

# Creating a custom flavor of Linux OS From Scratch with Web Interface

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**Abstract** — There are many Linux distros (operating systems) available on internet which are targeted for different users like standard users, developers, penetration testers, and sysadmins. But it's very difficult to create own flavor of operating system for anyone because it is a very complicated to compile the source code from scratch. Its very useful when we can create our own operating system from scratch within seconds from online.

**Index Terms** — Linux, Distros, ArchLinux, Gentoo, LFS, Debian, Ubuntu, ShellScripts, OpenBuildSystems, OperatingSystems, Distributions, Unix, OpenSource

## 1. INTRODUCTION

Arch Linux is a general-purpose Linux distribution that strives to provide the latest stable versions of most software by following a rolling-release model. The default installation is a minimal base system, configured by the user to only add what is purposely required. Arch Linux is a particularly good distribution of Linux for this purpose, because its package manager makes upgrading easy and because many programs of interest to econometricians are included as part of the distribution. In any case, it takes a while to end up used to Linux, particularly for the individuals who have no past involvement with Unix. New clients may wish to start by introducing it on a more established PC, or as a moment working framework on a work area machine that will be rebooted every now and then at any rate.

The principle preferred standpoint of Linux was that software engineers could utilize the Linux Kernel to plan their own custom working frameworks. With time, another scope of easy to understand OS's raged the PC world. Presently, Linux is a standout amongst the most prevalent and generally utilized Kernel, and it is the foundation of well-known working frameworks like Debian, Knoppix, Ubuntu, and Fedora. Nevertheless, the list does not end here as there are thousands of OS's based on Linux which offer a variety of functions to the users. Linux Kernel is normally used in combination of GNU project by Dr. Richard Stallman. All modern distributions of Linux are actually distributions of Linux/GNU.

### 1.1 Popular linux distributions

#### 1.1.1 General

These distributions offer a broad range of advantages, strengths and can be made to serve most operating system uses.

#### 1.1.2 Debian

Debian is the largest upstream Linux distribution with a bigger community and features stable, testing, and un

stable branches, offering over 43,000 packages. The available number of Arch binary packages is more modest. However, when including the AUR, the quantities are comparable.

Debian has a more vehement stance on free software but still includes non-free software in its non-free repos. Arch is more lenient, and therefore inclusive, concerning non-free packages as defined by GNU.

Debian focuses on stringent testing of the Stable branch, which is "frozen" and supported up to five years. Arch packages are more current than Debian Stable, being more comparable to the Debian Testing and Unstable branches and has no fixed release schedule.

Debian is available for many architectures, including alpha, arm, hppa, i386, x86\_64, ia64, m68k, mips, mipsel, powerpc, s390, and sparc, whereas Arch is officially x86\_64, with community ports for i686 (Arch Linux 32) and ARM (Arch Linux ARM) only.

Arch provides more expedient support for building custom, installable packages from outside sources, with a ports-like package build system. Debian does not offer a ports system, relying instead on its large binary repositories.

The Arch installation system only offers a minimal base, transparently exposed during system configuration, whereas Debian's methods, such as the use of apt tasks to install pre-selected groups of packages, offer a more automatically configured approach as well as several alternative methods of installation. Arch generally packages software libraries together with their header files, whereas in Debian header files have to be downloaded separately.

Arch keeps patching to a minimum, thus avoiding problems that upstream are unable to review, whereas Debian patches its packages more liberally for a wider audience.

#### 1.1.3 Fedora

Fedora is community developed, yet corporately backed by Red Hat; it is often presented as a testbed release system. Fedora packages and projects migrate to RHEL and some eventually become adopted by other distributions. Arch has no fixed releases and does not serve as a testing branch for another

er distribution.

Fedora packages use the RPM format with the DNF package manager. Arch uses pacman to manage tar. xz packages. Fedora refuses to include non-free software in official repositories due to its dedication to free software, though third-party repositories are available for such packages. Arch is more lenient in its disposition toward non-free software, leaving the discernment to the user.

Fedora offers many installation options including a graphical installer as well as a minimal option. Fedora "spins" also provide alternative assortments of desktop environments to choose from, each with a modest assortment of default packages. Arch, on the other hand, only provides a few scripts meant to ease the process of a minimal base system install.

Fedora has a scheduled release cycle, but officially supports discrete version upgrades with the Fed-up tool. Arch is a rolling-release system. Arch features a ports system, whereas Fedora does not. Both Arch and Fedora are targeted at experienced users and developers. Both strongly encourage their users to contribute to project development.

Fedora has earned much community recognition for integration of SELinux, GCJ compiled packages (to remove the need for Oracle's JRE), and prolific upstream contribution; Red Hat and thus, Fedora developers by extension, contribute the highest percentage of Linux kernel code as compared to any other project.

Arch Linux provides what is widely regarded as the most thorough and comprehensive distribution wiki. The Fedora wiki is used in the original sense of the word "wiki", or a way to exchange information between developers, testers and users rapidly. It is not meant to be an end-user knowledge base like Arch's. Fedora's wiki resembles an issue tracker or a corporate wiki.

#### 1.1.4 Slackware

Slackware uses BSD-style init scripts, whereas Arch uses systemd. Arch supplies a package management system in pacman which, unlike Slackware's standard tools, offers automatic dependency resolution and allows for more automated system upgrades. Slackware users typically prefer their method of manual dependency resolution, citing the level of system control it grants them, as well as Slackware's excellent supply of pre-installed libraries and dependencies.

Arch is a rolling-release system. Slackware is seen as more conservative in its release cycle, preferring proven stable packages. Arch is more bleeding-edge in this respect. Arch Linux provides many thousands of binary packages within its official repositories, whereas Slackware official repositories are more modest.

Arch offers the Arch Build System, an actual ports-like system and also the AUR, a very large collection of PKGBUILDs contributed by users. Slackware offers a similar, though slimmer system at slackbuilds.org which is a semi-official repository of Slack builds, which are analogous to Arch

PKGBUILDs. Slackware users will generally be quite comfortable with most aspects of Arch.

#### 1.1.5 Newbie distros

Sometimes called "newbie distros", the beginner-friendly distributions share a lot of similarities, though Arch is quite different from them. Arch may be a better choice if you want to learn about GNU/Linux by building up from a small base, as an installation of Arch installs few packages in comparison. Specific differences between distributions are described below.

#### 1.1.6 Ubuntu

Ubuntu is a popular Debian-based distribution commercially sponsored by Canonical Ltd., while Arch is an independently developed system built from scratch.

The two projects have very different goals and are targeted at a different user base. Arch is designed for users who desire a do-it-yourself approach, whereas Ubuntu provides a preconfigured system. Arch presents a simpler design from the base installation onward, relying on the user to customize it to their own specific needs. Many Arch users have started on Ubuntu and eventually migrated to Arch.

Arch development is not biased towards any one particular user interface beyond what its community provide support for. Furthermore, Canonical's commercial nature has led them to some controversial decisions, such as the inclusion of advertisements in Unity's Dash menu and user data collection. Arch is an independent, community-driven project with no commercial agenda.

Ubuntu moves between discrete releases every 6 months, whereas Arch is a rolling-release system.

The two communities differ in some ways as well. The Arch community is much smaller and is strongly encouraged to contribute to the distribution. In contrast, the Ubuntu community is relatively large and can therefore tolerate a much larger percentage of users who do not actively contribute to development, packaging, or repository maintenance.

#### 1.1.7 Linux Mint

Linux Mint was born as an Ubuntu derivative, and later added the LMDE (Linux Mint Debian Edition) that is instead based on #Debian. On the other hand, Arch is an independent distribution that relies on its own build system and repositories.

Mint includes several graphical tools for easier maintenance, called Mint Tools. Arch only provides simple command-line tools like pacman and leaves system management to be organized by the user. Mint mainly ships with Cinamon or MATE as its GUI, and alternatively KDE or Xfce4.

#### 1.1.8 OpenSUSE

OpenSUSE is centered around the RPM package format and its well-regarded YaST2 GUI-driven configuration tool. Arch does not offer such a facility. openSUSE, may therefore be more appropriate for users who want a more GUI-driven environment, automatic configuration, or expected functionality

out of the box while still allowing depth of customization.

### 1.1.9 Mandriva/Mageia

Mandriva Linux (formerly Mandrake Linux) was created in 1998 with the goal of making GNU/Linux easy to use for everyone; it is RPM-based and uses the uremia package manager. Mageia is a Mandriva fork created by former Mandriva employees which opposes its parent distribution's commercial position, being a non-profit and community-driven project. Arch takes a simpler approach than Mandriva or Mageia, being text-based and relying on more manual configuration and is aimed at intermediate to advanced users.

## 2. LITERATURE SURVEY

### 2.1 Introduction

Linux is an operating system for personal computers developed by Linus Torvalds in 1991. Initially, Linux supported only the Intel 80x86 processor. Over the years, support has been added so that Linux can run on various other processors. Currently, Linux is one of very few operating systems that run on a wide range of processors, including Intel IA-32, Intel IA-64, AMD, DEC, PowerPC, Motorola, SPARC, and IBM S/390.

Linux is similar to UNIX in that it borrows many ideas from UNIX and implements the UNIX API. However, Linux is not a direct derivative of any particular UNIX distribution.

Linux is undoubtedly the fastest-growing operating system today. It is used in areas such as embedded devices all the way to mainframes. One of the interesting and most important facts about Linux is that it is open-sourced. The Linux kernel is licensed under the GNU General Public License (GPL); the kernel source code is freely available and can be modified to suit the needs of your machine.

### 2.2 Literature survey on operating system

James G Mackinnon, et al [1] explained a concept that Linux just refers to the core of the operating system, the so called "kernel," which interacts directly with the hardware and supervises the operation of other programs. However, a working Linux system includes many other components, without which it would not be very useful. Many of these are GNU programs from the Free Software Foundation, while others were developed from work originally done at universities such as MIT and Berkeley. All of this software is normally packaged as what is called a "distribution." There are several popular distributions. This review concentrates on Debian GNU/Linux ([www.debian.org](http://www.debian.org)), the one with which I am most familiar. Debian is entirely non-commercial; it is maintained by hundreds of volunteers from around the world. The current version at the time this review was written is Version 2.1. Other popular distributions are commercial. They include Red Hat ([www.redhat.com](http://www.redhat.com)), Caldera ([www.caldera.com](http://www.caldera.com)), Slackware ([www.slackware.com](http://www.slackware.com)) a more complete list may be found at [www.linux.org](http://www.linux.org). Each of these distributions may be particularly suitable for some users.

Vasishath koushal, et al [2] explained the advantages of Linux distributions. Linux is bundled with features of Windows and Mac OS X. Linux is a multi-task and multi user operating system. A multitask operating system can do several tasks at the same time (well, not quite so, but it seems like that from the human point of view). A multiuser operating system has a concept of "userquot" a way to identify the person that is using the system and can allow different users to perform different tasks in the computer and protect one user's tasks from interfering with another user's programs. Many people are not aware about Linux Operating system, and are still stuck with the old windows Operating System, still not aware about the vast expansion of Linux "the future of operating system". The community behind Linux, especially Linux is what attracts many people to the operating system.

Abhimanyu Sharma, et al [3] concluded that an operating system (OS) is a collection of software that manages computer hardware resources and provides common services for computer programs. The operating system is an essential component of the system software in a computer system. Application programs usually require an operating system to function.

### Functions of an operating system

- Booting the computer
- Performs basic computer tasks
- Provides a user interface
- Handles system resources
- Provides file management

Pankaj Guptha, et al [4] introduced types of operating systems. An operating system is a collection of system programs, tools, and utilities that manage computer hardware resources and offer common services for client application software. The operating system is the first program to execute upon booting a computer. An operating system runs users' application programs and provides them a suitable interface to interact with the computer hardware.

There are four designs to the OS according to the kernel.

- **Monolithic (simple) OS:** This is the oldest design of the OS. While executing programs the OS does not distinguish between the user mode and the system mode.
- **Layered OS:** The modules of the OS are divided into layer forming a hierarchical structure. As all requests pass through multiple layers, this makes the OS less efficient.
- **Microkernel OS:** In this approach the kernel provides only the most essential OS functions. System programs or user level programs implemented outside the kernel provides the remaining OS services.
- **Exokernel OS:** This is the latest trend in the design of the OS. This approach implements application level resource management, that is applications programs manage the hardware resources not the OS. As the

kernel provides only limited number of primitives, the Exokernel OS are very efficient. It provides applications with greater flexibility and better performance than Monolithic or Microkernel OS.

Athira joshi, et al [5] proposed the concept of network operating systems. The network operating systems are very important in today's emerging world-whether it is wired or wireless. In this work we have compared three different operating systems which are in wide use Today-Tiny OS, Mantis and SOS. There are a few more operating systems which will definitely bring more services and performance coverage's in terms of new communication terminologies.

Madhuri Bhaganagare, et al [6] explained about various Linux distributors. They are:

- **Debian**  
GNU/Linux is a distribution that emphasizes free software. It supports many hardware platforms. Debian and distributions based on it use the .deb package format and the DPKG package manager and its frontends. 6.2 Knoppix It is based on Debian
- **Ubuntu**  
It is a distribution based on Debian, designed to have regular releases, a consistent user experience and commercial support on both desktop and server.
- **Unofficial variants**  
This distribution and derivatives are not controlled or guided by Canonical Ltd. and generally have different goals in mind.
- **Gentoo**  
Distributions based on Gentoo use the Portage package management system with emerges or one of the alternative package managers.
- **Red Hat Linux and SUSE Linux**  
These are the original major distributions that used the RPM file format, which is today used in several package management systems. Red Hat Linux divided into a community-supported distribution sponsored by Red Hat called Fedora, and a commercially supported distribution called Red Hat Enterprise Linux, whereas SUSE divided into openSUSE and SUSE Linux Enterprise.
- **Pacman**  
It is a package manager that can resolve dependencies and automatically downloading and installing all necessary packages. In theory, a user need only run a single command to completely update the system.
- **Slackware**  
It is known as a highly customizable distribution that stresses ease of maintenance and reliability over cutting-edge software and automated tools. Generally considered a distribution for advanced users.
- **Independent**

This are the operating system made by the independent users.

## 2.3 Comparison between Arch Linux and other popular GNU/Linux distributions

### 2.3.1 Source-based

Source-based distributions are highly portable, giving the advantage of controlling and compiling the entire OS and applications for a particular machine architecture and usage scheme, with the disadvantage of the time-consuming nature of source compilation. The Arch base and all packages are only compiled for the x86\_64 architecture.

### 2.3.2 CRUX

Arch features pacman, which handles binary system package management and works seamlessly with the Arch Build System. CRUX uses a community contributed system called portaget, which, in combination with its own ports system, handles dependency resolution, but builds all packages from source (though the CRUX base installation is binary). Both Arch and CRUX officially support only the x86\_64 architecture.

Arch uses a rolling-release system and features a large array of binary package repositories as well as the Arch User Repository. CRUX provides a more slimmed-down officially supported ports system in addition to a comparatively modest community repository.

### 2.3.3 LFS

LFS, (or Linux from Scratch) exists simply as documentation. The book instructs the user on obtaining the source code for a minimal base package set for a functional GNU/Linux system, and how to manually compile, patch and configure it from scratch. LFS is as minimal as it gets and offers an excellent and educational process of building and customizing a base system.

LFS provides no online repositories; sources are manually obtained, compiled and installed with make. (Several manual methods of package management exist and are mentioned in LFS Hints).

Arch provides these very same packages, plus system, a few extra tools and the powerful pacman package manager as its base system, already compiled for x86\_64. Along with the minimal Arch base system, the Arch community and developers provide and maintain many thousands of binary packages installable via pacman as well as PKGBUILD build scripts for use with the Arch Build System. Arch also includes the make pkg tool for expediently building or customizing.pkg.tar.xz packages, readily installable by pacman.

Judd Vinet built Arch from scratch, and then wrote pacman in C. Historically, Arch was sometimes humorously described simply as "Linux, with a nice package manager."

### 2.3.4 Gentoo Linux

Both Arch Linux and Gentoo Linux are rolling release systems,

making packages available to the distribution a short time after they are released upstream.

Arch only supports x86\_64 while Gentoo officially supports x86 (i486/i686), x86\_64, PPC/PPC64, SPARC, Alpha, ARM, MIPS, HPPA, S/390 and Itanium architectures. Gentoo's official package and system management tools tend to be rather more complex and "powerful" than those provided by Arch, and certain features which are at the very heart of Gentoo (USE flags, SLOTS, etc.) do not have any direct Arch Linux equivalent. Some of that is due to the fact that Arch is primarily a binary distro, but differences in design philosophy also play a big role, with Arch taking a more principled stance in favor of architectural simplicity and avoiding over-engineering.

Because both the Gentoo and Arch installations only include a base system, both are considered to be highly customizable. If comfortable with system, Gentoo users will also generally feel at ease with most other aspects of Arch.

### 3. SYSTEM ANALYSIS

#### 3.1 Existing system

SUSE Studio was an online Linux software creation tool by SUSE. Users can develop their own Linux distro, software appliance or virtual appliance, mainly choosing which applications and packages they want on their "custom" Linux and how it looks.

#### 3.2 Proposed system

Users can customize every part of OS just by selecting them on website. We can use these builds on dockers also for deploying web applications. SUSE Studio don't have options for selecting bootloader and other applications.

#### 3.3 Feasibility Study

##### 3.3.1 Technical feasibility

**Input:** Required modules and applications of Operating System

**Process:** Building OS image

**Output:** Installable Operating System ISO image

##### 3.3.2 Operational feasibility

Build process of OS image is very quick because it only injects the installation scripts into OS image instead of downloading all of them

##### 3.3.3 Economical feasibility

While extracting the OS image the usage of CPU and memory is low compared to openSUSE build system

#### 3.4 System Requirements

##### 3.4.1 Hardware requirements

The hardware requirements may serve as the basis for a contract for the implementation of the system and should there-

fore be a complete and consistent specification of the whole system. They are used by software engineers as the starting point for the system design. It shows what the system does and not how it should be implemented.

- Minimum 8GB RAM
- 1Ghz processor (Multi processor recommend)

##### 3.4.2 Software requirements

The software requirements document is the specification of the system. It should include both a definition and a specification of requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the team's and tracking the team's progress throughout the development activity.

- ❖ Arch Linux Operating System
- ❖ PHP Server
- ❖ Arch repository
- ❖ Arch Linux minimal base ISO image

##### 3.4.3 Modules

###### 3.4.3.1 Script generator

Script generator automatically processes the user selections and generates installation script.

###### 3.4.3.2 Client-side logs window

Console window on client side displays server-side operations live.

###### 3.4.3.3 Automated ISO builder

ISO builder generates installable OS image for user.

### 4. IMPLEMENTATION

#### 4.1 Languages Used

##### 4.1.1 PHP

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language.

##### 4.1.2 BASH

Bash is a Unix shell and command language written by Brian Fox for the GNU Project as a free software replacement for the Bourne shell.

##### 5.1.3 HTML, CSS, JS, AJAX

AJAX is a developer's dream, because you can:

- Update a web page without reloading the page
- Request data from a server - after the page has loaded
- Receive data from a server - after the page has loaded

- Send data to a server - in the background

HTML is the standard markup language for creating Web pages.

- HTML stands for Hyper Text Markup Language
- HTML describes the structure of Web pages using markup
- HTML elements are the building blocks of HTML pages
- HTML elements are represented by tags

CSS is a language that describes the style of an HTML document. CSS describes how HTML elements should be displayed. JavaScript is the programming language of HTML and the Web.

## 5. CONCLUSION

The Linux operating system provides an excellent platform for doing theoretical and applied econometrics. Arch Linux is a particularly good distribution among Linux operating systems. It takes a while to become used to Linux, especially for those who have no previous experience with Unix. New users may wish to begin by installing it on an older computer, or as a second operating system on a desktop machine that will be rebooted from time to time anyway. Some econometricians will undoubtedly find that Linux suits their needs extremely well, while others may find that Linux as a desktop operating system is not to their taste. However, even those who are in the latter group will probably find that Linux is an ideal operating system for running web servers, mail servers, and compute servers.

Running Linux is fun! It brings back much of the excitement that used to characterize computing in days gone by. One reason for this is that there is a strong sense of community among Linux users. Another reason is that Linux users experience a sense of rapid progress: New software is constantly appearing, older software is constantly improving, and even the most experienced can always find new and better ways to use the enormously powerful tools that come with the system.

There is no single operating system that is the right choice for every organization and every application. Many organizations find that the best approach is to run multiple operating systems. Linux and Windows are mostly preferred choices among them.

The above studies have been done in through reference to the manuals and distro documents. It has come to a deep understanding of how every Linux based distribution functions and also their different flavor. With this document anybody can able to identify the need-based selection of the appropriate distro and build it on their own.

## 6. FUTURE ENHANCEMENTS

Linux as an OS will flourish. But not in a way that most people think. Most people think Linux to be just the different distribution of desktop OS e.g. Ubuntu, Mint, elementary, etc. But Linux is much more than that. Linux is an ecosystem of FOSS libraries, plugins, and applications with Linux kernel at their core, which can be used to build an OS on which a device can operate.

Standardized: A flavor of Linux that has uniform look and feel, common design language, and that allows itself to be extended, but keeping the design language same.

Platform targeted: Fixed to one niche area, e.g. desktop, handhelds, device adaptive interface, or any future interface

Fork: A flavor of Linux, with the minimal commonality that it uses the Linux kernel in one way or other

In the future we will interact with devices in a way we cannot really predict now. Many devices which are just automatic now, will become smart, interactive and connected in future. These devices will require OS. Linux is best positioned to take this role. Some platforms I can think of are - smart cars, smart homes, etc. Demand for Linux developers will increase, but not overnight.

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