

# Preparing Your Computer for LFS101x

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 **LINUX FOUNDATION**

# TRAINING

This class is intended to be very hands-on: in order to learn about Linux you must use it.

In order to try out the various steps described in the class and to perform the exercises you will need Linux installed on your computer. If you already have a running Linux system you don't really need to read the rest of this document, although you may find it interesting.

If you don't have **Linux** already installed, this guide will help you accomplish the task of getting up and running.

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# Introduction

# 1 Introduction

In the early days of Linux, installation was a back-breaking process, involving downloading dozens of floppy disks (through slow telephone lines) and loading them one by one.

Eventually distributors developed CD-based installations which were far more user-friendly, and as the size of the installation gradually expanded DVD-based methods also became widespread.

The early install programs presented one with many configurable choices, especially regarding:

- **Desktop Manager:** (usually **GNOME** or **KDE**) which controls the look and feel of the desktop
- **Software Selection:** Unlike vendors of other operating systems, **Linux** distributors offer not just the basic operating system and utilities, but a wide range of applications and utilities. For other operating systems, the equivalents would have to be separately installed (after basic system installation) after downloading and/or purchase from a variety of sources. It is convenient that most **Linux** users can find all the software they will ever need provided freely in the distribution's packaging system.

Often the new **Linux** user didn't possess the knowledge or experience to assess the parameters of these choices or their long-range repercussions.

As a result most distributions now limit the number of choices that must be made during installation to a small number of basic questions; default answers are those most commonly useful. Typically no more than a few obvious questions must be answered during the install, which proceeds rather quickly. More detailed software selection can be made post-install through the use of various graphical package management systems.

## 1.1 Quick Guide

We are going to give you some detail on how to install Linux but for the impatient here are the steps:

- 1 Decide which Linux distribution you want to use. (Later we will give a table of common choices and useful links for downloading install media, and helpful tutorials on procedure.)
- 2 Download the install Image, which will be either a local or network install image or a Live image (which can also be used for install.)
- 3 Decide if you want to do a:
  - Native installation:** To do this you will need a machine with enough useable disk space or will have to repartition to make space available.
  - Virtual Machine installation:** To do this you'll have to first install a hypervisor program as described later.
  - Live CD/DVB/USB method:** To do this no install is needed, but performance will be weaker.
- 4 Do the install following distribution-supplied directions.
- 5 Enjoy!



# Linux Distribution Choices

## 2 Linux Distribution Choices

The term **Linux** may mean different things to different people but in a narrow sense it refers only to the operating system **kernel**: the basic program that underlies everything else that communicates with the hardware (such as CPU, memory and attached devices) and the applications that run on the computer.

Everything else on your computer (including all the software needed to give you a nice graphical desktop) provides the full **operating system** to which many applications are added. When people use the loosely defined term **Linux System** they really should be saying **Linux-based System**.

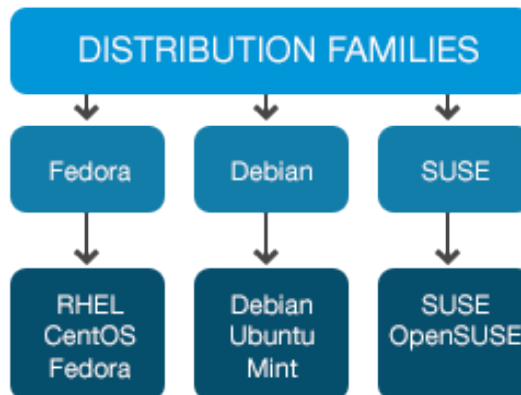
It's a lot of work to assemble all the other components that are stacked above the **Linux** kernel (applications, libraries, graphical environments etc) and it is the job of a **Linux Distribution** to integrate all these components in a clean and updatable entity that users can take advantage of.

There are many different Linux distributions (sometimes called distros). While it would be easier for the purposes of this class to choose one and give instructions accordingly, we will not do that for two reasons:

- We want you to understand what is globally true for all **Linux** systems and what is only true for a given family of distributions.
- The **Linux Foundation** does not endorse or promote any one particular distribution since we support the community as a whole.

Thus we will show how things work on the following distribution families :

- **Fedora**: Including **Fedora**, **Red Hat Enterprise Linux (RHEL)**, and **CentOS**.
- **Debian**: Including **Debian**, **Ubuntu** and **Mint**.
- **SUSE**: Including **SUSE** and **OpenSUSE**.



What unites the members of a given family is largely the method of software packaging, installation and updating. In the course we will use **CentOS**, **Ubuntu** and **OpenSUSE** as the representative members of their respective families.

Relatively inexperienced users may find **Ubuntu** or **Mint** easiest to get oriented with, while those used to working on more powerful hardware or so-called **Enterprise** systems may find **CentOS** or **OpenSUSE** easiest to grasp.

We should note that there are many more distribution choices available; <http://lwn.net/Distributions> has a very complete list. Some distributions really don't fit into the above three families, but they are unlikely to be ones that new users to Linux gravitate towards. Thus we will work within these three families.

Here is a table listing the main websites for the major distributions in the three above-mentioned families. You can easily find download media using these links or at mirror sites mentioned there such as <http://mirrors.kernel.org> which is administered by the Linux Foundation.

### Distribution Location

DISTRIBUTION	LOCATION
FEDORA	<a href="http://www.fedoraproject.org">http://www.fedoraproject.org</a>
REDHAT (RHEL)	<a href="http://www.redhat.com">http://www.redhat.com</a>
CENTOS	<a href="http://www.centos.org">http://www.centos.org</a>
DEBIAN	<a href="http://www.debian.org">http://www.debian.org</a>
UBUNTU	<a href="http://www.ubuntu.com">http://www.ubuntu.com</a>
MINT	<a href="http://www.linuxmint.org">http://www.linuxmint.org</a>
SUSE	<a href="http://www.suse.com">http://www.suse.com</a>
OPENSUSE	<a href="http://www.opensuse.org">http://www.opensuse.org</a>





Visual  
Installation  
Demonstrations

### 3 Visual Installation Demonstrations

Many companies, organizations and individuals have done screen captures of the installation process and posted them online. We recommend you view one appropriate for your distribution choice.

Here is a table of representative resources of this nature. A little searching on the web will find more, we are sure.

DISTRIBUTION	LOCATION
FEDORA	<a href="http://www.if-not-true-then-false.com/2014/fedora-20-heisenbug-install-guide">http://www.if-not-true-then-false.com/2014/fedora-20-heisenbug-install-guide</a>
CENTOS	<a href="http://www.binarytides.com/centos-6-5-installation-screenshots">http://www.binarytides.com/centos-6-5-installation-screenshots</a>
DEBIAN	<a href="http://www.if-not-true-then-false.com/2012/debian-unstable-testing-netinstall">http://www.if-not-true-then-false.com/2012/debian-unstable-testing-netinstall</a>
DEBIAN	<a href="http://www.debian-tutorials.com/how-to-install-debian-wheezy-screenshots-guide">http://www.debian-tutorials.com/how-to-install-debian-wheezy-screenshots-guide</a>
UBUNTU	<a href="http://www.ubuntu.com/download/desktop/install-ubuntu-desktop">http://www.ubuntu.com/download/desktop/install-ubuntu-desktop</a>
MINT	<a href="http://itsfoss.com/guide-install-linux-mint-16-dual-boot-windows">http://itsfoss.com/guide-install-linux-mint-16-dual-boot-windows</a>
OPENSUSE	<a href="http://opensuse-guide.org/installation.php">http://opensuse-guide.org/installation.php</a>

While this document provides a starting point to help you with installation, it is a general guide and we heavily recommend you also read over a guide specific to your chosen distribution.

Please note that whether you do a **Virtual Machine** install with a **hypervisor**, or a **Native Install** on a bare metal machine, the procedures are essentially the same and these demonstrations are just as applicable in either case.



# Installation Methods

# 4 Installation Methods

All Linux distributions provide downloadable installation media in the form of optical media images (CD and/or DVD) which can be easily burned to a physical disk, or USB stick images, together with instructions on how to produce a USB drive that can be booted from for installation.

These images vary in type of machine (e.g., 64-bit or 32-bit; we recommend doing only 64-bit installs on modern hardware that supports it) or small or large (e.g., minimal or full desktop or server system).

Alternatively, one can do a much smaller download and get a network install image which has just a few files; then the installation procedure goes out on the Internet to get whatever else is needed. Such a network install has only a short initial download, but the install process itself can take a long time based on your network download speed. A full install image may also support going out to the Internet during installation, like a network install, but only to retrieve software with a newer version available than was included in the full install image.

## 4.1 Using Live Media Instead of a Full Install

Many popular distributions provide Live CD, DVD, or USB media which can be used to run Linux without actually installing it on your disk drives. As you can imagine, this is the safest method of experimenting with Linux if you already have a computer running another operating system.

There are disadvantages however:

- Slow startup: every time you boot up the hardware has to be examined and the operating system set up as if you were doing a fresh install.
- Performance can be poor, so more memory and CPU power may be required to make things run acceptably.
- It can be awkward to save any work or other material either on the normal hard disk or to external media etc, although it can be done. In particular, any changes in setup or any other software that is installed may be lost each time one boots up.

Please note that the Live media image and the Install image is the same for many modern user-friendly distributions! One simply boots off the Live image and then clicks on Install once the system starts. One very nice aspect of this dual-use media is that before you even attempt an install, you know whether or not the Linux-based operating system can recognize and work with all of your hardware and peripherals, such as your network card, sound system, webcam etc.

## 4.2 Installing a Hypervisor and a Virtual Machine

Everyone has probably heard the phrase Virtual Machine. This is a full guest operating system (which may or may not be Linux) which runs on top of a Hypervisor program on a

host machine, which can be running any operating system with an available hypervisor, including all flavors of Windows, Linux and Mac OS.

An advantage of using the virtual machine images is that you can't fundamentally destroy your host system while running them, and they run as an unprivileged application, which may be more compatible with company IT policies, if applicable. A further advantage, especially with on-line classes, is that a system failure does not take you off-line.

The disadvantages have mostly to do with performance and requiring somewhat more memory and CPU power. However, in many circumstances this will not be not be a disqualifying aspect.

You will have to install a hypervisor program if you don't already have one. Here are two easily obtainable low- or no-cost solutions:

- **Oracle Virtual Box**

Can be downloaded from <http://www.virtualbox.org>

Exists for **Windows**, **Linux**, **MacOS** and **Solaris** operating systems.

- **VMware**

Exists in full-featured products such as **VMware Workstation** but also in a freely downloadable version, **VMware Player** which can be reached at <http://www.vmware.com/try-vmware.html>. While **VMware Player** is free of charge only for **Windows** and **Linux** host operating systems, **VMware Fusion** is a low cost program for the **MacOS**.

Once you have installed the hypervisor, installing a guest operating system is pretty easy. You don't even have to burn the install image to a **CD** or **DVD**; you can just point the hypervisor to the .iso image file on your computer. In some cases (such as for **Virtual Box**) you can even perform an automatic installation which doesn't even ask you questions when you install!

The rest of the discussion on installation for the most part applies here, except you won't have to worry about the difficult things like partitioning; you can just take the default choices. However, make sure you assign enough disk space (say at least 20 GB to be safe, although you'll probably need quite a bit less).

### 4.3 Performing a Native Linux Installation

Virtually all popular **Linux** distributions have straightforward installation instructions these days, and most provide a live CD or USB stick which can also be used to do an install. One first boots off the Live media; a successful boot verifies that the **Linux** distribution is out-of-the-box compatible with your hardware, and you can then click on install to place the Linux distribution on your hard disk. (Using **Wubi** to install **Ubuntu** from within **Windows** does not count as a native installation. Performance is worse than using a virtual machine as discussed above, and we do not support this option.)

In the simplest case you do a pure **Linux** installation, which involves wiping the hard disk and discarding whatever operating system was previously installed. Unless you are installing **Linux** on a machine you can completely dedicate for that purpose, it is likely that is not

what you want; instead you want to set up a **multi-boot** configuration. This will present you a choice when the system starts between **Linux**, **Windows** or another operating system, or between different versions of **Linux**; e.g, you might have **Ubuntu** and **Fedora** separately installed on the same machine.

Multi-boot installations require you to be very careful when you install so pay attention to the parts where you are asked about your disk setup, to make sure you only use parts of your hard disk which are not already in use. If you are lucky, your install program can deal with your pre-existing format easily. However, if there is no available space that can be freshly partitioned, or partitions which can be erased and recycled, life can get complicated. This is what we discuss in the next section.

### 4.4 Disk Space and Partitioning

In order to proceed with installation, you generally need enough available space on the hard disk. Furthermore, it has to be in either unallocated free space outside of any existing partition, or partitions must be available for reformatting.

This is non-trivial for most systems that have not already had multi-boot configurations set up before; this step (which must be taken care of first) can easily be more time-consuming than the actual installation. We have seen systems which took hours to prepare a suitable partitioning setup, but once done, installation finished in about 20 minutes.

Most **LiveCD/USB** media contain system software to resize, move, create and delete disk partitions; utilizing a program called **gparted**. If you are lucky you can simply use **gparted** to shrink an already existing partition and free up 20-30 GB or so, then do your normal installation. Be careful during the procedure to properly answer any questions about your hard disk layout so you do not destroy existing, in-use partitions.

Many systems may already have four **primary** disk partitions in use; if this is the case you cannot create any new partitions. (You can have no more than four primary partitions, or up to three primary partitions plus an extended partition, in which you can create a number of **logical** partitions.) For example, some manufacturers set up two partitions reserved for **Windows** (a boot partition and the C: drive), one partition reserved for the recovery disk and one partition for manufacturer diagnostics. If you are stuck with this situation, you have to delete a partition to get your primaries down to three or do more complicated things, such as converting one of the primary partitions to a logical one, and you will still have to do some steps of shrinking and moving partitions.

It is impossible for us at the **Linux Foundation** to give detailed instructions on how to do this. Each system varies as to its pre-existing layout, and the potential for turning your system into a doornstop is quite high. We do not have the technical support bandwidth to take care of things like this. Therefore, we will simply refer you to your favored distribution and its install pages for technical assistance.

Once you have performed a successful installation, you can install any further software packages you may need as you notice they are missing, using the methods you will learn in class.

Please note that very recent hardware may contain **UEFI Secure Boot** mechanisms. If this is enabled in the **BIOS**, the situation is more complicated and there is not yet a universally-

accepted method of making **Linux** co-exist with it. It is beyond our current ability to give technical support in this situation.

The bottom line is that unless you feel comfortable messing with your partitioning setup, have the time to deal with any potential problems, and have an available lifeline if disaster strikes, you will probably be better off doing a virtual machine installation or using a **Live** media option.

## **LINUX FOUNDATION**

The Linux Foundation promotes, protects and standardizes Linux by providing unified resources and services needed for open source to successfully compete with closed platforms.

To learn more about our Linux Training program, please visit us at [training.linuxfoundation.org](https://training.linuxfoundation.org).