6.0 if you need to run VMs with software virtualization, as this has been discontinued in 6.1. Version 6.0 will remain supported until July 2020.

If you're looking for the latest VirtualBox 5.2 packages, see [VirtualBox 5.2 builds](#). Please also use version 5.2 if you still need support for 32-bit hosts, as this has been discontinued in 6.0. 5.2 will remain supported until July 2020.

VirtualBox 6.1.12 platform packages

- [Windows hosts](#)
- [OS X hosts](#)
- [Linux distributions](#)
- [Solaris hosts](#)

The binaries are released under the terms of the GPL version 2.

See the [changelog](#) for what has changed.

You might want to compare the checksums to verify the integrity of downloaded packages. *The SHA256 checksums should be favored as the MD5 algorithm must be treated as insecure!*

- [SHA256 checksums, MD5 checksums](#)

Note: After upgrading VirtualBox it is recommended to upgrade the guest additions as well.

VirtualBox 6.1.12 Oracle VM VirtualBox Extension Pack

- [All supported platforms](#)

Support for USB 2.0 and USB 3.0 devices, VirtualBox RDP, disk encryption, NVMe and PXE boot for Intel cards. See [this chapter from the User Manual](#) for an introduction to this Extension Pack. The Extension Pack binaries are released under the [VirtualBox Personal Use and Evaluation License \(PUEL\)](#). Please install the same version extension pack as your installed version of VirtualBox.

VirtualBox 6.1.12 Software Developer Kit (SDK)

- [All platforms](#)

3 Click the "VirtualBox 5.2 builds" button

4

Download_Old_Builds_5_2 - Ora... x +

virtualbox.org/wiki/Download_Old_Builds_5_2

VirtualBox

Download VirtualBox (Old Builds): VirtualBox 5.2

The Extension Packs in this section are released under the [VirtualBox Personal Use and Evaluation License](#). All other binaries are released under the terms of the GPL version 2. By downloading you agree to the terms and conditions of the respective license.

- 5.2 SDK (5.2.44)
- VirtualBox 5.2.44 (released July 14 2020)**
 - Windows hosts
 - OS X hosts
 - Solaris hosts
 - Linux Hosts:
 - Oracle Linux 8 / Red Hat Enterprise Linux 8 / CentOS 8
 - Oracle Linux 7 / Red Hat Enterprise Linux 7 / CentOS 7
 - Oracle Linux 6 / Red Hat Enterprise Linux 6 / CentOS 6 32-bit | 64-bit
 - Ubuntu 18.04 / 18.10 / 19.04
 - Ubuntu 16.04 32-bit | 64-bit
 - Ubuntu 14.04 / 14.10 / 15.04 32-bit | 64-bit
 - Debian 9 32-bit | 64-bit
 - Debian 8 32-bit | 64-bit
 - openSUSE 15.0
 - openSUSE 13.2 / Leap 42 32-bit | 64-bit
 - Fedora 29 / 30
 - Fedora 26 / 27 / 28 32-bit | 64-bit
 - All distributions 32-bit 64-bit
 - Extension Pack
 - Sources
 - MDS checksums, SHA256 checksums
- VirtualBox 5.2.42 (released May 15 2020)**
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 - Ubuntu 18.04 / 18.10 / 19.04
 - Ubuntu 16.04 32-bit | 64-bit
 - Ubuntu 14.04 / 14.10 / 15.04 32-bit | 64-bit

4 Download the appropriate installer according to your host OS (mine is Windows - so I select Windows)

5

Download_Old_Builds_5_2 - Ora... x +

virtualbox.org/wiki/Download_Old_Builds_5_2

VirtualBox

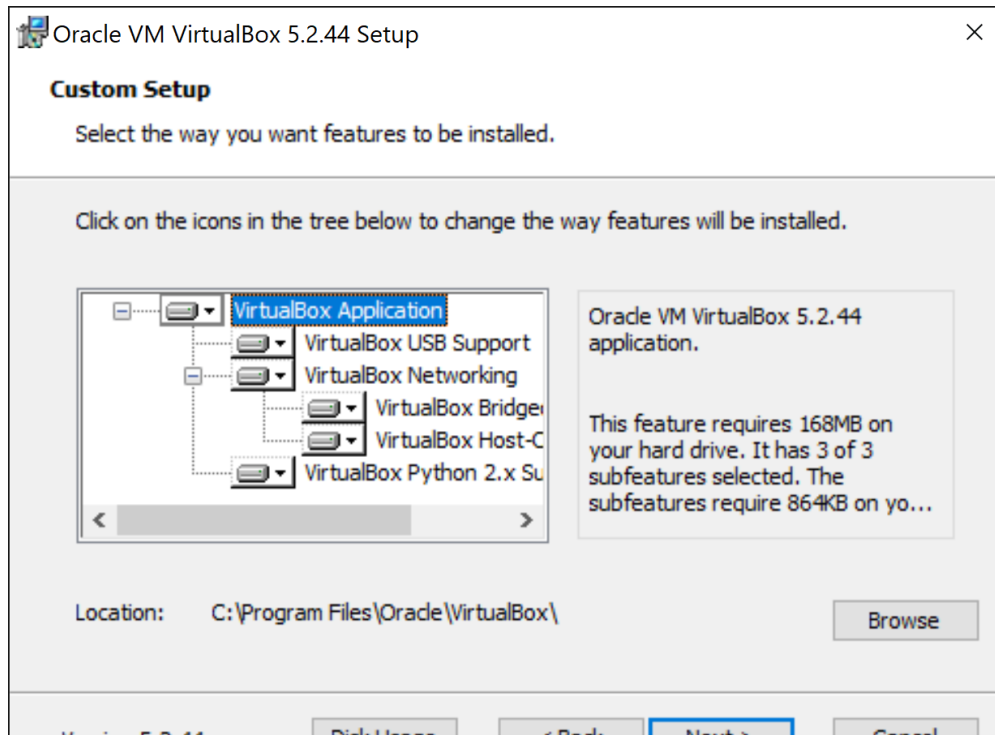
Download VirtualBox (Old Builds): VirtualBox 5.2

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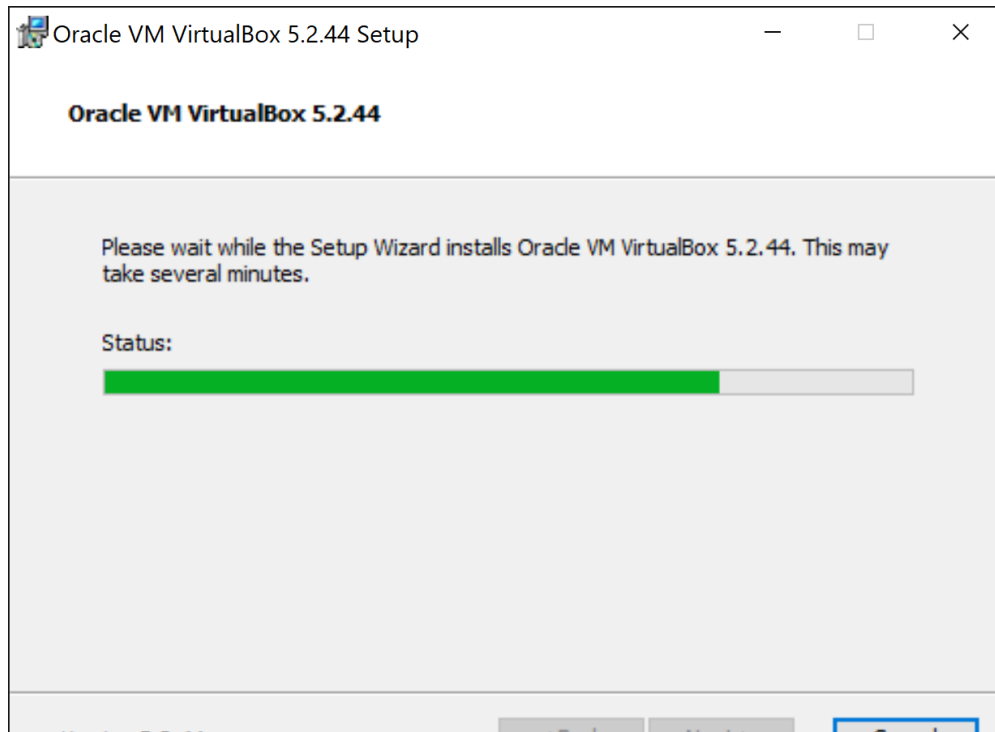
5 VirtualBox has started downloading

6



6 Start installing VirtualBox with default options

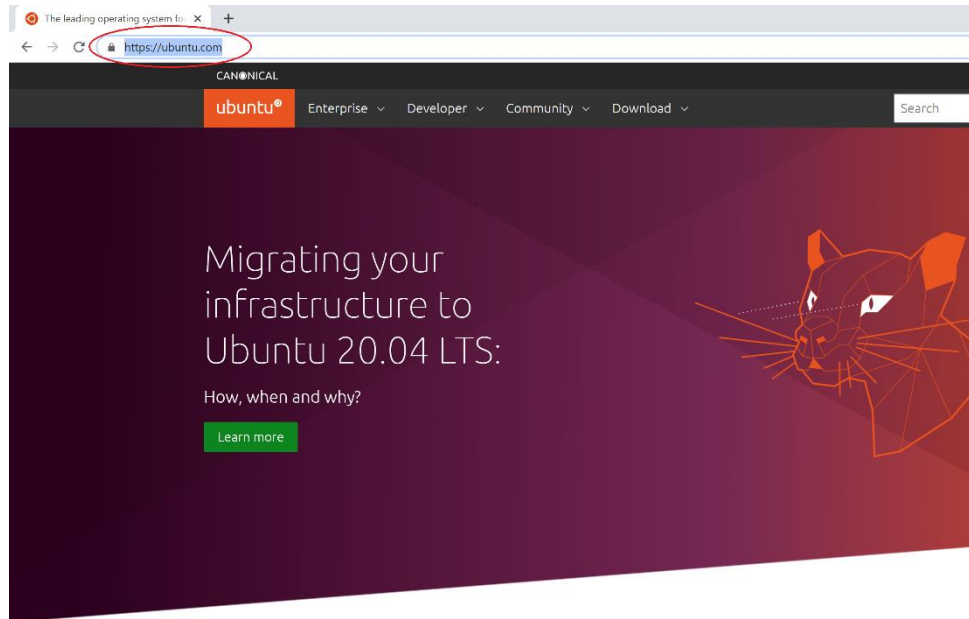
7



7 VirtualBox installation is in progress

Part B (Installing Ubuntu in VirtualBox):

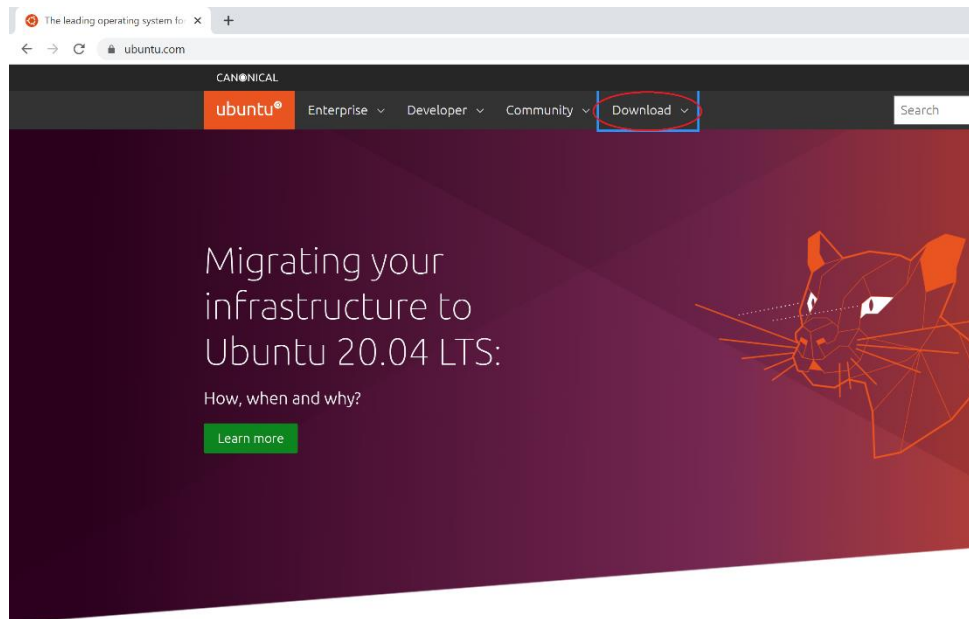
1



 [Update: Canonical managed services and Ubuntu support during COVID-19 outbreak >](#)

1 In the meantime, go to <https://ubuntu.com>

2



 [Update: Canonical managed services and Ubuntu support during COVID-19 outbreak >](#)

2 Click on Download

3

The screenshot shows the Ubuntu website's download page. The navigation bar includes 'ubuntu', 'Enterprise', 'Developer', 'Community', and 'Download'. The main content is divided into four columns: 'Ubuntu Desktop', 'Ubuntu Server', 'Ubuntu for IoT', and 'Ubuntu Cloud'. Under 'Ubuntu Desktop', the '20.04 LTS' button is highlighted with a red circle. Below this, there are sections for 'TUTORIALS', 'READ THE DOCS', 'OTHER WAYS TO DOWNLOAD', and 'UBUNTU FLAVOURS'.

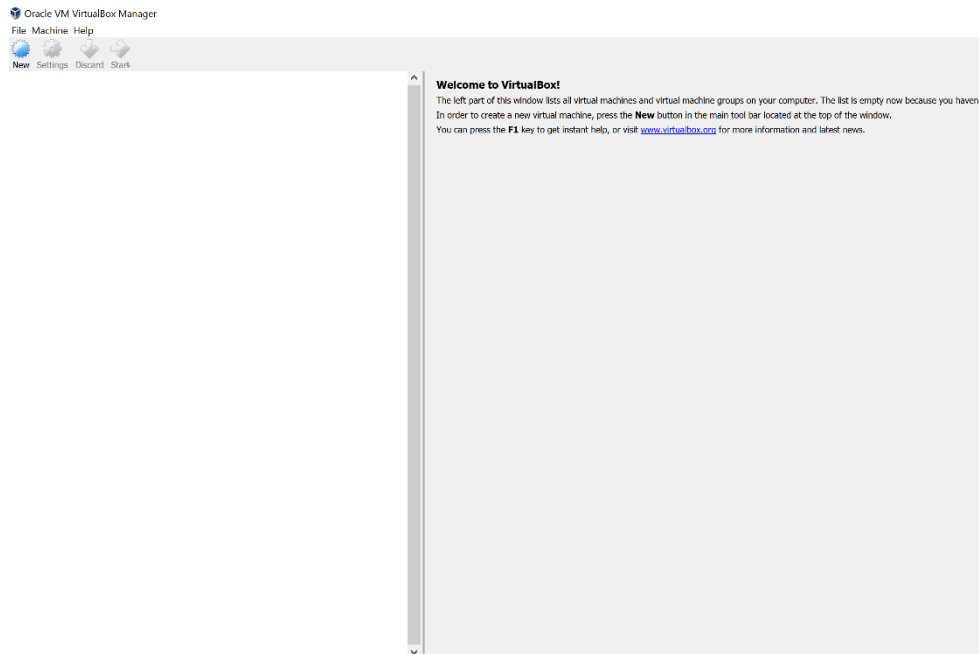
3 Download the 20.04 LTS version

4

The screenshot shows the 'Thank you for downloading Ubuntu Desktop' page. The main heading is 'Thank you for downloading Ubuntu Desktop'. Below it, there are links for 'download now' and 'help on installing'. At the bottom, there is a 'Help us to keep Ubuntu free to download, share and use by contributing to ...' section with a 'Community projects' input field. To the right, there is a 'NEWSLETTER SIGNUP' section with a 'Select topics you're interested in' dropdown menu. At the bottom left, a download progress bar shows 'ubuntu-20.04.1-de...iso' with a red circle around it.

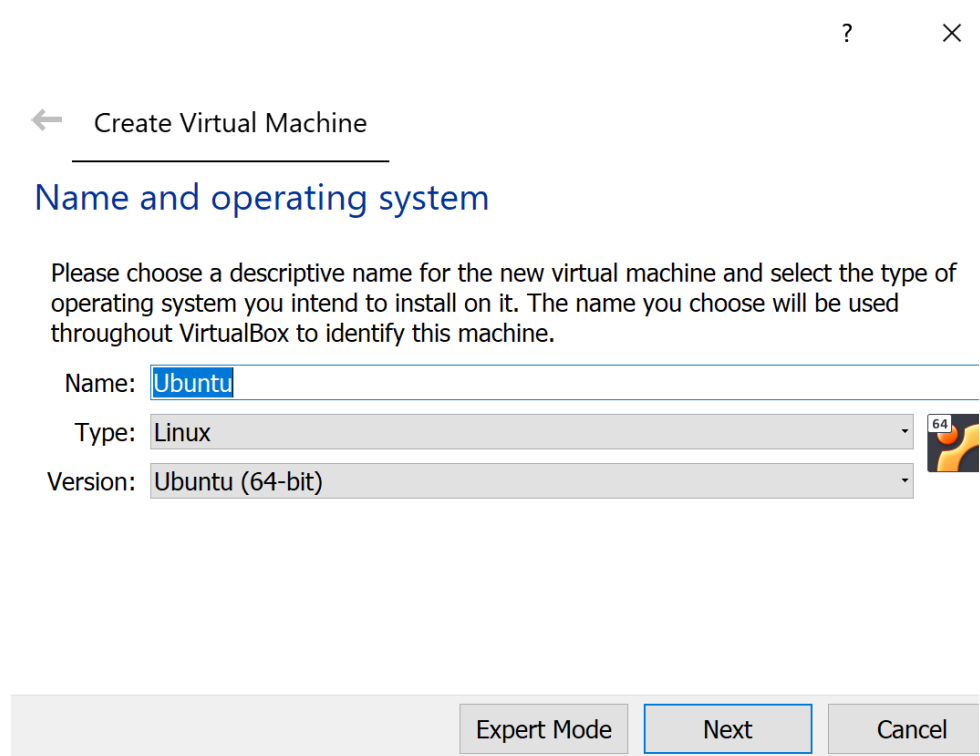
4 Ubuntu 20.04 iso image download is in progress

5



5 Open VirtualBox and click on New

6



6 Name the Virtual Machine and click Next

7

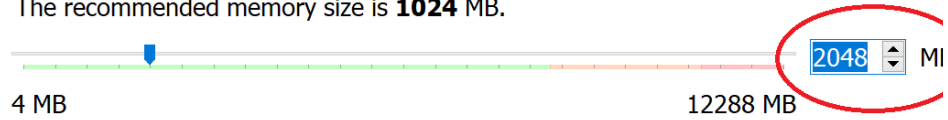
? ×

← Create Virtual Machine

Memory size

Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended memory size is **1024 MB**.



Next

Cancel

7 Set the memory size to be 2048 MB

8

? ×

← Create Virtual Machine

Hard disk

If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.

If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.

The recommended size of the hard disk is **10.00 GB**.

- Do not add a virtual hard disk
- Create a virtual hard disk now
- Use an existing virtual hard disk file

Empty

Create

Cancel

8 Select "Create a virtual hard disk now"

9

? X

← Create Virtual Hard Disk

Storage on physical hard disk

Please choose whether the new virtual hard disk file should grow as it is used (dynamically allocated) or if it should be created at its maximum size (fixed size).

A **dynamically allocated** hard disk file will only use space on your physical hard disk as it fills up (up to a maximum **fixed size**), although it will not shrink again automatically when space on it is freed.

A **fixed size** hard disk file may take longer to create on some systems but is often faster to use.

- Dynamically allocated
- Fixed size

Next Cancel

9 Select "Dynamically allocated"

10

? X

← Create Virtual Hard Disk

File location and size

Please type the name of the new virtual hard disk file into the box below or click on the folder icon to select a different folder to create the file in.

Ubuntu 

Select the size of the virtual hard disk in megabytes. This size is the limit on the amount of file data that a virtual machine will be able to store on the hard disk.

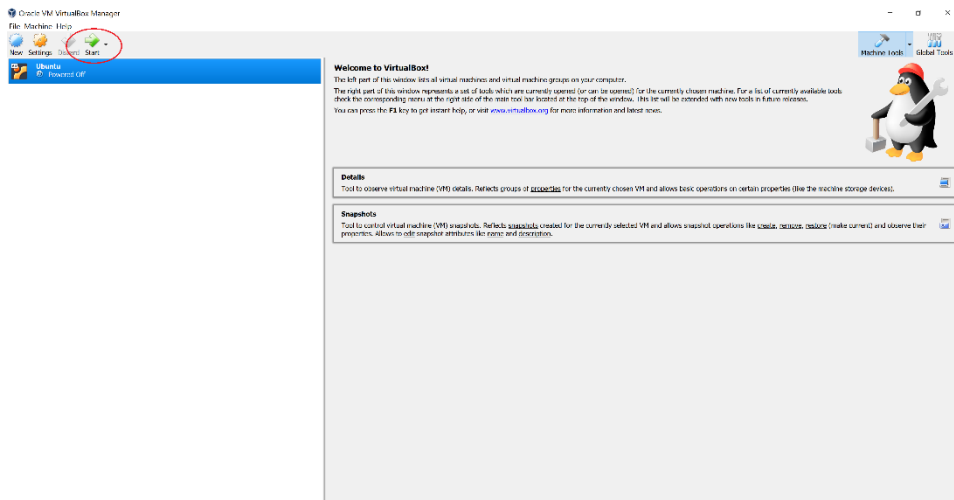
4.00 MB 2.00 TB

25.00 GB

Create Cancel

10 Please ensure that you are allocating at least 25 GB of hard disk space

11



11 Once created, "start" the created virtual machine

12

? X

← Select start-up disk

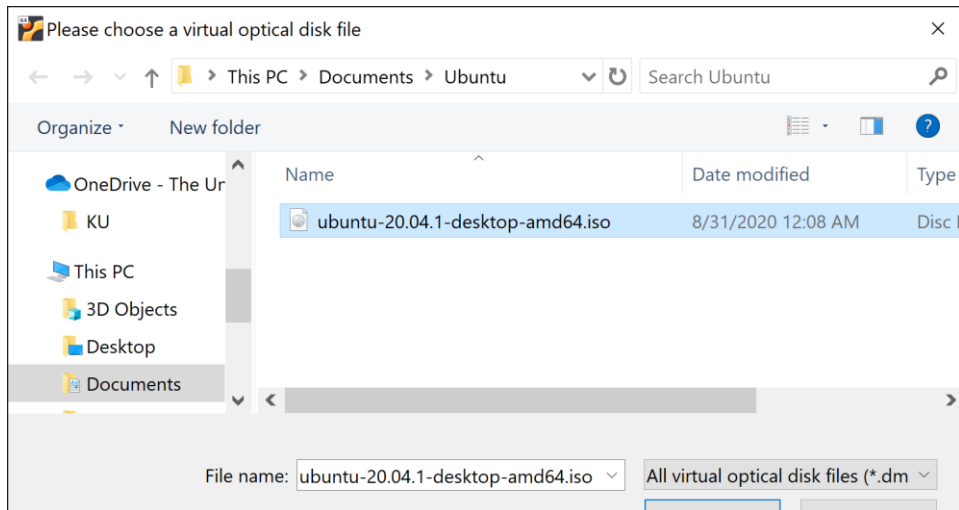
Please select a virtual optical disk file or a physical optical drive containing a disk to start your new virtual machine from.

The disk should be suitable for starting a computer from and should contain the operating system you wish to install on the virtual machine if you want to do that now. The disk will be ejected from the virtual drive automatically next time you switch the virtual machine off, but you can also do this yourself if needed using the Devices menu.



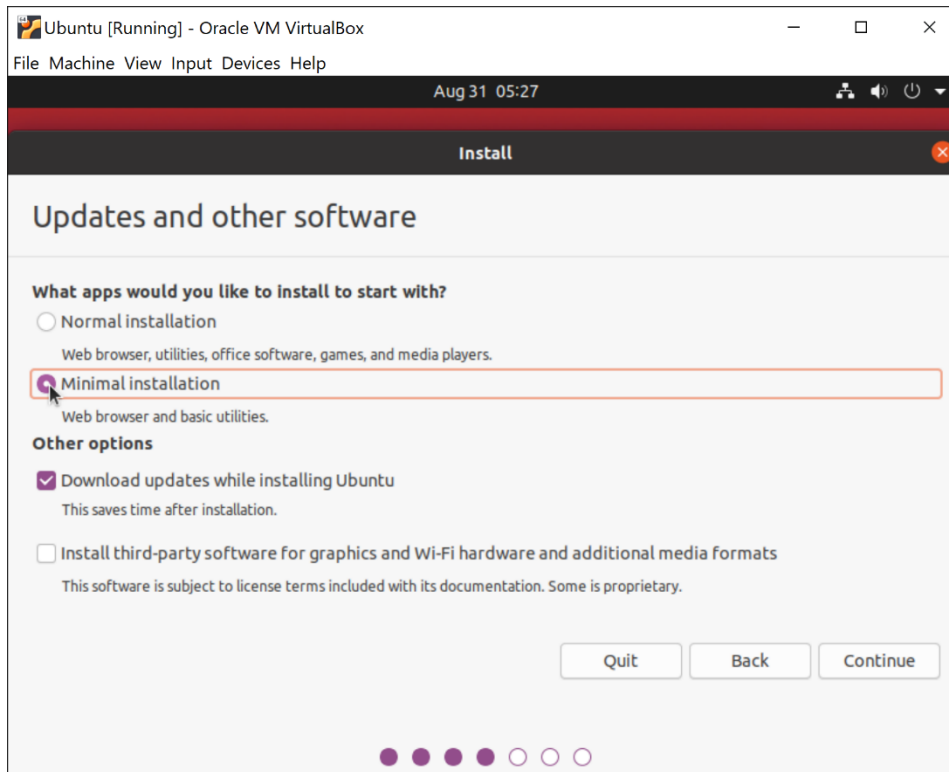
12 The newly created machine is asking for a disk. Select the "browse" button

13



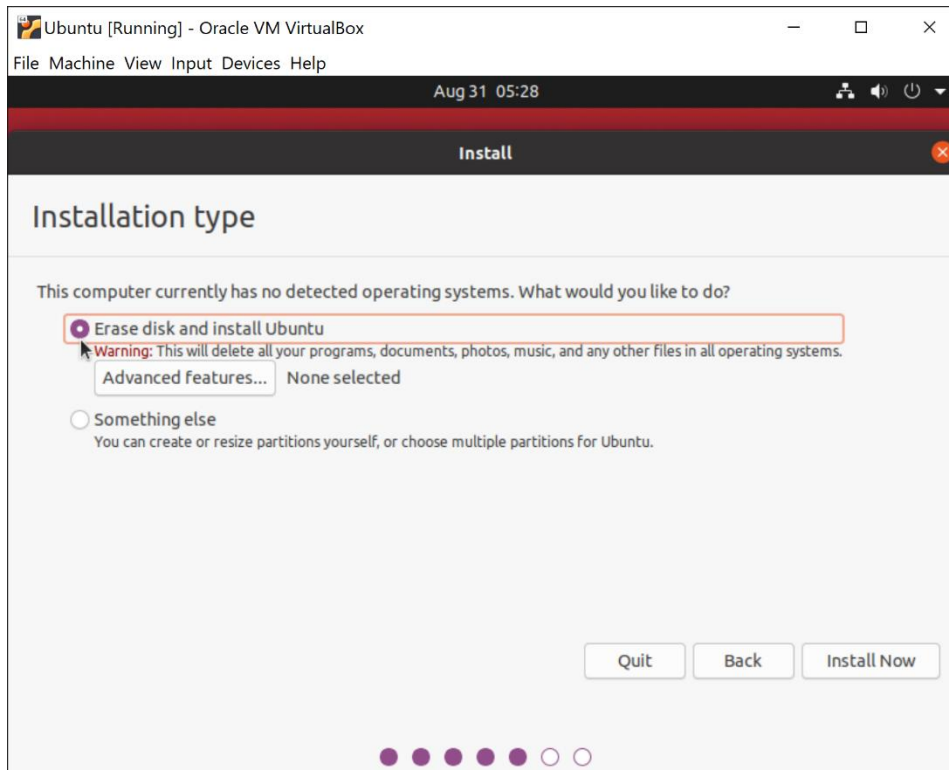
13 Select the downloaded Ubuntu 20.04 LTS image

14



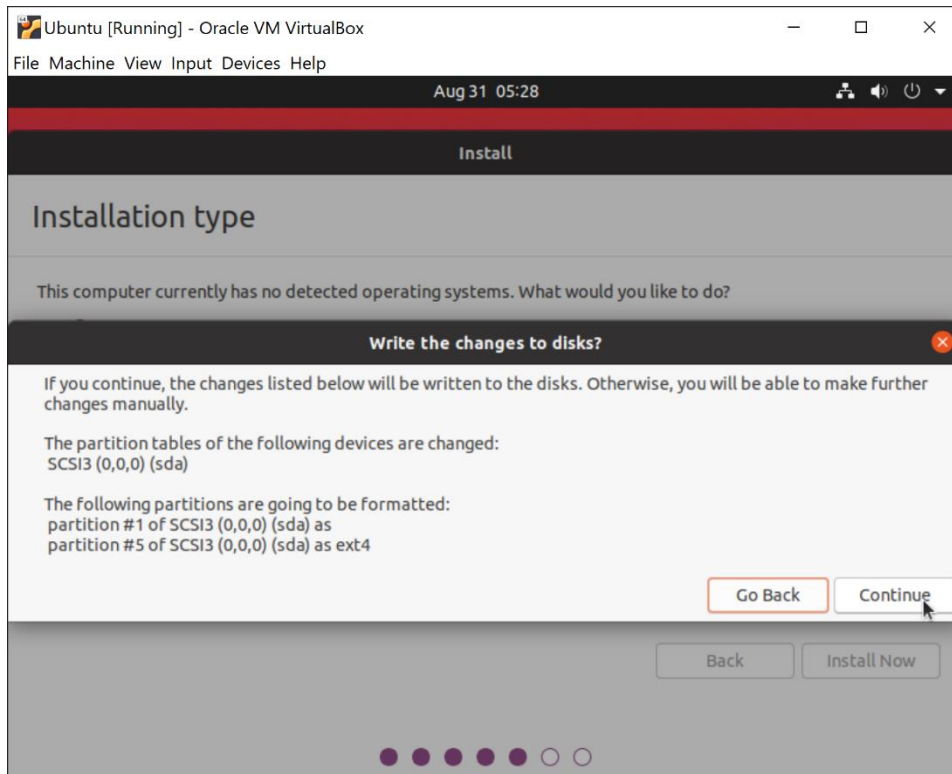
14 Start "installing" Ubuntu with "Minimal Installation"

15



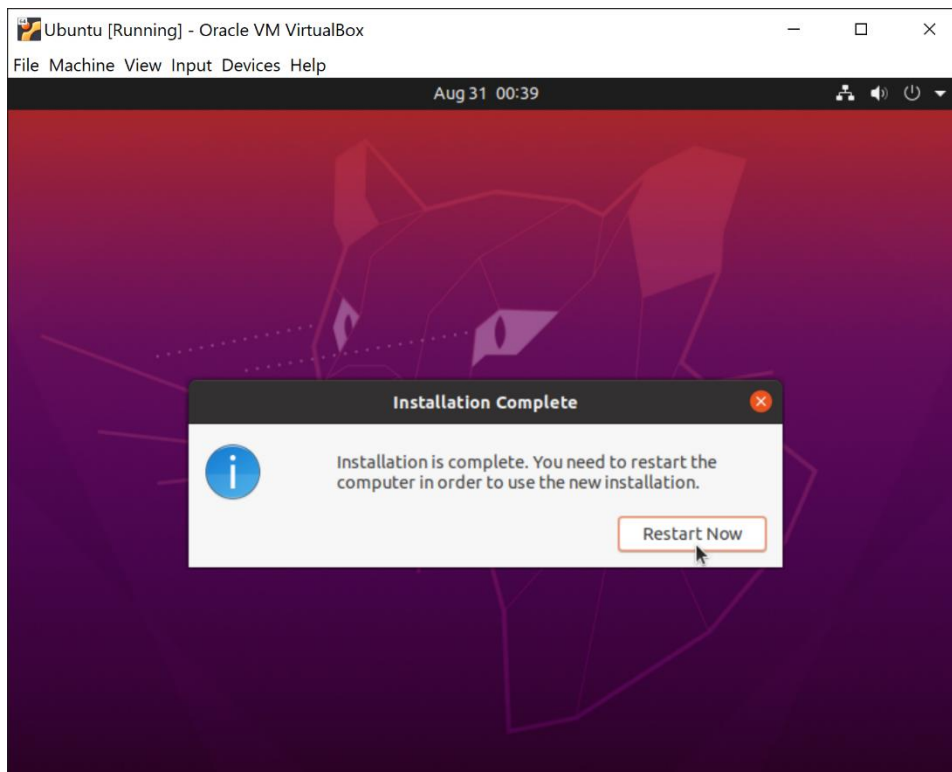
15 Select "Erase disk..." - This will essentially erase the virtual hard disk of the virtual machine that we have created

16



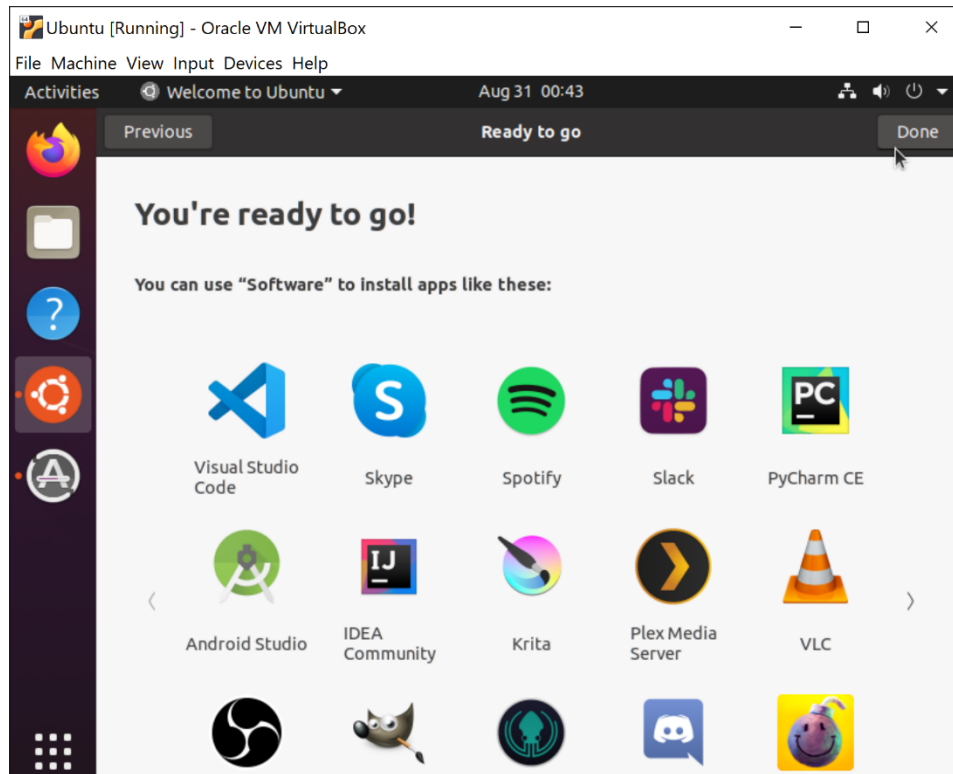
16 Click continue

17



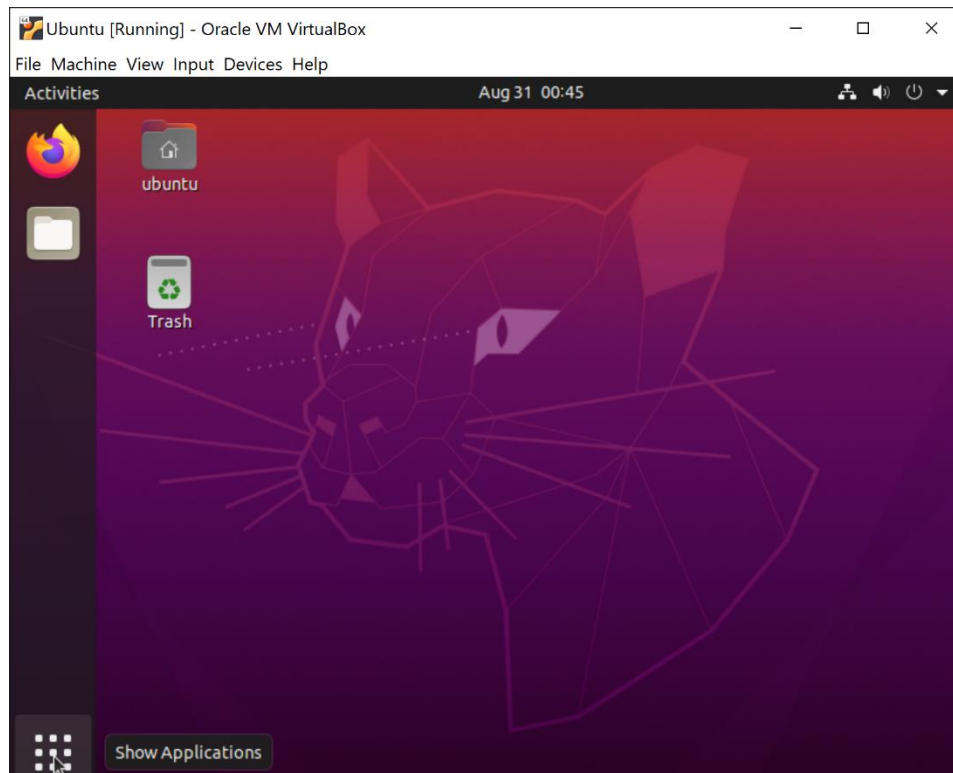
17 Restart now to complete installation

18



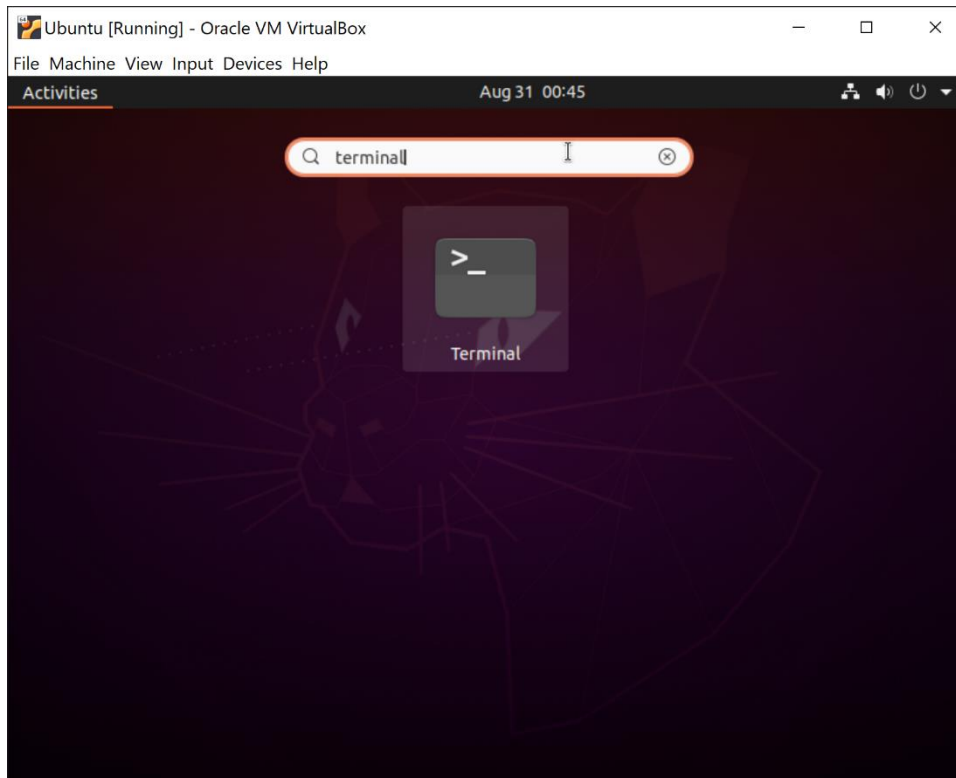
18 Please do not install any third party applications since we want to keep our OS as lightweight as possible

19



19 Click the "Show Applications" button symbolized as a dotted grid

20



20 Search for the terminal and open it

- 21 From the terminal, execute the following commands to install “gcc” and “qemu”
- i. `sudo apt-get install gcc`
 - ii. `sudo apt-get install qemu`

Now you can use this Virtual Linux machine on your personal computer to perform all the labs.

However, even if your lab solutions are working on your own machine, you should make sure that your code is giving the right output on the cycle servers as well. You can use the “scp” command in the terminal to copy your source code and compiled program from your virtual machine to the cycle servers. Then you can use the “ssh” command in the terminal to log in to the cycle servers from within the virtual machine. Once you have established an SSH connection with your cycle server space, you can use the terminal to execute commands (like compiling your source code or running your compiled program or making changes to your source code using “vim” editor) on the cycle server.

- a. SCP:
- i. Copying from your VM to the cycle server:
`scp <file(s)_on_vm> <your_online_id@cycle1.eecs.ku.edu:/home/your_online_id/your_dir>`

ii. Copying from the cycle server to your VM:

```
scp <your_online_id@cycle1.eecs.ku.edu:/home/your_online_id/file(s)> <directory_on_vm>
```

b. SSH:

```
ssh -Y <your_online_id@cycle1.eecs.ku.edu>
```

2. Using PuTTY:

Alternatively, if you do not wish to install a virtual machine and prefer working remotely on the cycle servers then you can use the PuTTY software as an SSH client.

Download the software from the following page:

<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

Install the software and open it.

In the hostname, write “cycle1.eecs.ku.edu”. Port should be default 22. Connection type should be SSH. Then click open. You should receive a terminal asking for your KU online id and password. Once you log into the cycle server, you can write code with “vim”, compile code with “gcc” and run your code.