PRESENTS

ARTIFICIAL INTELLIGENCE IN MOBILITY

INSTALLATION GUIDE

IN COLLABORATION WITH

COMPANY CONFIDENTIAL

INSTALLING UBUNTU Ver-20.04

PREREQUISITES

1. System requirements (recommended):
    - 2 GHz dual-core processor
    - 4GB memory
    - 25GB available disk space for storage (less if installing the minimal version)
    - DVD drive or USB port

2. At least a 4GB USB drive

Note: It is advised to take a full system backup before proceeding with the installation as faulty installation can lead to loss/corruption of data

STEP 1: DOWNLOAD THE INSTALLATION MEDIA

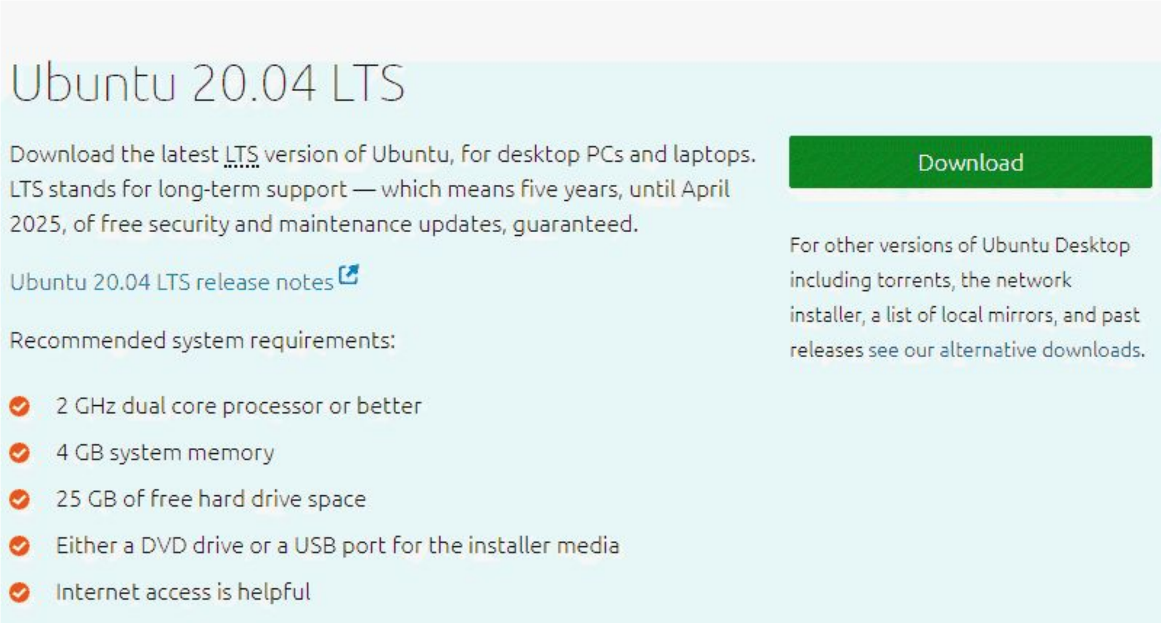
1. In a web browser, visit the Ubuntu download page and pick a version suitable for your machine. The most popular versions include:

    - Ubuntu Desktop
    - Ubuntu Server
    - Ubuntu Derivatives

2. Once you find the version you need, click the green **Download** button. You'll be taken to a thank-you page, and your download should start. (We will download and install Ubuntu 20.04 for desktops.)

The download is an **.iso** file. You can use it to create a bootable USB drive.

3. Save the file to a location of your choice.



Ubuntu 20.04 LTS

Download the latest LTS version of Ubuntu, for desktop PCs and laptops. LTS stands for long-term support — which means five years, until April 2025, of free security and maintenance updates, guaranteed.

Ubuntu 20.04 LTS release notes

Recommended system requirements:

- 2 GHz dual core processor or better
- 4 GB system memory
- 25 GB of free hard drive space
- Either a DVD drive or a USB port for the installer media
- Internet access is helpful

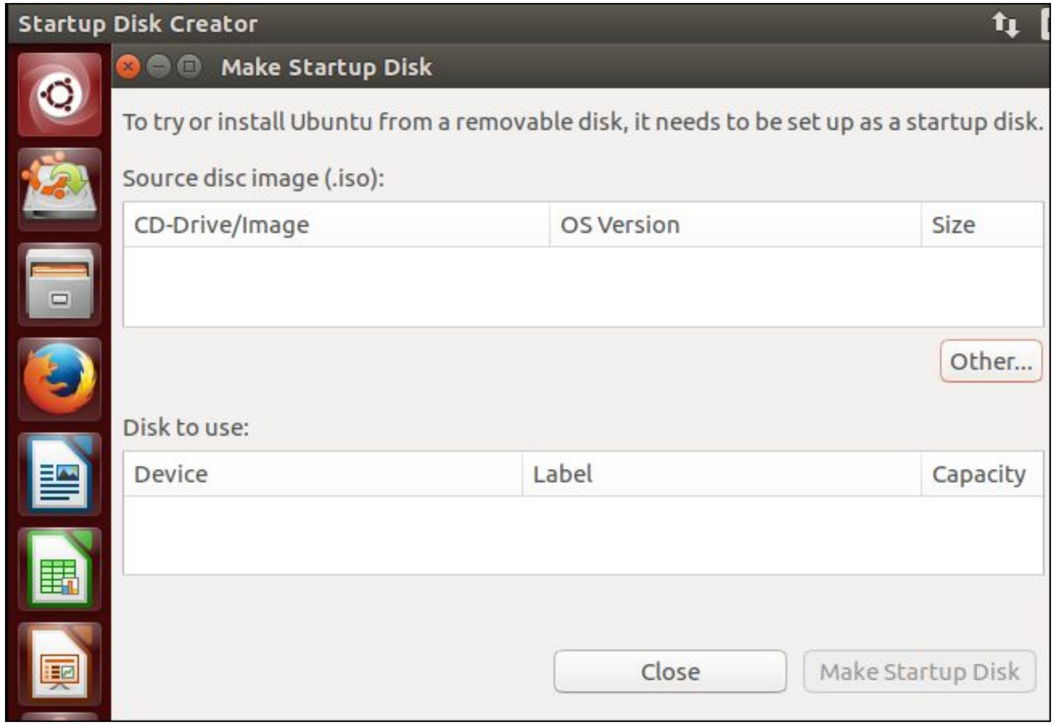
For other versions of Ubuntu Desktop including torrents, the network installer, a list of local mirrors, and past releases see our alternative downloads.

STEP 2: CREATE BOOTABLE USB

You will need a USB drive with 4GB or more. **This process will delete all data on the USB drive.** Make sure to backup any existing data on the USB drive.

Option 1: Create a Bootable USB Drive on Ubuntu

- Use the **Create startup disk** tool:
- Open a **search dialog**, and type *create startup*.
- If it's not installed, the Software Center will offer the option to install it – choose the option for USB drive, then open the utility.
- In the top pane, click **Other**, then browse and select the Ubuntu 20.04 .iso file you downloaded.
- In the bottom pane, select your USB drive.
- Click **Make startup disk.**



To try or install Ubuntu from a removable disk, it needs to be set up as a startup disk.

Source disc image (.iso):

CD-Drive/Image	OS Version	Size

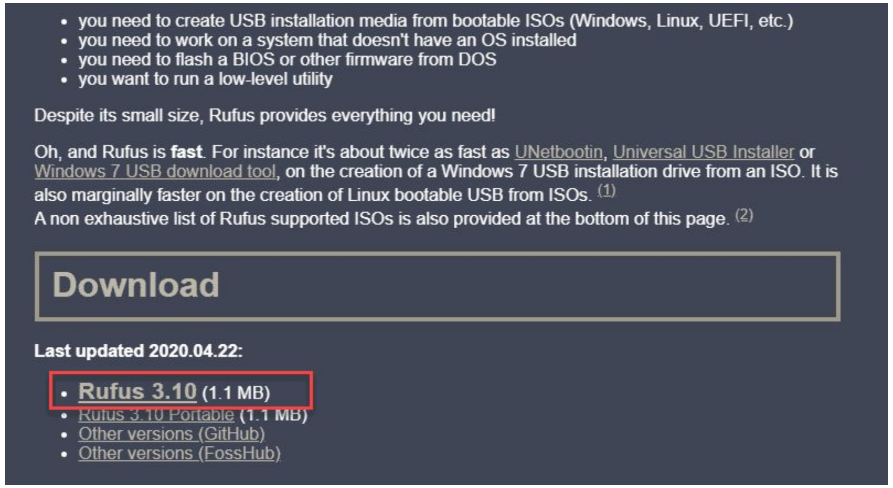
Disk to use:

Device	Label	Capacity

Option 2: Create Bootable USB Drive on Windows

You'll need to install a third-party utility called **Rufus** to create a USB bootable drive.

1. Download the Rufus utility. Scroll down to the download section and click the link to download the latest version of Rufus.
2. Run the file once downloaded.
3. A pop-up dialog opens. You will be prompted whether you want to check for online updates. Select **No**.
4. The Rufus utility launches. Plug in the USB drive – you should see the drive pop up in the device field.
   - Set the USB as the device you wish to write to.
   - In the *Boot Selection* drop-down, click **Disk or ISO Image.**
   - Click the **Select** button to the right.
   - Browse and select the .iso Ubuntu file you downloaded earlier.
5. Click **Start**.



- you need to create USB installation media from bootable ISOs (Windows, Linux, UEFI, etc.)
- you need to work on a system that doesn't have an OS installed
- you need to flash a BIOS or other firmware from DOS
- you want to run a low-level utility

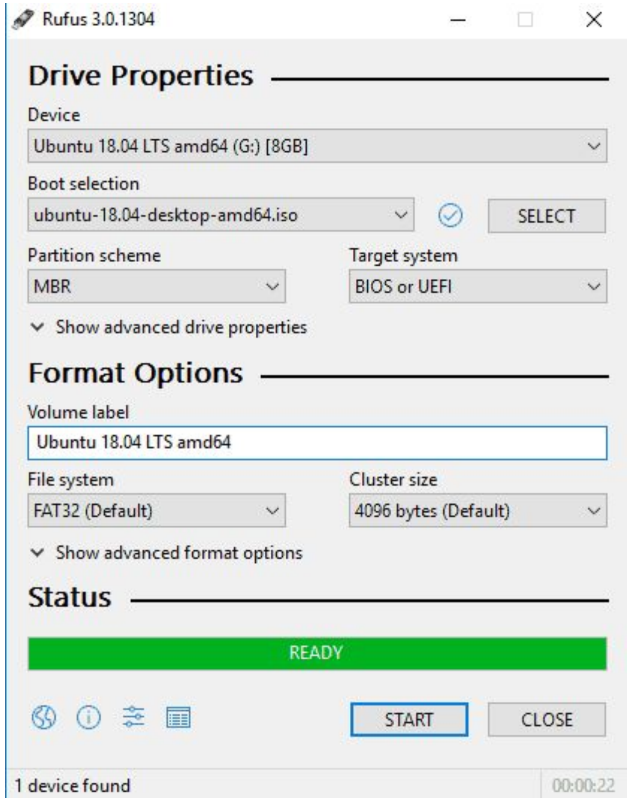
Despite its small size, Rufus provides everything you need!

Oh, and Rufus is **fast**. For instance it's about twice as fast as UNetbootin, Universal USB Installer or Windows 7 USB download tool, on the creation of a Windows 7 USB installation drive from an ISO. It is also marginally faster on the creation of Linux bootable USB from ISOs. (1)
A non exhaustive list of Rufus supported ISOs is also provided at the bottom of this page. (2)

Download

Last updated 2020.04.22:

- Rufus 3.10 (1.1 MB)
- Rufus 3.10 Portable (1.1 MB)
- Other versions (GitHub)
- Other versions (FossHub)



Rufus 3.0.1304

Drive Properties

Device: Ubuntu 18.04 LTS amd64 (G:) [8GB]

Boot selection: ubuntu-18.04-desktop-amd64.iso

Partition scheme: MBR

Target system: BIOS or UEFI

Format Options

Volume label: Ubuntu 18.04 LTS amd64

File system: FAT32 (Default)

Cluster size: 4096 bytes (Default)

Status

READY

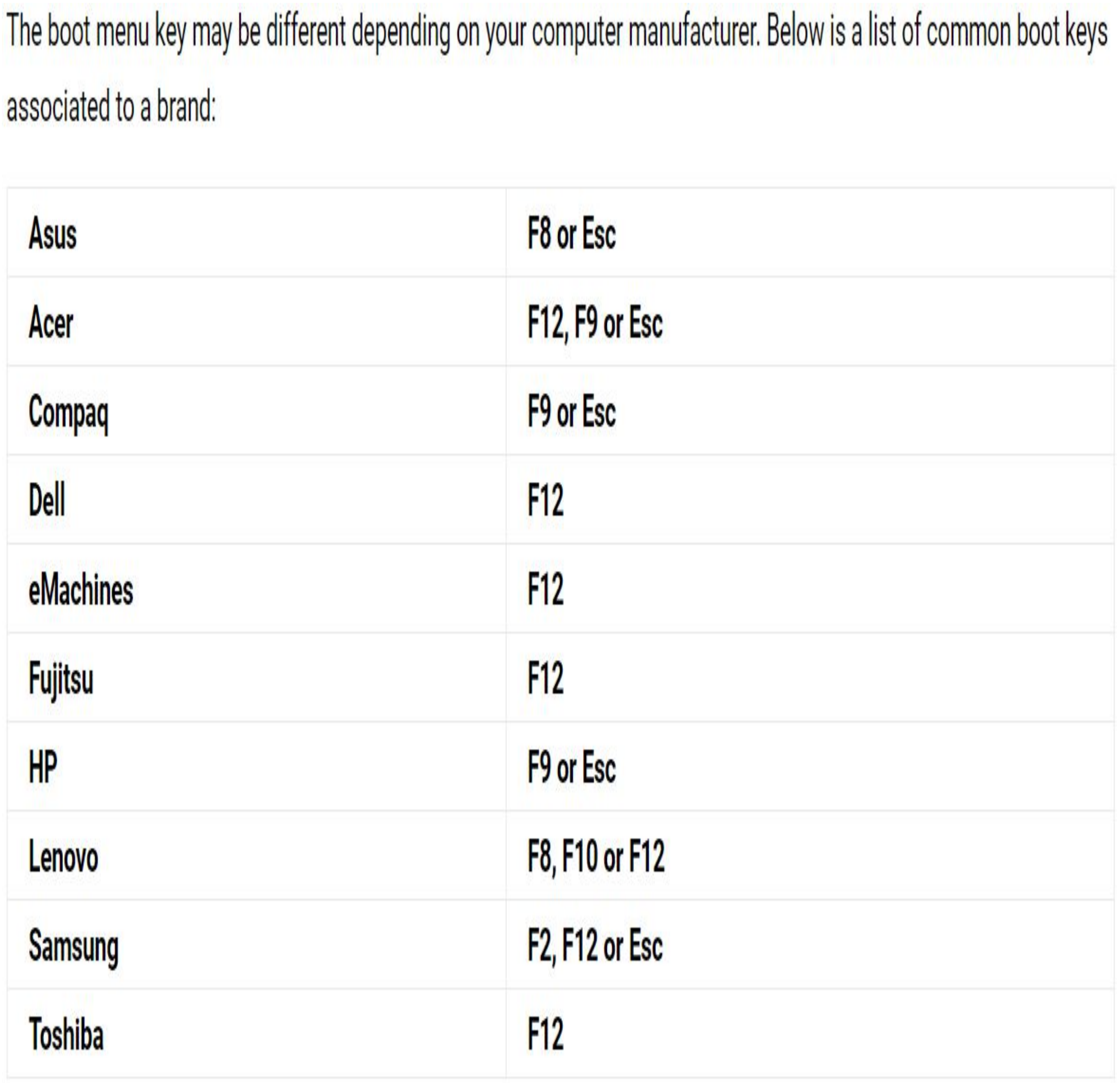
1 device found 00:00:22

STEP 3: BOOT UP UBUNTU FROM USB

1. **Turn off your system**. Make sure you remove all other USB devices, such as printers, memory cards, etc.
2. **Insert the Ubuntu USB drive** into the system and turn on your machine.
There are two possible scenarios:
    - The computer boots the USB drive automatically.
    - You need to manually configure USB booting in the **Boot Menu** or **BIOS/UEFI**.
3. To manually configure the boot order, tap the boot menu key about once or twice per second as soon as the computer powers on.
4. Once you see your boot menu, use the arrows to pick the Ubuntu media to boot from. For a DVD, the entry will usually have DVD or Optical in the name. USB is usually labeled USB.

Your system should start loading the Ubuntu live disc menu.

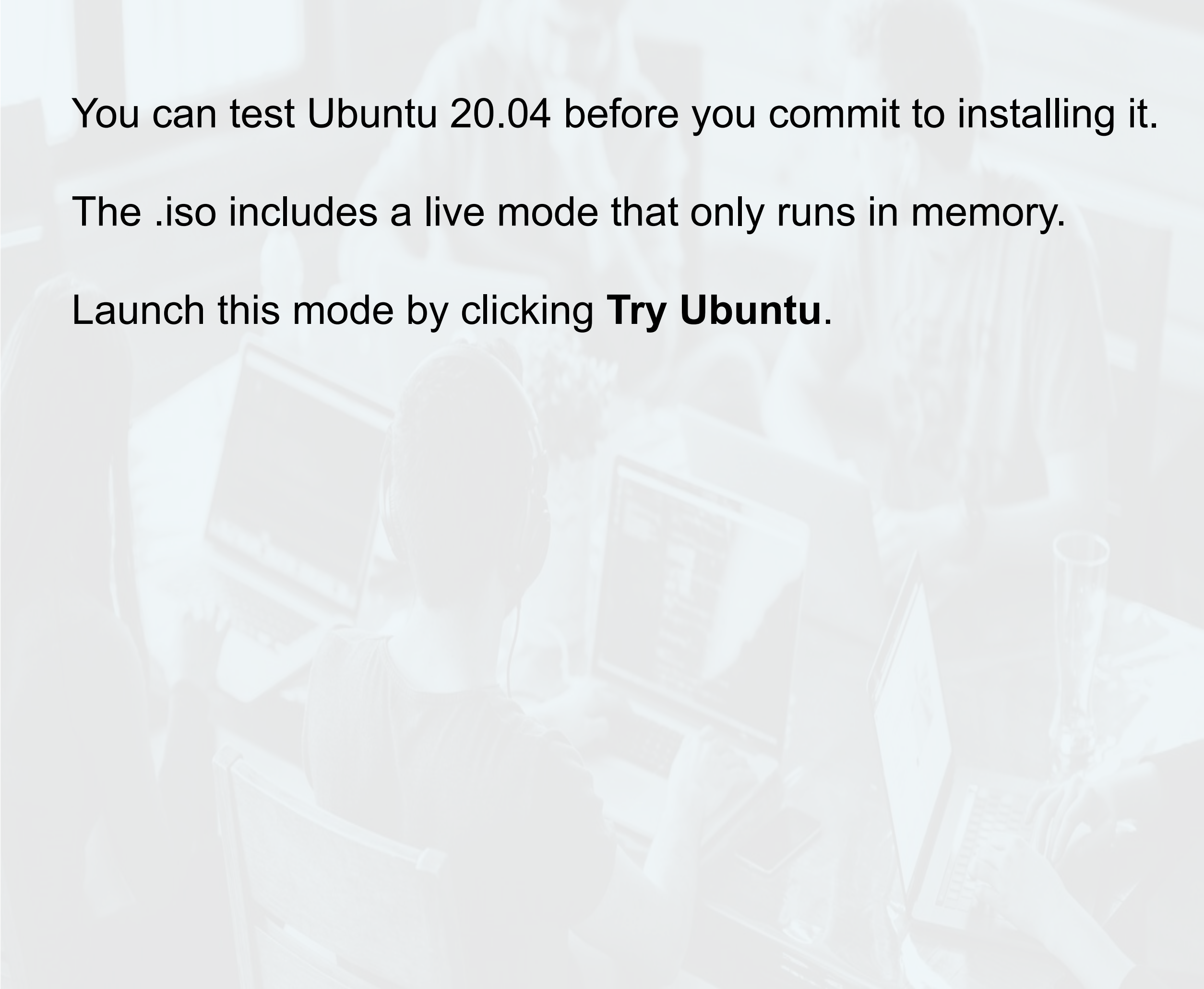
Note: If you are experiencing issues when booting the USB from the boot menu, try to boot the USB from BIOS/UEFI.



The boot menu key may be different depending on your computer manufacturer. Below is a list of common boot keys associated to a brand:

Asus	F8 or Esc
Acer	F12, F9 or Esc
Compaq	F9 or Esc
Dell	F12
eMachines	F12
Fujitsu	F12
HP	F9 or Esc
Lenovo	F8, F10 or F12
Samsung	F2, F12 or Esc
Toshiba	F12

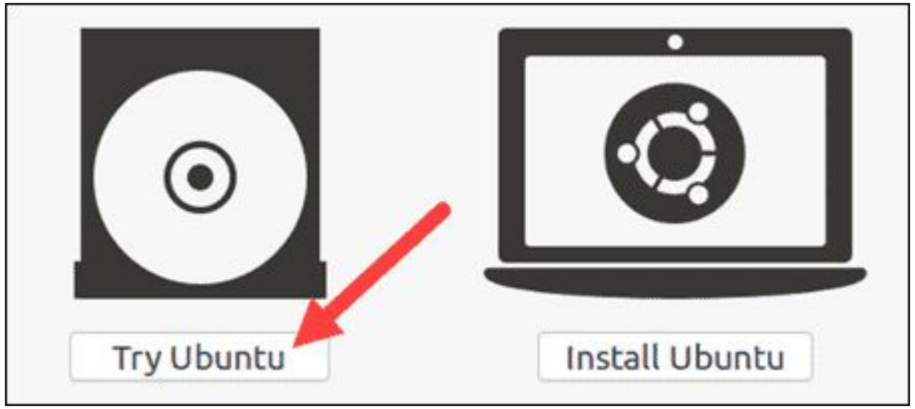
STEP 4: RUN UBUNTU



You can test Ubuntu 20.04 before you commit to installing it.

The .iso includes a live mode that only runs in memory.

Launch this mode by clicking **Try Ubuntu**.

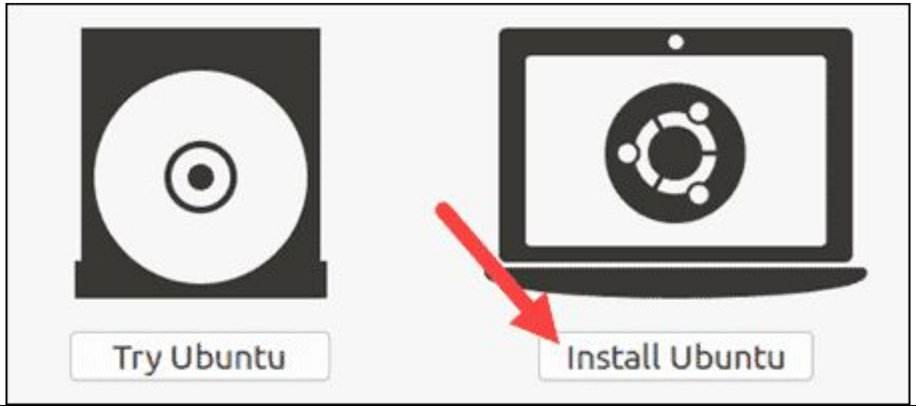


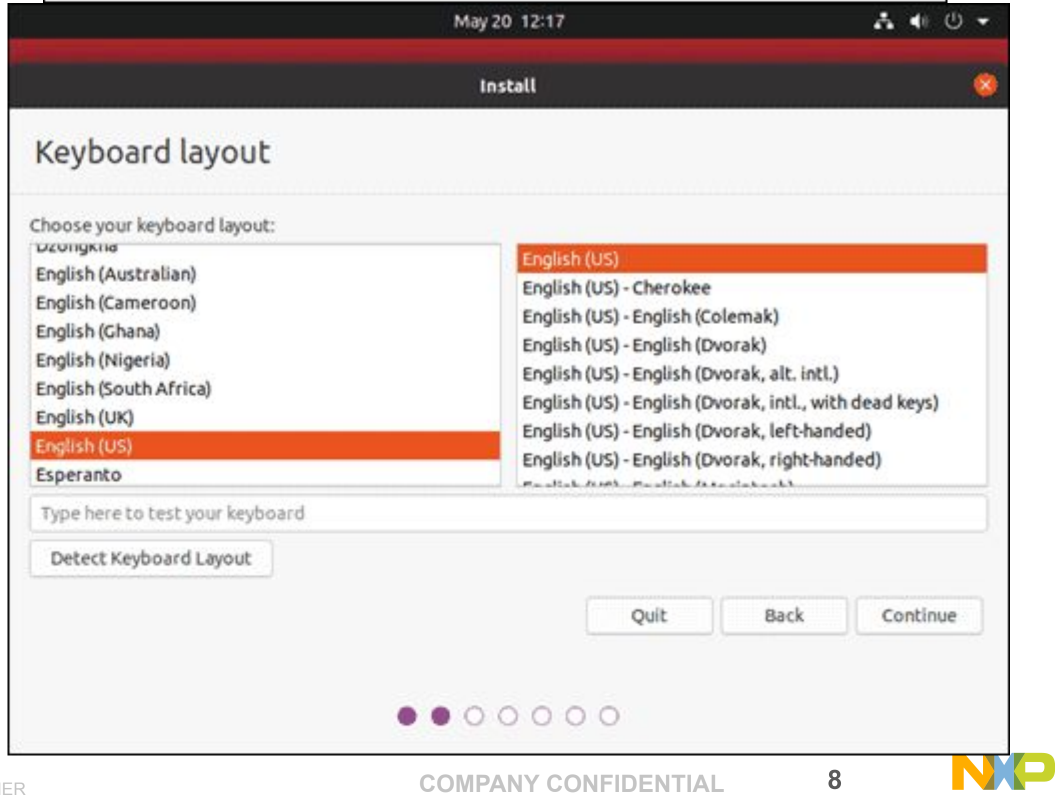
STEP 5: INSTALL UBUNTU 20.04 LTS DESKTOP

To begin the installation, click **Install Ubuntu**.

Choose Keyboard Layout

By default, the system will select English and English.
If you have a non-standard keyboard, you can select it in the list.
Alternately, click **Detect Keyboard Layout** and the system will automatically choose your keyboard.
If you need to test your keyboard, use the labeled field.
When you're ready, click **Continue**.





Keyboard layout

Choose your keyboard layout:

Dzongkha
English (Australian)
English (Cameroon)
English (Ghana)
English (Nigeria)
English (South Africa)
English (UK)
English (US)
Esperanto

English (US)
English (US) - Cherokee
English (US) - English (Colemak)
English (US) - English (Dvorak)
English (US) - English (Dvorak, alt. intl.)
English (US) - English (Dvorak, intl., with dead keys)
English (US) - English (Dvorak, left-handed)
English (US) - English (Dvorak, right-handed)

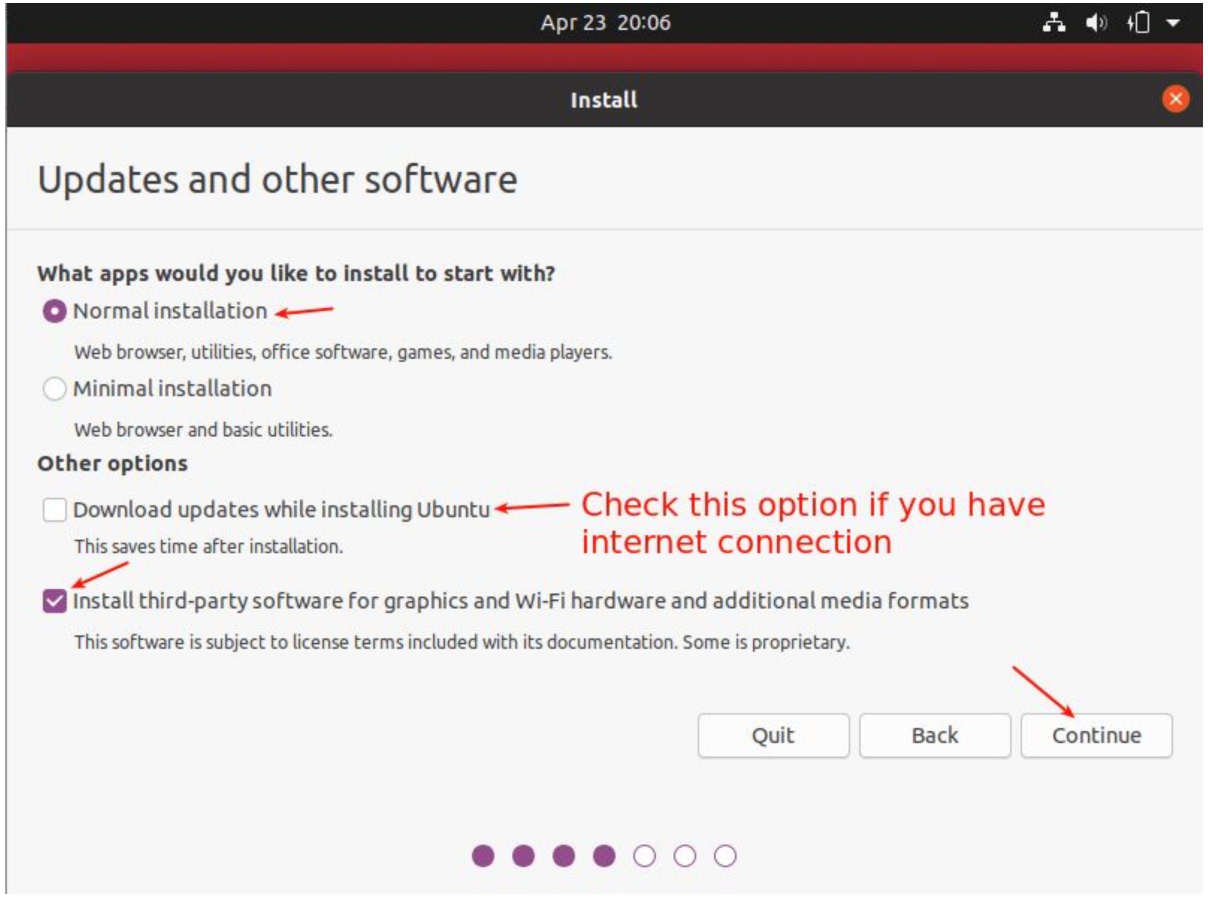
Type here to test your keyboard

Choose Starting Applications

- **Normal Installation(Recommended)** – This is the full Ubuntu Desktop experience, with office software, games, and media players.
- **Minimal Installation –** Choose this to save disk space, especially if you won’t be using media players or productivity software.

You’ll also be asked to confirm other options:

- **Download updates while installing Ubuntu** – This does the work of downloading large package files during the installation. Once the installation finishes, the packages will be ready to apply as updates.
- **Install third-party software for graphics and Wi-Fi hardware and additional media formats –** Some hardware, like graphics cards and wi-fi cards, do not have open-source driver support. Also, some media formats, such as .wmv, do not fall under the GPL license. If you need support for these, you’ll need to agree to additional terms of use.



Updates and other software

What apps would you like to install to start with?

● Normal installation

Web browser, utilities, office software, games, and media players.

○ Minimal installation

Web browser and basic utilities.

Other options

□ Download updates while installing Ubuntu

This saves time after installation.

Check this option if you have internet connection

☑ Install third-party software for graphics and Wi-Fi hardware and additional media formats

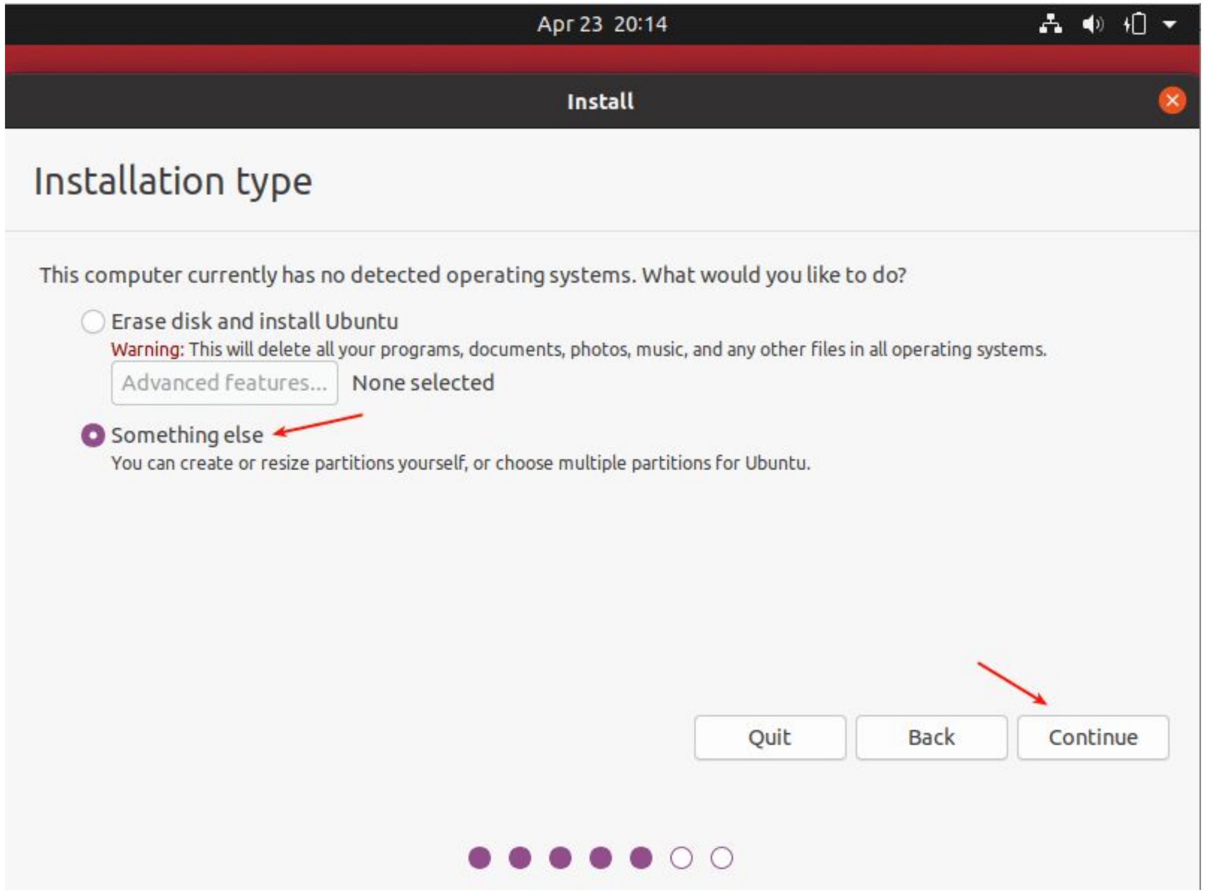
This software is subject to license terms included with its documentation. Some is proprietary.

DISK PARTITIONING

Next, you'll be presented with an **Installation Type** dialog.

Scenario 1: Keep only ubuntu ver 20 on hard disk: You can wipe the hard drive clean prior to installing Ubuntu by clicking **Erase disk and install Ubuntu**. If you go this route, skip ahead to the next step. Advanced users may want to edit **Advanced Features**.

Scenario 2: Using an Unpartitioned Harddrive (without an OS installed)
For this scenario, you need to set up partitions manually so choose **Something else** and click **Continue**.



Apr 23 20:14

Install

Installation type

This computer currently has no detected operating systems. What would you like to do?

○ Erase disk and install Ubuntu
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.
Advanced features... None selected

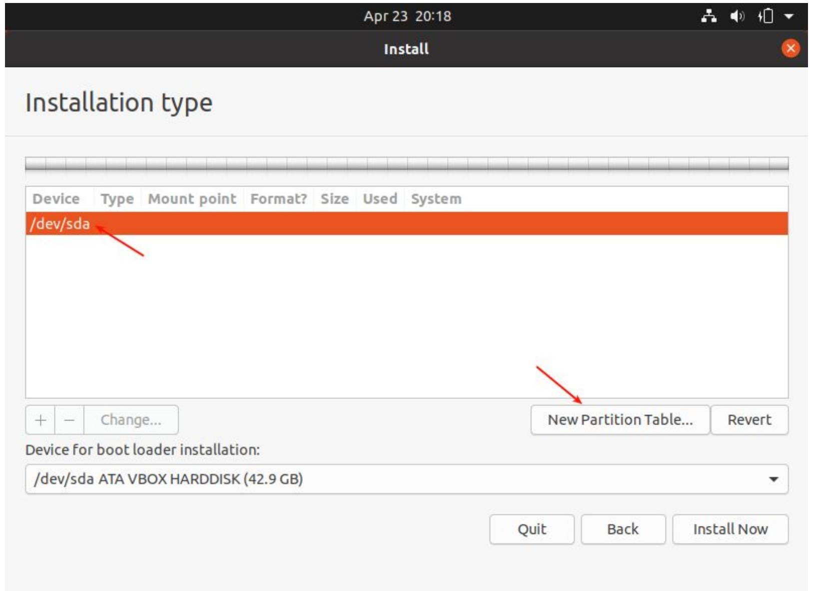
● Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

SCENARIO 2 CONTINUED…

Now you need to partition your hard drive for the installation. Simply select/click on the unpartitioned storage device from the list of available storage devices. Then click **New Partition Table**.
Note that the installer will auto-select the device on which the boot-loader will be installed as shown in the following screenshot.

Next, click **Continue** from the pop-up window to create an empty partition table on the device

Now you should be able to see the free space created equivalent to the capacity of the hard drive. Double click on the free space to create a partition as described next.



Apr 23 20:18

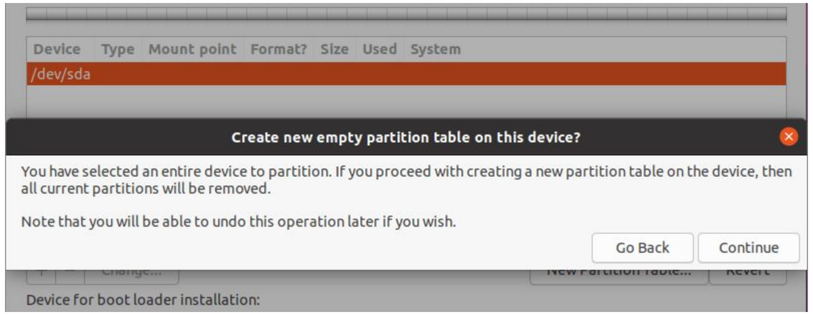
Install

Installation type

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						

Device for boot loader installation:

/dev/sda ATA VBOX HARDDISK (42.9 GB)



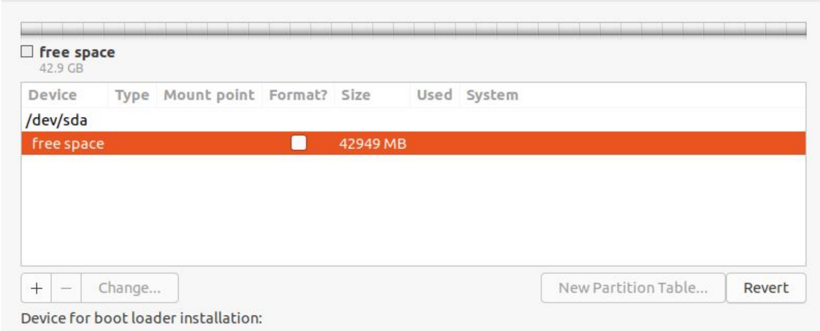
Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						

Create new empty partition table on this device?

You have selected an entire device to partition. If you proceed with creating a new partition table on the device, then all current partitions will be removed.

Note that you will be able to undo this operation later if you wish.

Device for boot loader installation:



☐ free space
42.9 GB

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						
free space			☐	42949 MB		

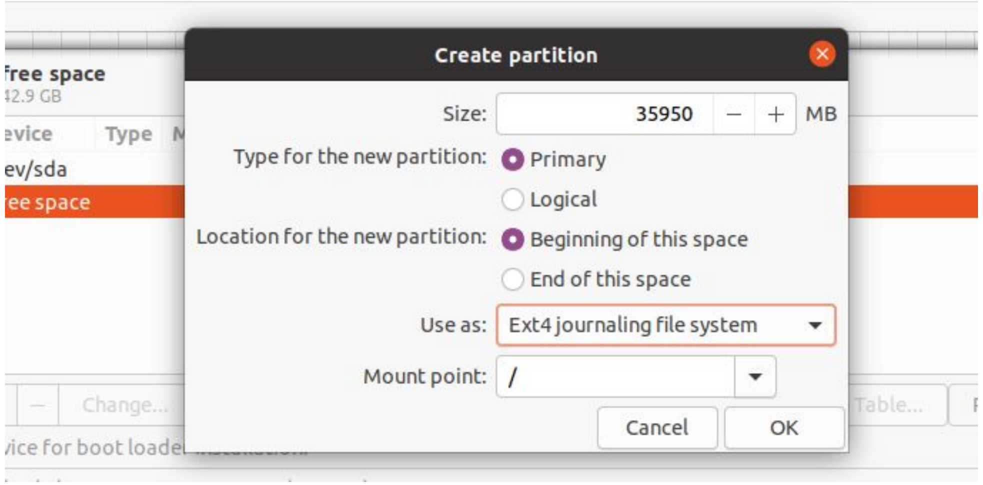
Device for boot loader installation:

SCENARIO 2 CONTINUED…

To create a root(/) partition (where the base system files will be installed), enter the size of the new partition out of the total free space. Then set the file system type to **EXT4** and the mount point to / from the drop-down list.

Now the new partition should appear in the list of partition as shown in the next screenshot.

Next, you need to create a **swap** partition/area. Double click on the current free space to create a new partition to be used as swap area. Then enter the swap **partition size** and set **swap area** as shown in the following screenshot.



Create partition

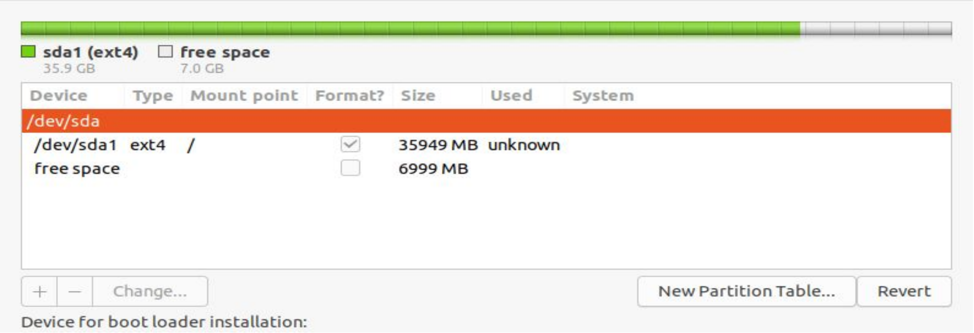
Size: 35950 MB

Type for the new partition: ● Primary ○ Logical

Location for the new partition: ● Beginning of this space ○ End of this space

Use as: Ext4 journaling file system

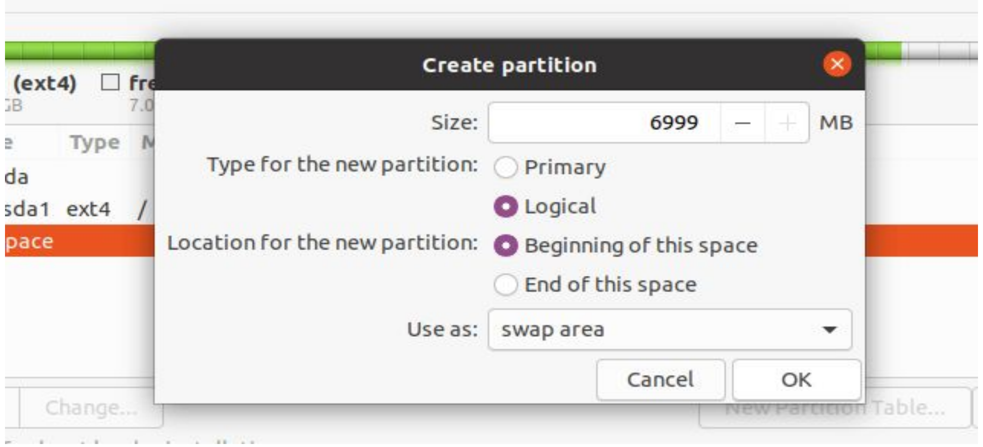
Mount point: /



🟩 sda1 (ext4) 35.9 GB ☐ free space 7.0 GB

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						
/dev/sda1	ext4	/	☑	35949 MB	unknown	
free space			☐	6999 MB		

Device for boot loader installation:



Create partition

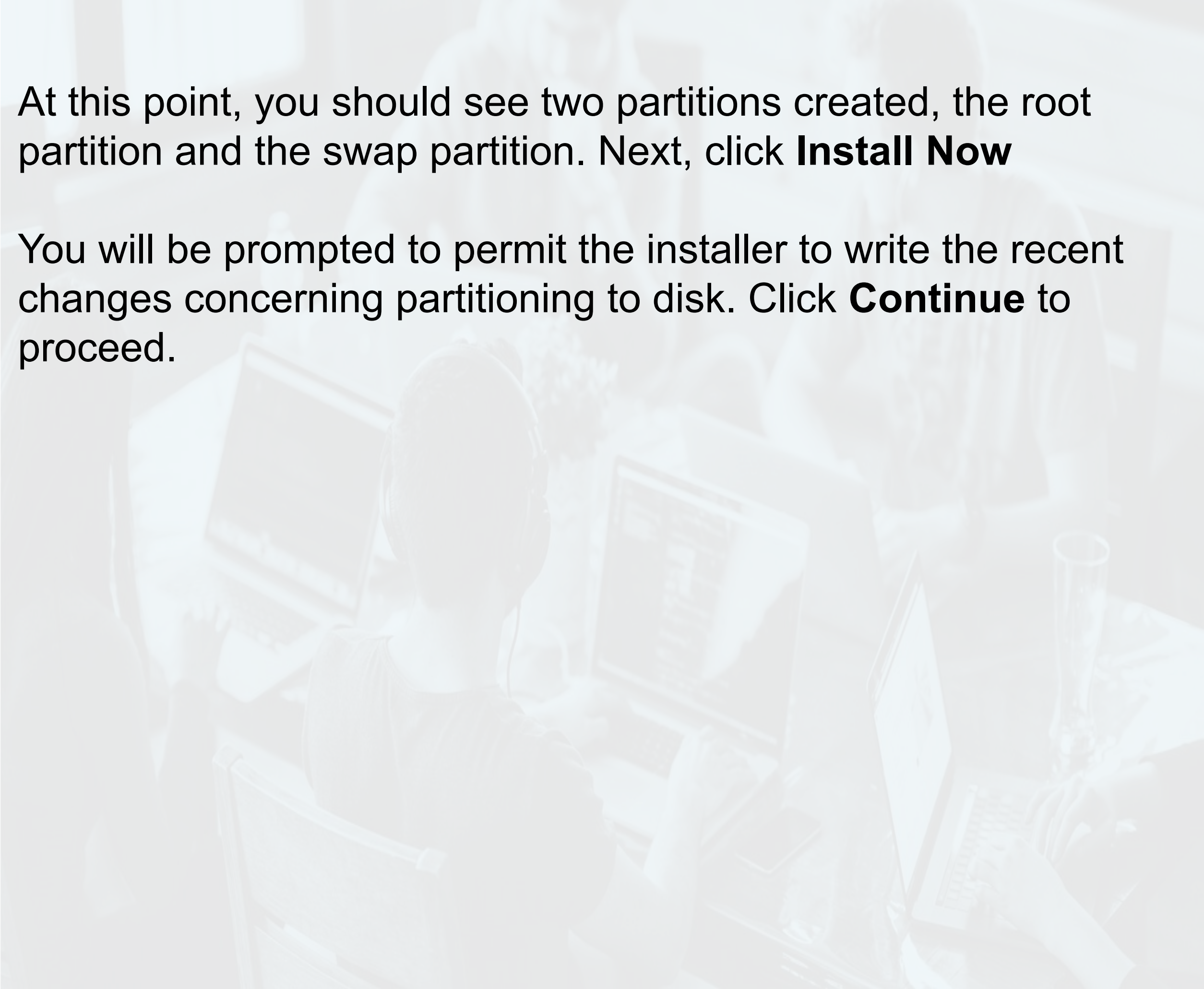
Size: 6999 MB

Type for the new partition: ○ Primary ● Logical

Location for the new partition: ● Beginning of this space ○ End of this space

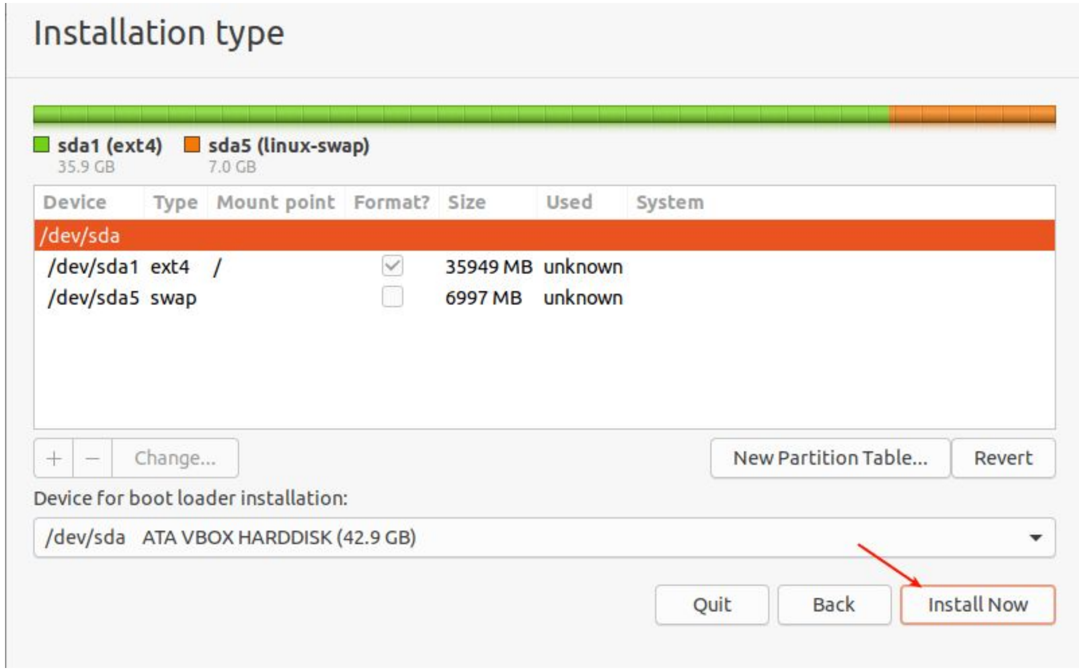
Use as: swap area

SCENARIO 2 CONTINUED…



At this point, you should see two partitions created, the root partition and the swap partition. Next, click **Install Now**

You will be prompted to permit the installer to write the recent changes concerning partitioning to disk. Click **Continue** to proceed.



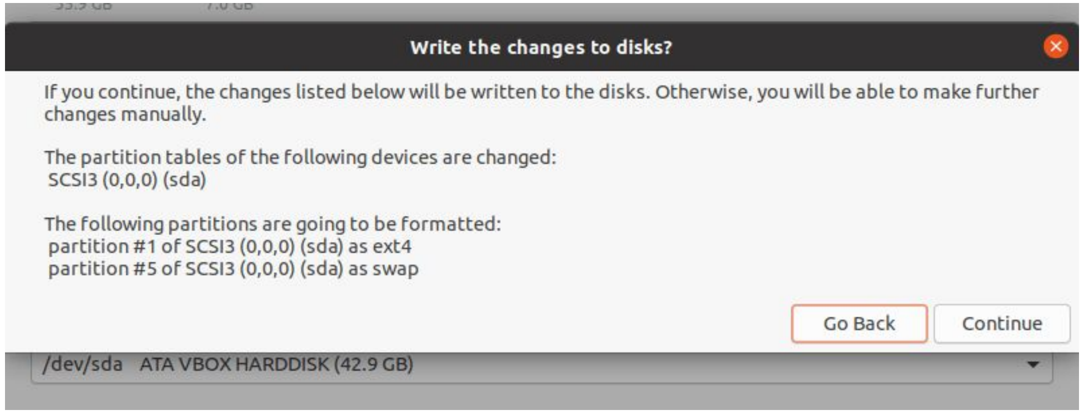
Installation type

🟩 sda1 (ext4) 35.9 GB 🟧 sda5 (linux-swap) 7.0 GB

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						
/dev/sda1	ext4	/	☑	35949 MB	unknown	
/dev/sda5	swap		□	6997 MB	unknown	

Device for boot loader installation:

/dev/sda ATA VBOX HARDDISK (42.9 GB)



Write the changes to disks?

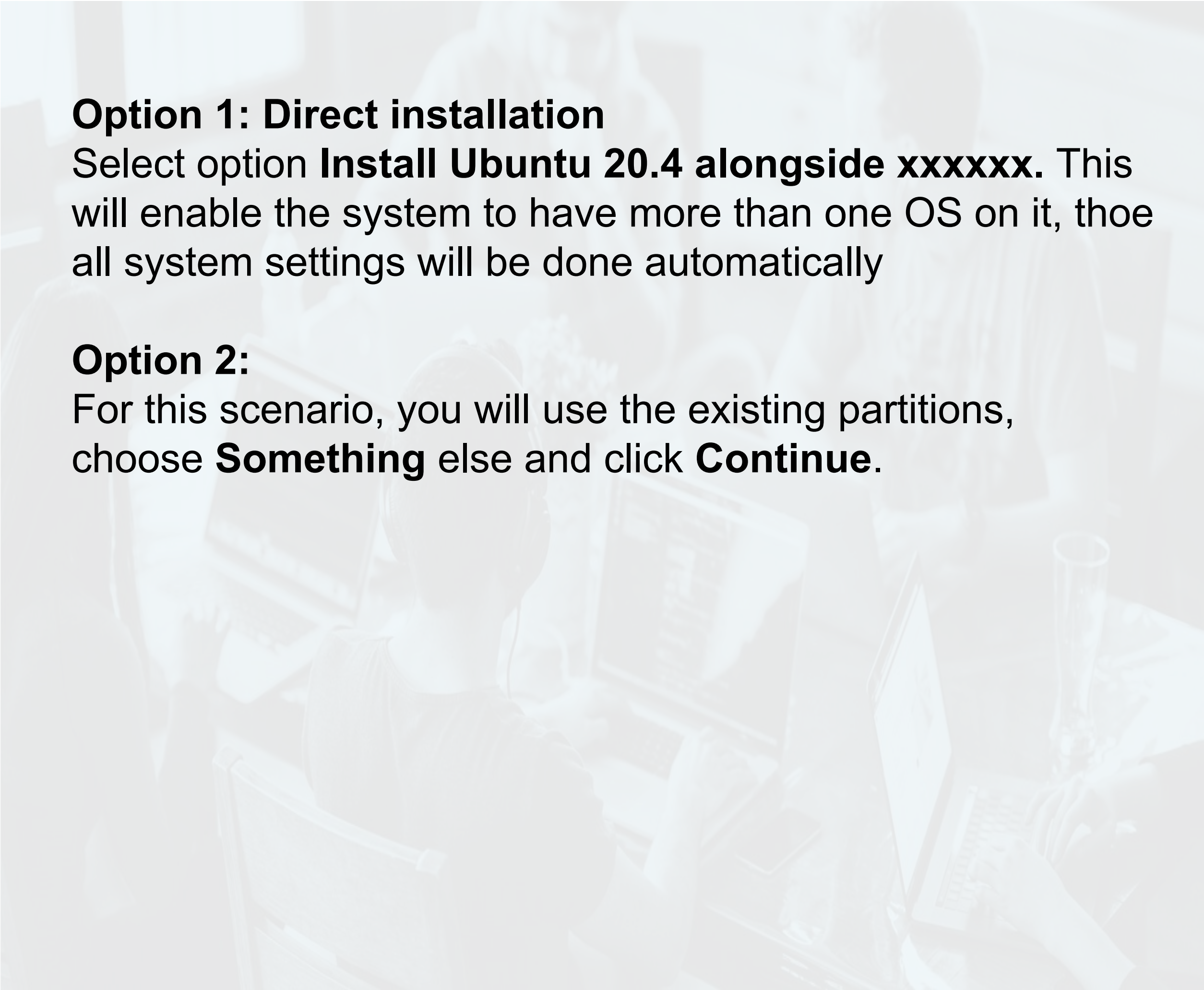
If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
SCSI3 (0,0,0) (sda)

The following partitions are going to be formatted:
partition #1 of SCSI3 (0,0,0) (sda) as ext4
partition #5 of SCSI3 (0,0,0) (sda) as swap

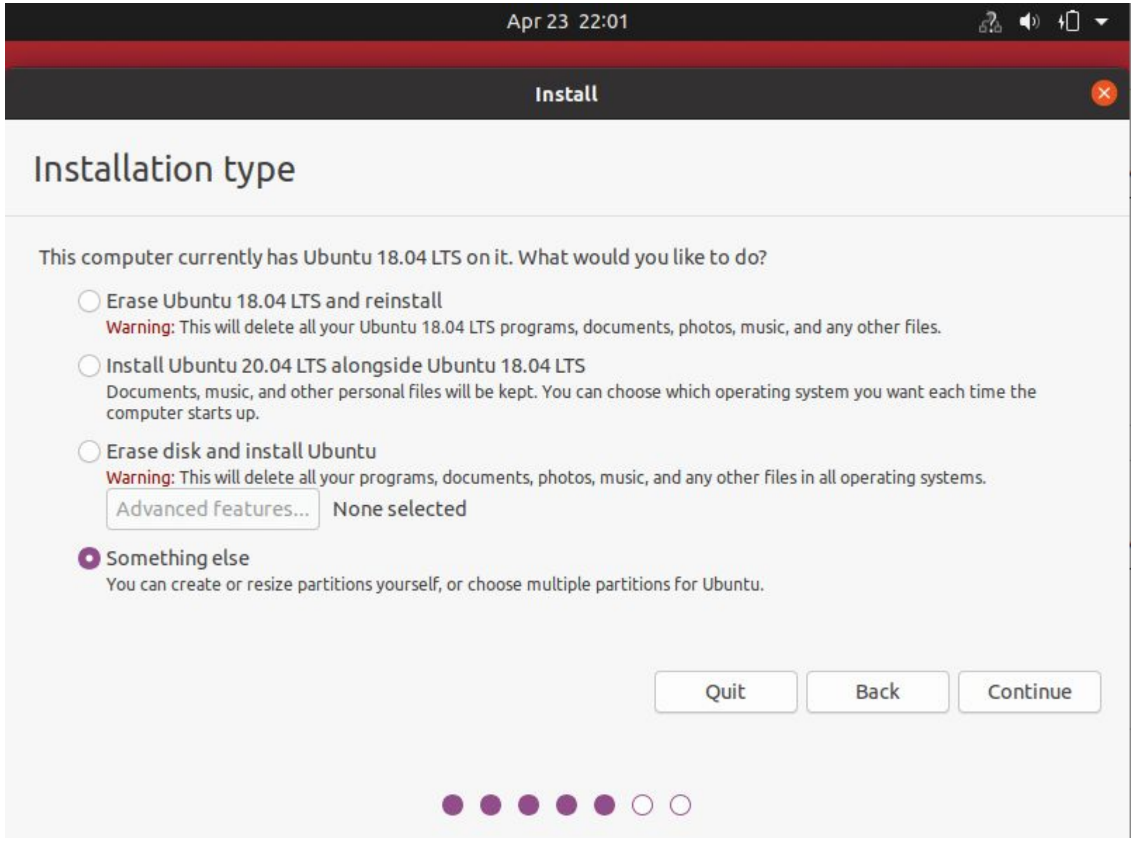
/dev/sda ATA VBOX HARDDISK (42.9 GB)

SCENARIO 3: USING AN ALREADY PARTITIONED HARD DRIVE (WITH AN EXISTING OS INSTALLED)



Option 1: Direct installation
Select option **Install Ubuntu 20.4 alongside xxxxxx.** This will enable the system to have more than one OS on it, thoe all system settings will be done automatically

Option 2:
For this scenario, you will use the existing partitions, choose **Something** else and click **Continue**.



Installation type

This computer currently has Ubuntu 18.04 LTS on it. What would you like to do?

○ Erase Ubuntu 18.04 LTS and reinstall
Warning: This will delete all your Ubuntu 18.04 LTS programs, documents, photos, music, and any other files.

○ Install Ubuntu 20.04 LTS alongside Ubuntu 18.04 LTS
Documents, music, and other personal files will be kept. You can choose which operating system you want each time the computer starts up.

○ Erase disk and install Ubuntu
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.
Advanced features... None selected

● Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

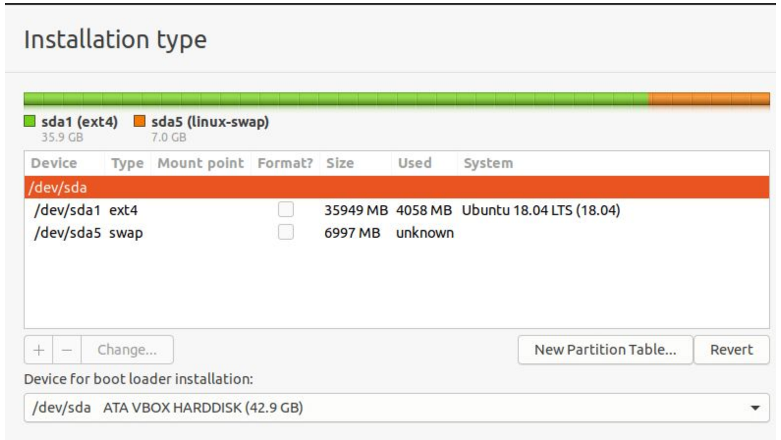
SCENARIO 3 CONTINUED…

Then you should see your existing partitions for example, as shown in the following screenshot. Double click on the partition with the previous OS installation, **Ubuntu 18.04** in our case.

Next, edit the partition and set the file system size, file system type to **Ext4**, and then check the format option and set the mount point to root(/).

Accept the changes in the hard drive partition table, in the next pop-up window by clicking **Continue**.

Now you should have a **root** and **swap** partition as shown in the following screenshot. Note that the swap partition will be auto-detected by the installer. So click **Install Now** to proceed.



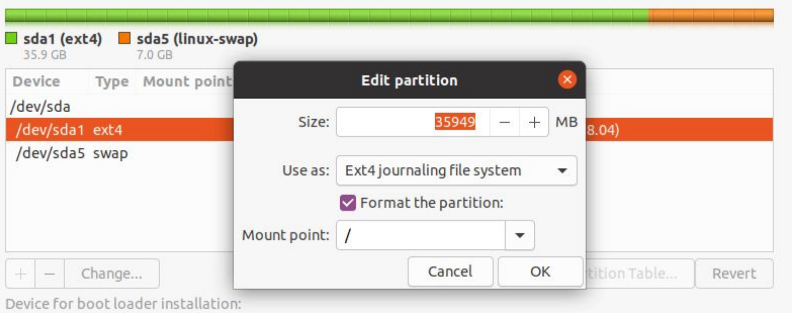
Installation type

🟩 sda1 (ext4) 35.9 GB   🟧 sda5 (linux-swap) 7.0 GB

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						
/dev/sda1	ext4		□	35949 MB	4058 MB	Ubuntu 18.04 LTS (18.04)
/dev/sda5	swap		□	6997 MB	unknown	

Device for boot loader installation:

/dev/sda ATA VBOX HARDDISK (42.9 GB)



🟩 sda1 (ext4) 35.9 GB   🟧 sda5 (linux-swap) 7.0 GB

Device	Type	Mount point
/dev/sda		
/dev/sda1	ext4	
/dev/sda5	swap	

Edit partition

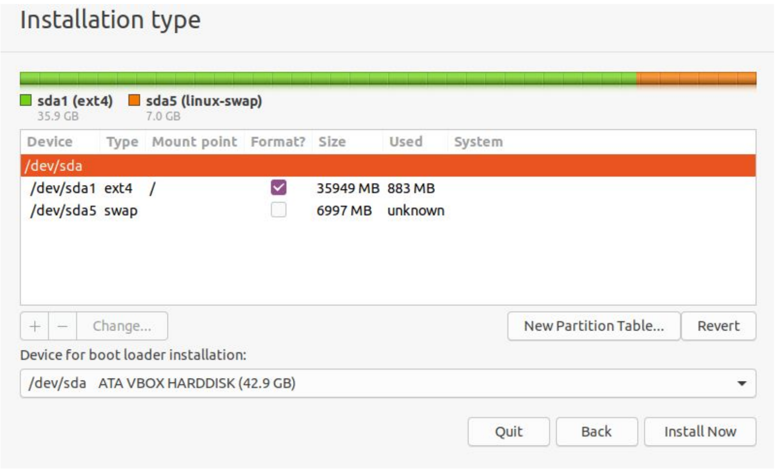
Size: 35949 MB

Use as: Ext4 journaling file system

☑ Format the partition:

Mount point: /

Device for boot loader installation:



Installation type

🟩 sda1 (ext4) 35.9 GB   🟧 sda5 (linux-swap) 7.0 GB

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						
/dev/sda1	ext4	/	☑	35949 MB	883 MB	
/dev/sda5	swap		□	6997 MB	unknown	

Device for boot loader installation:

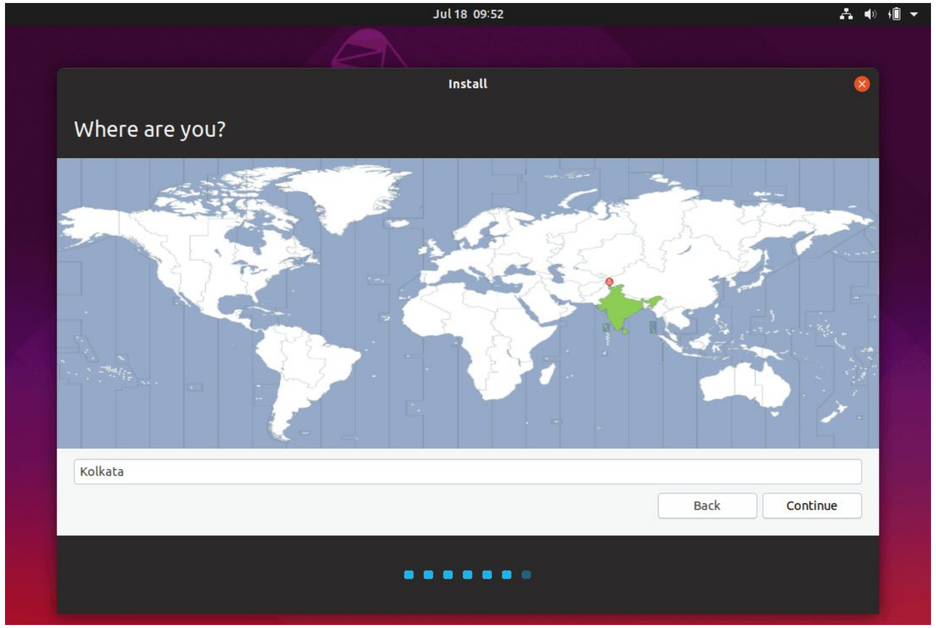
/dev/sda ATA VBOX HARDDISK (42.9 GB)

INSTALLATION CONTINUED…

Next, select your **location** and click **Continue**.

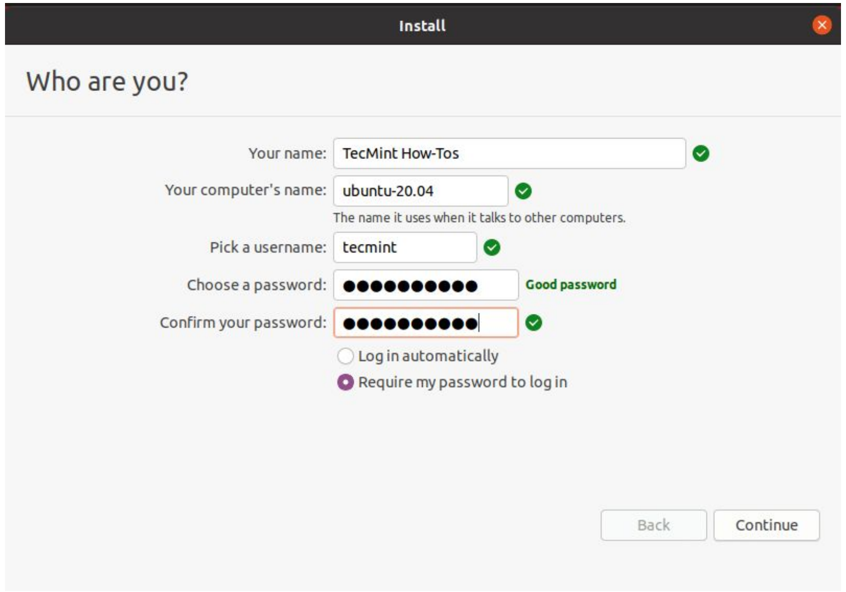
Then provide your user details for system account creation. Enter your full name, computer name and username, and a strong, secure password as shown in the following screenshot. Then click Continue.

Now the actual base system installation will begin as shown in the screenshot. Wait for it to finish.



Where are you?

Kolkata



Who are you?

Your name: TecMint How-Tos

Your computer's name: ubuntu-20.04

The name it uses when it talks to other computers.

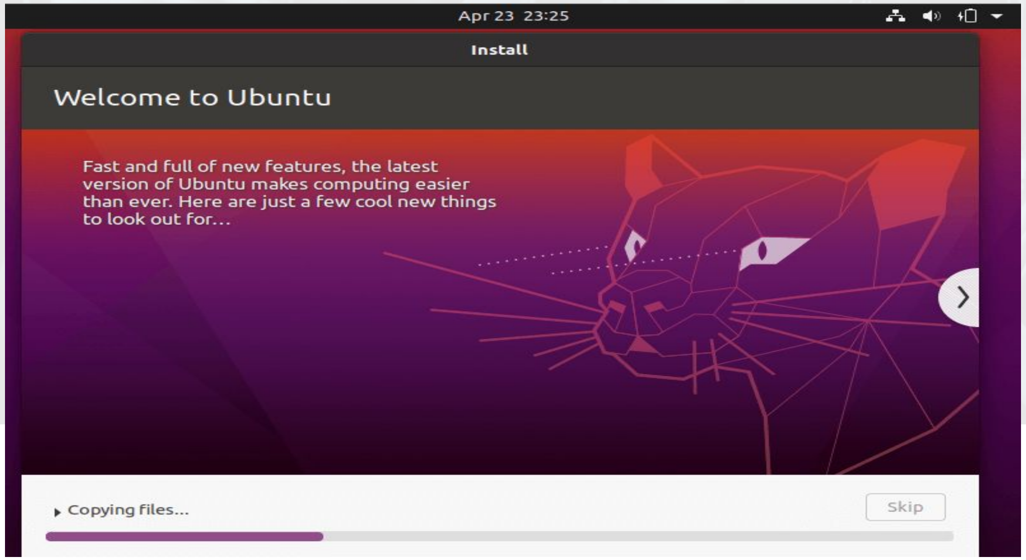
Pick a username: tecmint

Choose a password: ●●●●●●●●●● Good password

Confirm your password: ●●●●●●●●●●

○ Log in automatically

● Require my password to log in

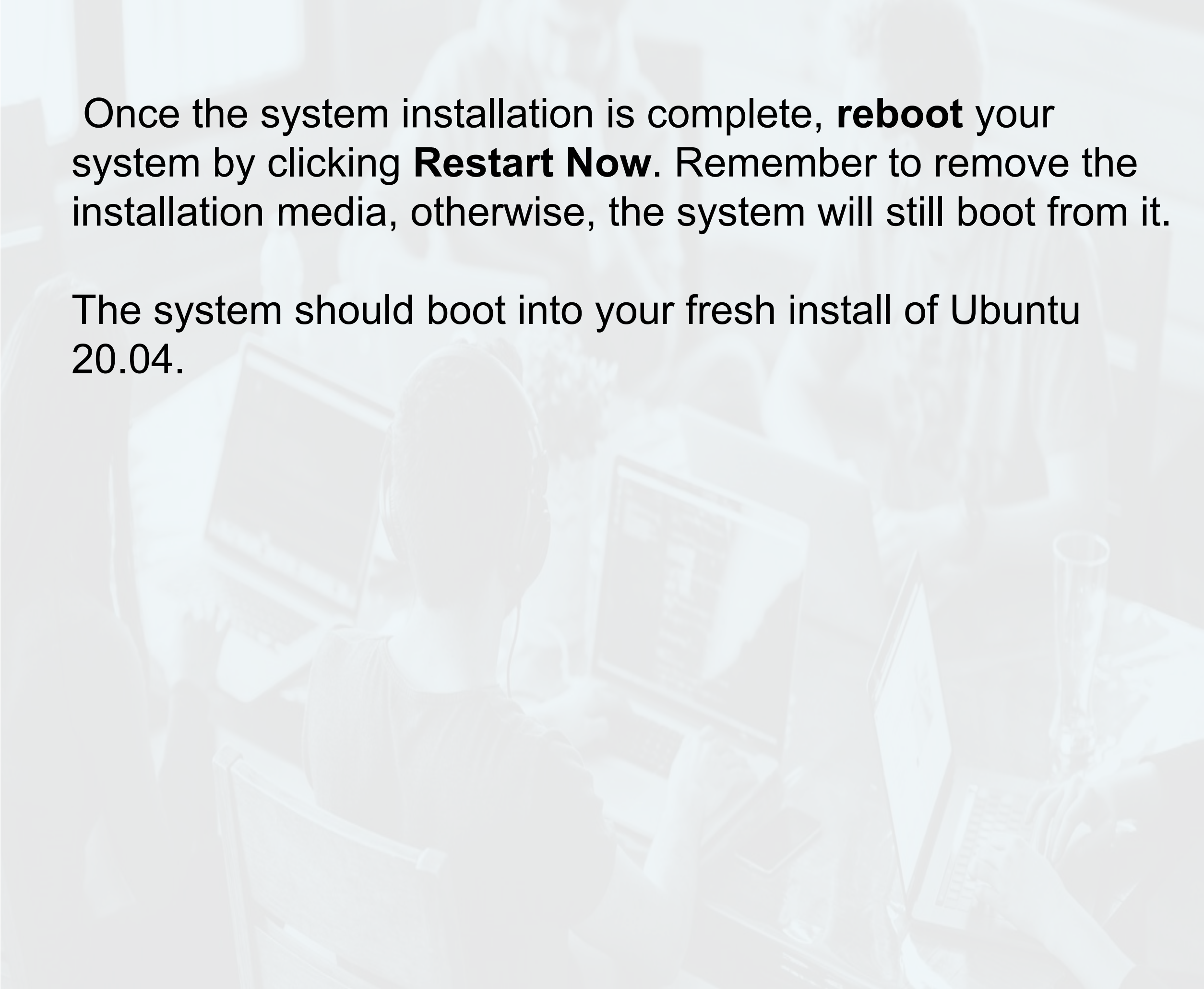


Welcome to Ubuntu

Fast and full of new features, the latest version of Ubuntu makes computing easier than ever. Here are just a few cool new things to look out for…

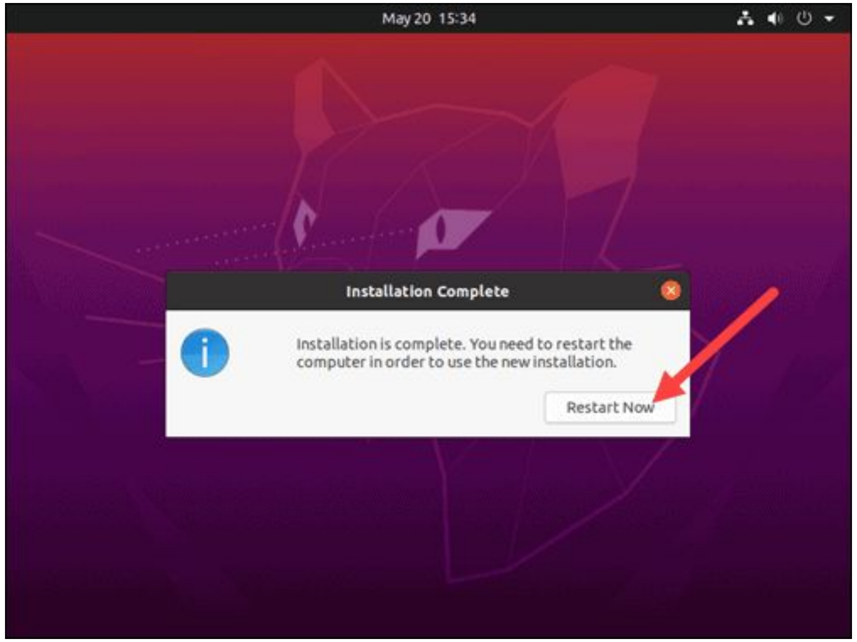
Copying files…

INSTALLATION CONTINUED…



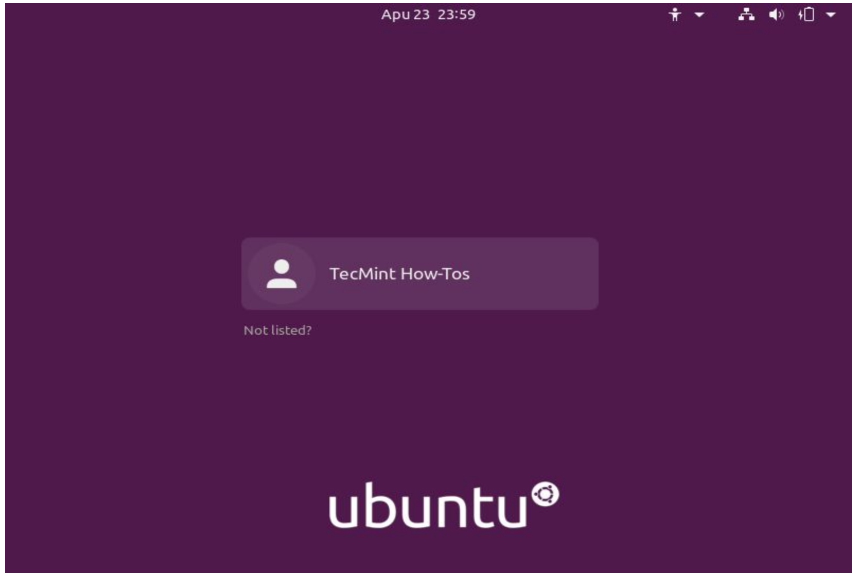
Once the system installation is complete, **reboot** your system by clicking **Restart Now**. Remember to remove the installation media, otherwise, the system will still boot from it.

The system should boot into your fresh install of Ubuntu 20.04.



Installation Complete

Installation is complete. You need to restart the computer in order to use the new installation.

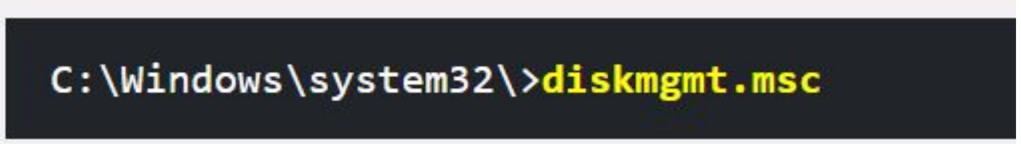


HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT

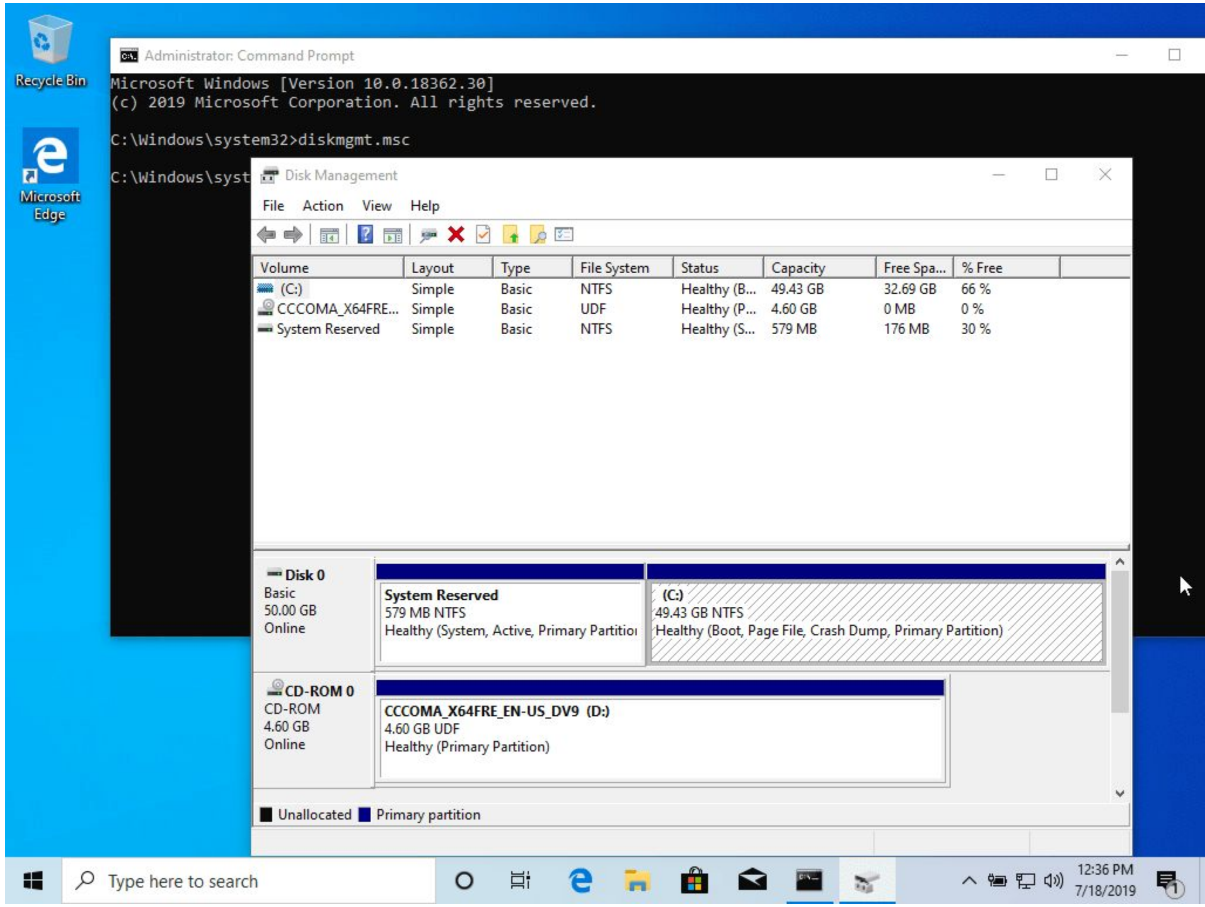
Step 1: Prepare Windows Machine for Dual-Boot

1. The first thing you need to take care of is to create free space on the computer hard disk in case the system is installed on a single partition.
Log in to your Windows machine with an administrative account and right-click on the **Start Menu -> Command Prompt** (Admin) in order to enter Windows Command-Line.

Once in **CLI**, type diskmgmt.msc on prompt and the **Disk Management** utility should open. From here, right-click on C: the partition and select **Shrink Volume** in order to resize the partition.



```
C:\Windows\system32\>diskmgmt.msc
```



```
Microsoft Windows [Version 10.0.18362.30]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Windows\system32>diskmgmt.msc

C:\Windows\syst
```

Volume	Layout	Type	File System	Status	Capacity	Free Spa...	% Free
(C:)	Simple	Basic	NTFS	Healthy (B...	49.43 GB	32.69 GB	66 %
CCCOMA_X64FRE...	Simple	Basic	UDF	Healthy (P...	4.60 GB	0 MB	0 %
System Reserved	Simple	Basic	NTFS	Healthy (S...	579 MB	176 MB	30 %

Disk 0
Basic
50.00 GB
Online

System Reserved
579 MB NTFS
Healthy (System, Active, Primary Partitioi

(C:)
49.43 GB NTFS
Healthy (Boot, Page File, Crash Dump, Primary Partition)

CD-ROM 0
CD-ROM
4.60 GB
Online

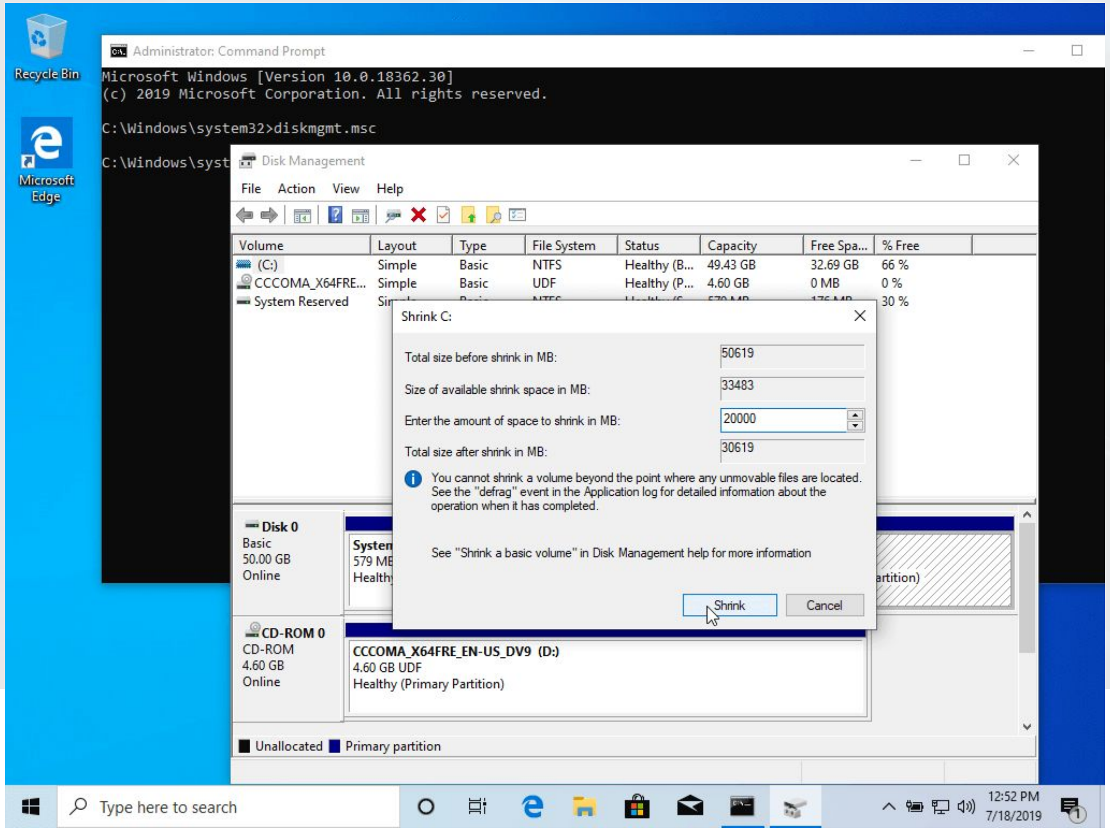
CCCOMA_X64FRE_EN-US_DV9 (D:)
4.60 GB UDF
Healthy (Primary Partition)

■ Unallocated ■ Primary partition

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED…

On Shrink C: enter a value on space to shrink in MB (use at least **20000 MB** depending on the **C:** partition size) and hit **Shrink** to start partition resize as illustrated below (the value of space shrink from below image is lower and only used for demonstration purposes).

Once space has been resized you will see a new unallocated space on the hard drive. Leave it as default and reboot the computer in order to proceed with the Ubuntu installation.



```
Microsoft Windows [Version 10.0.18362.30]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Windows\system32>diskmgmt.msc

C:\Windows\syst
```

Volume	Layout	Type	File System	Status	Capacity	Free Spa...	% Free
(C:)	Simple	Basic	NTFS	Healthy (B...	49.43 GB	32.69 GB	66 %
CCCOMA_X64FRE...	Simple	Basic	UDF	Healthy (P...	4.60 GB	0 MB	0 %
System Reserved	Si						30 %

Shrink C:

Total size before shrink in MB: 50619

Size of available shrink space in MB: 33483

Enter the amount of space to shrink in MB: 20000

Total size after shrink in MB: 30619

You cannot shrink a volume beyond the point where any unmovable files are located. See the "defrag" event in the Application log for detailed information about the operation when it has completed.

See "Shrink a basic volume" in Disk Management help for more information

Disk 0
Basic
50.00 GB
Online

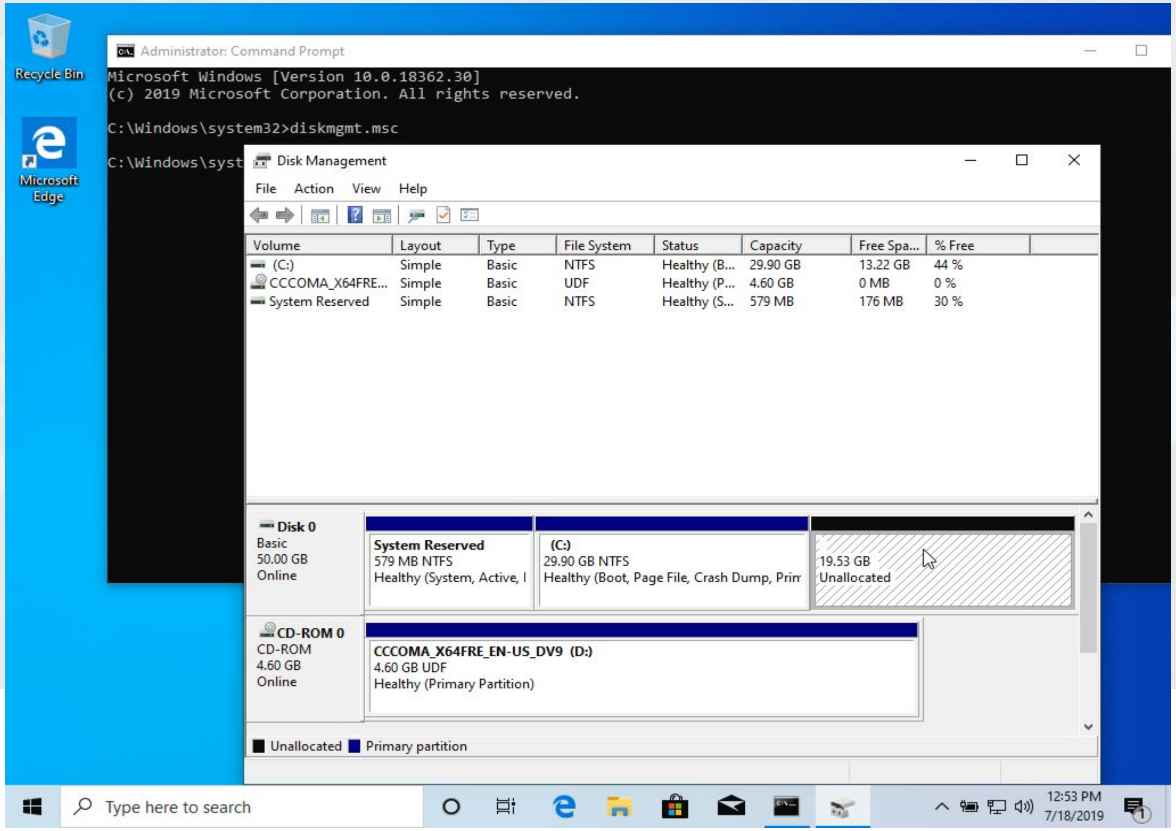
System
579 MB
Healthy

artition)

CD-ROM 0
CD-ROM
4.60 GB
Online

CCCOMA_X64FRE_EN-US_DV9 (D:)
4.60 GB UDF
Healthy (Primary Partition)

■ Unallocated ■ Primary partition



```
Microsoft Windows [Version 10.0.18362.30]
(c) 2019 Microsoft Corporation. All rights reserved.

C:\Windows\system32>diskmgmt.msc

C:\Windows\syst
```

Volume	Layout	Type	File System	Status	Capacity	Free Spa...	% Free
(C:)	Simple	Basic	NTFS	Healthy (B...	29.90 GB	13.22 GB	44 %
CCCOMA_X64FRE...	Simple	Basic	UDF	Healthy (P...	4.60 GB	0 MB	0 %
System Reserved	Simple	Basic	NTFS	Healthy (S...	579 MB	176 MB	30 %

Disk 0
Basic
50.00 GB
Online

System Reserved
579 MB NTFS
Healthy (System, Active, I

(C:)
29.90 GB NTFS
Healthy (Boot, Page File, Crash Dump, Prim

19.53 GB
Unallocated

CD-ROM 0
CD-ROM
4.60 GB
Online

CCCOMA_X64FRE_EN-US_DV9 (D:)
4.60 GB UDF
Healthy (Primary Partition)

■ Unallocated ■ Primary partition

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

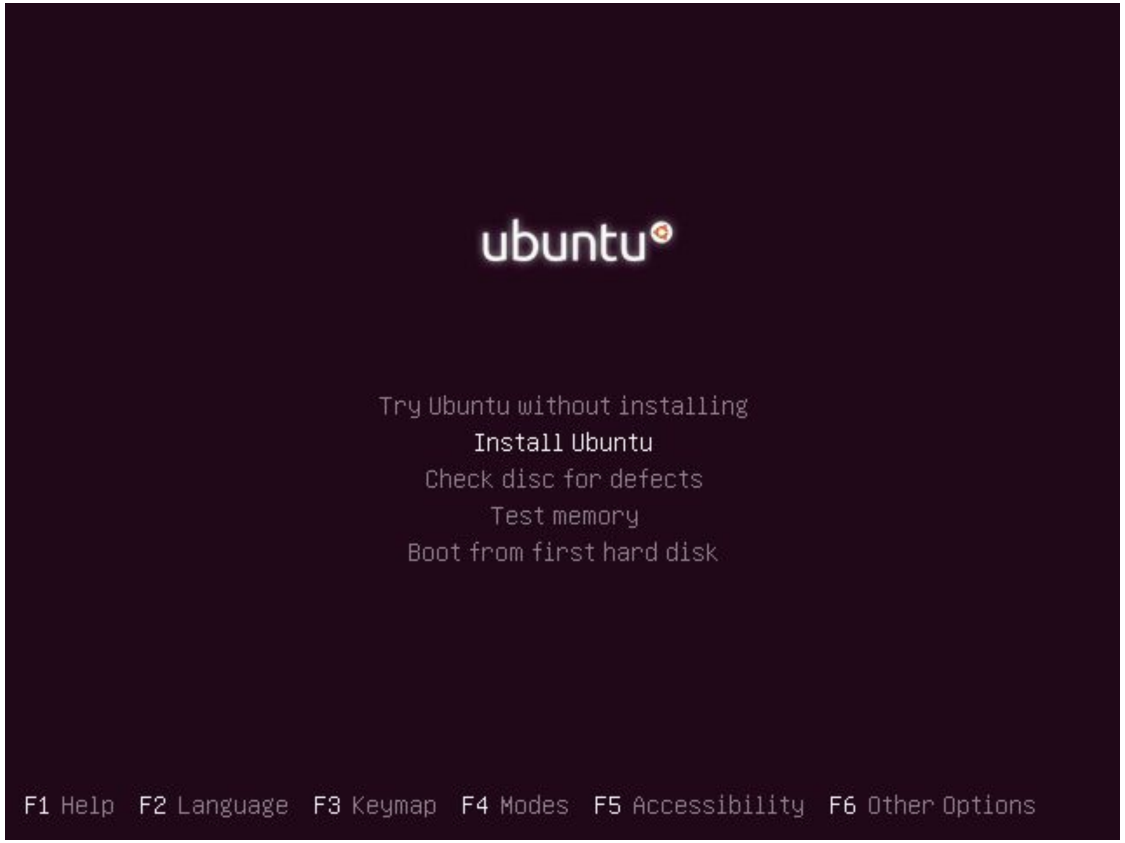
Step 2: Install Ubuntu with Windows Dual-Boot

Go the download link from the topic description and grab **Ubuntu Desktop 20.04 ISO** image.

Burn the image to a DVD or create a bootable USB stick using a utility such as **Universal USB Installer** (BIOS compatible) or **Rufus** (UEFI compatible).

Place the USB stick or DVD in the appropriate drive, reboot the machine and instruct the **BIOS/UEFI** to boot-up from the DVD/USB by pressing a special function key (usually **F12**, **F10** or **F2** depending on the vendor specifications).

Once the media boot-up a new grub screen should appear on your monitor. From the menu select **Install Ubuntu** and hit **Enter** to continue.



ubuntu

Try Ubuntu without installing
Install Ubuntu
Check disc for defects
Test memory
Boot from first hard disk

F1 Help F2 Language F3 Keymap F4 Modes F5 Accessibility F6 Other Options

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

Step 2: Install Ubuntu with Windows Dual-Boot

4. Go the download link from the topic description and grab **Ubuntu Desktop 20.04 ISO** image.

Burn the image to a DVD or create a bootable USB stick using a utility such as **Universal USB Installer** (BIOS compatible) or **Rufus** (UEFI compatible).

Place the USB stick or DVD in the appropriate drive, reboot the machine and instruct the **BIOS/UEFI** to boot-up from the DVD/USB by pressing a special function key (usually **F12**, **F10** or **F2** depending on the vendor specifications).

Once the media boot-up a new grub screen should appear on your monitor. From the menu select **Install Ubuntu** and hit **Enter** to continue.

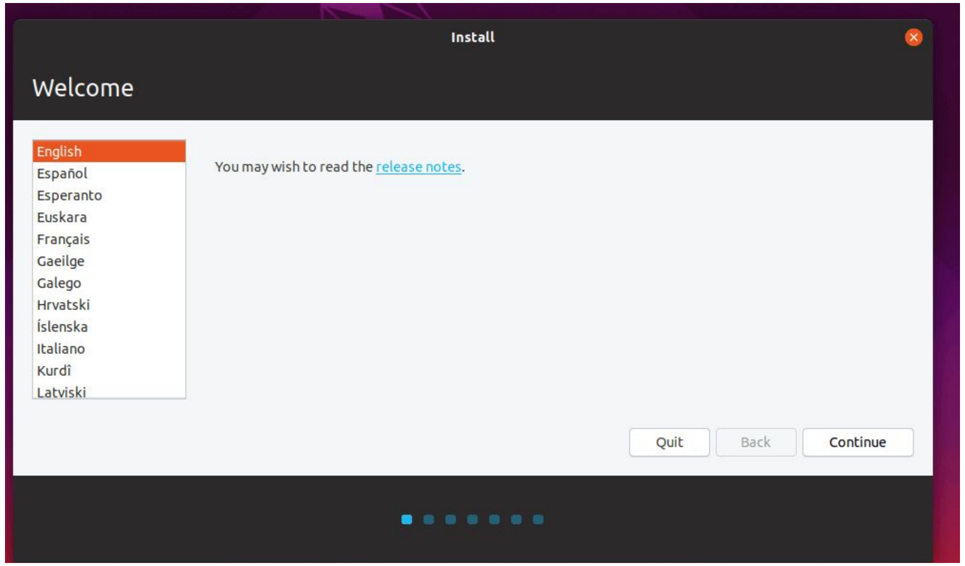
HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

5. After the boot media finishes loading into RAM you will end-up with a completely functional Ubuntu system running in live-mode.

On the Launcher hit on the second icon from top, **Install Ubuntu 20.04 LTS**, and the installer utility will start.

Choose the language you wish to perform the installation and click on the **Continue** button to proceed further.

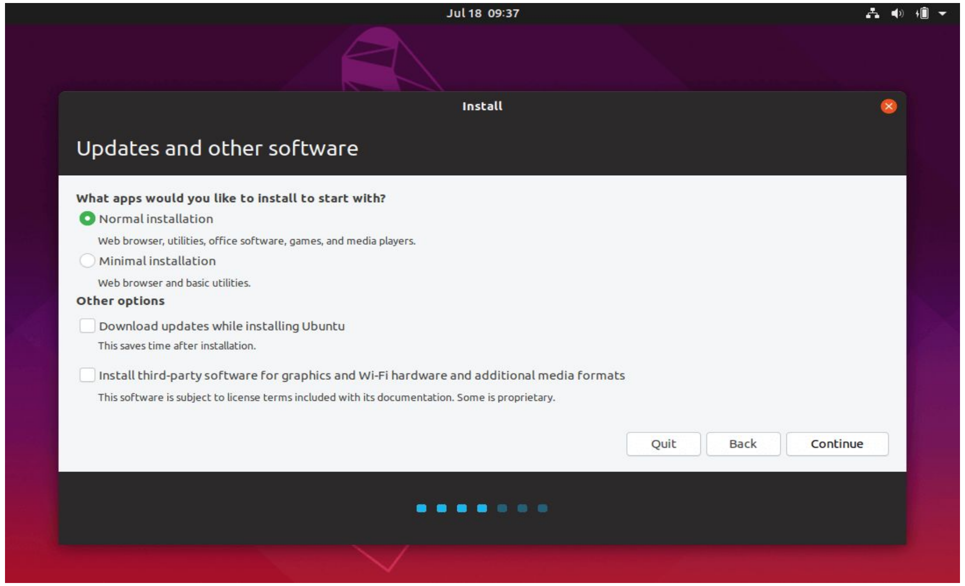
6. Next, choose the first option “**Normal Installation**” and hit on the **Continue** button again.


Install

Welcome

English

You may wish to read the release notes.


Jul 18 09:37

Install

Updates and other software

What apps would you like to install to start with?

● Normal installation

Web browser, utilities, office software, games, and media players.

○ Minimal installation

Web browser and basic utilities.

Other options

□ Download updates while installing Ubuntu

This saves time after installation.

□ Install third-party software for graphics and Wi-Fi hardware and additional media formats

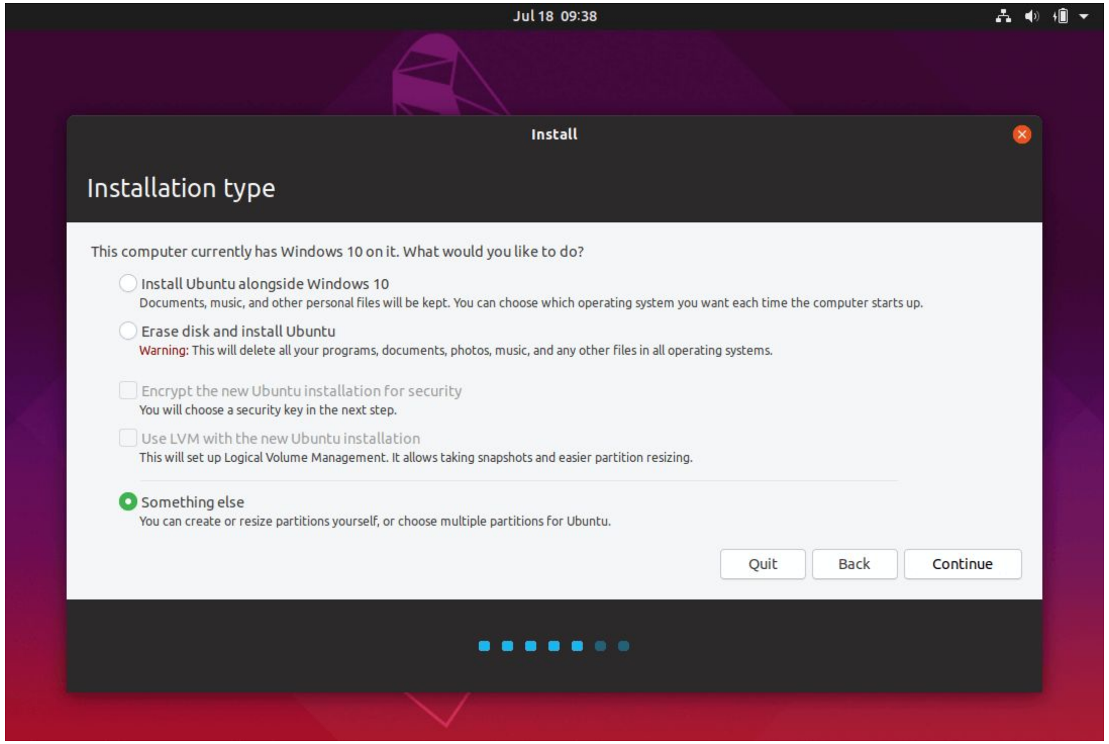
This software is subject to license terms included with its documentation. Some is proprietary.

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

7. Now it’s time to select an Installation Type.
 You can choose to **Install Ubuntu** alongside **Windows Boot Manager**, an option that will automatically take care of all the partition steps.

Use this option if you don’t require a personalized partition scheme. In case you want a custom partition layout, check the **Something else** option and hit on the **Continue** button to proceed further.

The option **Erase disk** and install Ubuntu should be avoided on dual-boot because is potentially dangerous and will wipe out your disk.



Installation type

This computer currently has Windows 10 on it. What would you like to do?

○ Install Ubuntu alongside Windows 10
Documents, music, and other personal files will be kept. You can choose which operating system you want each time the computer starts up.

○ Erase disk and install Ubuntu
Warning: This will delete all your programs, documents, photos, music, and any other files in all operating systems.

□ Encrypt the new Ubuntu installation for security
You will choose a security key in the next step.

□ Use LVM with the new Ubuntu installation
This will set up Logical Volume Management. It allows taking snapshots and easier partition resizing.

● Something else
You can create or resize partitions yourself, or choose multiple partitions for Ubuntu.

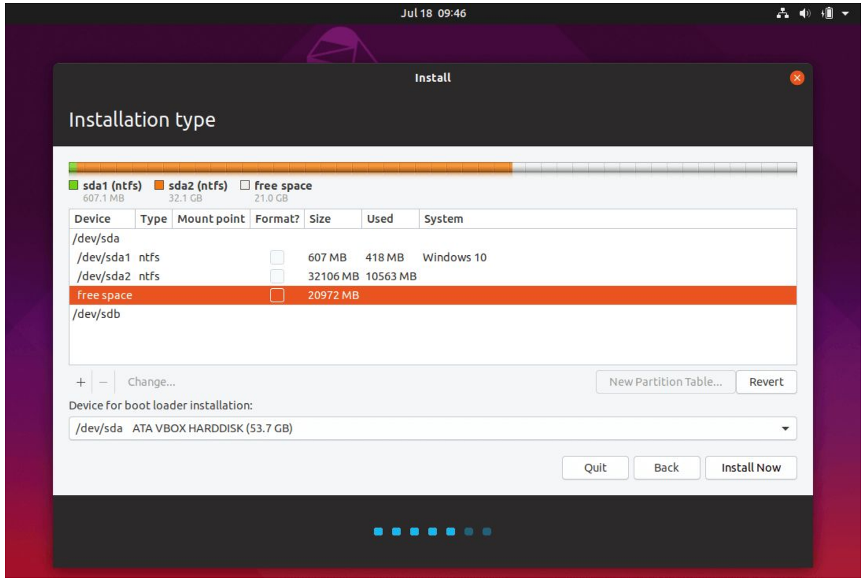
HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

8. On this step, we'll create our custom partition layout for **Ubuntu**. This guide will recommend that you create two partitions, one for root and the other for home accounts data and no partition for swap (use a swap partition only if you have limited RAM resources or you use a fast SSD).

To create the first partition, the root partition, select the free space (the shrinking space from Windows created earlier) and hit on the + icon below.

On partition settings use the following configurations and hit **OK** to apply changes:

- Size = at least **20000** MB
- Type for the new partition = **Primary**
- Location for the new partition = **Beginning**
- Use as = **EXT4** journaling file system
- Mount point = **/**



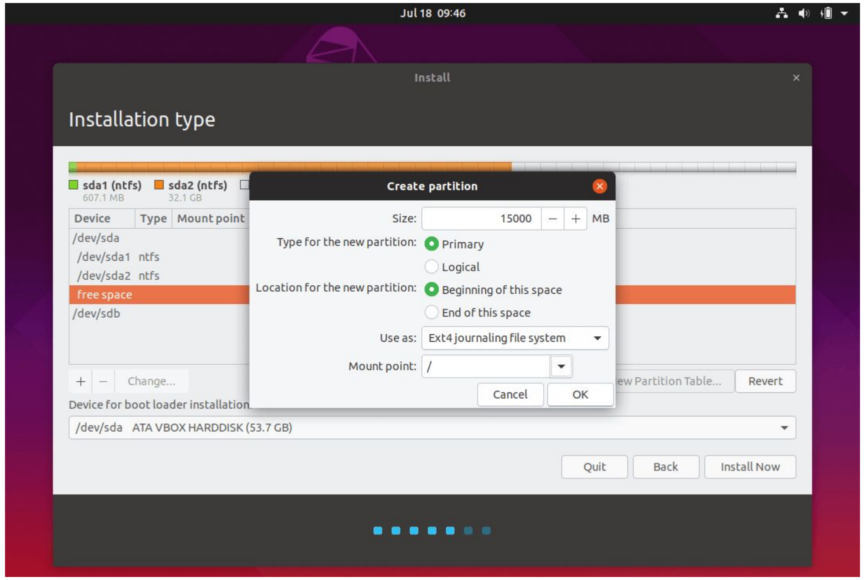
Installation type

🟩 sda1 (ntfs) 607.1 MB 🟧 sda2 (ntfs) 32.1 GB □ free space 21.0 GB

Device	Type	Mount point	Format?	Size	Used	System
/dev/sda						
/dev/sda1	ntfs		□	607 MB	418 MB	Windows 10
/dev/sda2	ntfs		□	32106 MB	10563 MB	
free space			□	20972 MB		
/dev/sdb						

Device for boot loader installation:

/dev/sda ATA VBOX HARDDISK (53.7 GB)



Installation type

Create partition

Size: 15000 MB

Type for the new partition: ● Primary ○ Logical

Location for the new partition: ● Beginning of this space ○ End of this space

Use as: Ext4 journaling file system

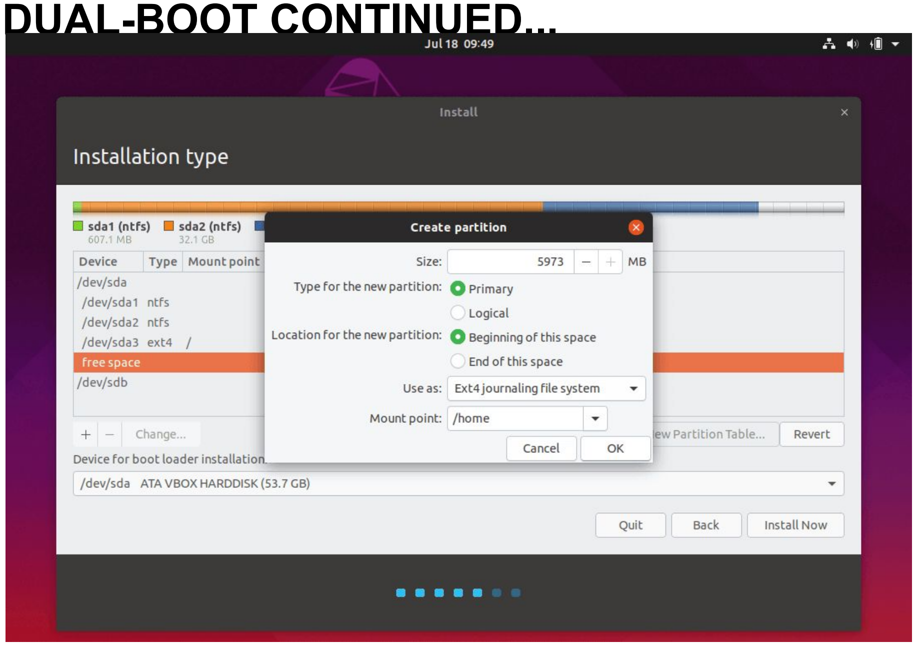
Mount point: /

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

Create the home partition using the same steps as above. Use all the available free space left for the home partition size. The partition settings should look like this:

- Size = all remaining free space
- Type for the new partition = **Primary**
- Location for the new partition = **Beginning**
- Use as = **EXT4** journaling file system
- Mount point = **/home**

9. When finished, hit the **Install Now** button in order to apply changes to disk and start the installation process.
A pop-up window should appear to inform you about **swap** space. Ignore the alert by pressing on the **Continue** button.
Next, a new pop-up window will ask you if you agree with committing changes to disk.
Hit **Continue** to write changes to disk and the installation process will now start.



Jul 18 09:49

Install

Installation type

sda1 (ntfs) 607.1 MB
sda2 (ntfs) 32.1 GB

Device	Type	Mount point
/dev/sda		
/dev/sda1	ntfs	
/dev/sda2	ntfs	
/dev/sda3	ext4	/
free space		
/dev/sdb		

Create partition

Size: 5973 MB

Type for the new partition: ● Primary ○ Logical

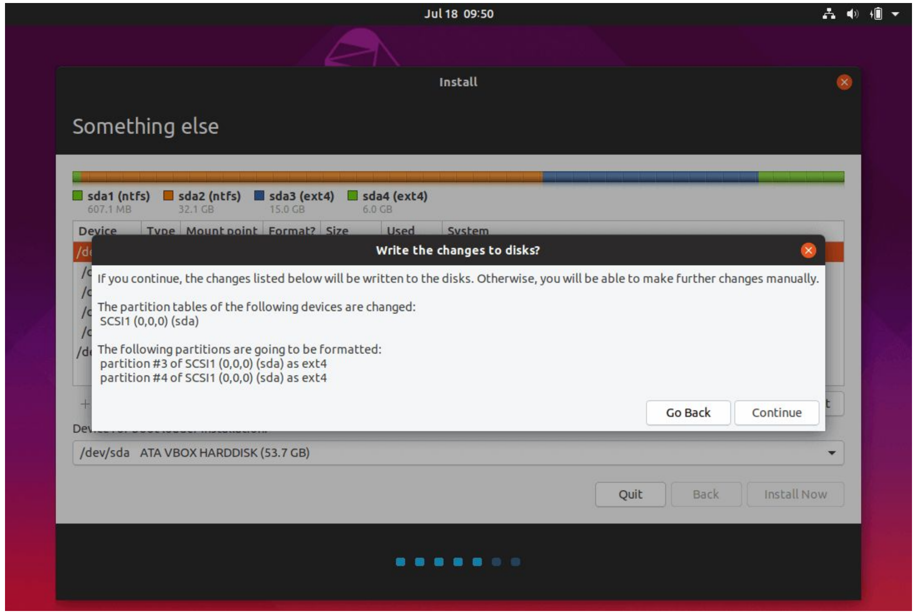
Location for the new partition: ● Beginning of this space ○ End of this space

Use as: Ext4 journaling file system

Mount point: /home

Device for boot loader installation:

/dev/sda ATA VBOX HARDDISK (53.7 GB)



Jul 18 09:50

Install

Something else

sda1 (ntfs) 607.1 MB
sda2 (ntfs) 32.1 GB
sda3 (ext4) 15.0 GB
sda4 (ext4) 6.0 GB

Device | Type | Mount point | Format? | Size | Used | System

Write the changes to disks?

If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
SCSI1 (0,0,0) (sda)

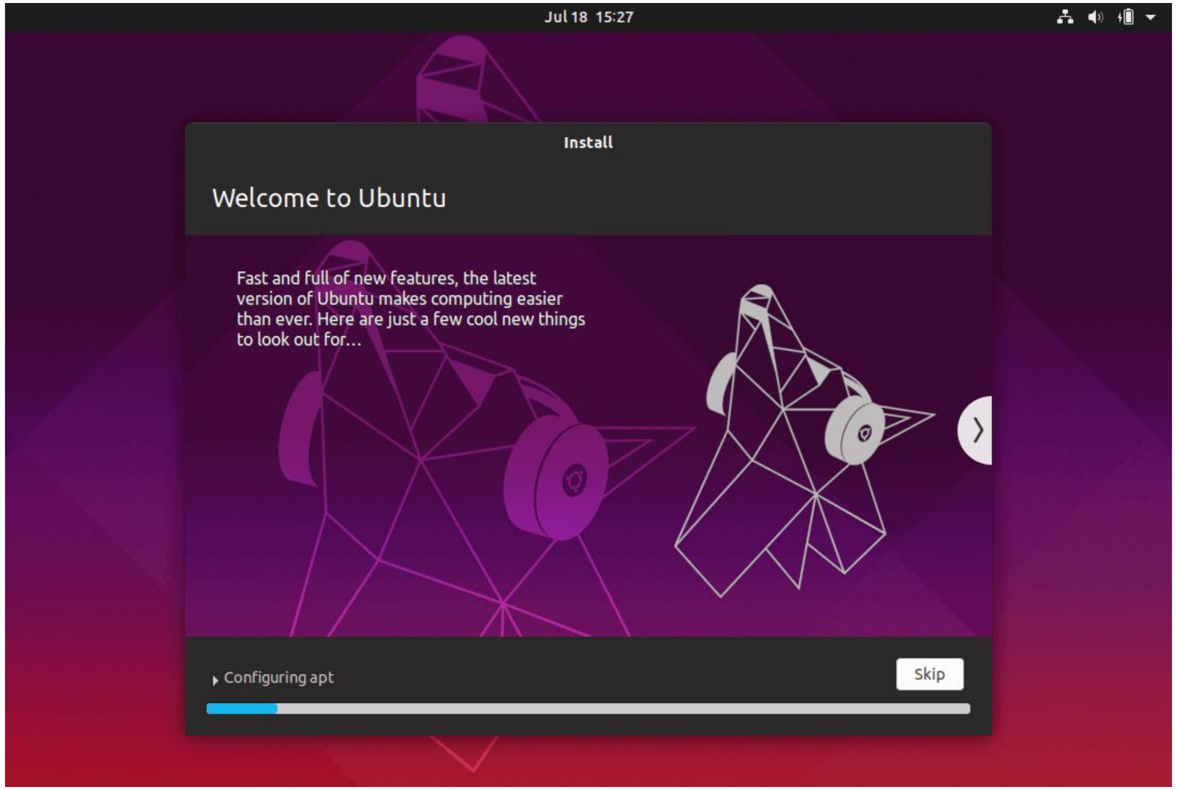
The following partitions are going to be formatted:
partition #3 of SCSI1 (0,0,0) (sda) as ext4
partition #4 of SCSI1 (0,0,0) (sda) as ext4

/dev/sda ATA VBOX HARDDISK (53.7 GB)

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

10. On the next screen adjust your machine physical location by selecting a city nearby from the map. When done hit **Continue** to move ahead.

11. Pick up a username and password for your administrative **sudo** account, enter a descriptive name for your computer and hit **Continue** to finalize the installation.
These are all the settings required for customizing the **Ubuntu** installation. From here on the installation process will run automatically until it reaches the end.



Jul 18 15:27

Install

Welcome to Ubuntu

Fast and full of new features, the latest version of Ubuntu makes computing easier than ever. Here are just a few cool new things to look out for...

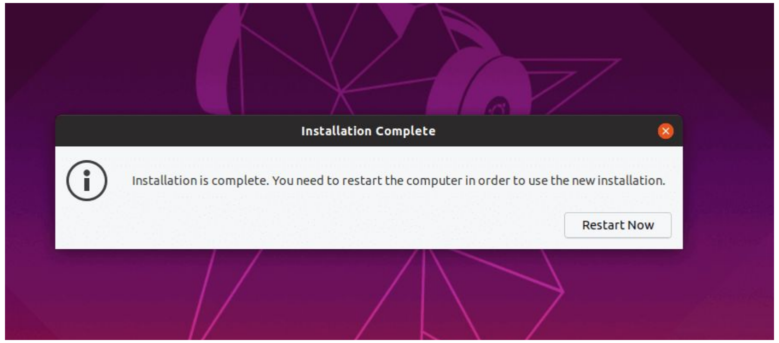
Configuring apt

HOW TO INSTALL UBUNTU ALONGSIDE WITH WINDOWS 10 OR 8 IN DUAL-BOOT CONTINUED...

12. After the installation process reaches its end hit on the **Restart Now** button in order to complete the installation.

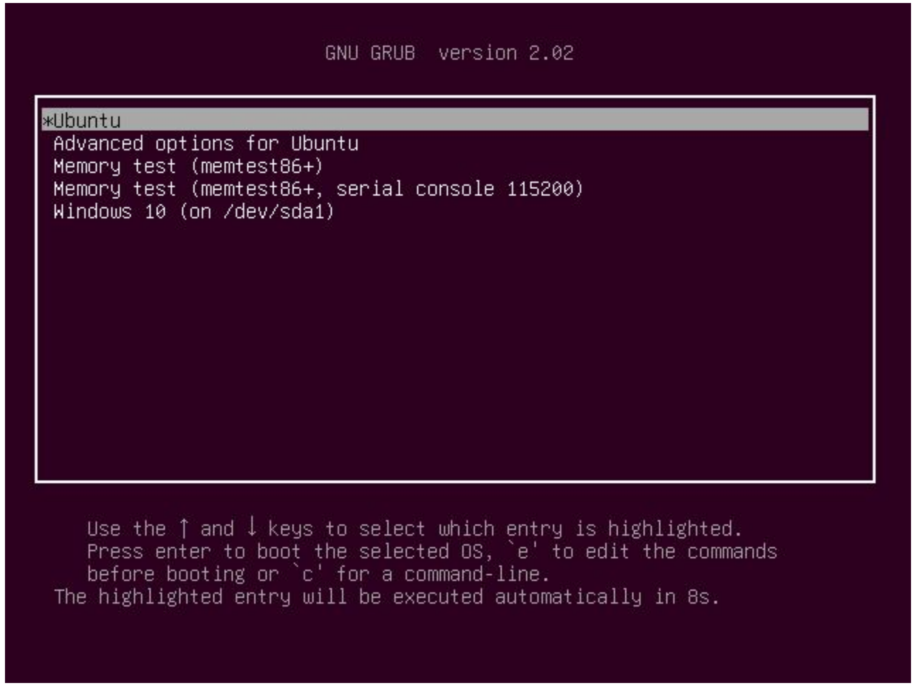
The machine will reboot into the **Grub** menu, where for ten seconds, you will be presented to choose what OS you wish to use further: **Ubuntu 20.04** or **Microsoft Windows**.

Ubuntu is designated as default OS to boot from. Thus, just press **Enter** key or wait for those **10** seconds timeout to drain.



Installation Complete

Installation is complete. You need to restart the computer in order to use the new installation.

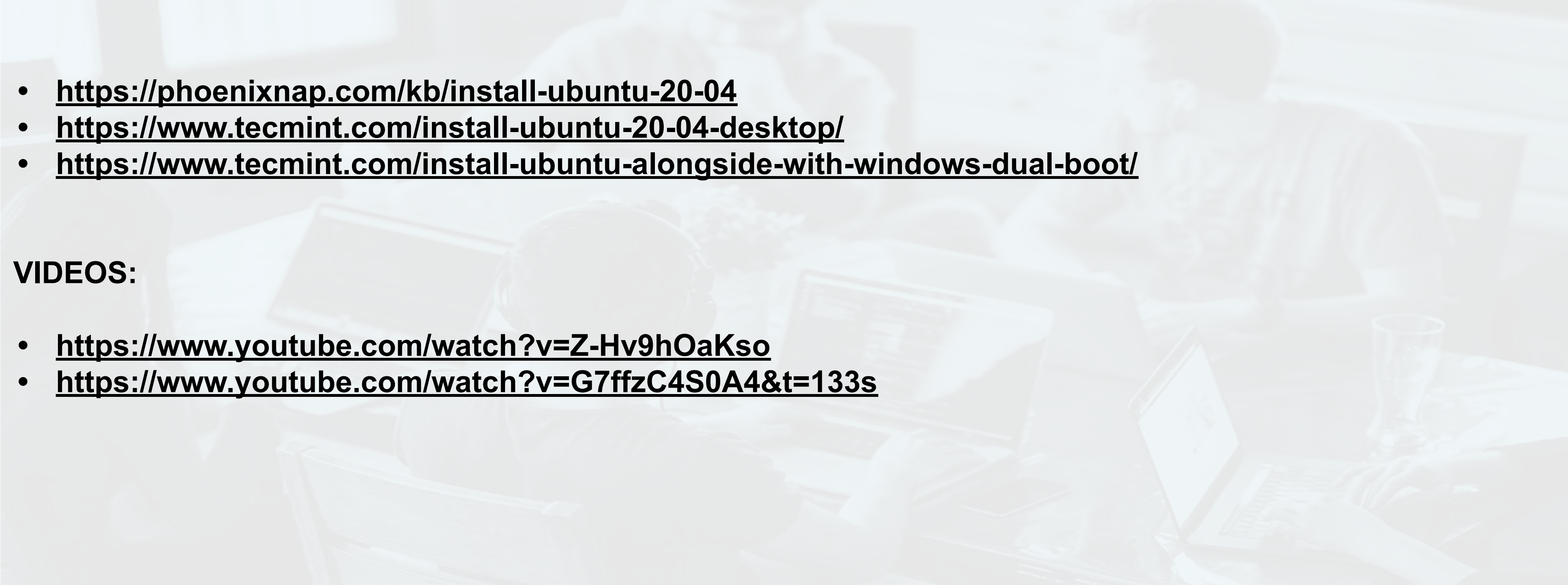


```
GNU GRUB  version 2.02

*Ubuntu
 Advanced options for Ubuntu
 Memory test (memtest86+)
 Memory test (memtest86+, serial console 115200)
 Windows 10 (on /dev/sda1)

    Use the ↑ and ↓ keys to select which entry is highlighted.
    Press enter to boot the selected OS, `e' to edit the commands
    before booting or `c' for a command-line.
 The highlighted entry will be executed automatically in 8s.
```

USEFUL LINKS



- https://phoenixnap.com/kb/install-ubuntu-20-04
- https://www.tecmint.com/install-ubuntu-20-04-desktop/
- https://www.tecmint.com/install-ubuntu-alongside-with-windows-dual-boot/

VIDEOS:

- https://www.youtube.com/watch?v=Z-Hv9hOaKso
- https://www.youtube.com/watch?v=G7ffzC4S0A4&t=133s

GAZEBO PLATFORM

GAZEBO

Gazebo is a full-fledged simulation environment. In 2021, NXP Online Design Challenge contestants may use the Gazebo simulation for an extra challenge at home. The benefit to using the Gazebo simulation environment is that you can test your code without crashing or damaging your actual car. The code modules that you run on your actual car can be ported to the Gazebo simulation environment with ease - and if you're using a brushless car, you'll essentially be running the same exact code.

PREREQUISITES:

To run Gazebo you will need an Ubuntu Linux (20.04) environment. You can run the Ubuntu as a native OS or as a virtual machine. Recommended specs for running the Gazebo simulation environment are as follows:

Component	Amount
Processor	Any modern quad-core processor or better
RAM	8GB of RAM or better
Hard Disk Space	~20GB of space (SSD recommended)

SETTING UP SIMULATION SOFTWARE

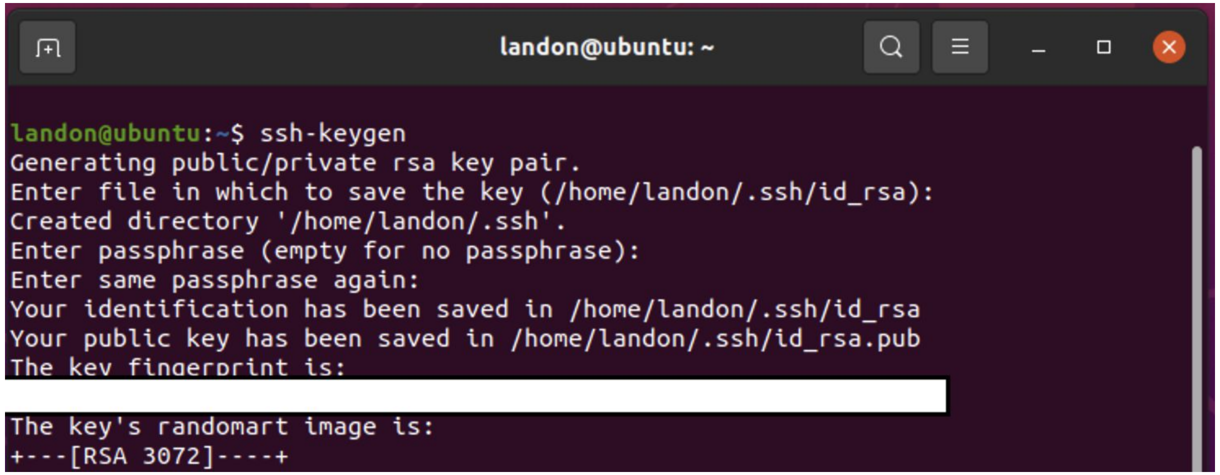
Setting up SSH keys

To use Gazebo, you will need to have a GitHub account. The installation scripts require a GitHub account with an SSH key.

To create an SSH key, run the following in a terminal:

```
$ ssh-keygen
```

Follow the prompt. We suggest just pressing enter until you reach the end. It will be easier if you just use the default path for the id_rsa file and if you go without a passphrase (though you're welcome to use one!). You should get the output below. Note that the RSA key is not shown here for security reasons:



```
landon@ubuntu:~$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/landon/.ssh/id_rsa):
Created directory '/home/landon/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/landon/.ssh/id_rsa
Your public key has been saved in /home/landon/.ssh/id_rsa.pub
The key fingerprint is:
[redacted]
The key's randomart image is:
+---[RSA 3072]----+
```

SETTING UP SIMULATION SOFTWARE

Next, you'll want to install xclip. This program will allow you to copy the contents of the id_rsa.pub file to your clipboard so you can paste it into GitHub. To install xclip, run the following command:

```
$ sudo apt install xclip git
```

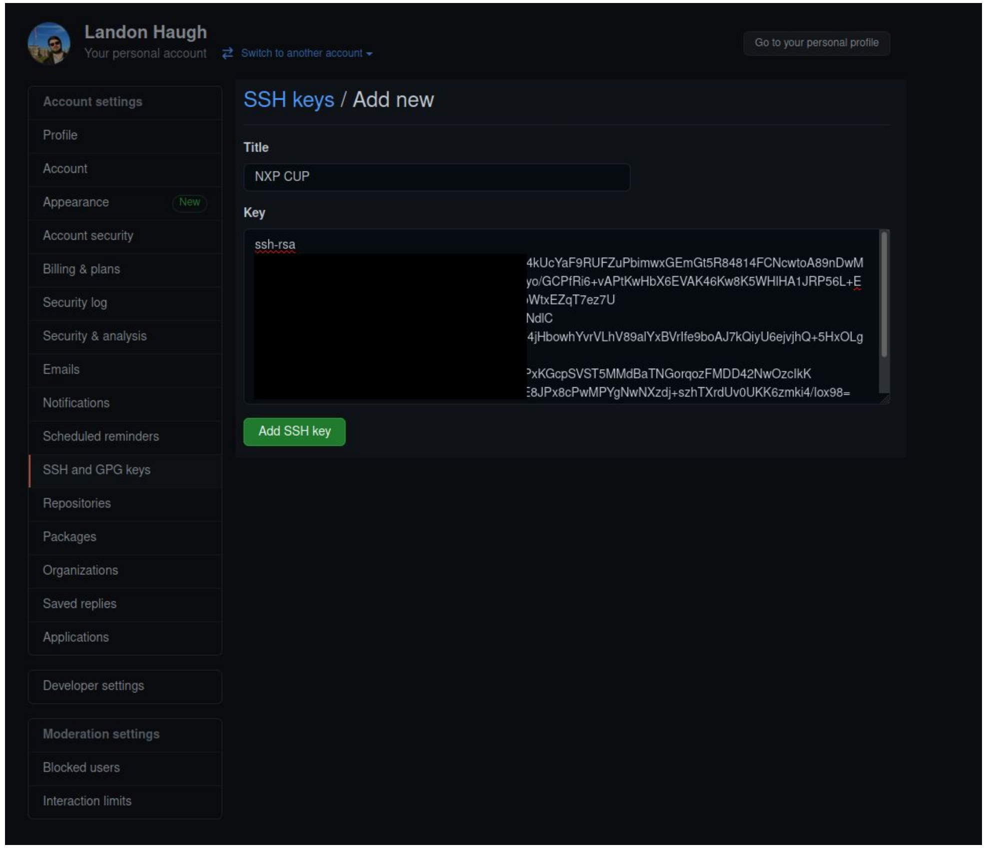
Once you've installed xclip, you need to copy the id_rsa.pub file to your clipboard. To do so, run the following command:

```
$ xclip -sel clip < ~/.ssh/id_rsa.pub
```

Adding your SSH key to GitHub

Now, log into your GitHub account and paste your SSH key. The SSH key field is located in your account settings under "SSH and GPG keys". Add a new SSH key by pressing "New SSH key" and pasting your SSH key in the box. Make sure to give it a name!

Once you've done this, you're ready to begin the installation.



SSH keys / Add new

Title

NXP CUP

Key

```
ssh-rsa
[redacted]4kUcYaF9RUFZuPbimwxGEmGt5R84814FCNcwtoA89nDwM
yo/GCPfRi6+vAPtKwHbX6EVAK46Kw8K5WHIHA1JRP56L+E
WtxEZqT7ez7U
NdIC
4jHbowhYvrVLhV89alYxBVrIfe9boAJ7kQiyU6ejvjhQ+5HxOLg

PxKGcpSVST5MMdBaTNGorqozFMDD42NwOzcIkK
E8JPx8cPwMPYgNwNXzdj+szhTXrdUv0UKK6zmki4/lox98=
```

SETTING UP SIMULATION SOFTWARE

Installing ROS2

To run Gazebo, you must have ROS2 installed.
Script is available for download on the gitbook (https://nxp.gitbook.io/nxp-aim/installation-of-nxp-gazebo)

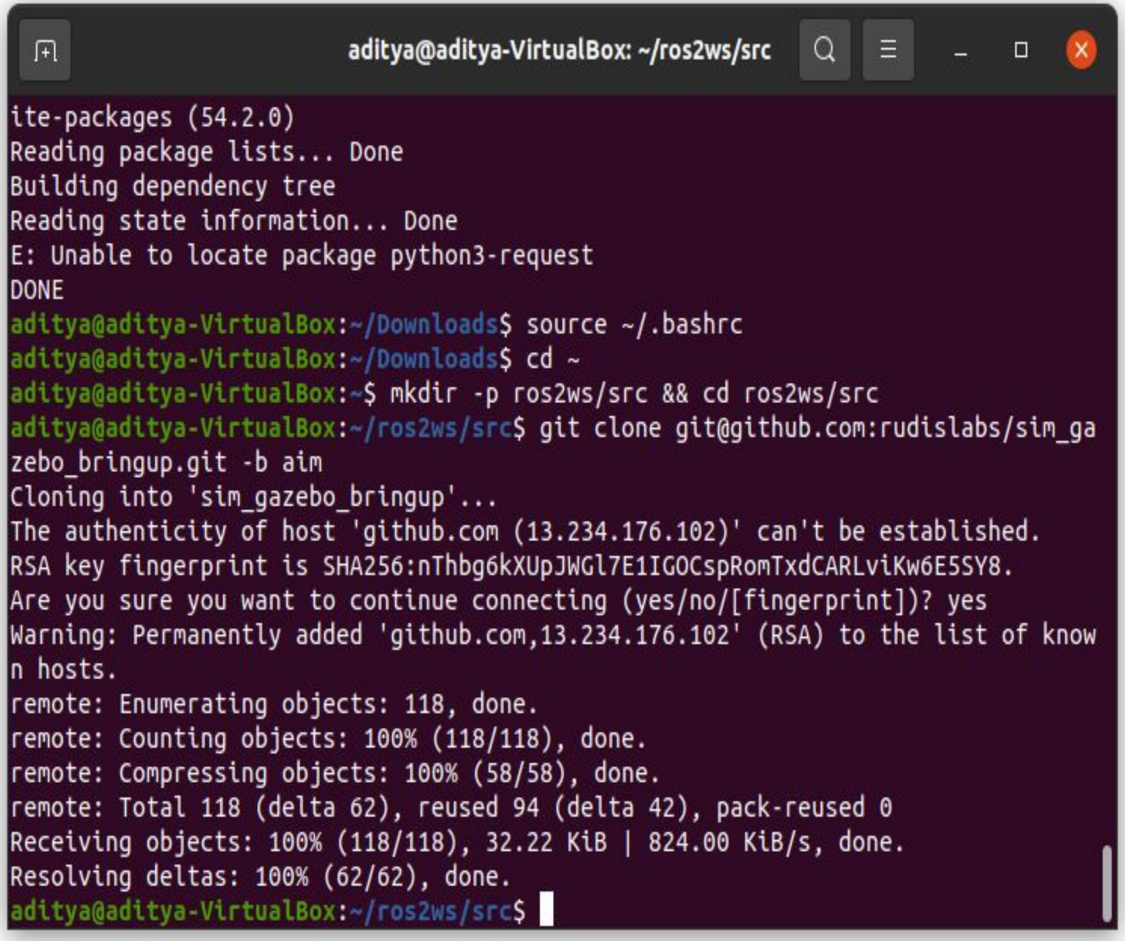
After downloading the file, now, we will need to run the *foxy_install_aim.sh* file to set up our software. To start, run the following command and make sure you get the expected output:

```
$ cd ~/Downloads
$ chmod a+x foxy_install_aim.sh
$ ./foxy_install_aim.sh
```

Note: This command will take a long time to finish since it is installing ROS2. It will show that it successfully installed by printing `DONE` once the script finishes.

And then source your .bashrc by running the following commands:

```
$ source ~/.bashrc
```



```
ite-packages (54.2.0)
Reading package lists... Done
Building dependency tree
Reading state information... Done
E: Unable to locate package python3-request
DONE
aditya@aditya-VirtualBox:~/Downloads$ source ~/.bashrc
aditya@aditya-VirtualBox:~/Downloads$ cd ~
aditya@aditya-VirtualBox:~$ mkdir -p ros2ws/src && cd ros2ws/src
aditya@aditya-VirtualBox:~/ros2ws/src$ git clone git@github.com:rudislabs/sim_ga
zebo_bringup.git -b aim
Cloning into 'sim_gazebo_bringup'...
The authenticity of host 'github.com (13.234.176.102)' can't be established.
RSA key fingerprint is SHA256:nThbg6kXUpJWGl7E1IGOCspRomTxdCARLviKw6E5SY8.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'github.com,13.234.176.102' (RSA) to the list of know
n hosts.
remote: Enumerating objects: 118, done.
remote: Counting objects: 100% (118/118), done.
remote: Compressing objects: 100% (58/58), done.
remote: Total 118 (delta 62), reused 94 (delta 42), pack-reused 0
Receiving objects: 100% (118/118), 32.22 KiB | 824.00 KiB/s, done.
Resolving deltas: 100% (62/62), done.
aditya@aditya-VirtualBox:~/ros2ws/src$ 
```

INSTALLING GAZEBO

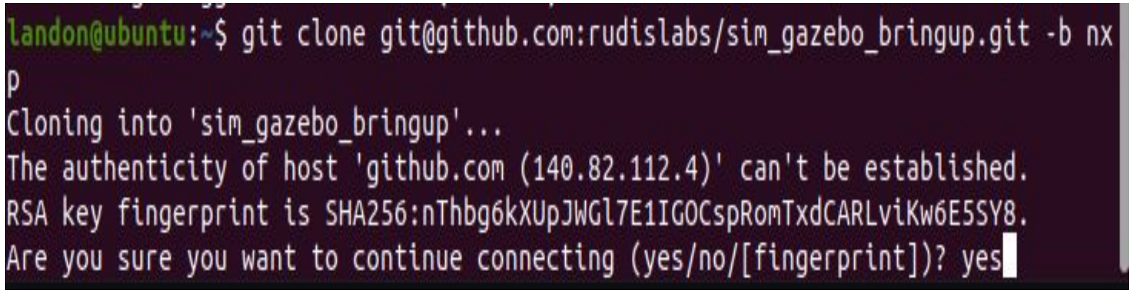
Cloning and running sim_gazebo_bringup
Installing Gazebo has become much easier over time. With this new install process, you'll be up and running with Gazebo in record time!

First, we need to create a ROS2 workspace directory to store the installation files. Go to your home folder and create a new folder called "ros2ws", and a folder inside of that called "src":

```
$ cd ~
$ mkdir -p ros2ws/src && cd ros2ws/src
```

Once you are in the directory `~/ros2ws/src`, it's time to clone the bringup repo. The bringup repo contains code that sets up the workspace for you automatically. To clone it, run the following command:

```
$ git clone git@github.com:rudislabs/sim_gazebo_bringup.git
-b aim
```



```
landon@ubuntu:~$ git clone git@github.com:rudislabs/sim_gazebo_bringup.git -b nx
p
Cloning into 'sim_gazebo_bringup'...
The authenticity of host 'github.com (140.82.112.4)' can't be established.
RSA key fingerprint is SHA256:nThbg6kXUpJWGl7E1IGOCspRomTxdCARLviKw6E5SY8.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

When git prompts you to continue connecting with your RSA fingerprint, type yes

INSTALLING GAZEBO

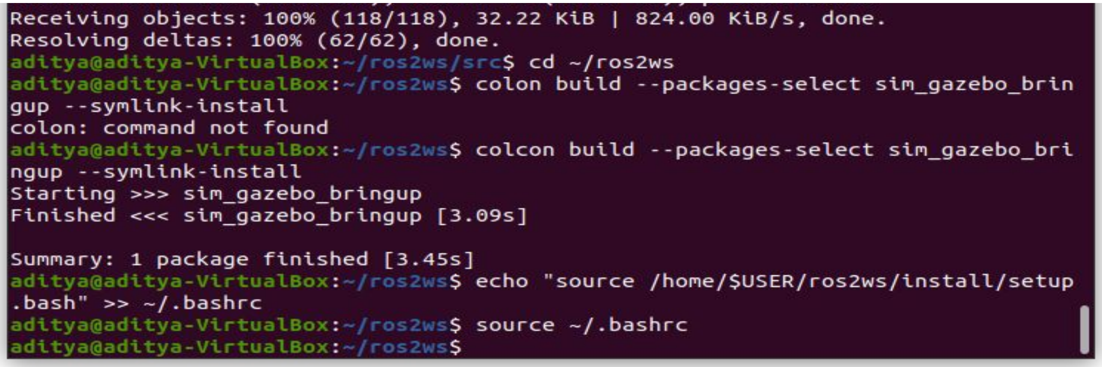
Next, we are going to run `sim_gazebo_bringup`. To do this, run the following commands:

```
$ cd ~/ros2ws
$ colcon build --packages-select sim_gazebo_bringup
--symlink-install
$ echo "source /home/$USER/ros2ws/install/setup.bash"
>> ~/.bashrc
$ source ~/.bashrc
```

Now that we have the bringup package set up, we can start installing all of the NXP Gazebo packages. Run the following command:

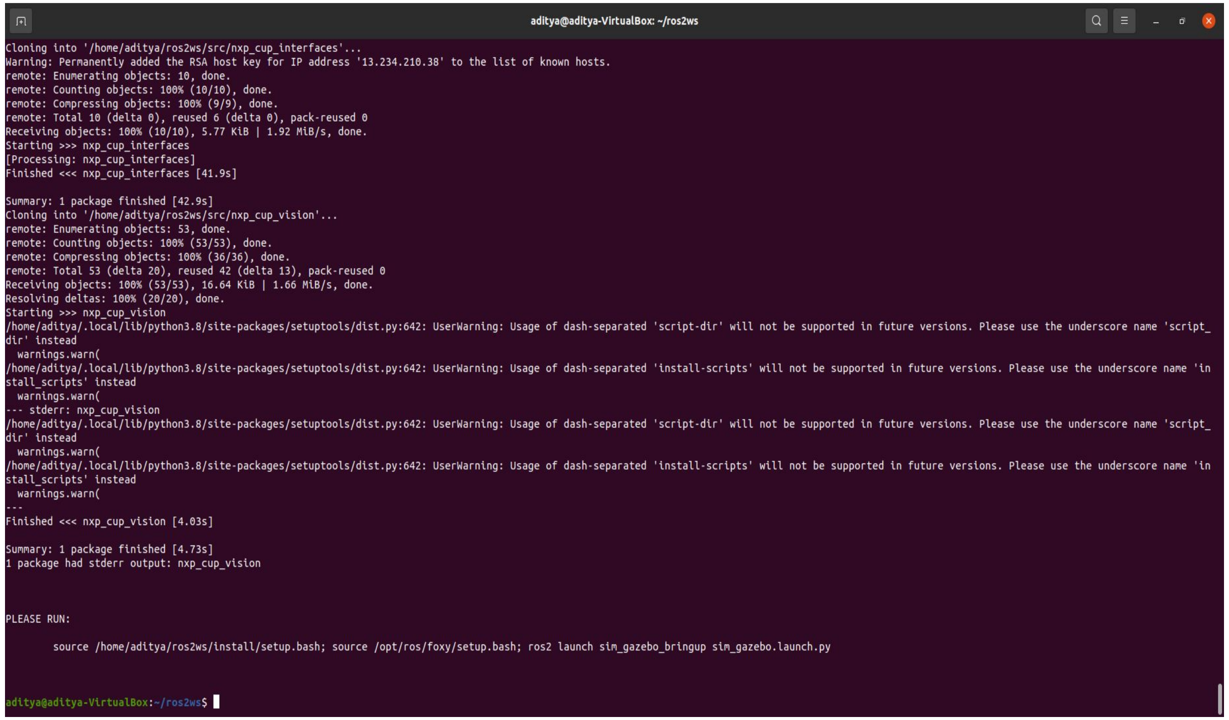
```
$ ros2 launch sim_gazebo_bringup sim_gazebo.launch.py
```

After running the above command you will be asked to run few commands a shown in the image. Copy them and run them before moving to next step of installation



```
Receiving objects: 100% (118/118), 32.22 KiB | 824.00 KiB/s, done.
Resolving deltas: 100% (62/62), done.
aditya@aditya-VirtualBox:~/ros2ws/src$ cd ~/ros2ws
aditya@aditya-VirtualBox:~/ros2ws$ colon build --packages-select sim_gazebo_brin
gup --symlink-install
colon: command not found
aditya@aditya-VirtualBox:~/ros2ws$ colcon build --packages-select sim_gazebo_bri
ngup --symlink-install
Starting >>> sim_gazebo_bringup
Finished <<< sim_gazebo_bringup [3.09s]

Summary: 1 package finished [3.45s]
aditya@aditya-VirtualBox:~/ros2ws$ echo "source /home/$USER/ros2ws/install/setup
.bash" >> ~/.bashrc
aditya@aditya-VirtualBox:~/ros2ws$ source ~/.bashrc
aditya@aditya-VirtualBox:~/ros2ws$
```



```
Cloning into '/home/aditya/ros2ws/src/nxp_cup_interfaces'...
Warning: Permanently added the RSA host key for IP address '13.234.210.38' to the list of known hosts.
remote: Enumerating objects: 10, done.
remote: Counting objects: 100% (10/10), done.
remote: Compressing objects: 100% (9/9), done.
remote: Total 10 (delta 0), reused 6 (delta 0), pack-reused 0
Receiving objects: 100% (10/10), 5.77 KiB | 1.92 MiB/s, done.
Starting >>> nxp_cup_interfaces
[Processing: nxp_cup_interfaces]
Finished <<< nxp_cup_interfaces [41.9s]

Summary: 1 package finished [42.9s]
Cloning into '/home/aditya/ros2ws/src/nxp_cup_vision'...
remote: Enumerating objects: 53, done.
remote: Counting objects: 100% (53/53), done.
remote: Compressing objects: 100% (36/36), done.
remote: Total 53 (delta 20), reused 42 (delta 13), pack-reused 0
Receiving objects: 100% (53/53), 16.64 KiB | 1.66 MiB/s, done.
Resolving deltas: 100% (20/20), done.
Starting >>> nxp_cup_vision
/home/aditya/.local/lib/python3.8/site-packages/setuptools/dist.py:642: UserWarning: Usage of dash-separated 'script-dir' will not be supported in future versions. Please use the underscore name 'script_
dir' instead
  warnings.warn(
/home/aditya/.local/lib/python3.8/site-packages/setuptools/dist.py:642: UserWarning: Usage of dash-separated 'install-scripts' will not be supported in future versions. Please use the underscore name 'in
stall_scripts' instead
  warnings.warn(
--- stderr: nxp_cup_vision
/home/aditya/.local/lib/python3.8/site-packages/setuptools/dist.py:642: UserWarning: Usage of dash-separated 'script-dir' will not be supported in future versions. Please use the underscore name 'script_
dir' instead
  warnings.warn(
/home/aditya/.local/lib/python3.8/site-packages/setuptools/dist.py:642: UserWarning: Usage of dash-separated 'install-scripts' will not be supported in future versions. Please use the underscore name 'in
stall_scripts' instead
  warnings.warn(
---
Finished <<< nxp_cup_vision [4.03s]

Summary: 1 package finished [4.73s]
1 package had stderr output: nxp_cup_vision



PLEASE RUN:

        source /home/aditya/ros2ws/install/setup.bash; source /opt/ros/foxy/setup.bash; ros2 launch sim_gazebo_bringup sim_gazebo.launch.py


aditya@aditya-VirtualBox:~/ros2ws$
```

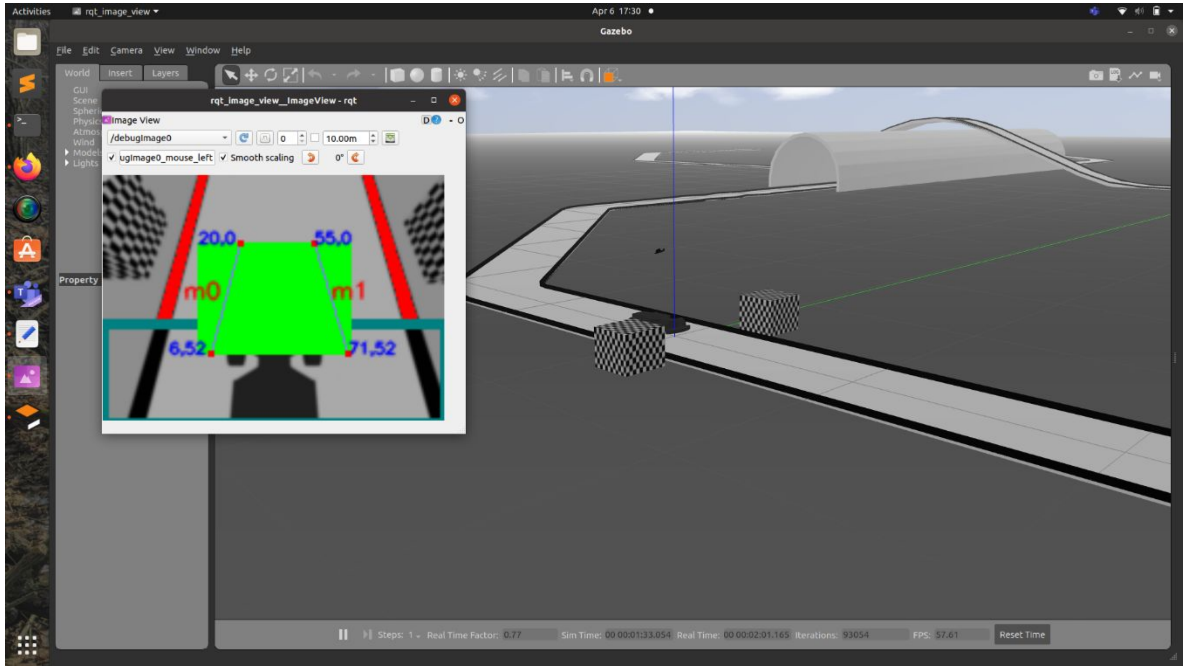
RUNNING THE GAZEBO SIMULATION

To run the Gazebo simulation, we suggest you first restart your VM or PC and/or log out and log back in. Once you've done so, you can run the following command to start the simulation stack and check to see if you get the expected result:

```
$ ros2 launch sim_gazebo_bringup sim_gazebo.launch.py
```

When you run this command, you should see that the Gazebo simulation is booted up, and a QT viewer window showing the simulated pixy camera output (from simulation environment) is opened. Here's what it looks like:

The terminal will start printing continuous ROS messages.



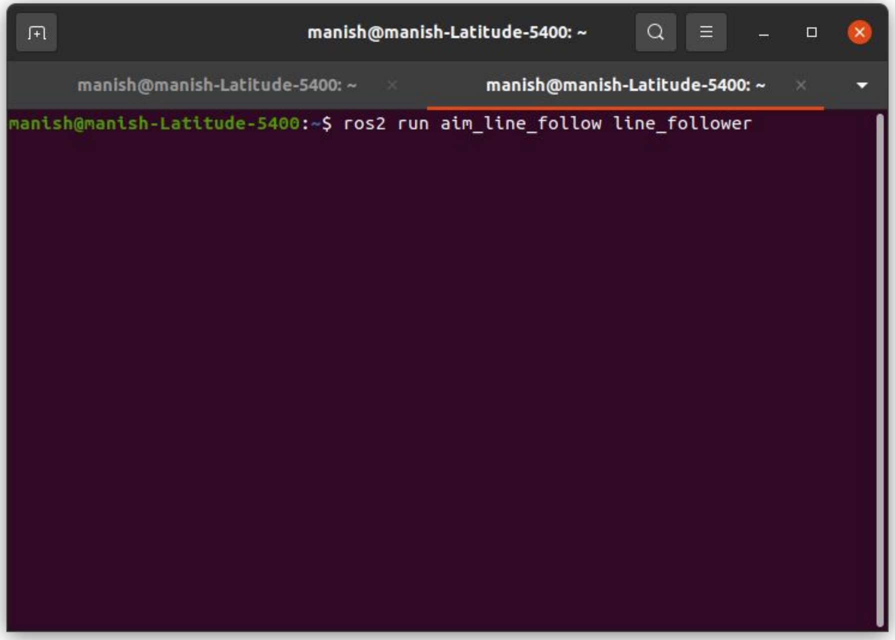
RUNNING THE EXAMPLE SELF-DRIVING ALGORITHM

Running the self-driving car code

To start the simulation open a new separate terminal and run the following command:

$ ros2 run aim_line_follow line_follower

You will now be able to see the car driving in the Gazebo window, as well as the QT window will show updated outputs from pixy camera as the car moves.

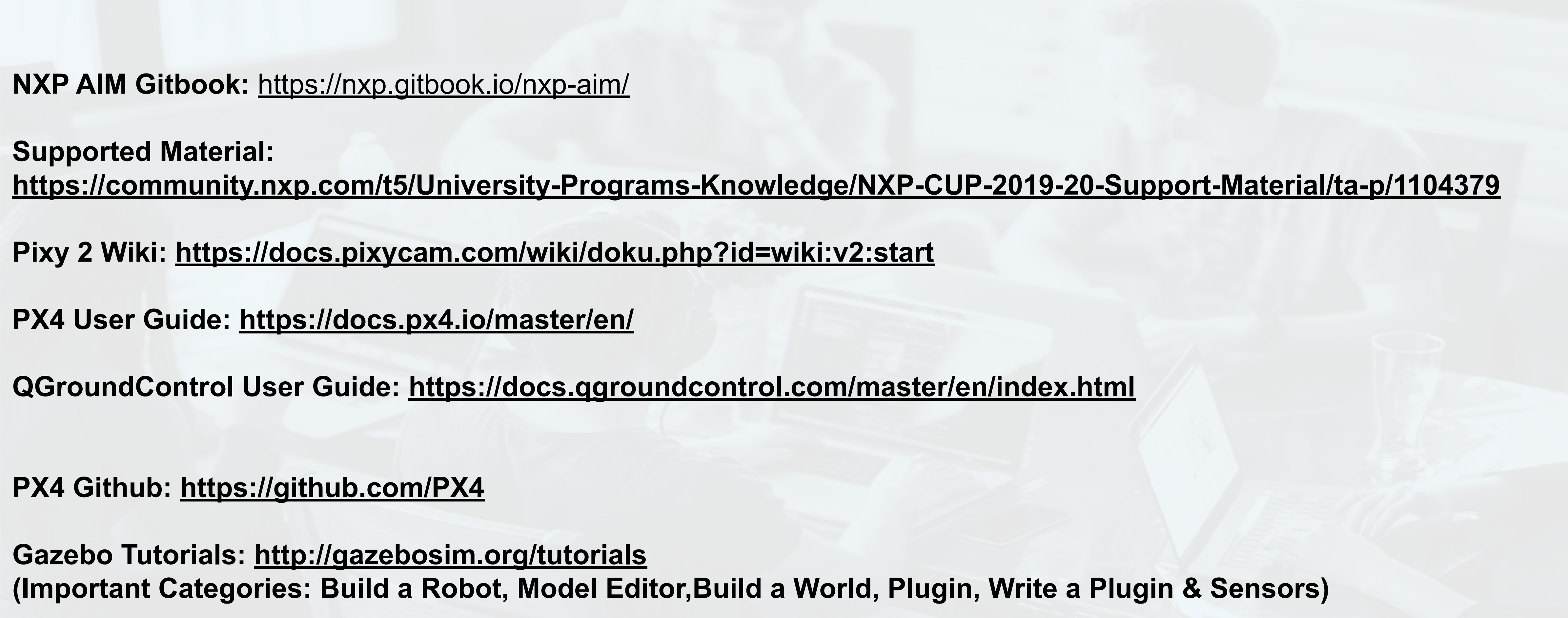


manish@manish-Latitude-5400: ~
manish@manish-Latitude-5400: ~
manish@manish-Latitude-5400: ~

```
manish@manish-Latitude-5400:~$ ros2 run aim_line_follow line_follower
```

NOTE: The code supplied does not currently drive around the track successfully.

USEFUL LINKS AND STUDY MATERIAL



NXP AIM Gitbook: https://nxp.gitbook.io/nxp-aim/

Supported Material:
https://community.nxp.com/t5/University-Programs-Knowledge/NXP-CUP-2019-20-Support-Material/ta-p/1104379

Pixy 2 Wiki: https://docs.pixycam.com/wiki/doku.php?id=wiki:v2:start

PX4 User Guide: https://docs.px4.io/master/en/

QGroundControl User Guide: https://docs.qgroundcontrol.com/master/en/index.html

PX4 Github: https://github.com/PX4

Gazebo Tutorials: http://gazebosim.org/tutorials
(Important Categories: Build a Robot, Model Editor,Build a World, Plugin, Write a Plugin & Sensors)

SECURE CONNECTIONS
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Thank you