Introduction to Programming

Week – *1*, Lecture – *1*

Introduction to Linux - I

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IIT KANPUR

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There are many Operating Systems that you can choose from – some free, others are paid

- Linux is a free Operating System, Windows and Macintosh are not !!

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- The BIOS performs a basic test to check the hardware for any problems
- This test is called Power-on Self-test or POST

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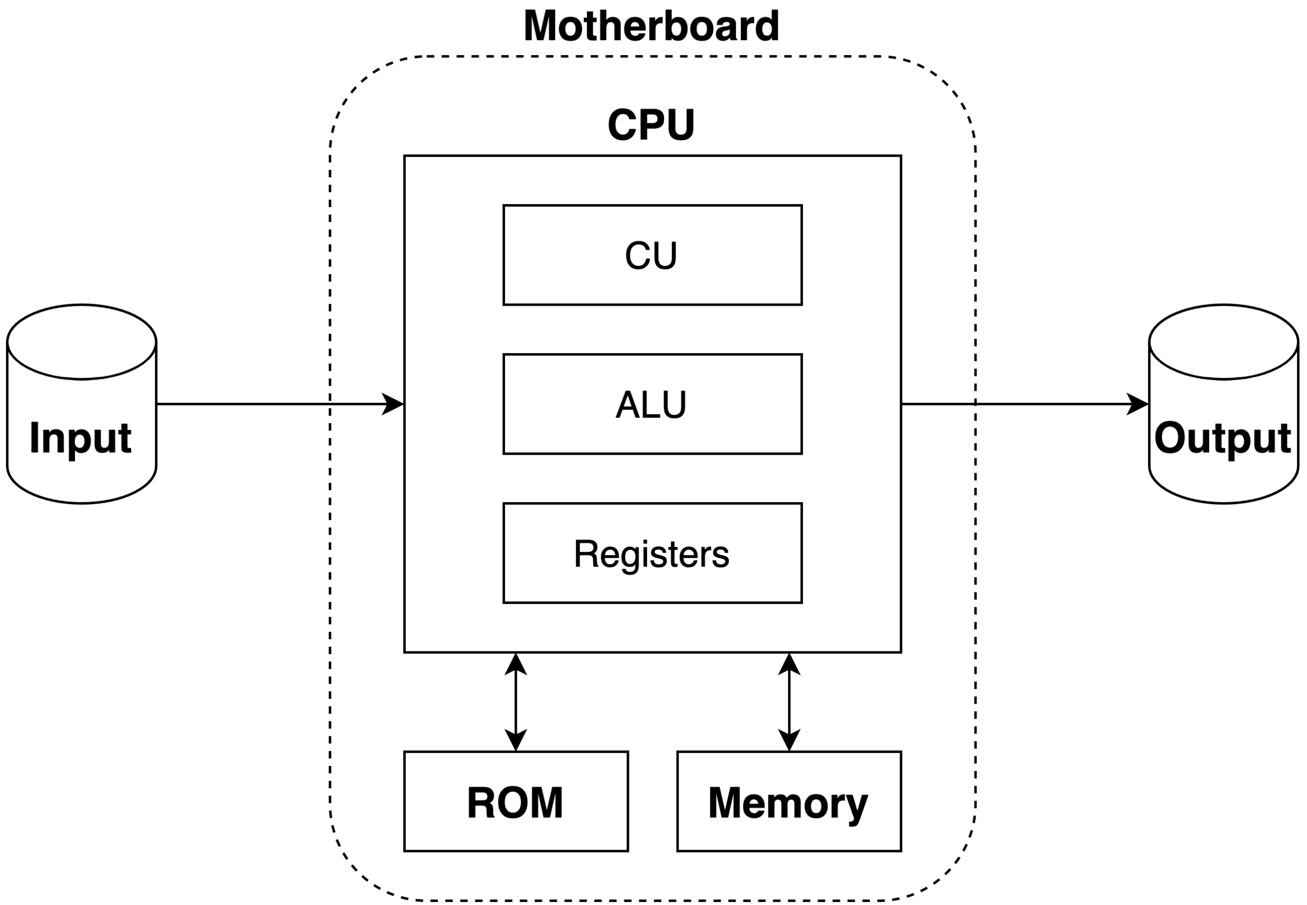
- The BIOS performs a basic test to check the hardware for any problems
- This test is called Power-on Self-test or POST
- The BIOS is “executed” directly from ROM – just like how a program is executed from the RAM

More detailed block diagram of Computer



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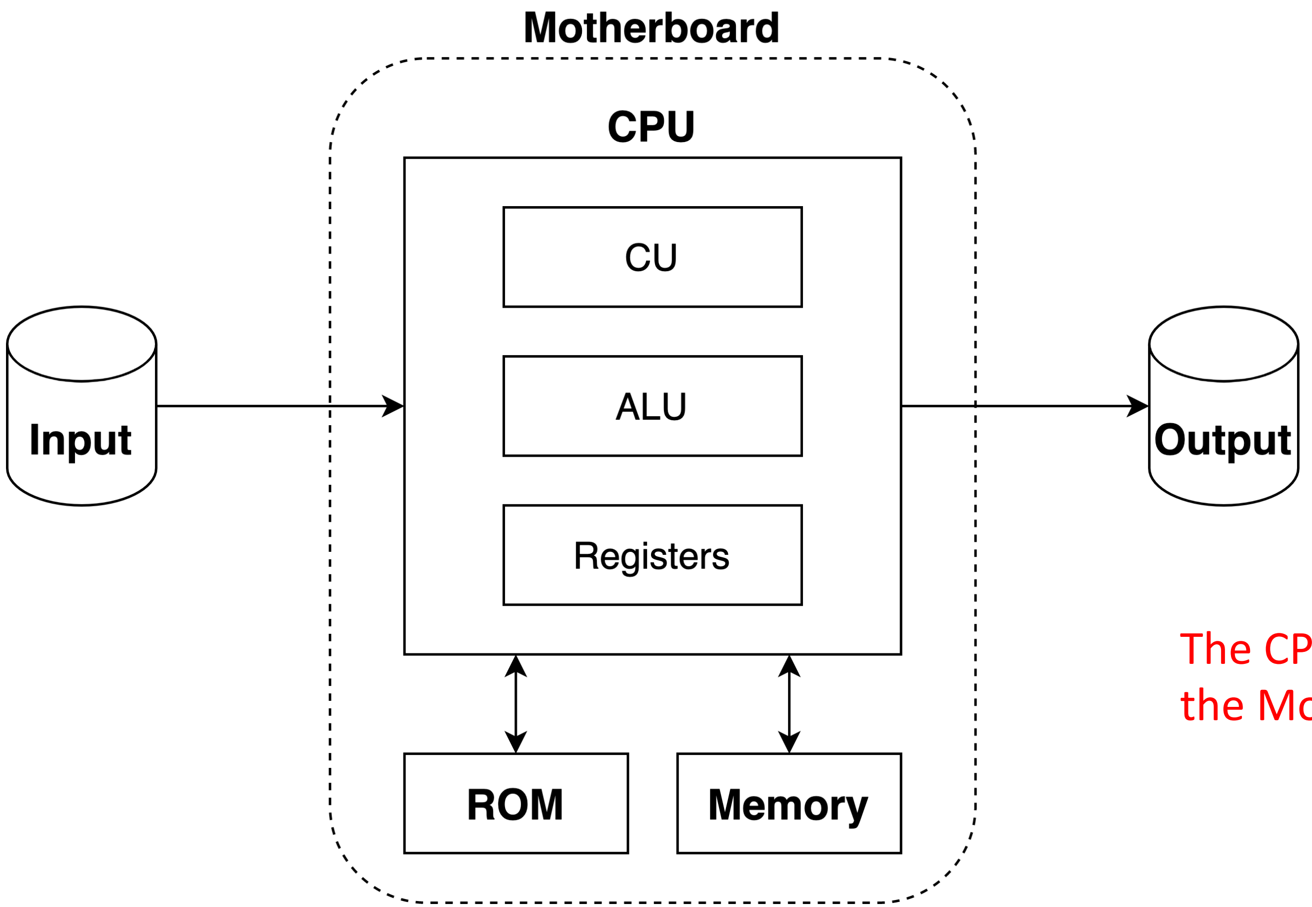

The CPU and ROM are “soldered” on the Motherboard

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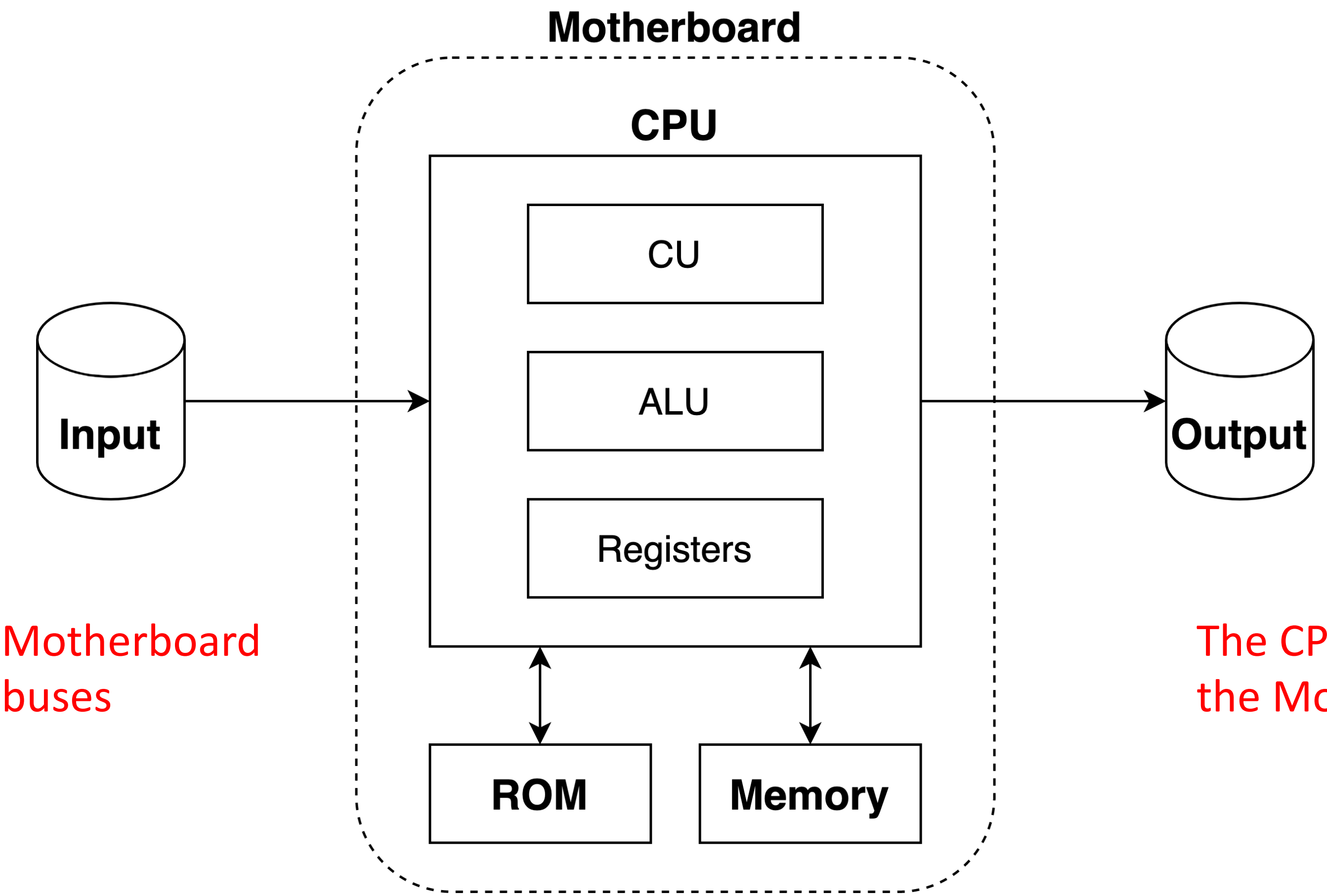

There are “slots” in the Motherboard to plug-in Memory and buses

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The Boot Sector

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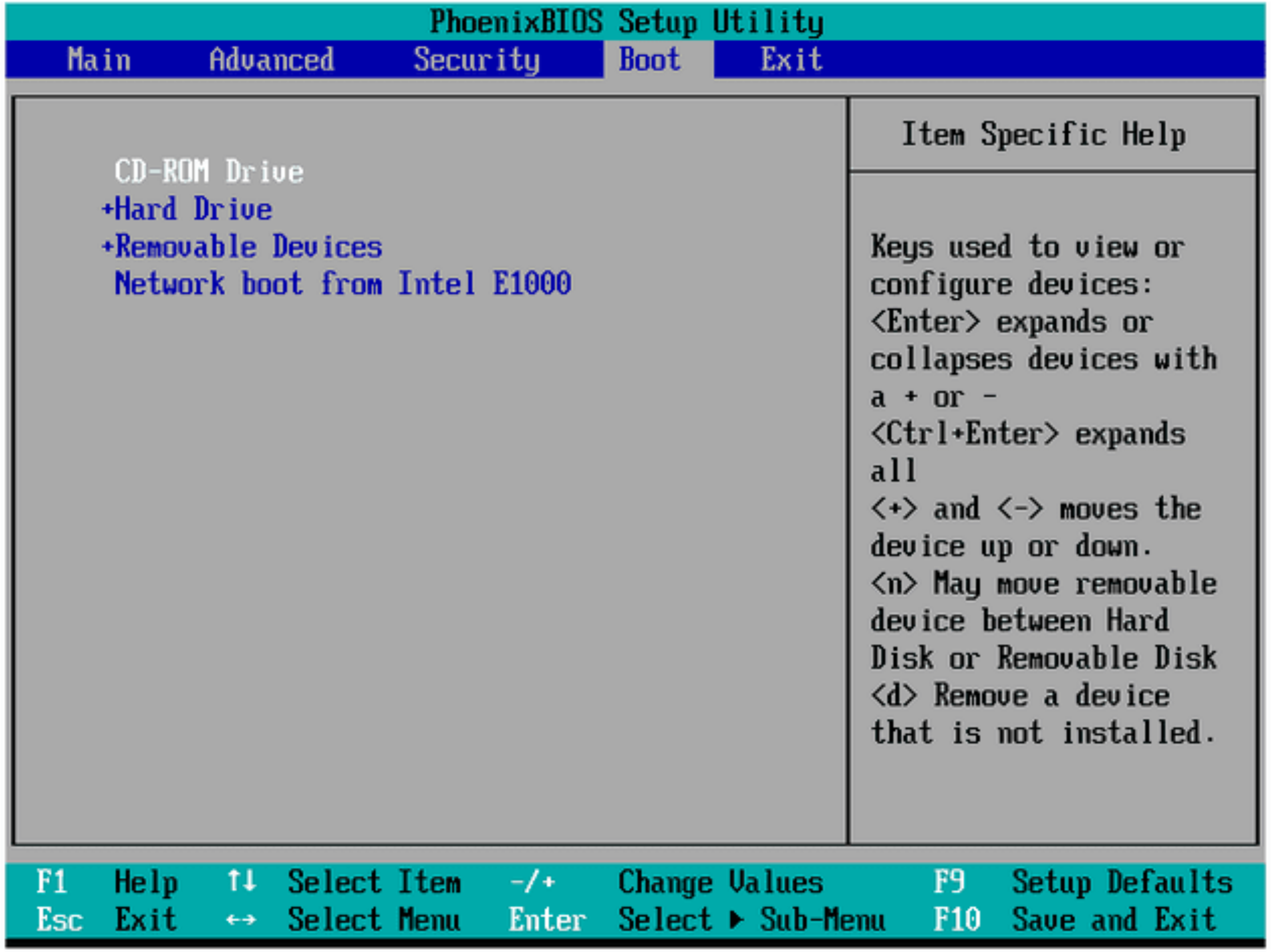

```
                    PhoenixBIOS Setup Utility
  Main     Advanced     Security     Boot     Exit

                                                 Item Specific Help
      CD-ROM Drive
     +Hard Drive
     +Removable Devices                          Keys used to view or
      Network boot from Intel E1000              configure devices:
                                                 <Enter> expands or
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                                                 <Ctrl+Enter> expands
                                                 all
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 F1   Help  ↑↓  Select Item  -/+    Change Values       F9   Setup Defaults
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```
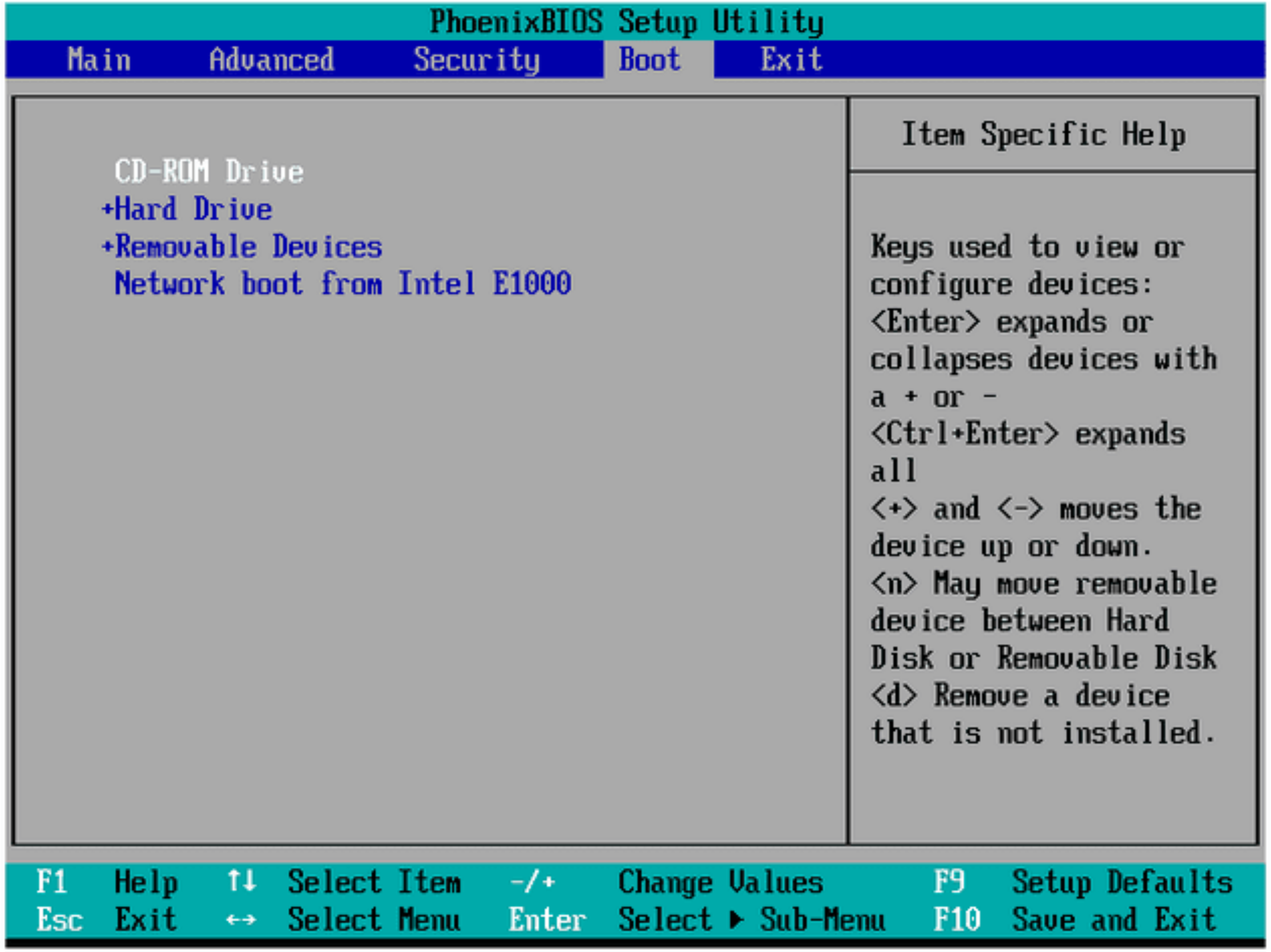

Source: https://www.lifewire.com/what-is-a-boot-sequence-2625814

Something like that



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A bootable storage device is one, which contains the “boot sector”

- Boot sector is the *first sector* of a storage device, containing a “special binary code”
- This code is essentially a program, that can eventually load the Operating System

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- Usually it only loads an “initial program” – and then the program loads rest of the Operating System

The Linux Kernel

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The Kernel is the core of every Linux Operating System

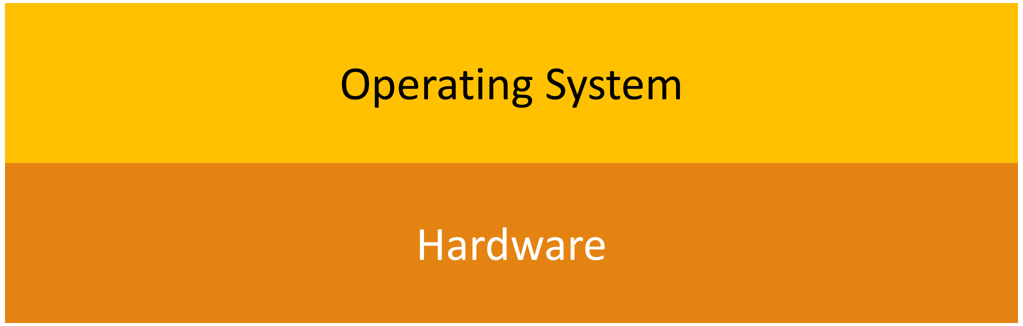
- It contains programs that can talk to, and manage, various hardware components
- Some of these programs, that talk to the different hardware devices are called *device drivers*

The Linux Kernel

Hardware

This is your hardware

The Linux Kernel

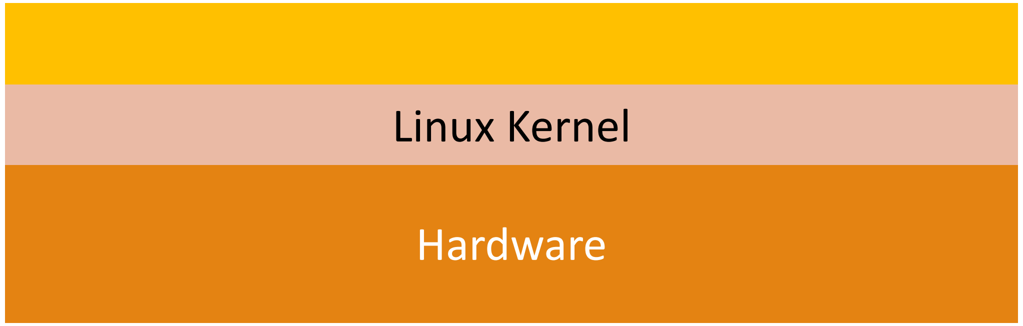


Operating System

Hardware

…and this is the Operating System

The Linux Kernel



…within the OS, Kernel is the part that talks to the hardware

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Other applications usually include creating a Graphical User Interface over the shell

- A collection of these programs is called a *desktop environment*
- Common examples of desktop environments are *GNOME, KDE, Unity, LXDE* and *XFCE*

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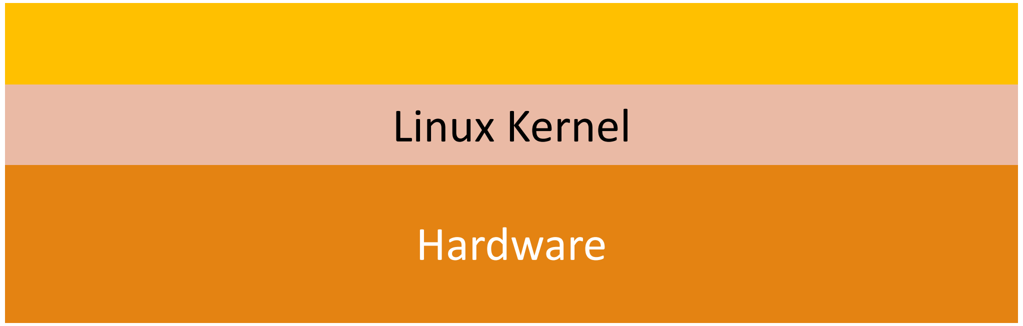

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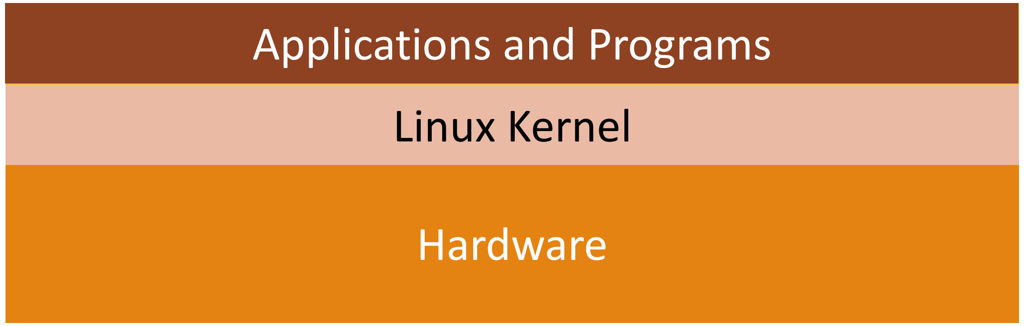

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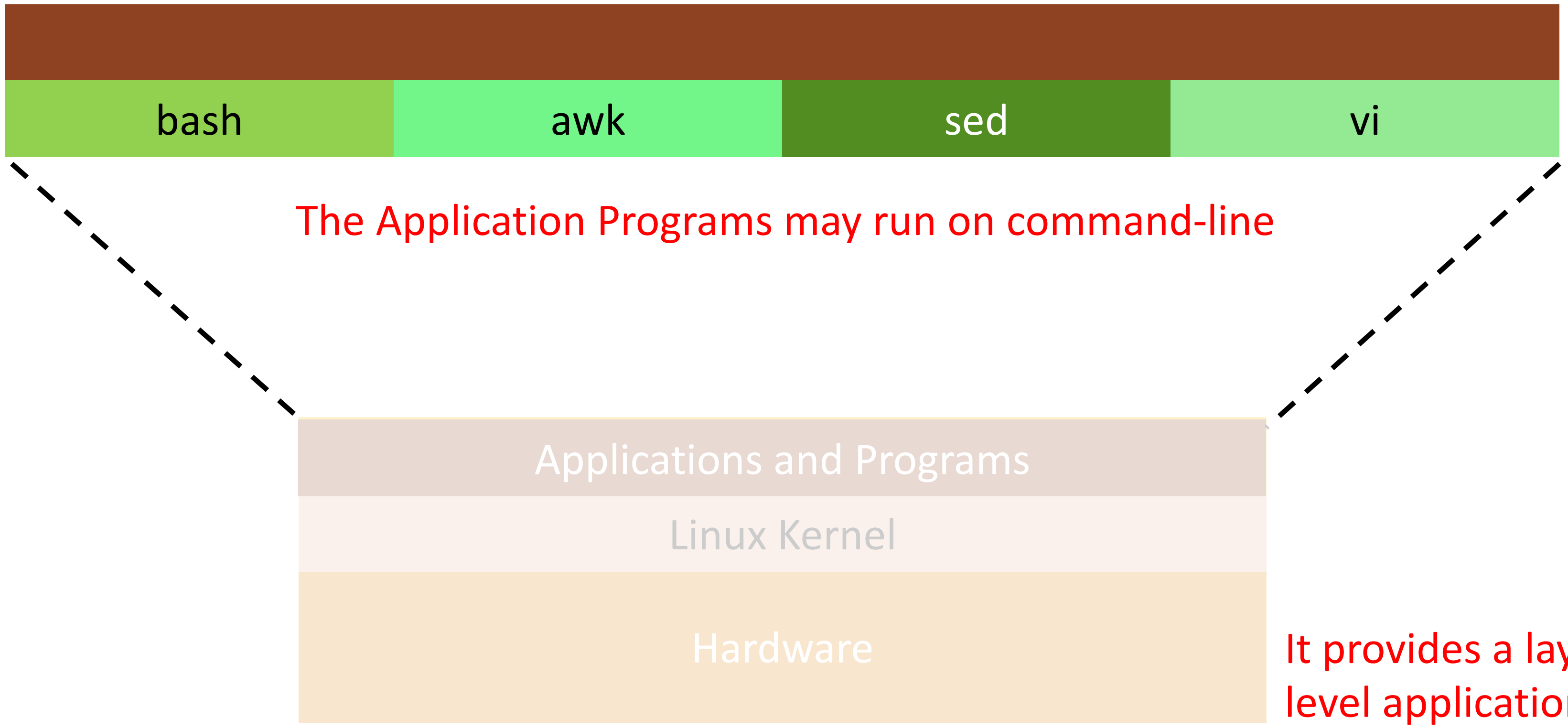

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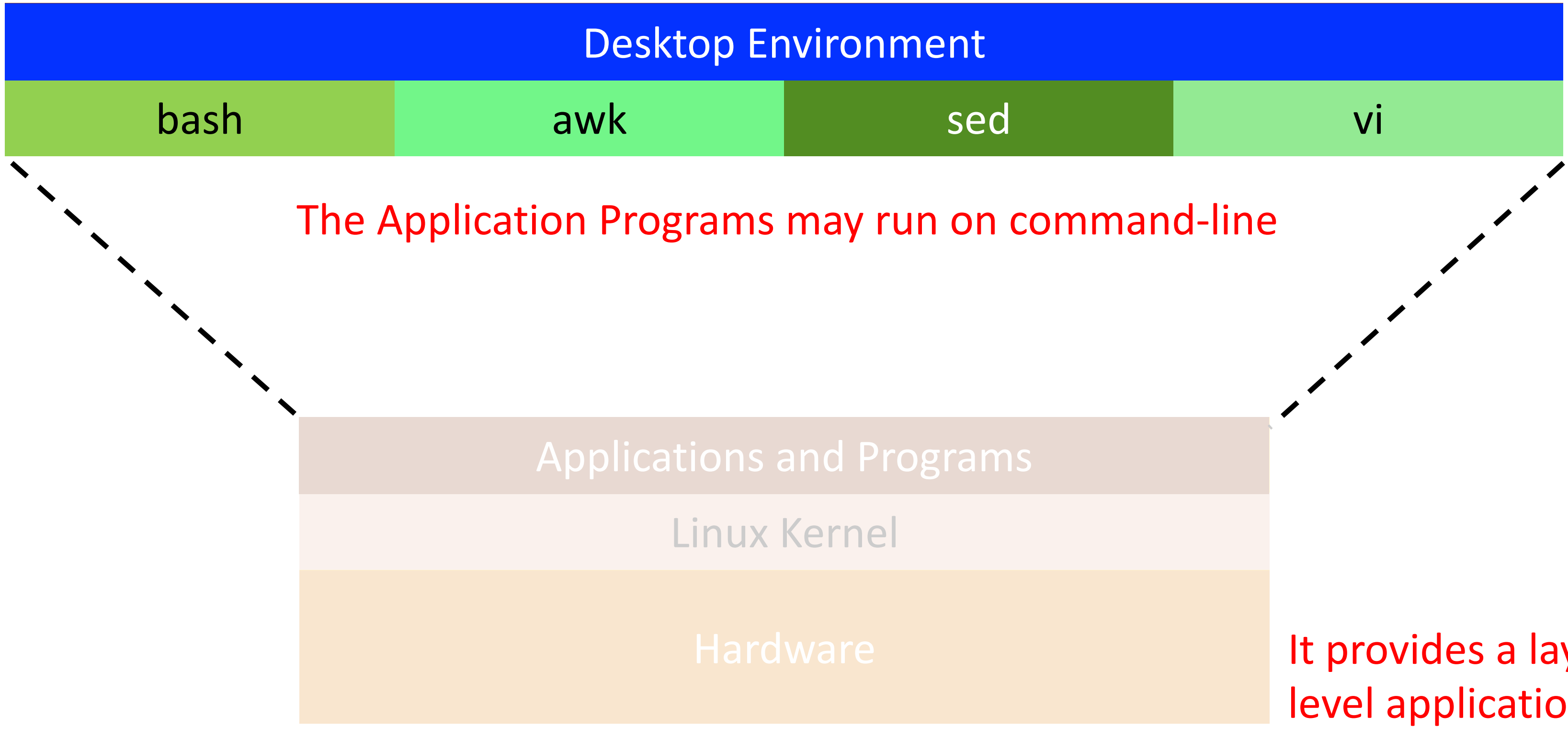
Or, they may be a part of a group of programs that provide a GUI to the user



Desktop Environment

bash awk sed vi

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Remember, in general, a Desktop Environment can be used with multiple distributions

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- Download the *ISO* file for the chosen version
  - An ISO file is an *image* of the Operating System – containing a collection of Applications
  - By the way, the common term for "Applications" in the Linux ecosystem is *Packages*

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  - I like both GNOME and LXDE – LXDE is comparatively lighter, i.e. can run with smaller RAM sizes better
- Download the *ISO* file for the chosen version
  - An ISO file is an *image* of the Operating System – containing a collection of Applications
  - By the way, the common term for “Applications” in the Linux ecosystem is *Packages*

Create a bootable USB disk with the ISO file, if you want to install it on your laptop as host OS

- There are tools like “LinuxLive USB Creator” that you can use for that
- Basically, the tool will copy the ISO on the USB disk, and create a “boot sector” for loading the OS

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Operating Systems can also “partition” physical storage into logical partitions or Volumes

- Recent Linux distributions use a partition management system, called *LVM* – use it if possible !!

Installation Notes – Lubuntu 18.04

Download the ISO

- You can download it from here: https://cdimage.ubuntu.com/lubuntu/releases/18.04/release/lubuntu-18.04.5-desktop-amd64.iso

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- On Windows, use LinuxLive USB Creator tool can be used for the same
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- Go to your BIOS setup (by pressing something like F2 or DEL when your machine starts) to do so

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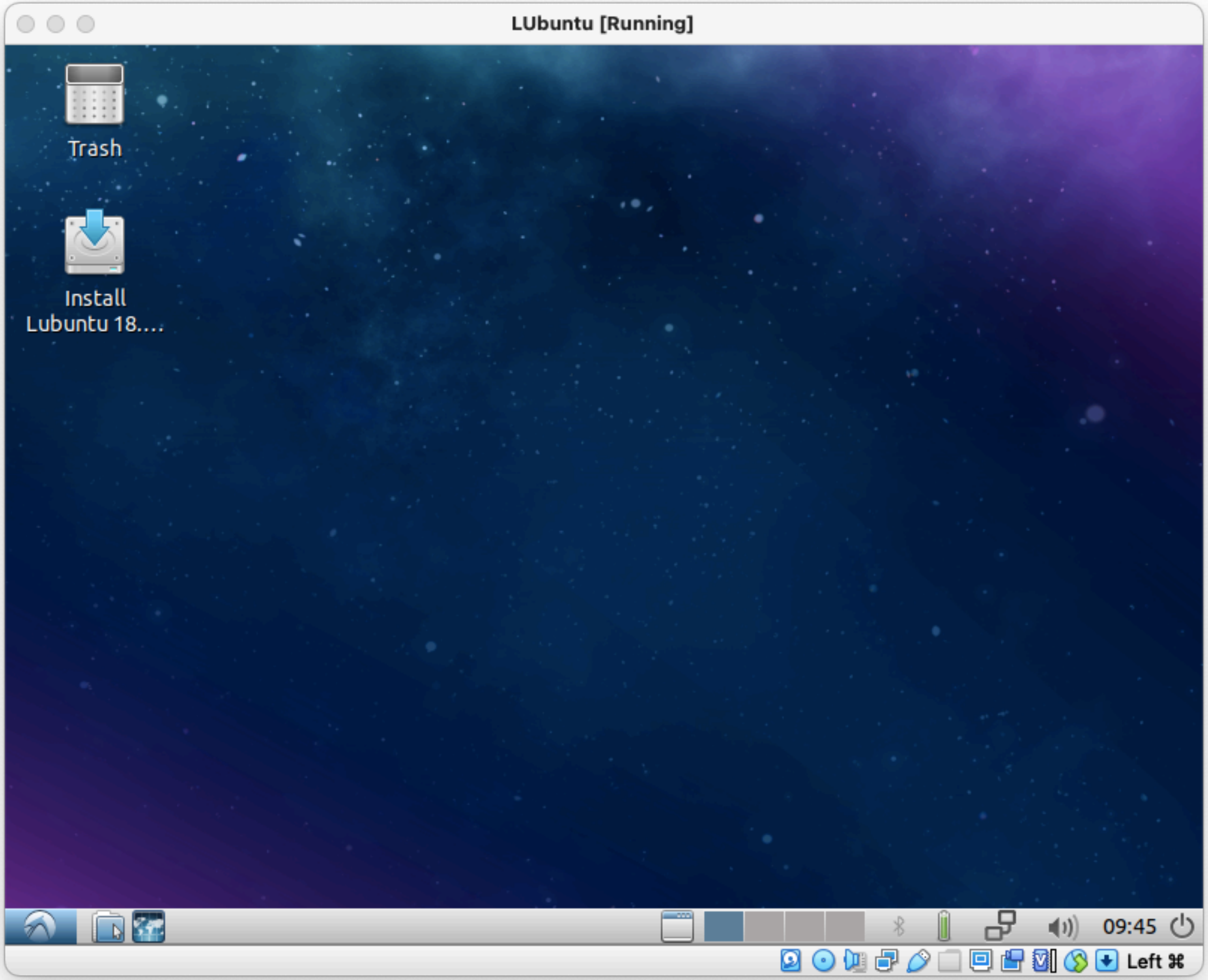
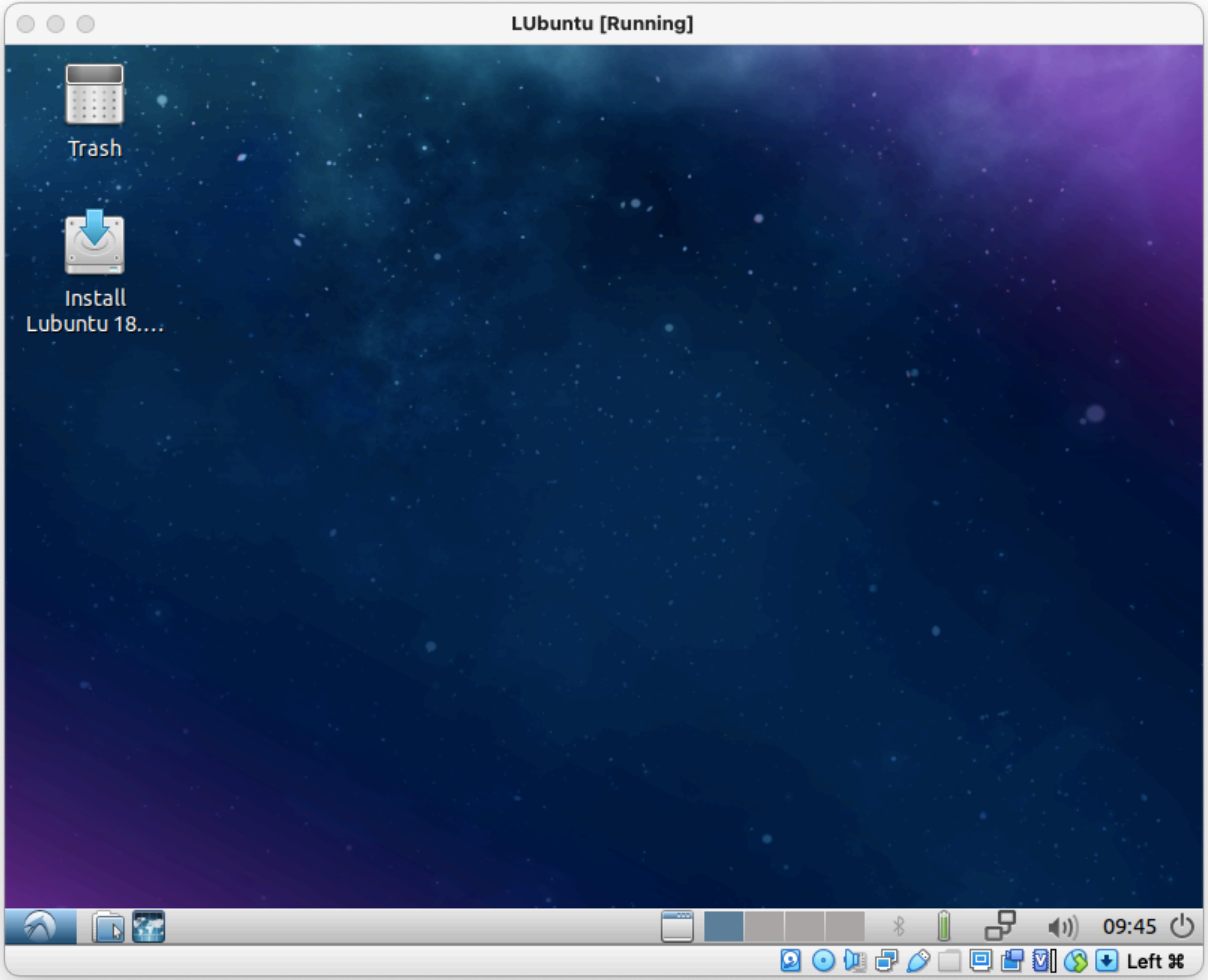
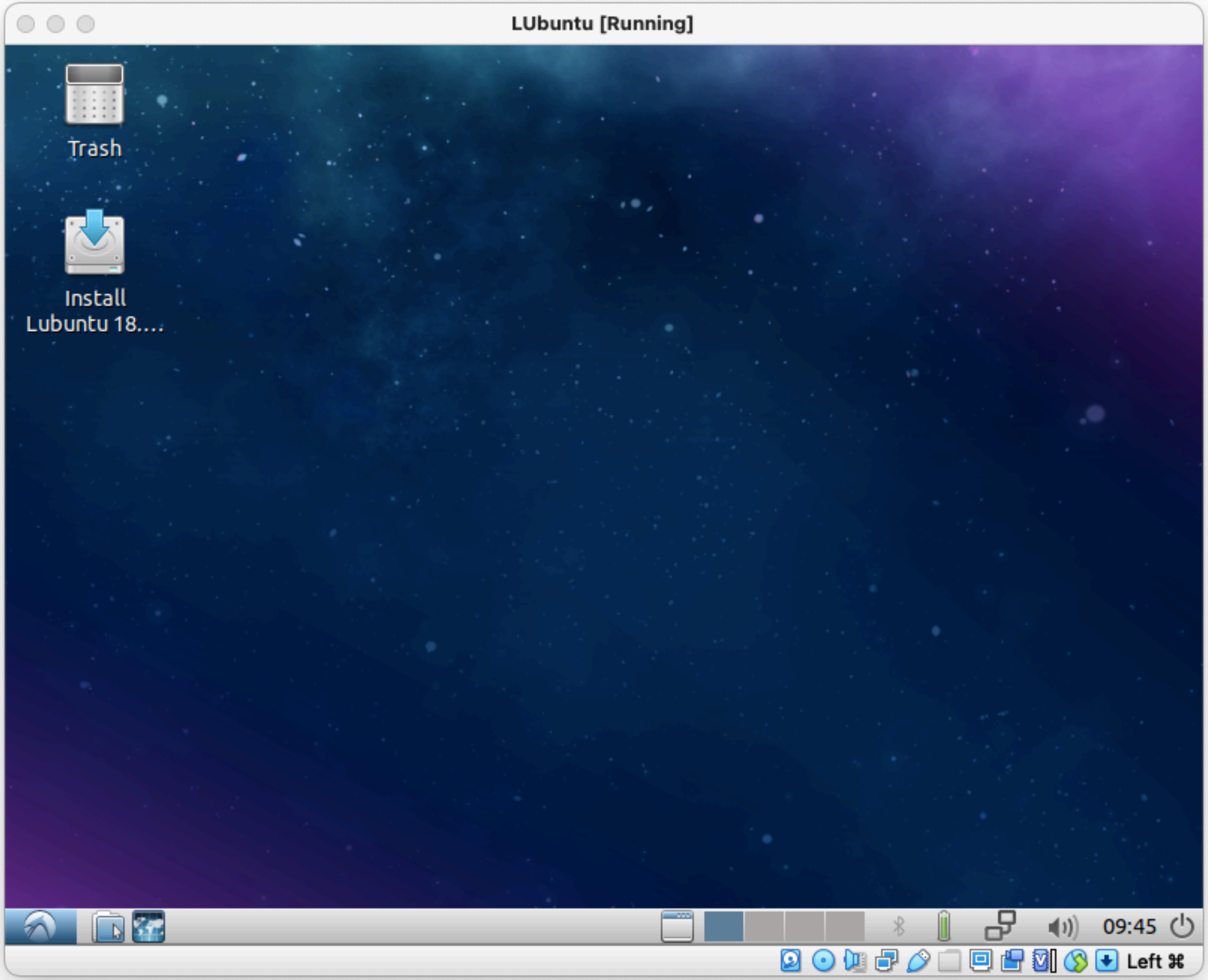
If you are installing it over a VM, you can directly use the ISO file

- See the video Using Virtualbox to get an idea


LUbuntu [Running]
Trash
Install
Lubuntu 18....
09:45
Left ⌘



Lubuntu boots – you can try it out in this mode, without installing



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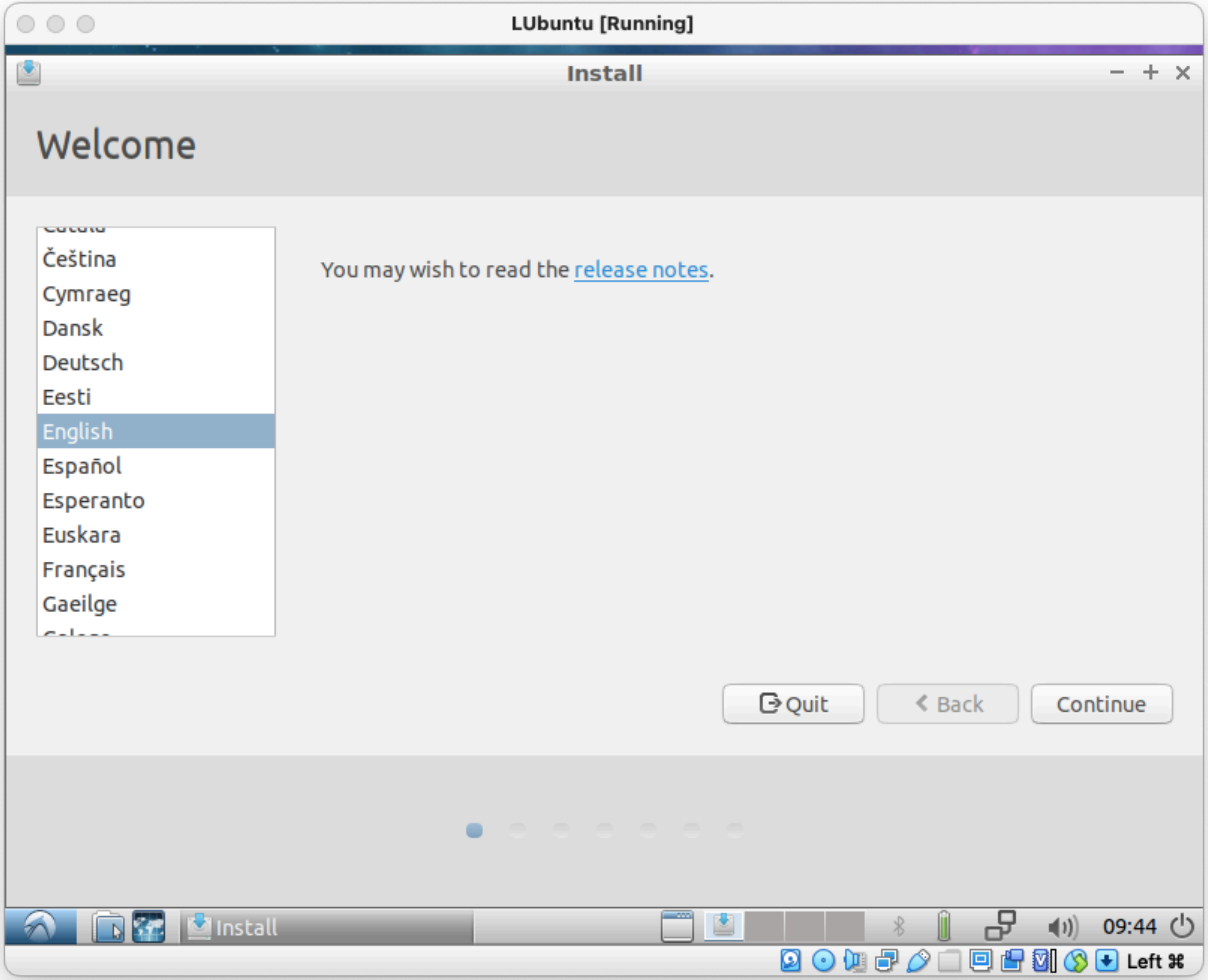
If you wish to install it... You can see where to click !!



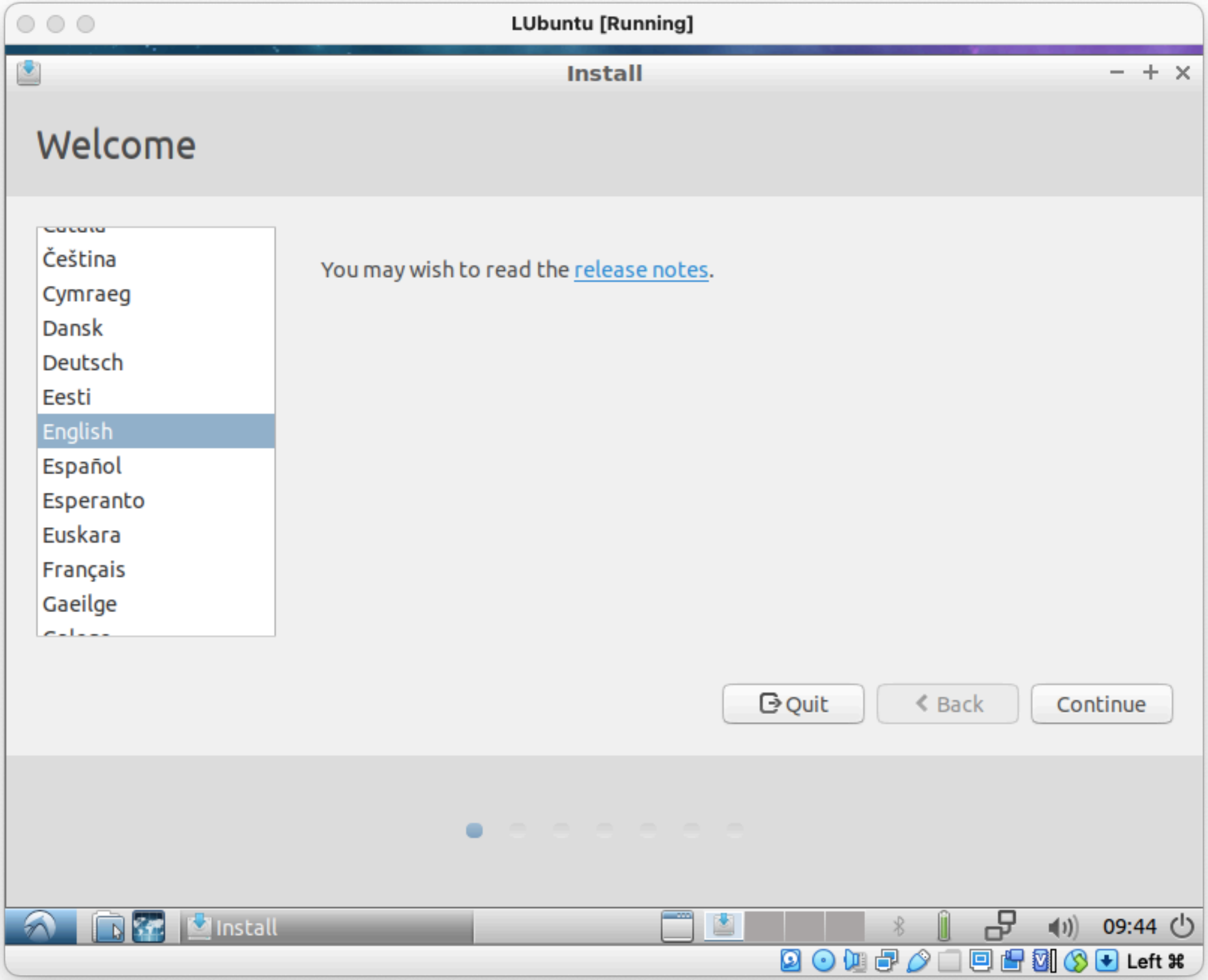
LUbuntu [Running]

Install

Welcome

- Čeština
- Cymraeg
- Dansk
- Deutsch
- Eesti
- English
- Español
- Esperanto
- Euskara
- Français
- Gaeilge

You may wish to read the release notes.



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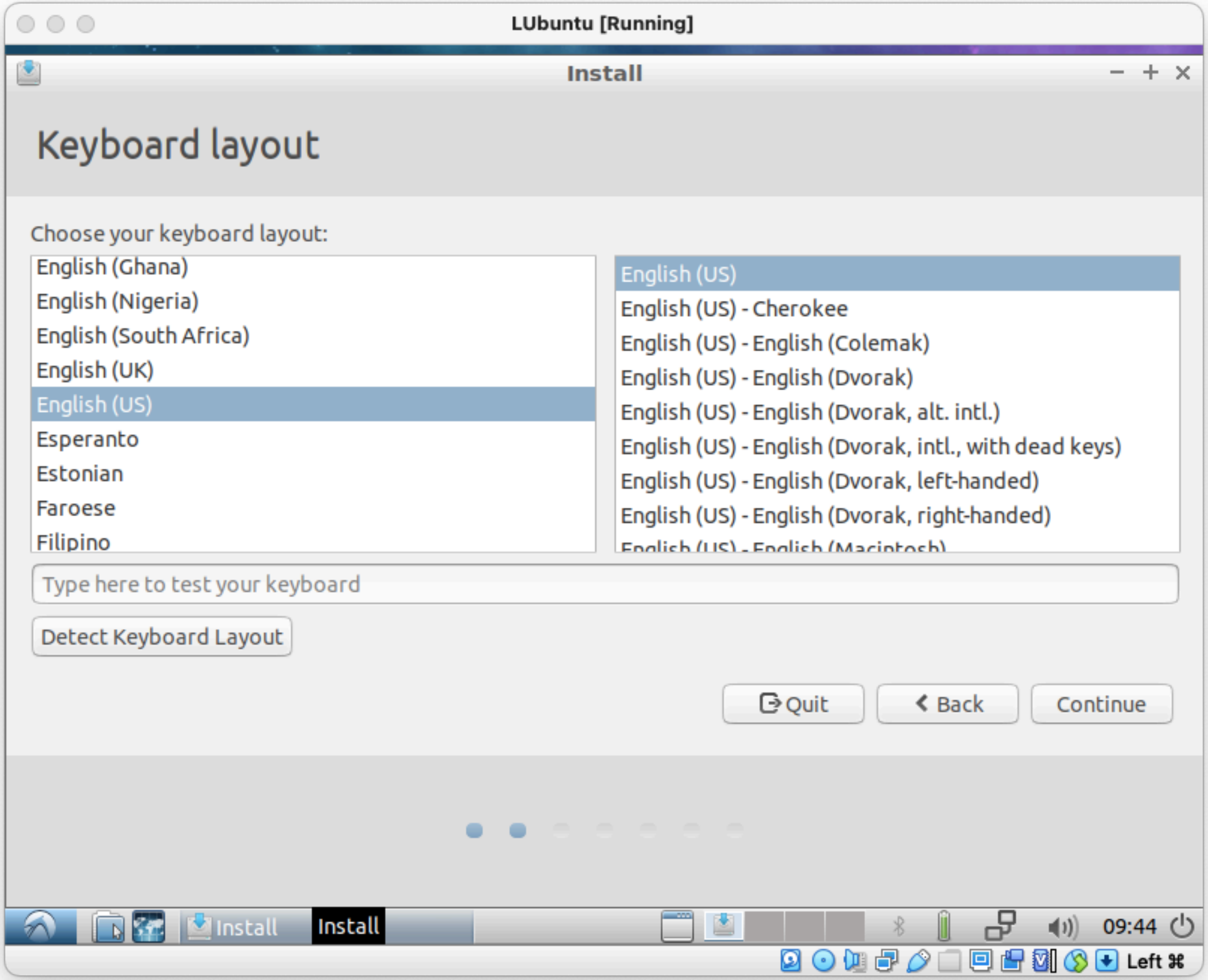
Pick your langauge



LUbuntu [Running]

Install

Keyboard layout

Choose your keyboard layout:

English (Ghana)
English (Nigeria)
English (South Africa)
English (UK)
English (US)
Esperanto
Estonian
Faroese
Filipino

English (US)
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English (US) - English (Dvorak, left-handed)
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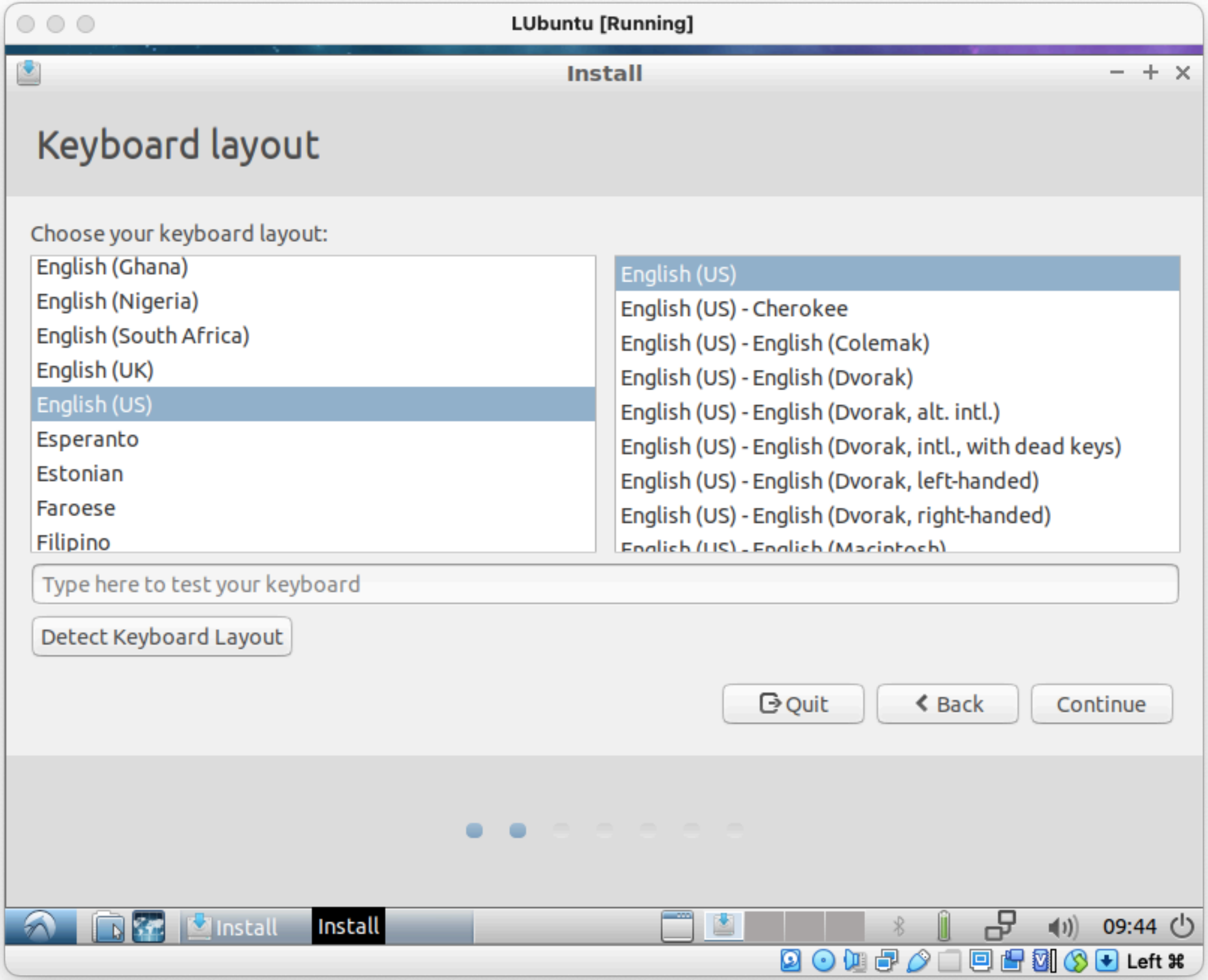
Type here to test your keyboard



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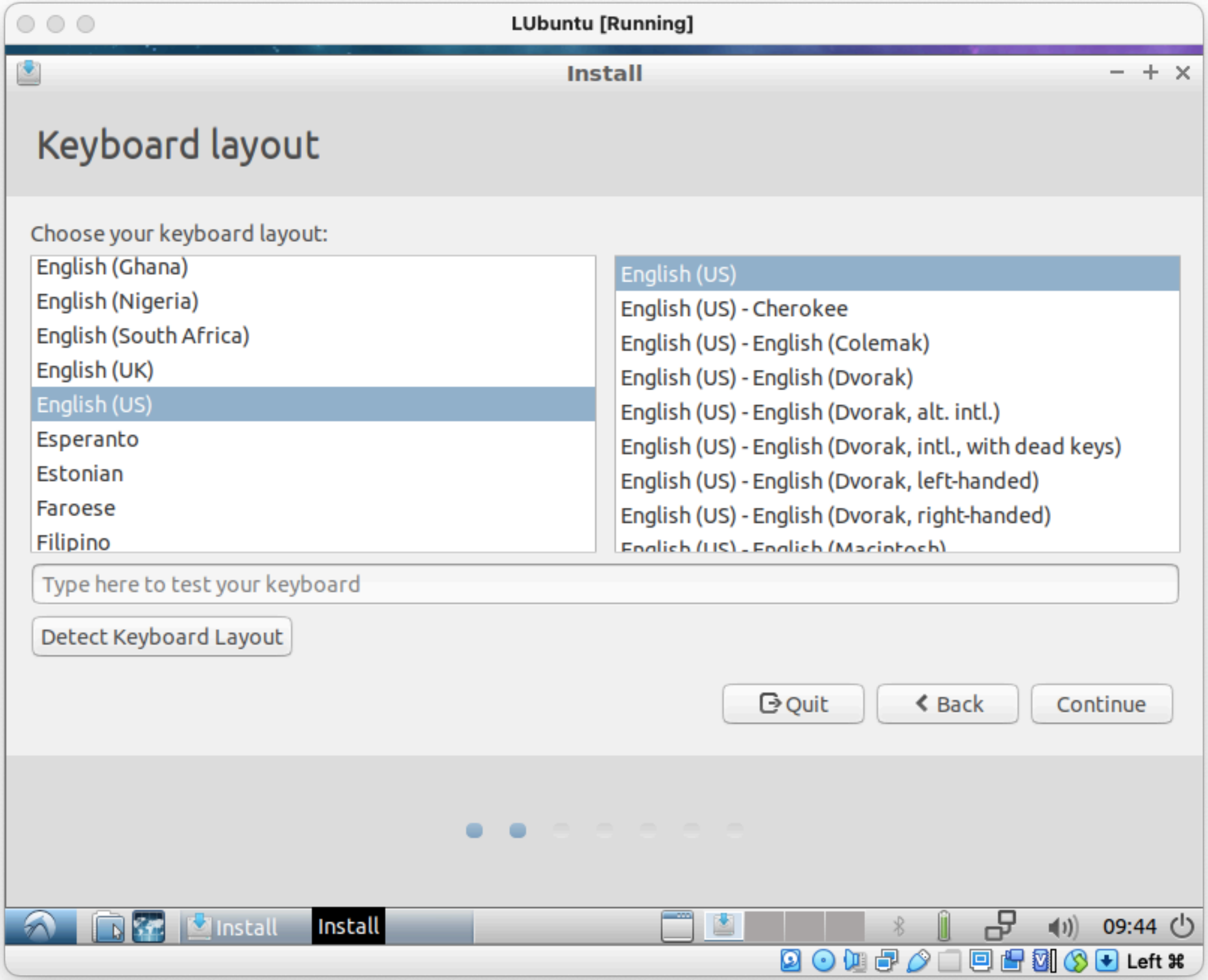

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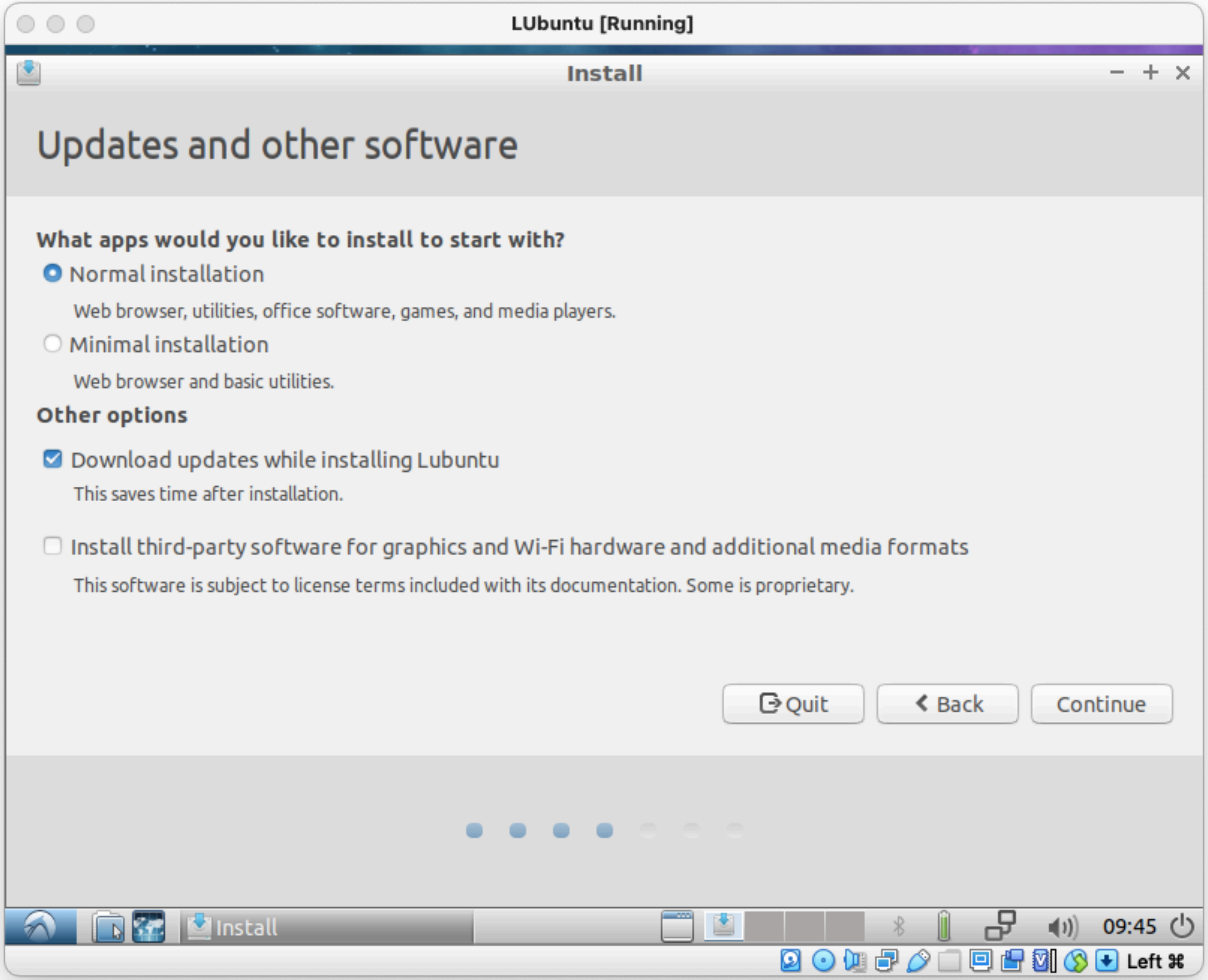
Detect Keyboard Layout

Choose your Keyboard layout

Unless you are using some fancy keyboard, leave the default selection



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.

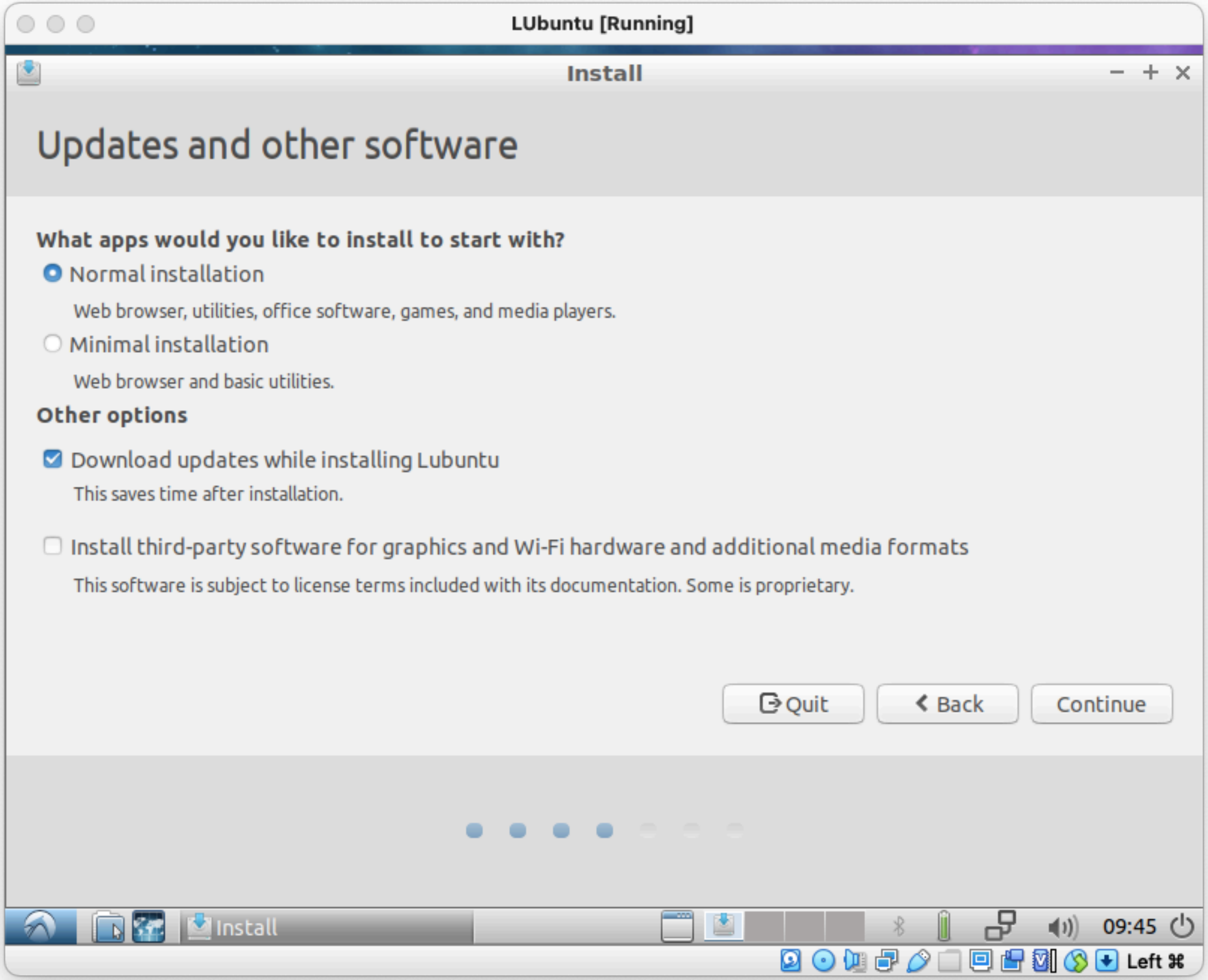
Other options

☑ Download updates while installing Lubuntu

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.



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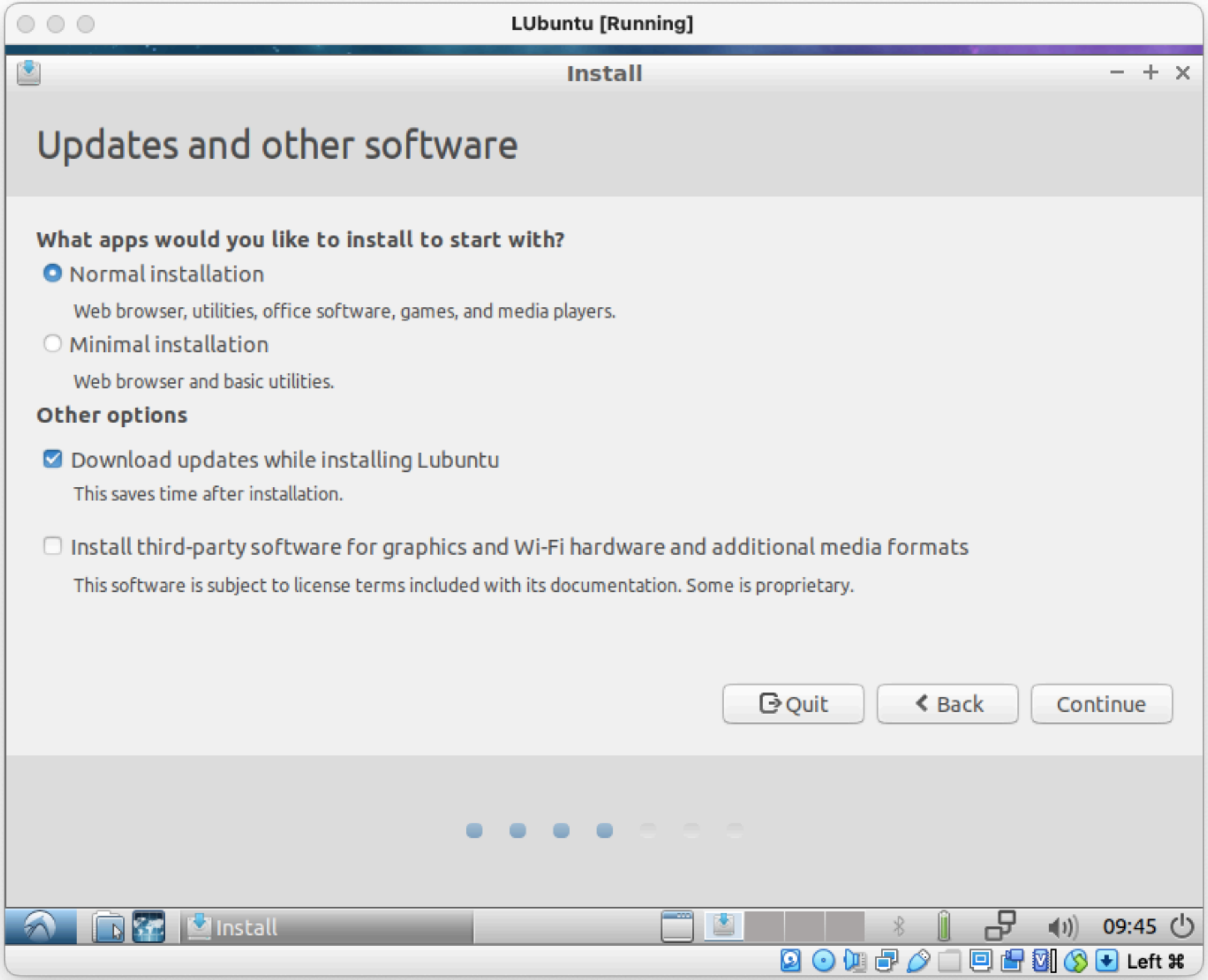

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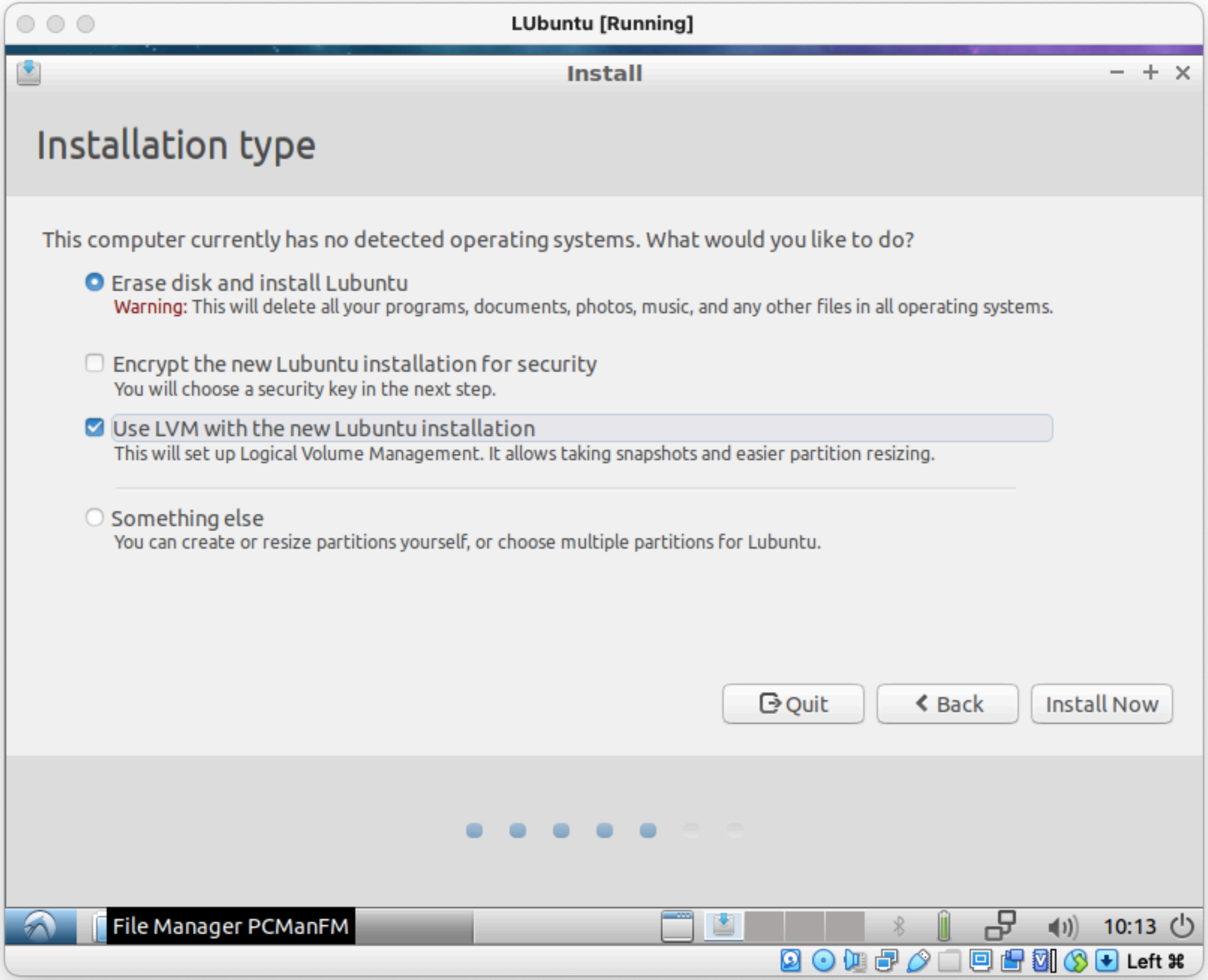
If you need the installation to be quick, uncheck the ”Download updates…” box



Installation type

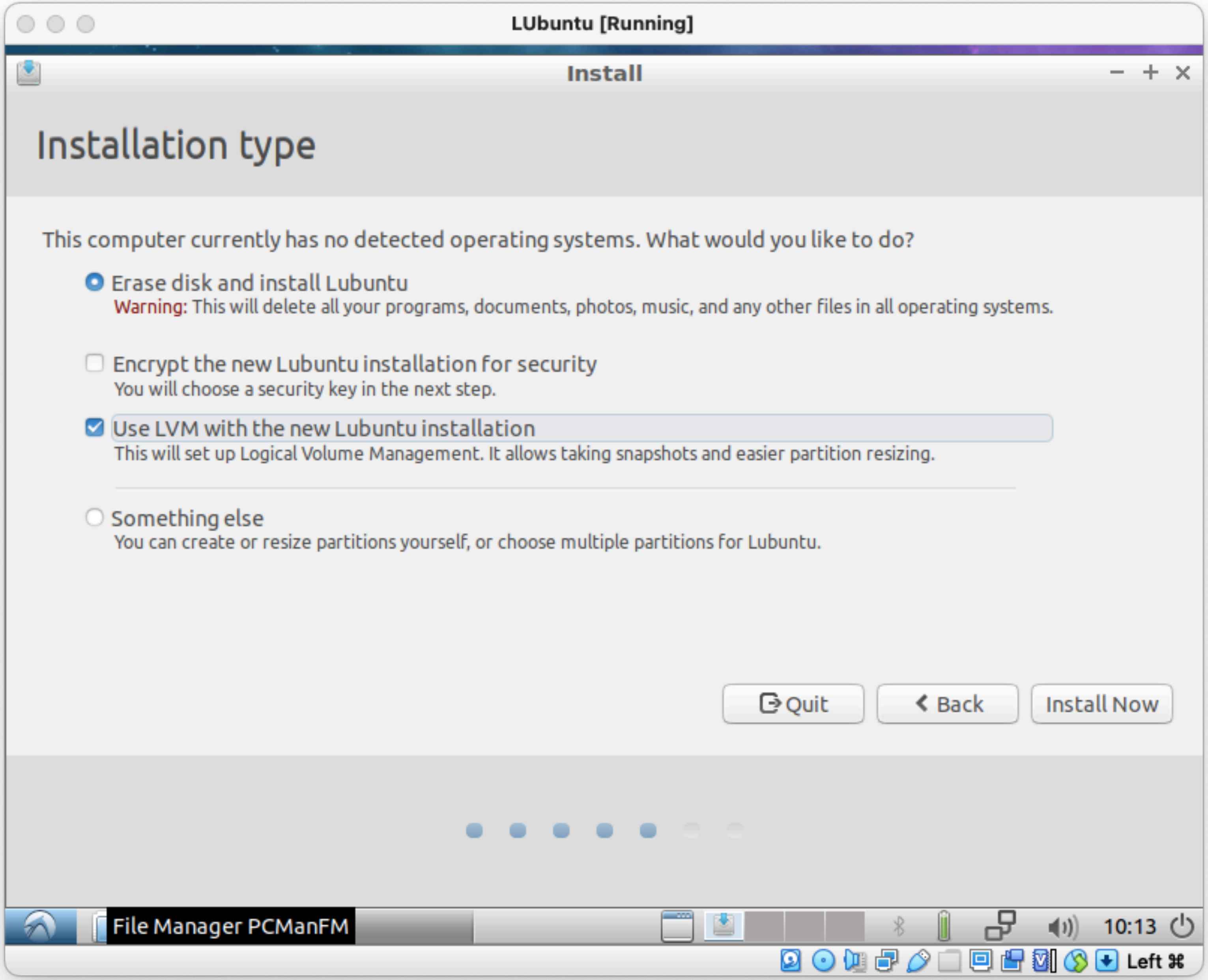
This computer currently has no detected operating systems. What would you like to do?

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

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

☑ Use LVM with the new Lubuntu 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 Lubuntu.



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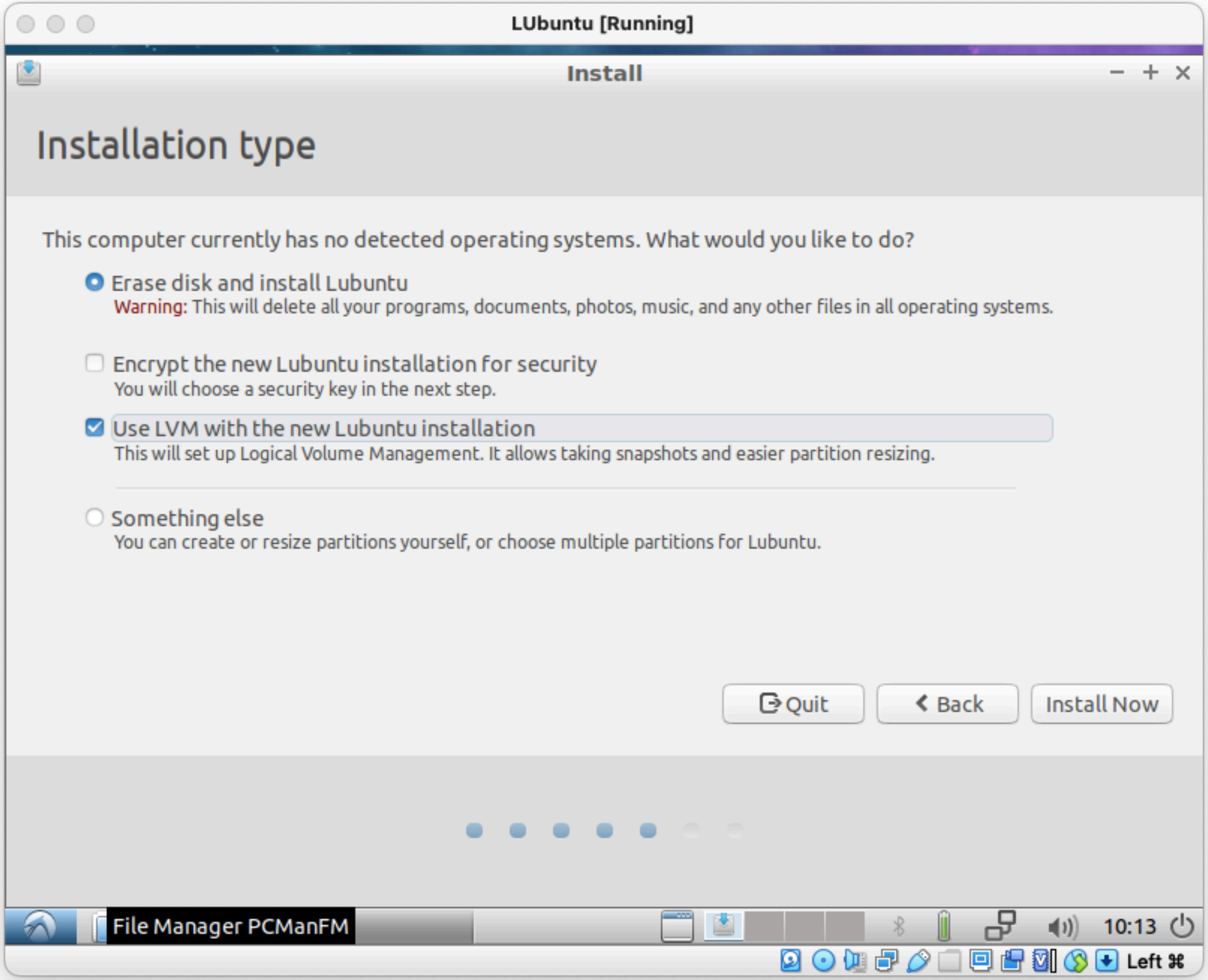

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From here on, all other screens are self-explanatory

Homework !!

Read more about File Systems used in the Linux ecosystem

- This article seems nice: https://opensource.com/article/18/4/ext4-filesystem

Prepare a short, one paragraph explanation, “praising” your chosen distribution :-D

Read more about the relationship between UNIX and Linux

- This could be a starting point: https://www.guru99.com/difference-unix-vs-linux.html