GNU/Linux Workshop

by Maryam Behzadi

What did we talk about?

Linux is NOT SCARY!

- Operating Systems
- Free Software
- Linux and GNU Project
- Linux Distros
- 10 Myths about Linux
- Where to Begin?
  - Get to know Free Softwares
  - Install Linux Virtually
  - Install Linux in Dual Boot Mode
  - Successful Migration
- Installation of Ubuntu in VirtualBox

What are we going to say today?

Ubuntu in Action

- Review Ubuntu Installation on VirtualBox
- MBR vs GPT
- BIOS vs UEFI
- Linux FHS
- History of Ubuntu

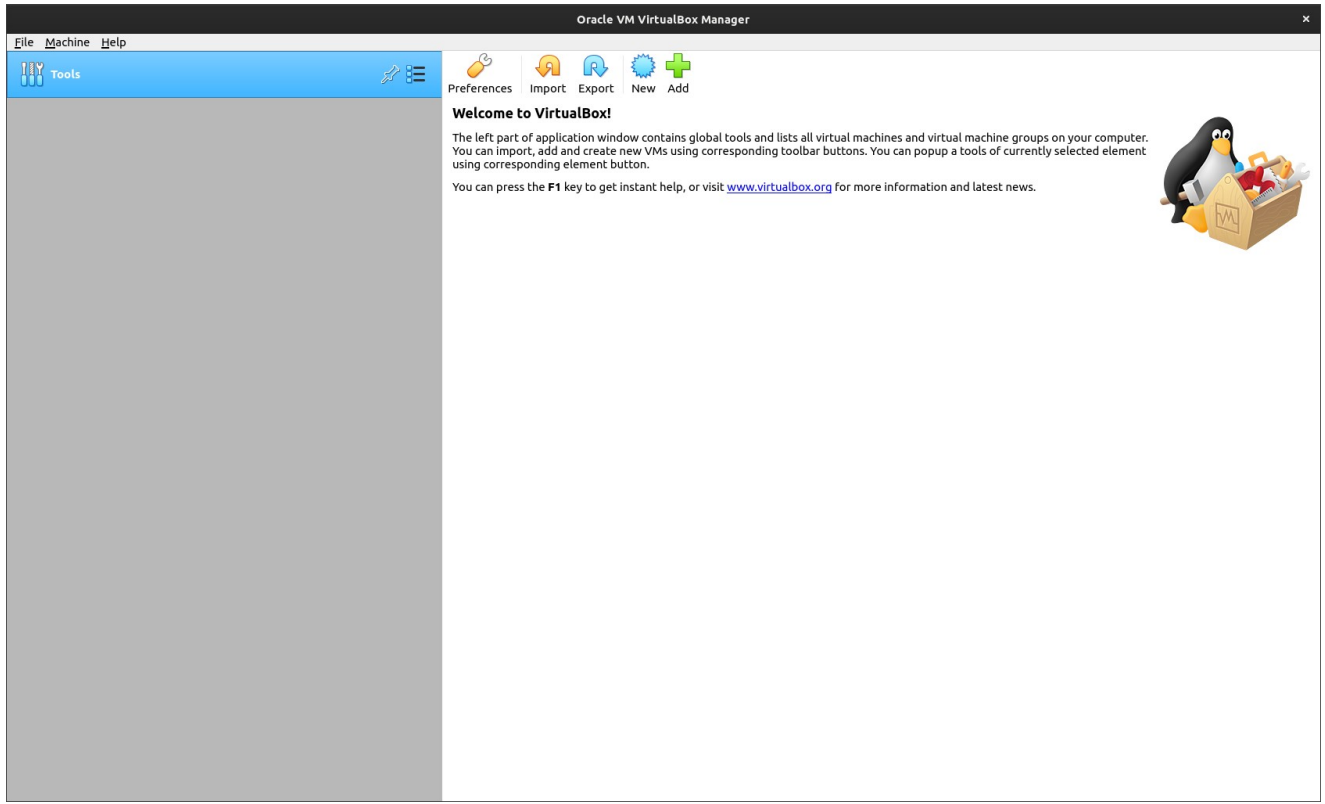
Ubuntu Installation

Installing Ubuntu on Oracle VirtualBox

VirtualBox | Introduction

x86 and Virtualization Product
Free Software
Open Source
Free Price
Oracle Corporation
Initial Release: 2007
Stable Release: 2 months ago
Active Development Community
Cross Platform (Linux, MacOS, Solaris, Windows)
GPLv2
General Purpose (server, desktop, embedded use)

VirtualBox | Creating VM



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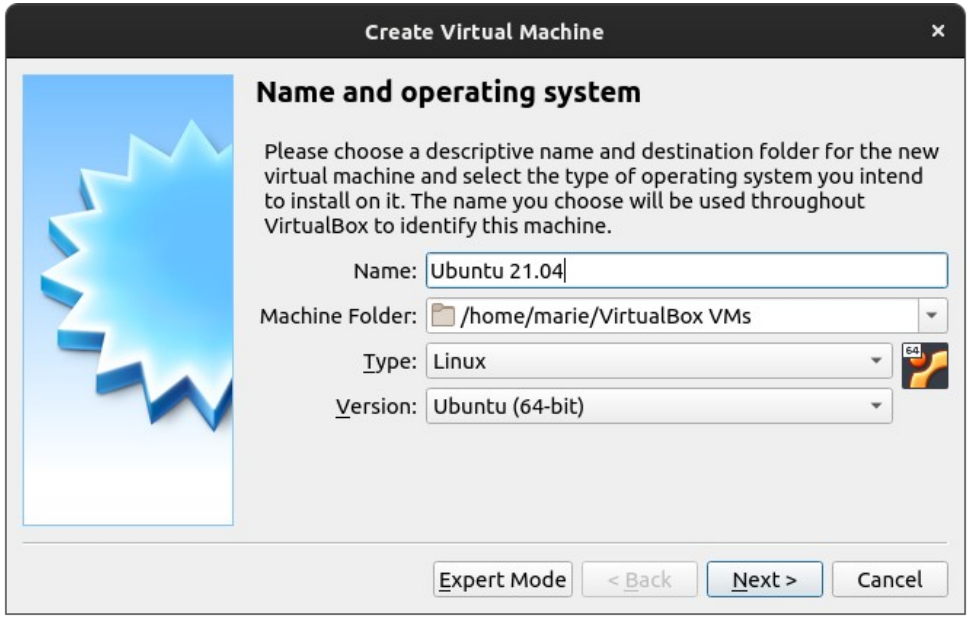

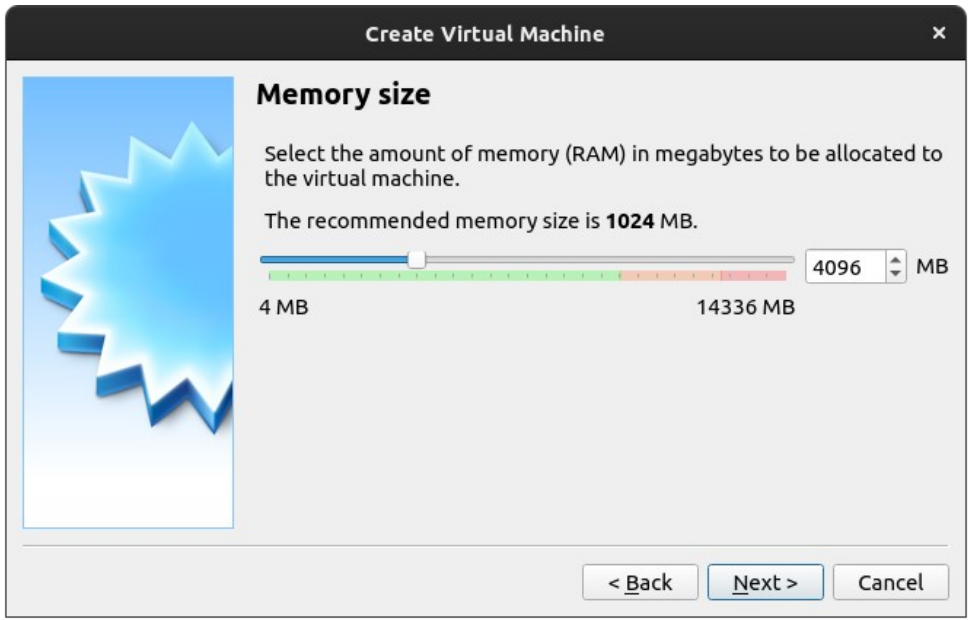

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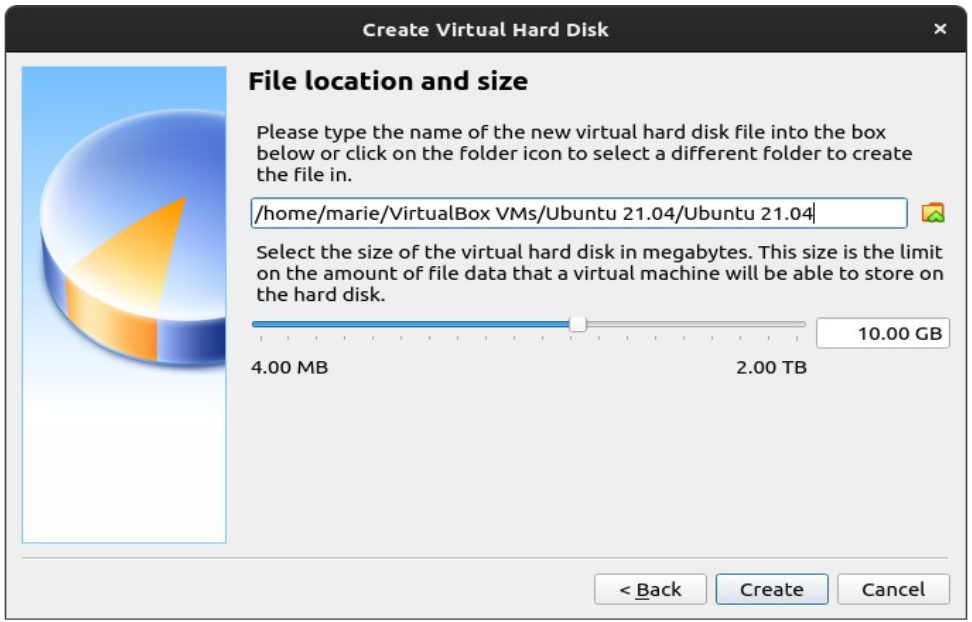

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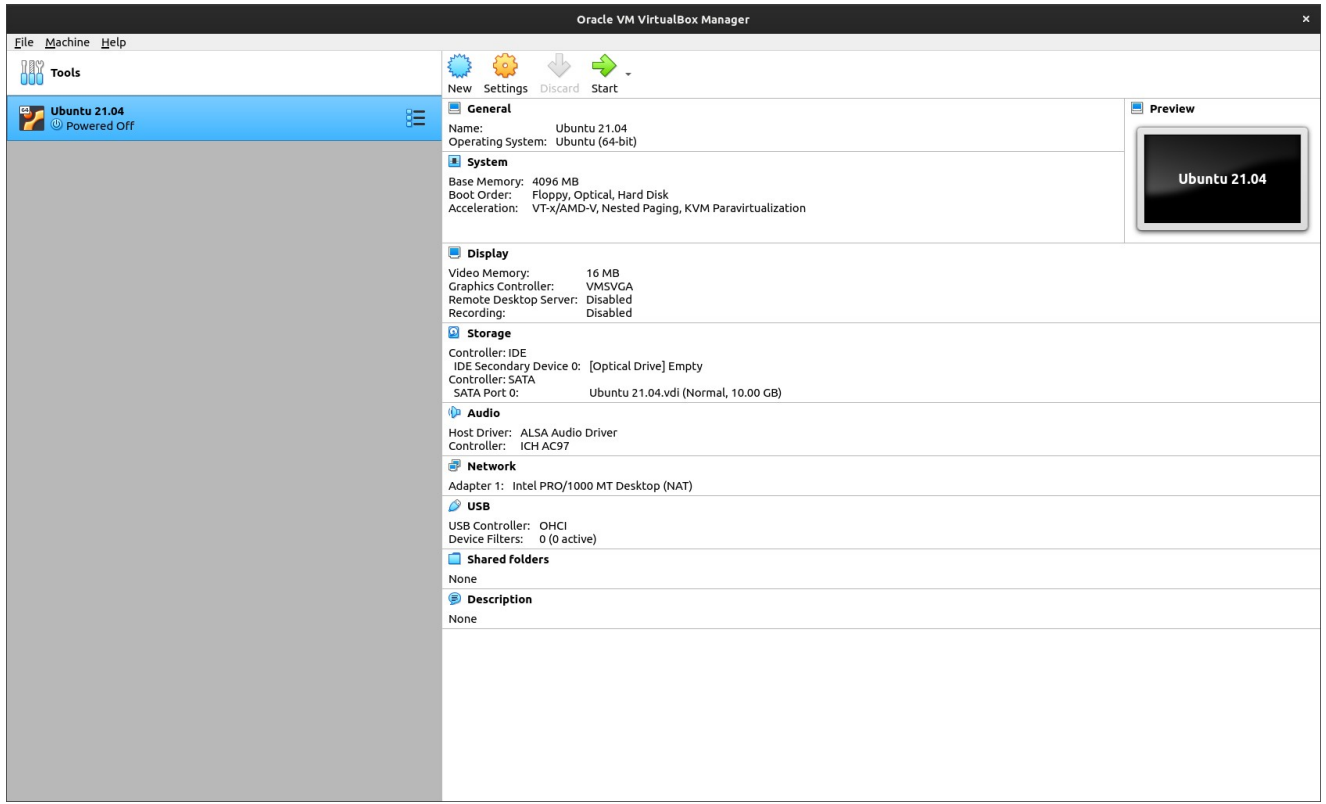

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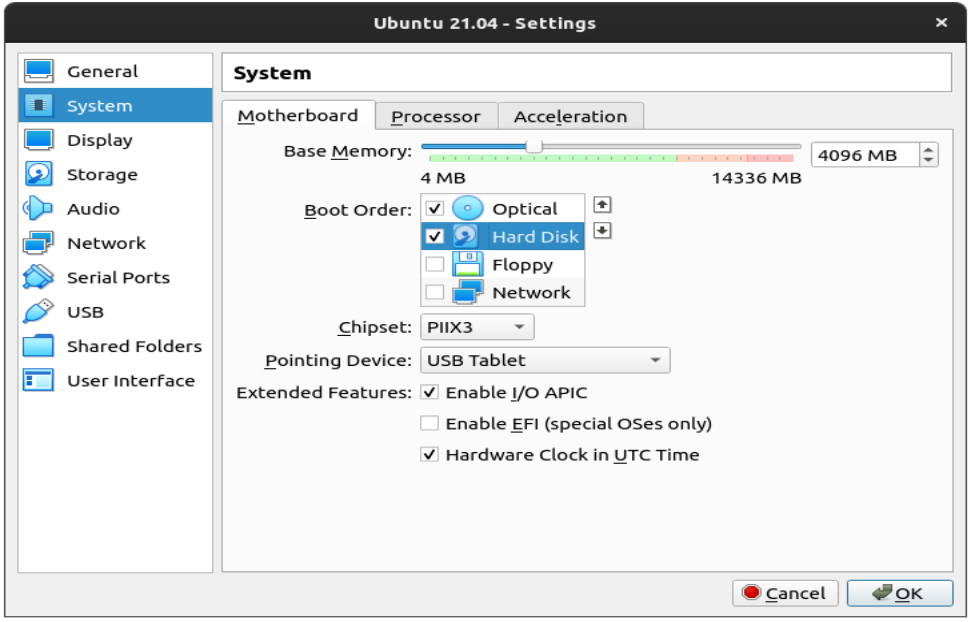

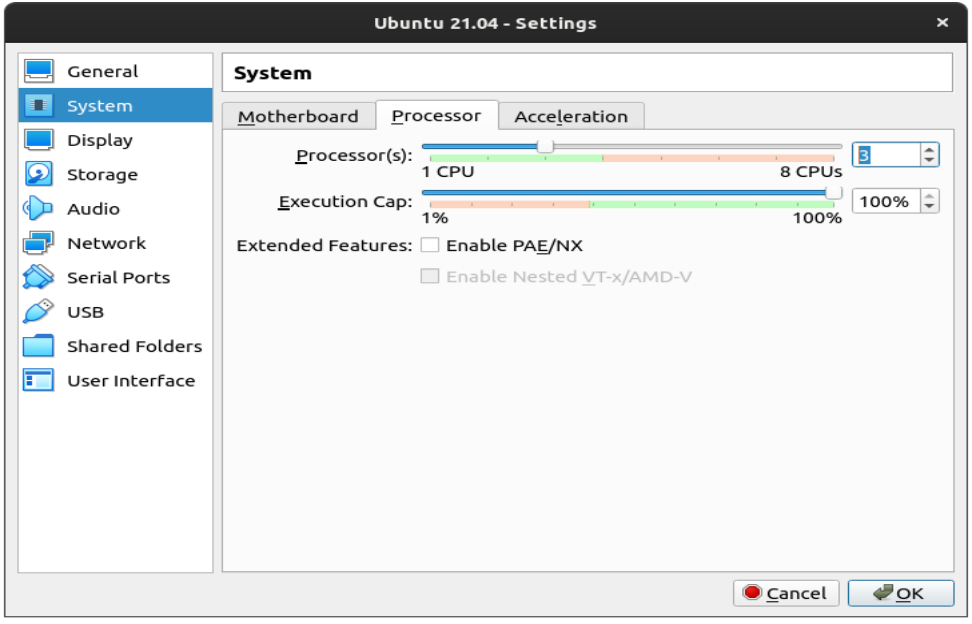

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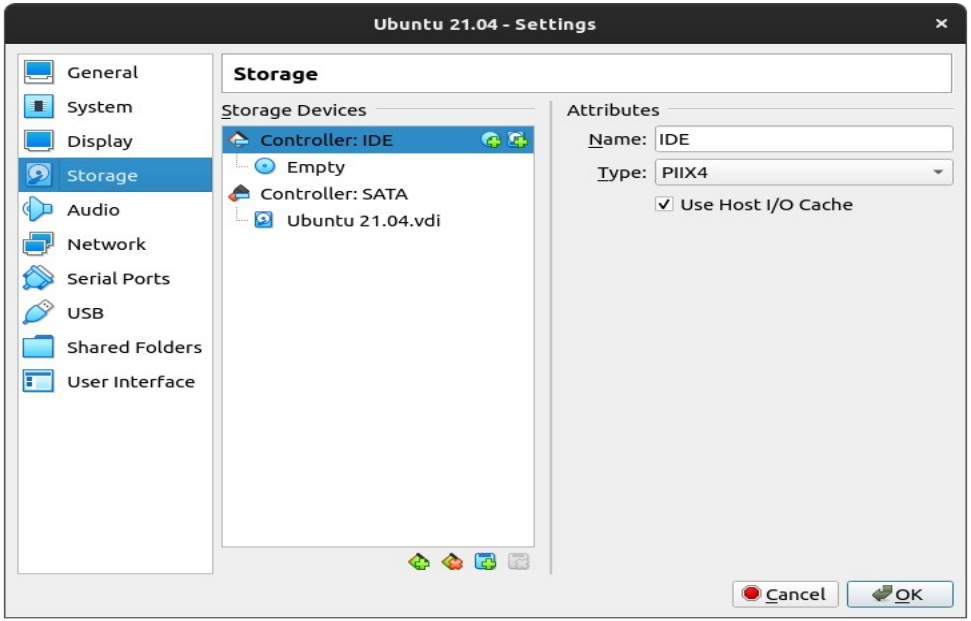

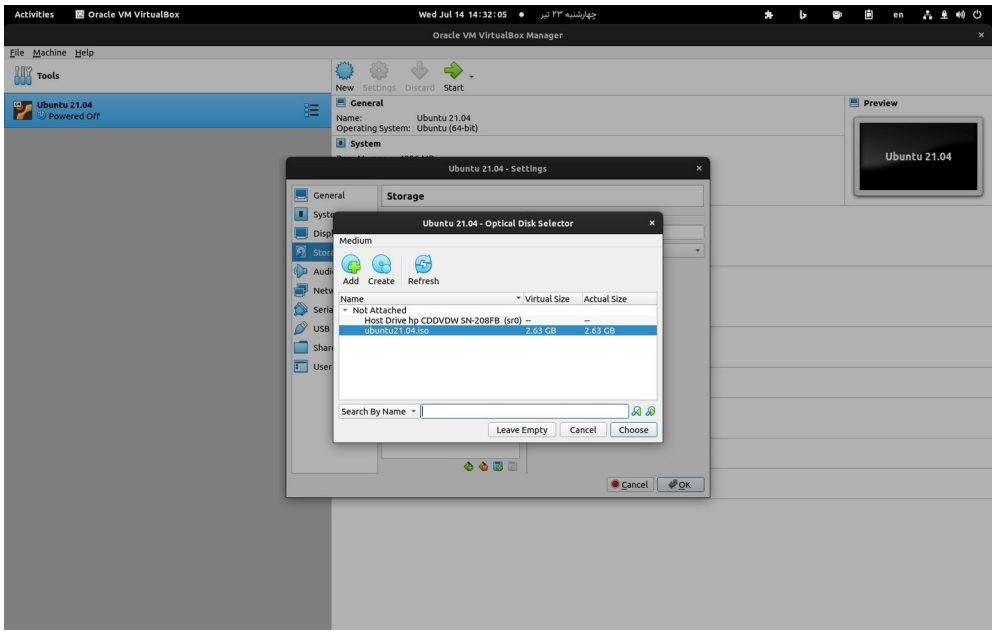

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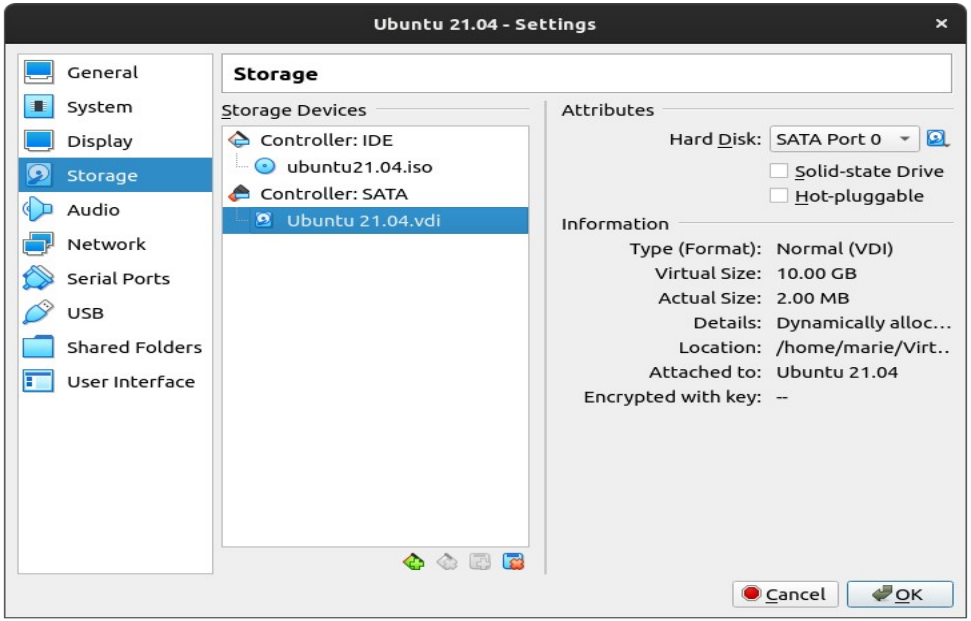

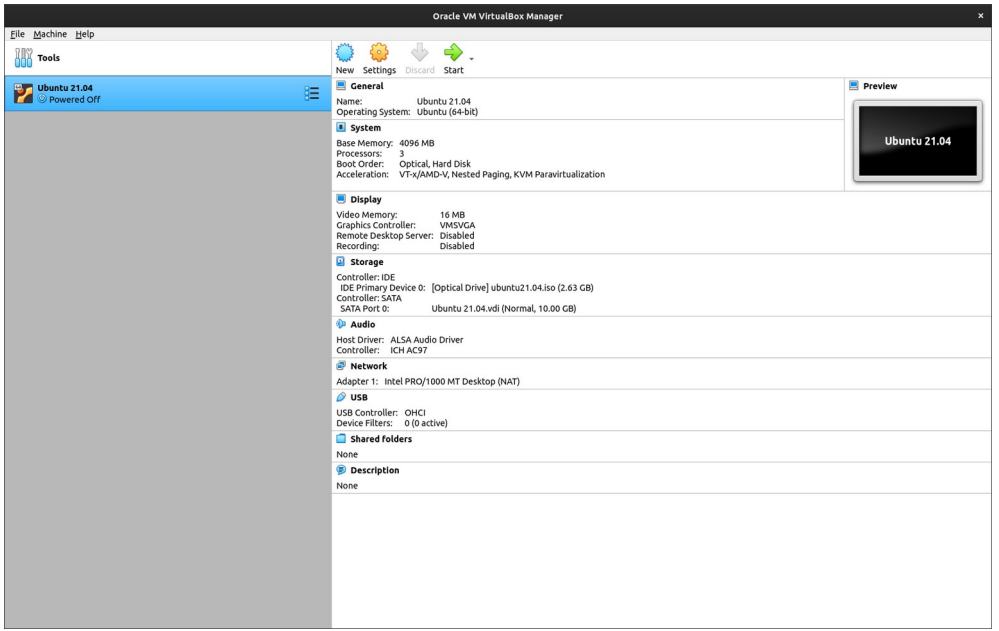

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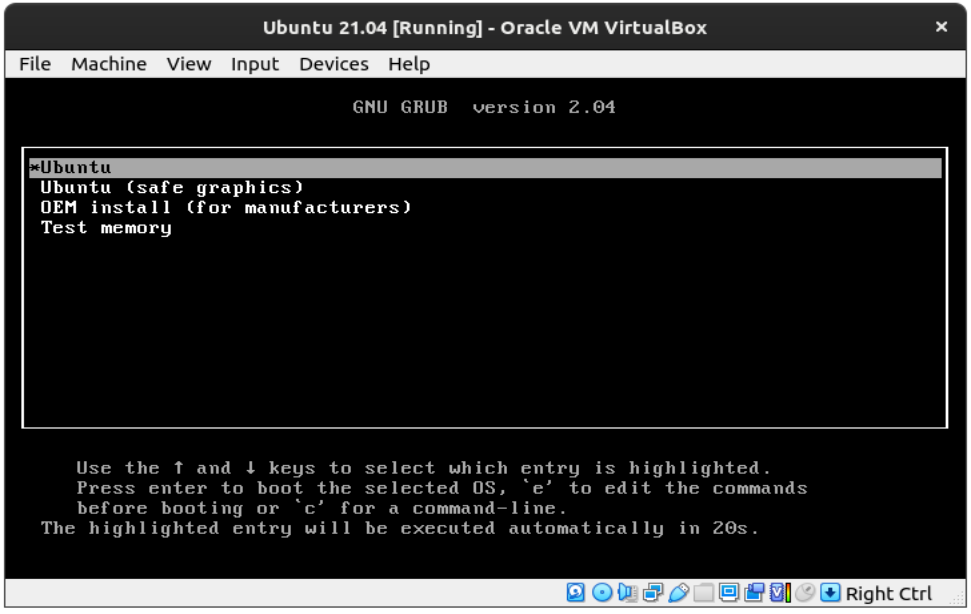

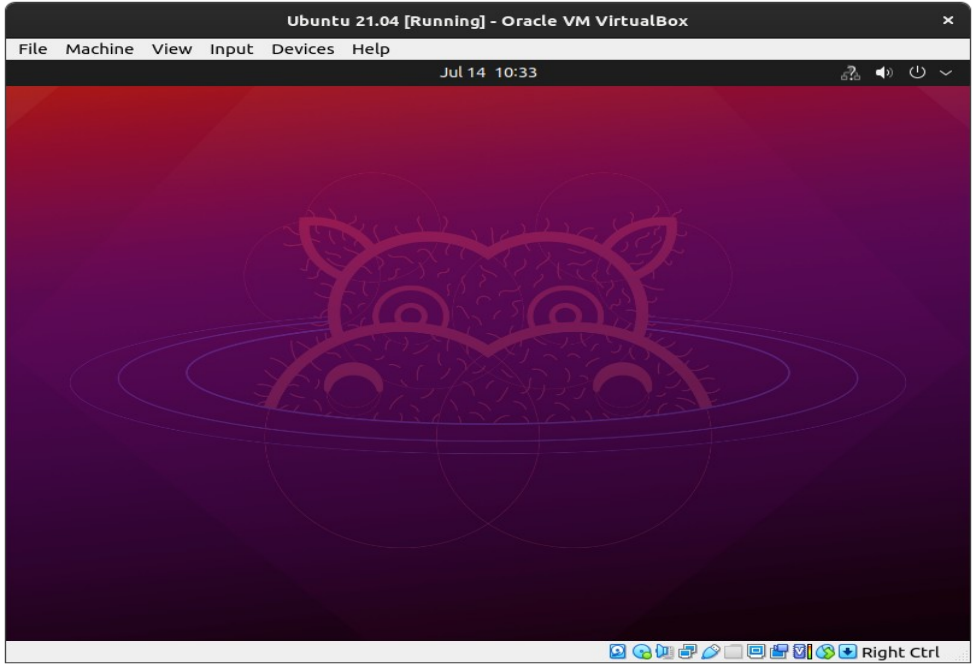

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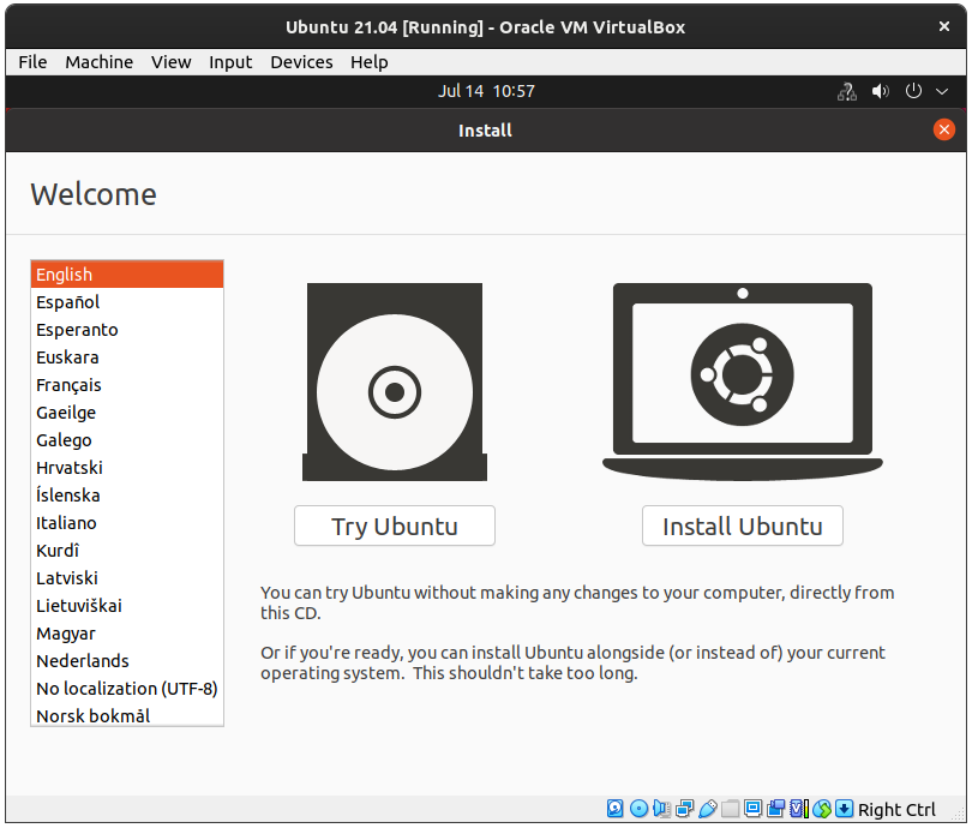

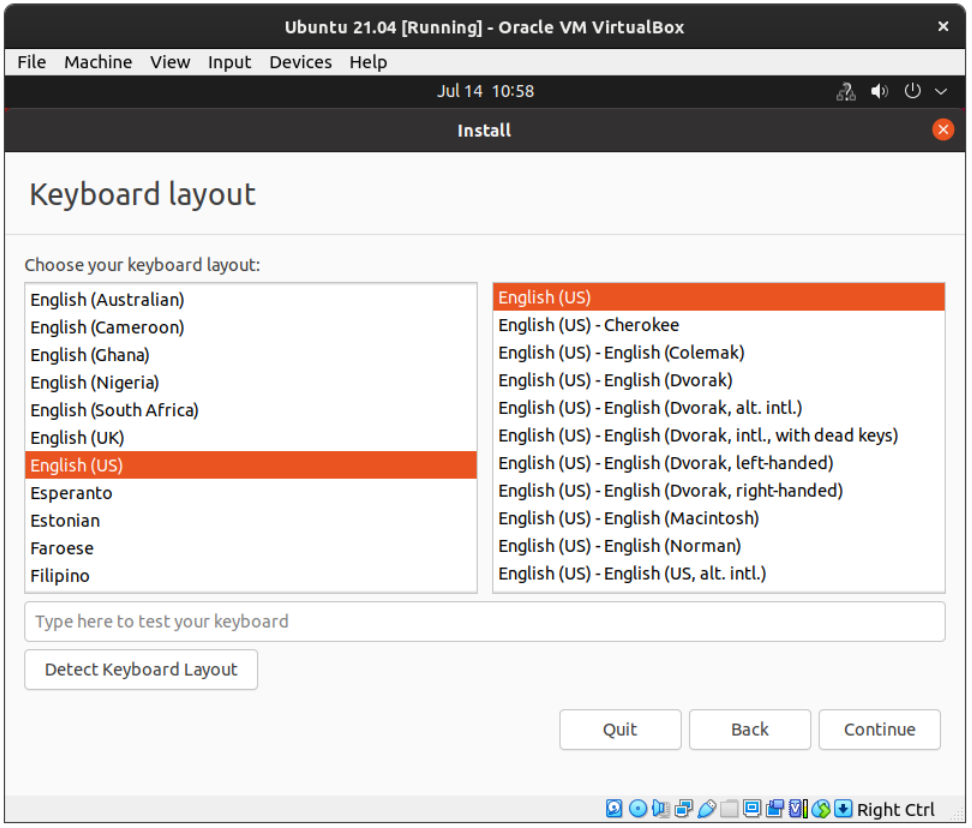

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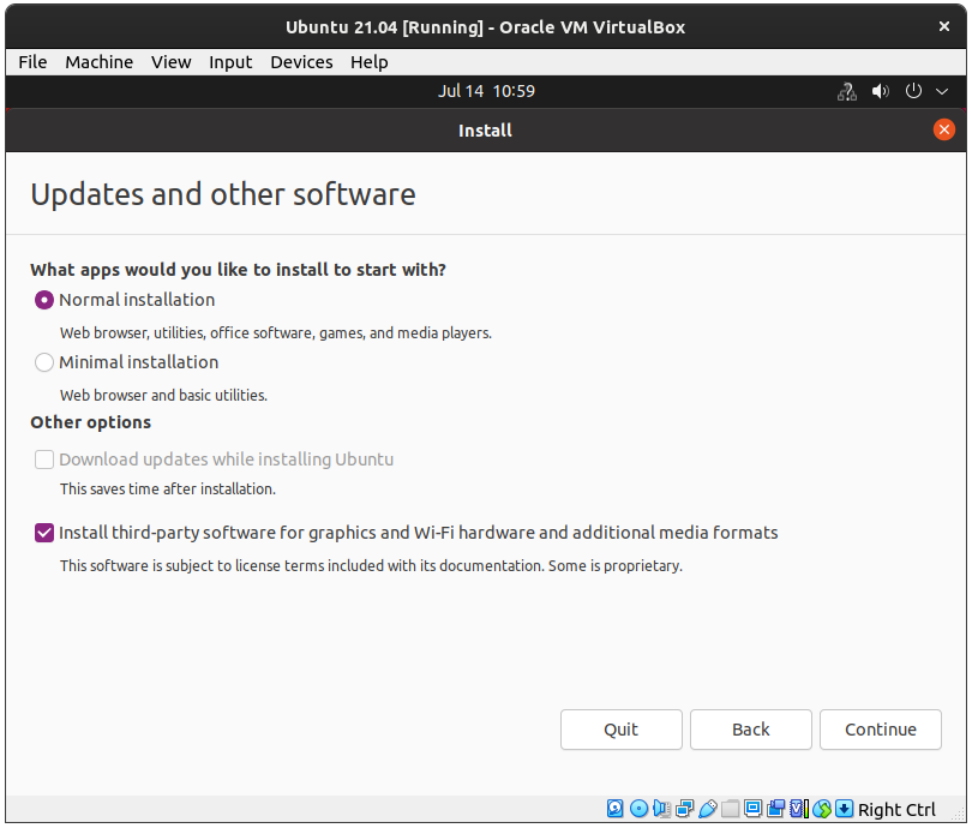

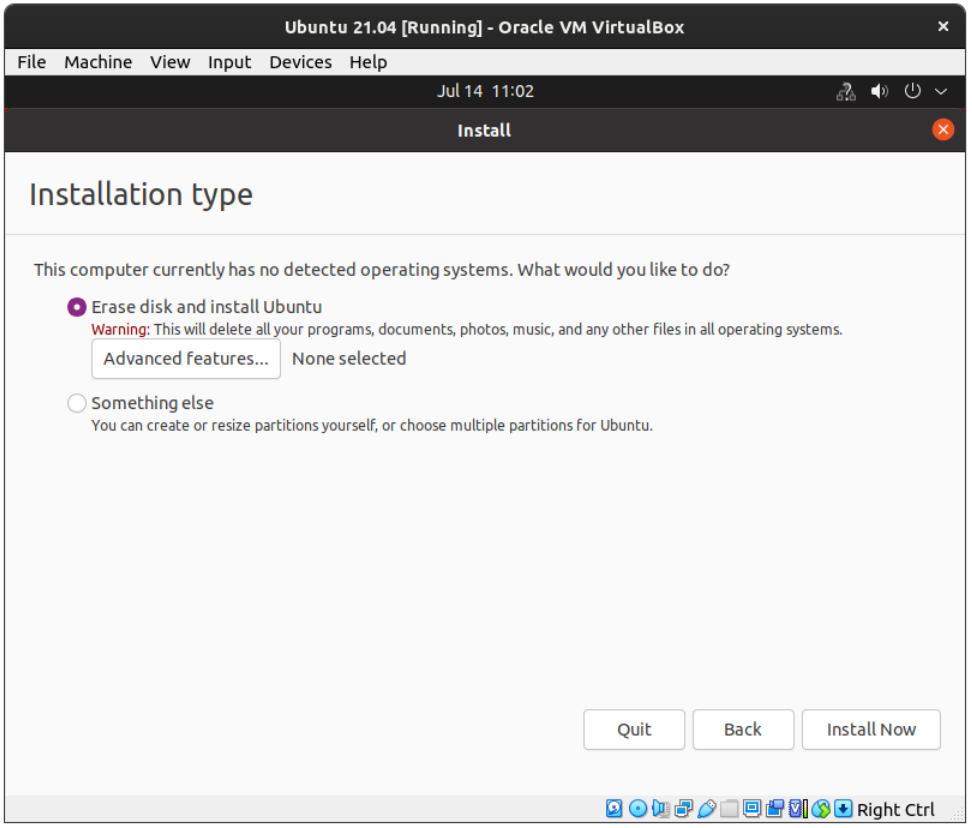

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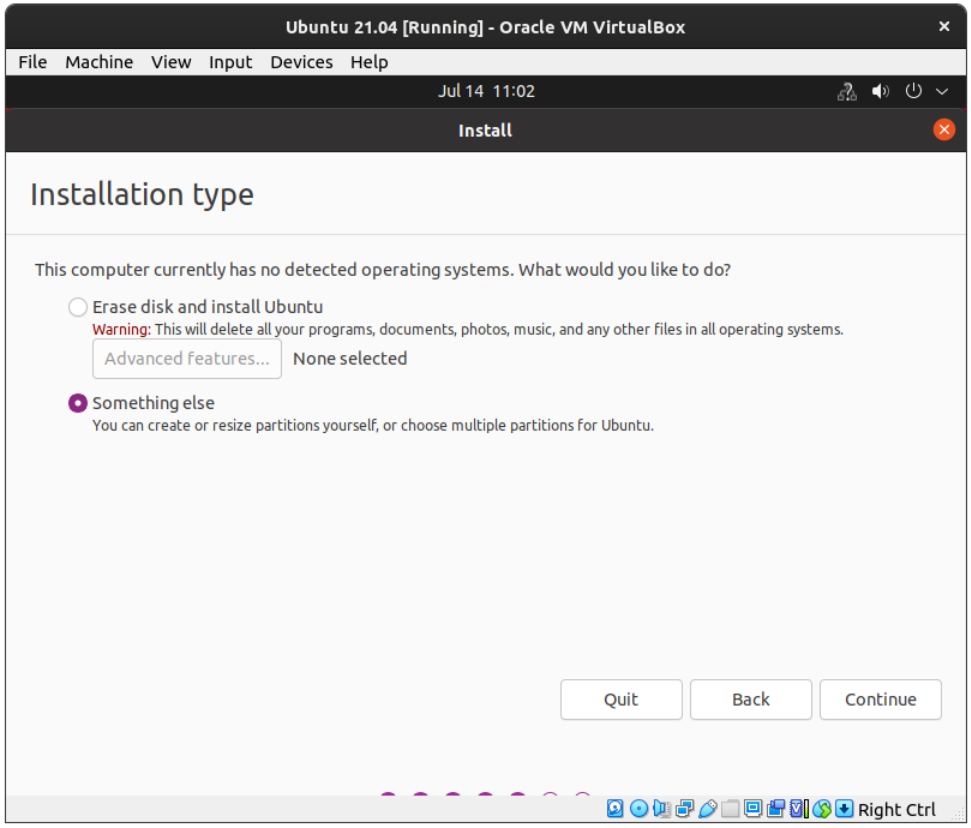

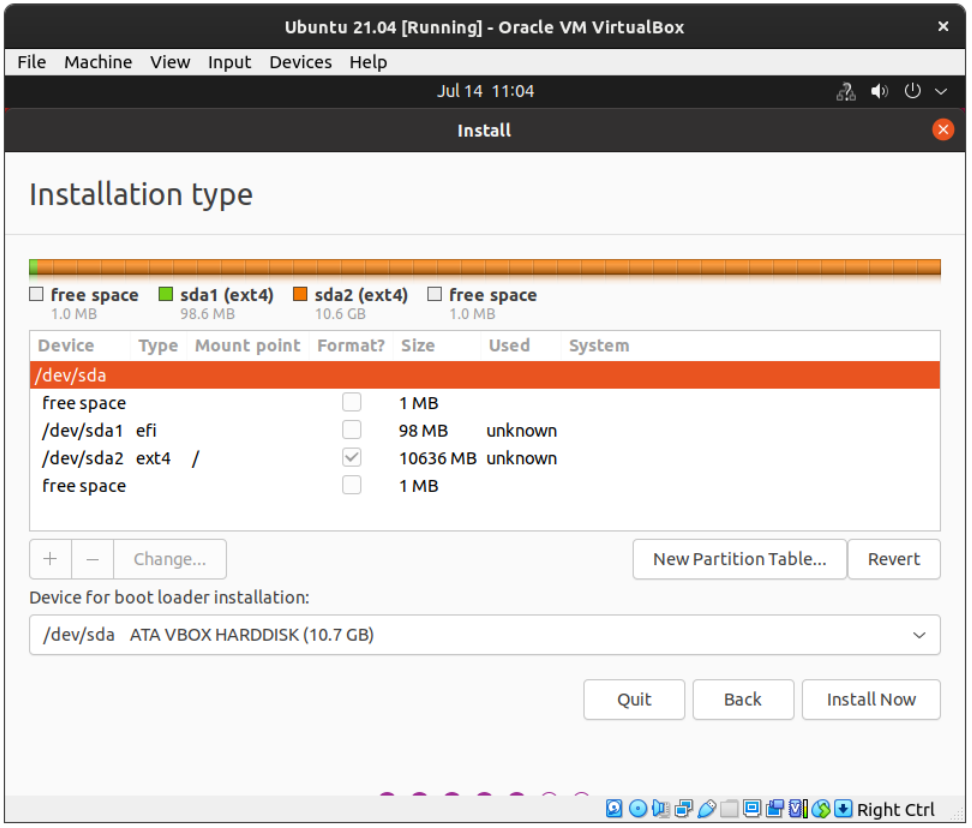

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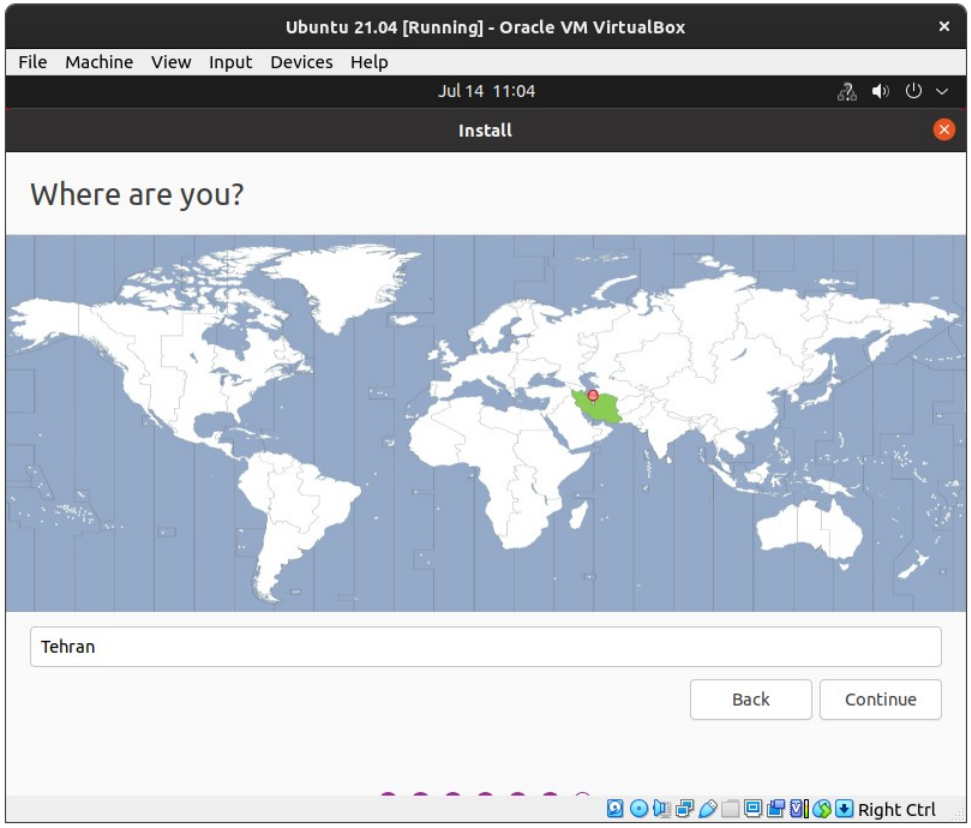

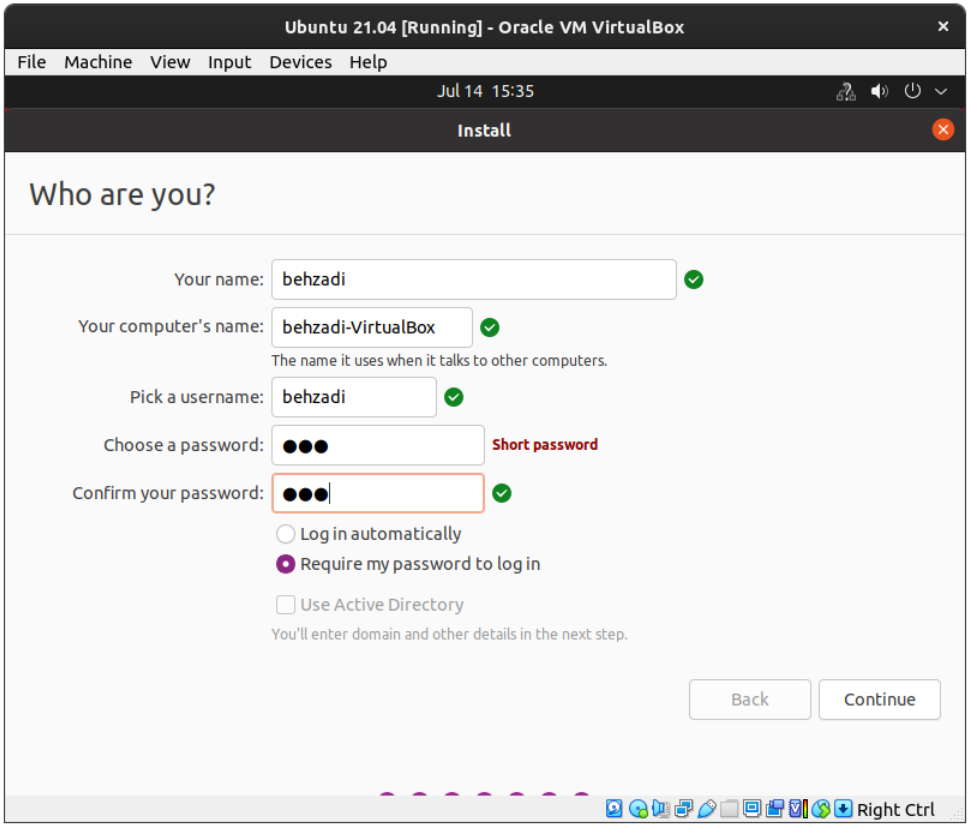

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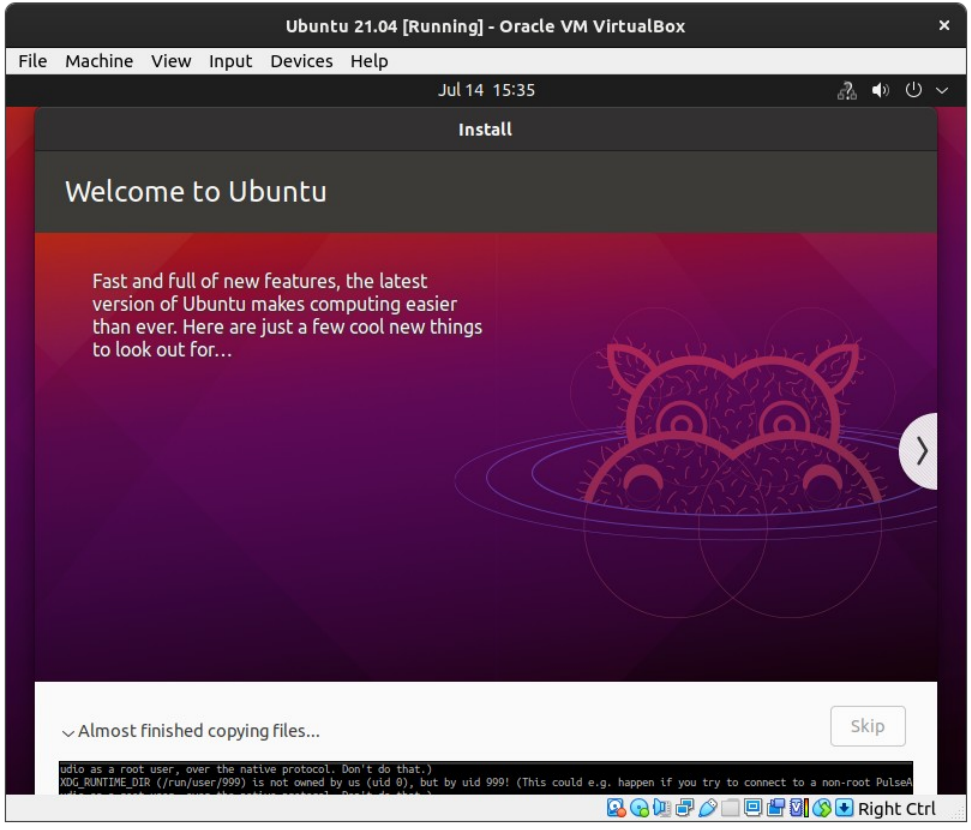
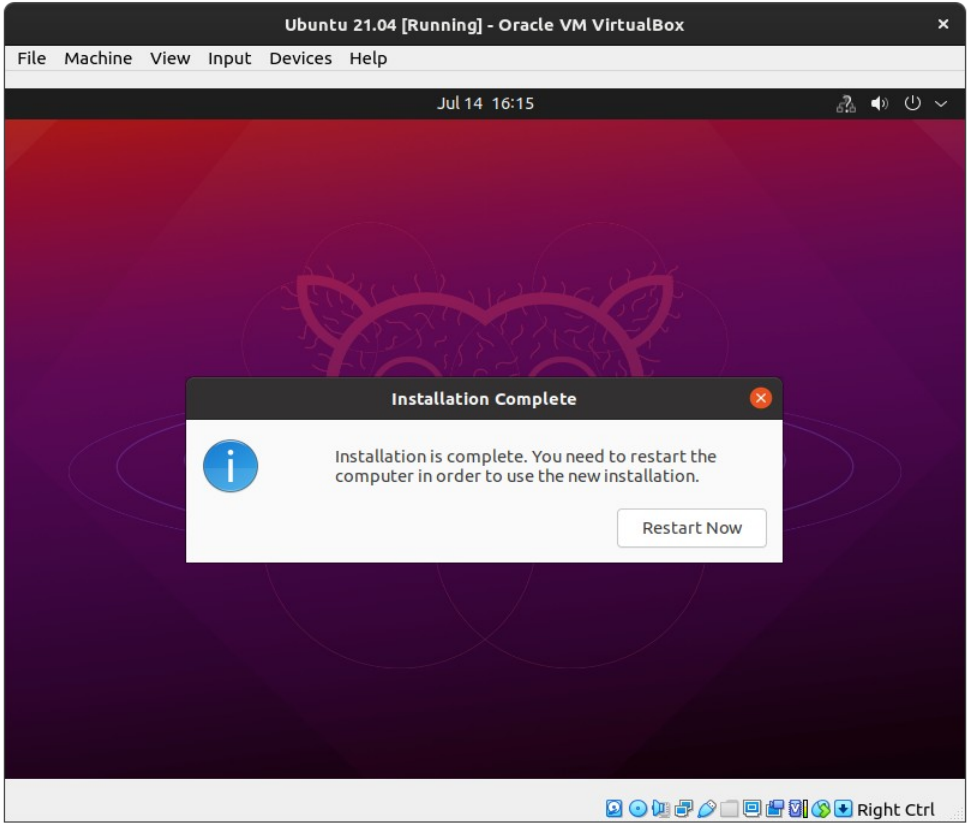
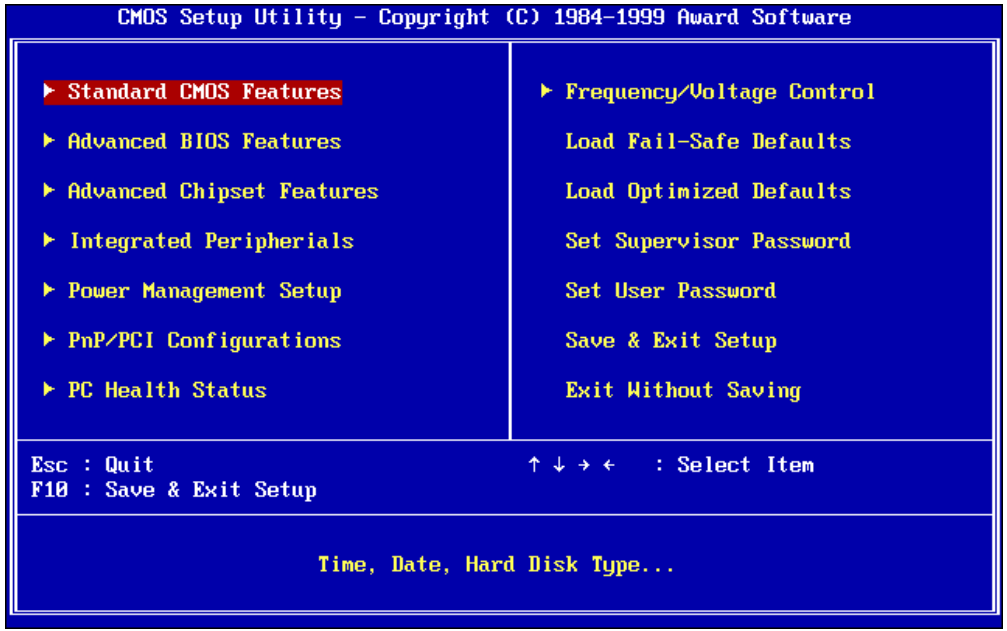




BIOS vs UEFI

What’s The Difference?

BIOS



Basic Input/Output System

The BIOS is where hardware meets software for the first time, and where all the boot magic begins.

The BIOS is used to perform hardware initialization during the booting process (power-on startup), and to provide runtime services for operating systems and programs.

The BIOS code is baked into the motherboard of your PC, usually stored on what is called an EEPROM 1 and is considerably hardware-specific.

The BIOS will soon be dead.

UEFI

Unified Extensible Firmware Interface

UEFI is a more modern and enhanced solution for BIOS.

UEFI Supports larger hard drives, faster boot times, more security features, and—conveniently—graphics and mouse cursors.

Most UEFI implementations provide BIOS emulation so you can choose to install and boot old operating systems that expect a BIOS instead of UEFI, so they're backwards compatible.

UEFI Supports Secure Boot.

GPT vs MBR

Partition Tables: What's The Difference?

What is Partition Table?

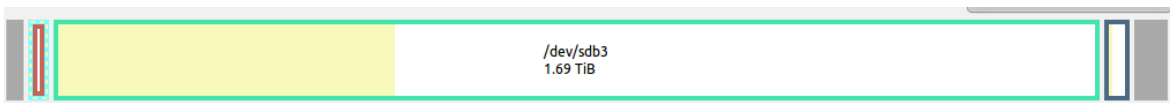
A partition table is a table maintained on a disk by the operating system.

If the partition table is lost, users can not normally write data on disk.

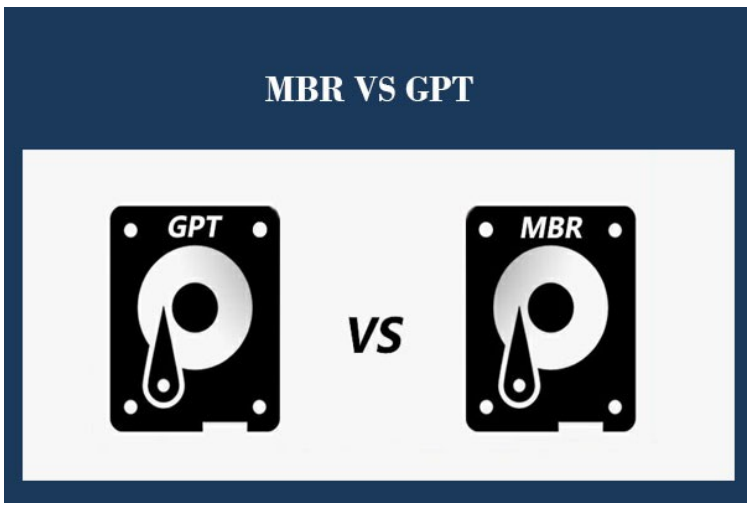
It outlines and describes the partitions on that disk.

Partition table can describe the partitions on disk.

[Info on Partitions, Begin and End Point, Bootable]



Partition	File System	Mount Point	Label	Size	Used	Unused	Flags
unallocated	unallocated			27.94 GiB	---	---	
/dev/sdb2	extended			3.81 GiB	---	---	
/dev/sdb5	linux-swap			3.81 GiB	---	---	
/dev/sdb3	ntfs	/media/Warehouse	Warehouse	1.69 TiB	562.67 GiB	1.14 TiB	
/dev/sdb4	ext4	/		41.91 GiB	8.02 GiB	33.89 GiB	
unallocated	unallocated			55.75 GiB	---	---	



MBR Partition Table

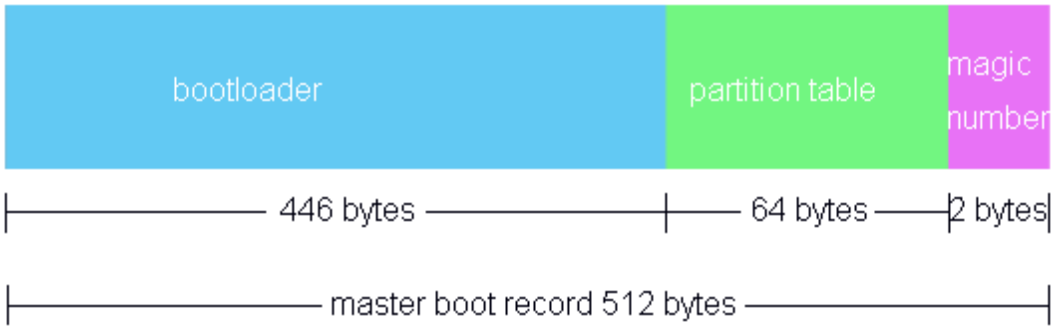
Master Boot Record

The MBR is a special type of boot sector

The MBR is located at the very beginning of partitioned computer mass storage devices

The MBR holds the info on how the logical partitions, containing file systems, are organized on that medium.

The MBR also contains executable code to function as a loader for the installed operating system (Boot Loader).



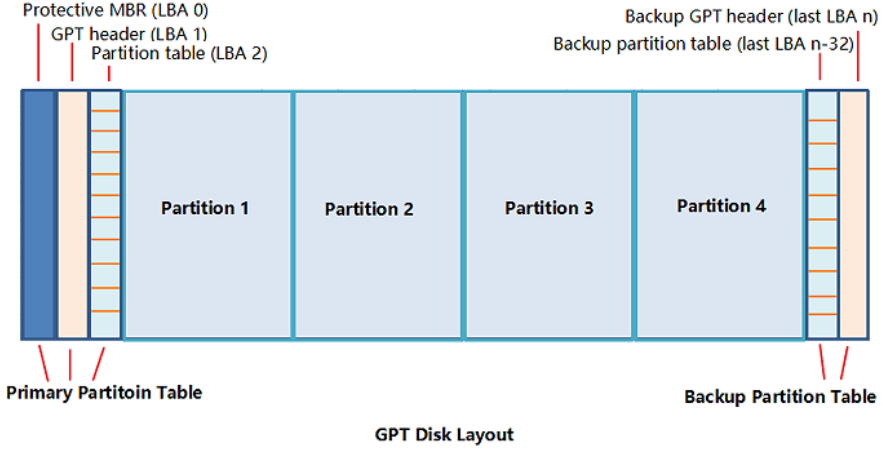
GPT Partition Table

GUID Partition Table

The GPT is the new standard for the layout of partition tables of a physical storage device.

The GPT is a part of UEFI Standard, yet it is also used for some BIOS systems.

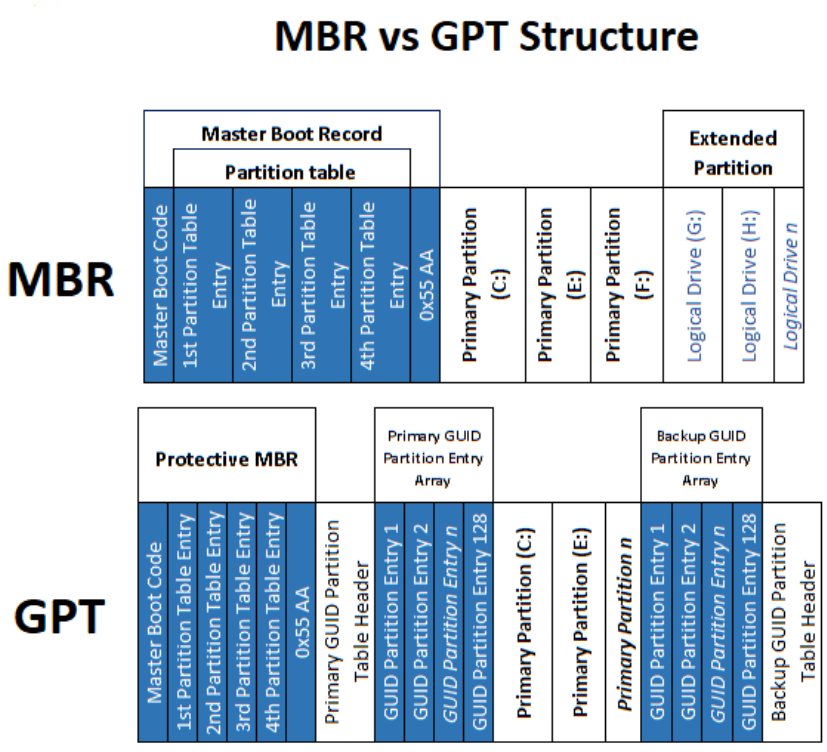
All Modern computers and Operating Systems support GPT. Some of them, including macOS and Windows may support GPT partitions only on systems with EFI support, but FreeBSD and most Linux Distros can boot from GPT Partitions with either BIOS or EFI.

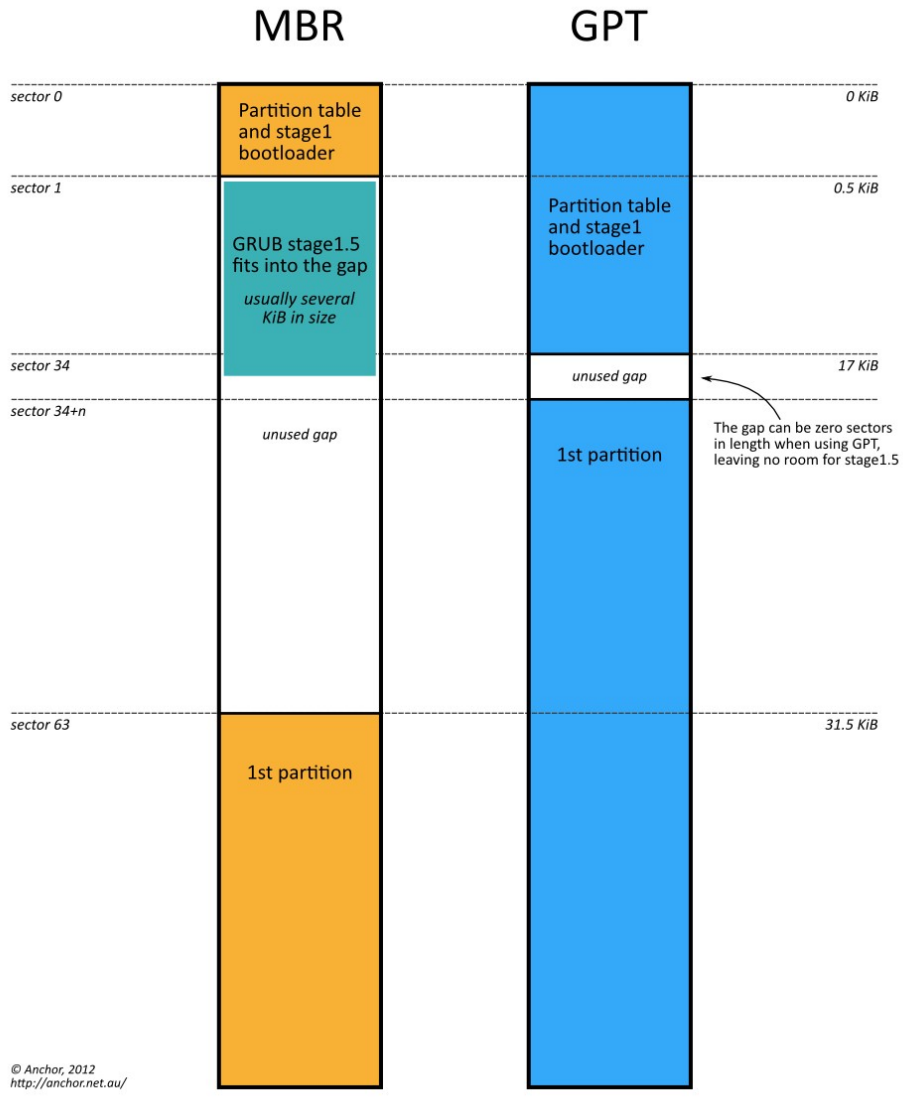


GPT Disk Layout

Block:	Contents:			
LBA 0	Protective MBR			
LBA 1	Primary GPT Header			
LBA 2	Entry 1	Entry 2	Entry 3	Entry 4
LBA 3	Entries 5 – 128			
LBA 34 to LBA -34	Partition 1			
	Partition 2			
	Remaining Partitions			
LBA – 33	Entry 1	Entry 2	Entry 3	Entry 4
LBA – 2	Entries 5 – 128			
LBA – 1	Secondary GPT Header			

GPT vs MBR


MBR vs GPT Structure
MBR
Master Boot Record
Partition table
Master Boot Code
1st Partition Table Entry
2nd Partition Table Entry
3rd Partition Table Entry
4th Partition Table Entry
0x55 AA
Primary Partition (C:)
Primary Partition (E:)
Primary Partition (F:)
Extended Partition
Logical Drive (G:)
Logical Drive (H:)
Logical Drive n
GPT
Protective MBR
Master Boot Code
1st Partition Table Entry
2nd Partition Table Entry
3rd Partition Table Entry
4th Partition Table Entry
0x55 AA
Primary GUID Partition Table Header
Primary GUID Partition Entry Array
GUID Partition Entry 1
GUID Partition Entry 2
GUID Partition Entry n
GUID Partition Entry 128
Primary Partition (C:)
Primary Partition (E:)
Primary Partition n
Backup GUID Partition Entry Array
GUID Partition Entry 1
GUID Partition Entry 2
GUID Partition Entry n
GUID Partition Entry 128
Backup GUID Partition Table Header


MBR
GPT
sector 0
0 KiB
Partition table and stage1 bootloader
sector 1
0.5 KiB
GRUB stage1.5 fits into the gap
usually several KiB in size
Partition table and stage1 bootloader
sector 34
17 KiB
unused gap
sector 34+n
unused gap
1st partition
The gap can be zero sectors in length when using GPT, leaving no room for stage1.5
sector 63
31.5 KiB
1st partition
© Anchor, 2012
http://anchor.net.au/

GPT vs MBR

GPT

- GPT-based drives can be much larger
- GPT also allows for a nearly unlimited number of partitions:
  - The Only Limitation Would be your OS
  - Windows allows up to 128 partitions on a GPT drive
- GPT is more Robust and can recover if the data is corrupted

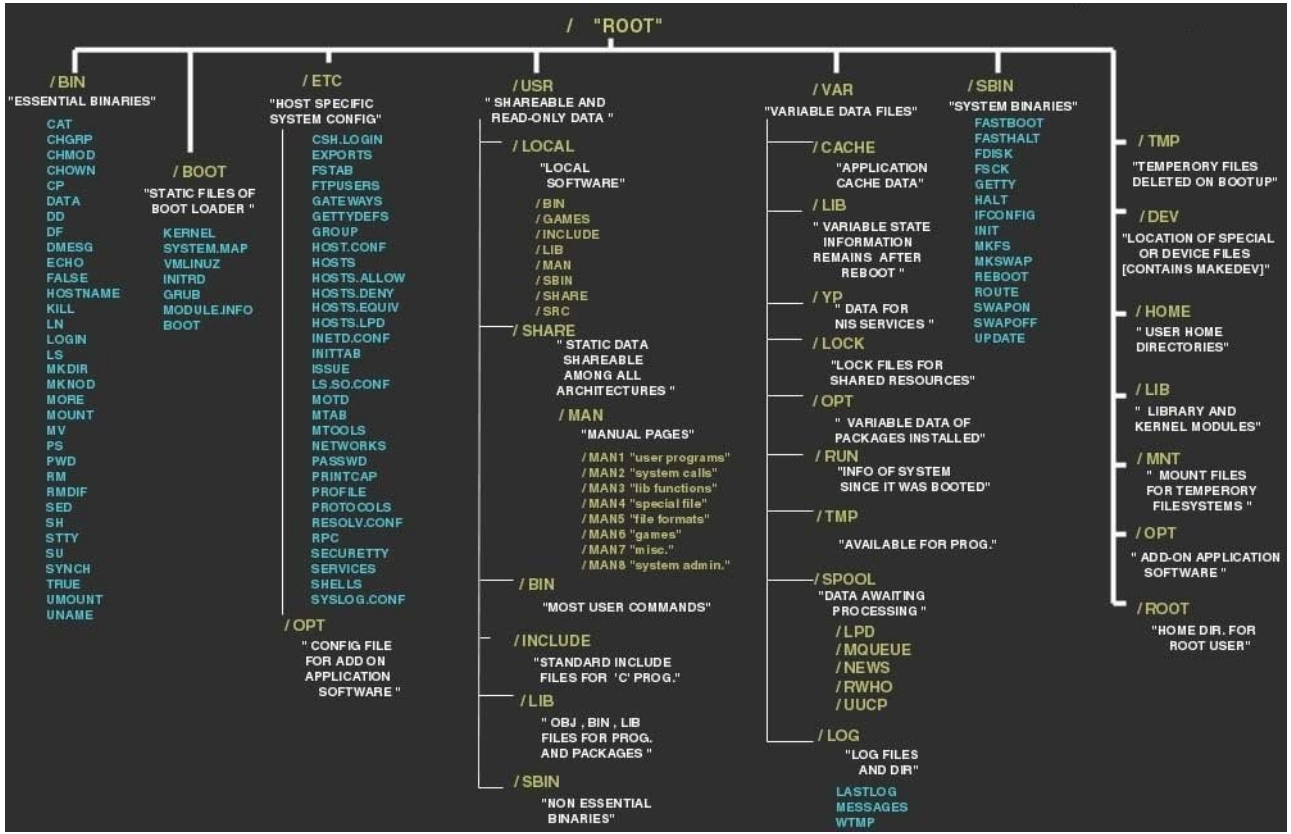
MBR

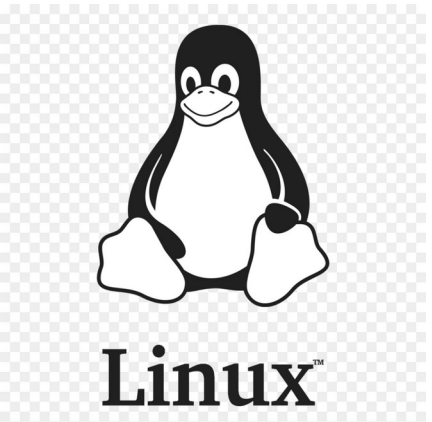
- only works with disks up to 2 TB in size
- only supports up to four primary partitions
- the partitioning and boot data is stored in one place
  - If this data is overwritten or corrupted, you're in trouble

Linux FHS

Linux Filesystem Hierarchy Standard

Filesystem Hierarchy Standard

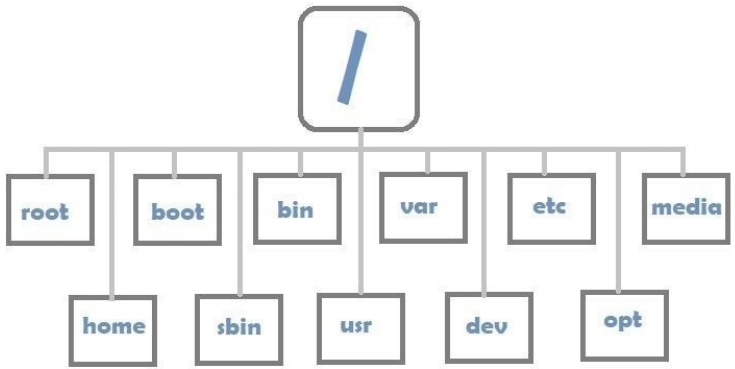




Everything...
is a file.

Filesystem Hierarchy Standard

Directory	Description
bin	Essential command binaries
boot	Static files of the boot loader
dev	Device files
etc	Host-specific system configuration
lib	Essential shared libraries and kernel modules
media	Mount point for removable media
mnt	Mount point for mounting a filesystem temporarily
opt	Add-on application software packages
run	Data relevant to running processes
sbin	Essential system binaries
srv	Data for services provided by this system
tmp	Temporary files
usr	Secondary hierarchy
var	Variable data



Ubuntu

Humanity to Others

Ubuntu Meaning

ubuntu

(n.) "*I am what I am because of who we all are*"; compassion, kindness and humanity that connect us together by sharing ourselves with others and caring for those around us

ubuntu ©

"Why let Microsoft give you Windows while Linux can give you a House ?"

Ubuntu Background

One of the most popular Linux Distributions

Free and Open-Source

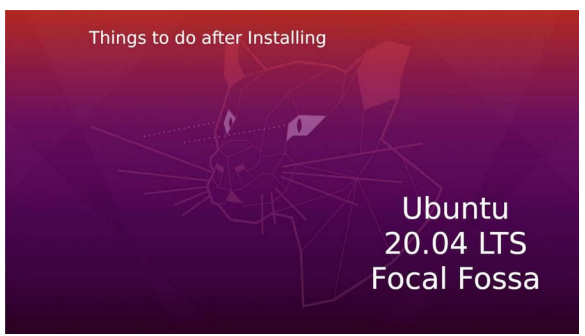
Based on Debian

Developed by Canonical + other developers

Three different editions: Server, Desktop, Core

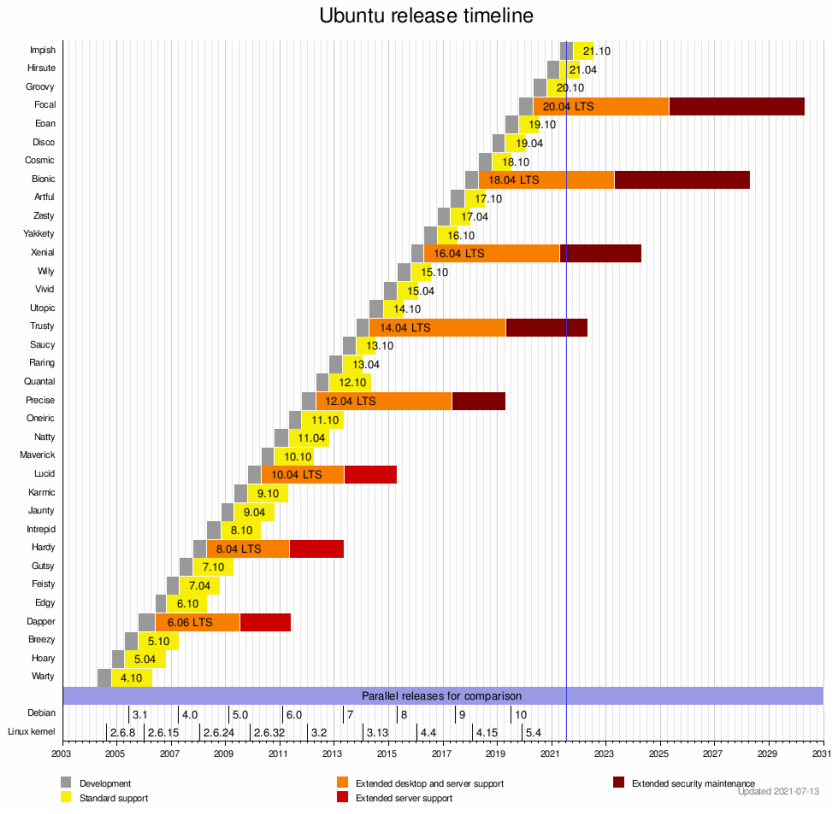
Two different release types:

Standard (release every 6 months, support for 9 months) and **LTS** (release every 2 years, support for 5 years)

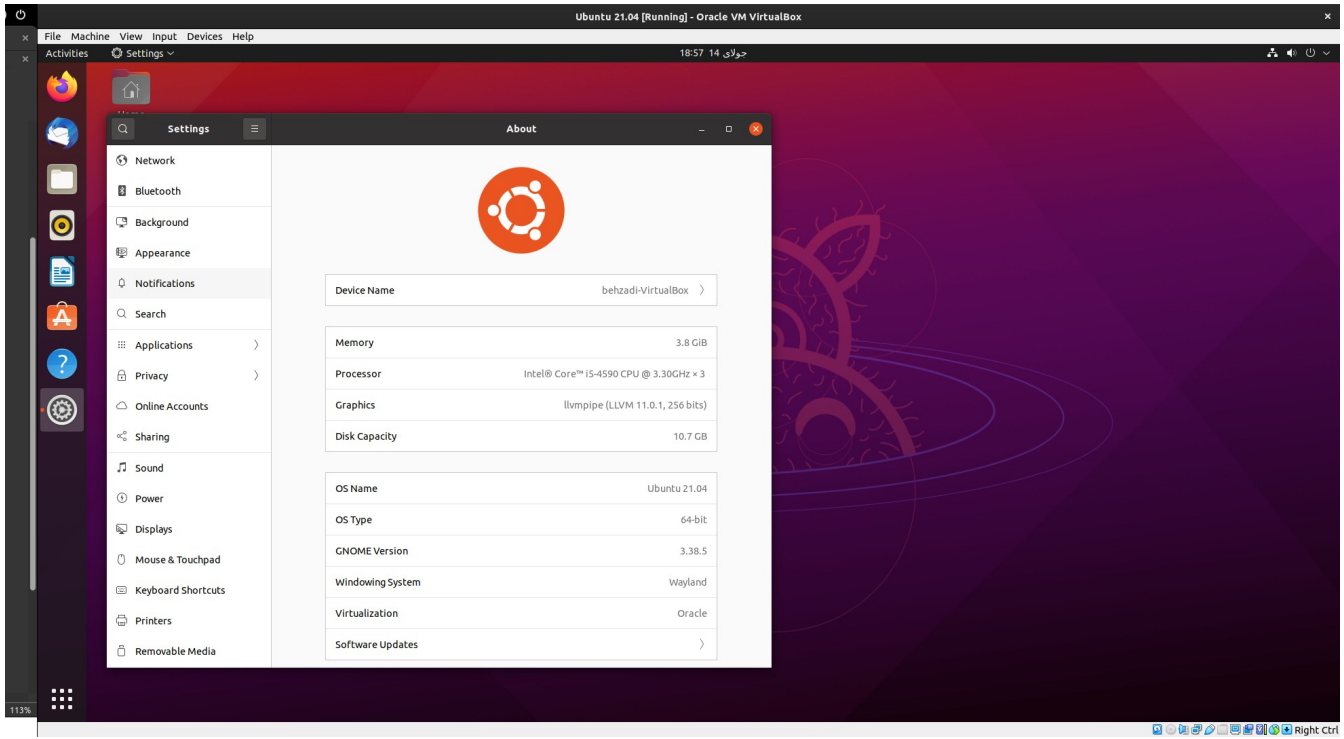


Ubuntu Releases

Version	Code name	Docs	Release	End of Standard Support	End of Life
Ubuntu 21.04	Hirsute Hippo	Release Notes	April 22, 2021	January 2022	January 2022
Ubuntu 20.10	Groovy Gorilla	Release Notes	October 22, 2020	July 2021	July 2021
Ubuntu **20.04.2 LTS**	Focal Fossa	Changes	February 4, 2021	April 2025	April 2030
Ubuntu 20.04.1 LTS	Focal Fossa	Changes	August 6, 2020	April 2025	April 2030
Ubuntu 20.04 LTS	Focal Fossa	Release Notes	April 23, 2020	April 2025	April 2030
Ubuntu **18.04.5 LTS**	Bionic Beaver	Changes	August 13, 2020	April 2023	April 2028
Ubuntu 18.04.4 LTS	Bionic Beaver	Changes	February 12, 2020	April 2023	April 2028
Ubuntu 18.04.3 LTS	Bionic Beaver	Changes	August 8, 2019	April 2023	April 2028
Ubuntu 18.04.2 LTS	Bionic Beaver	Changes	February 15, 2019	April 2023	April 2028
Ubuntu 18.04.1 LTS	Bionic Beaver	Changes	July 26, 2018	April 2023	April 2028
Ubuntu 18.04 LTS	Bionic Beaver	Release Notes	April 26, 2018	April 2023	April 2028
Ubuntu **16.04.7 LTS**	Xenial Xerus	Changes	August 13, 2020	April 2021	April 2024
Ubuntu 16.04.6 LTS	Xenial Xerus	Changes	February 28, 2019	April 2021	April 2024
Ubuntu 16.04.5 LTS	Xenial Xerus	Changes	August 2, 2018	April 2021	April 2024
Ubuntu 16.04.4 LTS	Xenial Xerus	Changes	March 1, 2018	April 2021	April 2024
Ubuntu 16.04.3 LTS	Xenial Xerus	Changes	August 3, 2017	April 2021	April 2024
Ubuntu 16.04.2 LTS	Xenial Xerus	Changes	February 16, 2017	April 2021	April 2024
Ubuntu 16.04.1 LTS	Xenial Xerus	Changes	July 21, 2016	April 2021	April 2024
Ubuntu 16.04 LTS	Xenial Xerus	Release Notes	April 21, 2016	April 2021	April 2024
Ubuntu **14.04.6 LTS**	Trusty Tahr	Changes	March 7, 2019	April 2019	April 2022
Ubuntu 14.04.5 LTS	Trusty Tahr	Changes	August 4, 2016	April 2019	April 2022
Ubuntu 14.04.4 LTS	Trusty Tahr	Changes	February 18, 2016	HWE August 2016	April 2022
Ubuntu 14.04.3 LTS	Trusty Tahr	Changes	August 6, 2015	HWE August 2016	April 2022
Ubuntu 14.04.2 LTS	Trusty Tahr	Changes	February 20, 2015	HWE August 2016	April 2022
Ubuntu 14.04.1 LTS	Trusty Tahr	Changes	July 24, 2014	April 2019	April 2022
Ubuntu 14.04 LTS	Trusty Tahr	Release Notes	April 17, 2014	April 2019	April 2022



Gnome Desktop



GNOME™

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https://hiva-iot.com