

# E-learning platform for Linux Shell

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*Abstract*---The World Wide Web has a more impact on the education sector. This paper aims to describe a novel way of extending the e-learning techniques used in the area of Linux education. This paper includes web site which contains not only all commands information, tutorials & videos but also Linux bash shell which provides free hand practical approach to end users anytime anywhere. In this paper, way of Linux shell access is explained, which is a key feature of the system.

## I. INTRODUCTION

The advent of the e-learning has given birth to newer ways for extending the practical education. The main problem in Linux training is that expertise in this field is not easily available. This can overcome by web-based system in which students/developers can get easy access to e-learning services and learn them without installing Linux in system. Online education has seen significant growth in the past decade, according to a report [1] released recently by U.S. Department of Education. Reference [3] defines e-learning as having three fundamental criteria: an e-learning system is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of information; it is delivered to the end-user via a computer using standard Internet. This paper uses open source software (OSS) technologies such as AJAX, shellinabox and some small Open Source utilities such as Ajax term / PHP term

## II. KEY CONCEPT

### A. Linux Architecture

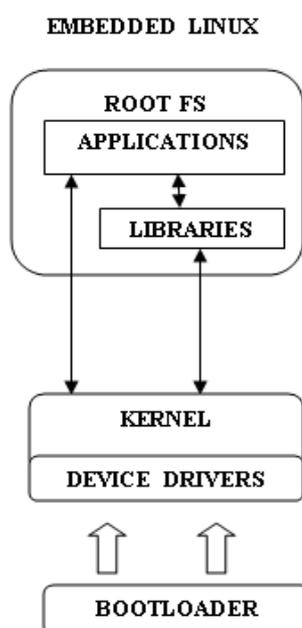


Fig. 1: Generic embedded Linux structure

### 1) Bootloader:

The bootloader is software that executes after the hardware's BIOS completes its start up tests. The bootloader starts an operating system. The operating system needs some type of software to initiate the core of the OS. Chain loading is usually used when a computer has many installed operating systems (multi-booting) and the primary bootloader cannot initiate one or more of the operating systems. The boot loader is the first piece of software started by the BIOS. It is responsible for loading the kernel with the wanted kernel parameters, and initial RAM disk before initiating the boot process. We can use different kinds of bootloaders in Arch, such as GRUB and Syslinux. Some bootloaders only support BIOS and some support both.

### 2) Linux Kernel:

Kernel is the core part of Linux [4]. It is responsible for all major activities of this operating system. It consists of various modules and it interacts directly with the underlying hardware. Kernel provides the required abstraction to hide low level hardware details to system or application programs. Kernel component code executes in a special privileged mode called kernel mode with full access to all resources of the computer. This code represents a single process, executes in single address space and do not require any context switch and hence is very efficient and fast. Kernel runs each process and provides system services to processes, provides protected access to hardware to processes.

### 3) Root files system:

A file system is a way of representing a hierarchical collection of directories, where each directory can contain either more directories or files. This hierarchy is a tree structure in which the files are always leaf nodes and directories are internal nodes when they contain something and leaf nodes otherwise. As the top node in a tree structure is the root node in Linux [4], so file system mounted at the top node is aptly called the root file system. It contains all the required libraries and the user applications arranged in a hierarchical manner.

### B. Linux Shell

The Linux shell program interprets user commands, which are either directly entered by the user, or which can be read from a file called the shell script or shell program. Shell scripts are interpreted, not compiled. The shell reads commands from the script line per line and searches for those commands on the system, while a compiler converts a program into machine readable form, an executable file - which may then be used in a shell script. Apart from passing commands to the kernel, the main task of a shell is providing a user environment, which can be configured individually using shell resource configuration files. A Linux shell [6] provides an interface that lets the user interact with the operating system by running commands. But a shell is also a fairly rich programming language: there are constructs for

flow control, alternation, looping, conditionals, basic mathematical operations, named functions, string variables, and two-way communication between the shell and the commands it invokes. Shells can be used interactively, from a terminal or terminal emulator such as xterm, and non-interactively, reading commands from a file. Most modern shells, including bash, provide command-line editing, in which the command line can be manipulated using emacs- or vi-like commands while it's being entered, and various forms of a saved history of commands [5]. Bash processing is much like a shell pipeline: after being read from the terminal or a script, data is passed through a number of stages, transformed at each step, until the shell finally executes a command and collects its return status. The shell is used to write commands and execute them.

### III. LINUX SHELL ACCESS THROUGH WEB BROWSER

The challenge arising next is to enable the remote development host's shell to be viewed directly through the web-browser. There is one small Open Source utilities which make this task easier. Linux shell is shown in fig.2.



```
user068@sshell ~$ ls -a
.  .bash_logout .bash_profile .bashrc .hushlogin .ssh
user068@sshell ~$
```

Fig. 2: Linux shell

#### A. Shell in a box

Shell In A Box (pronounced as shellinabox) is a web based terminal emulator created by Markus Gutschke. It has built-in web server that runs as a web-based SSH client on a specified port and prompt you a web terminal emulator to access and control your Linux Server SSH Shell remotely using any AJAX/JavaScript [7] and CSS enabled browsers without the need of any additional browser plugins such as FireSSH. By default, shellinaboxd listens on TCP port 4200 on localhost. By default, Shellinabox tool is included on many Linux distributions through default repositories, including Debian, Ubuntu and Linux Mint.

#### B. Web Browser

This paper includes website with an aim to bring free Linux education to everyone. The main advantage of website is one can learn at their own pace, comfort and time by them again and again till the concepts are well understood. These free Linux training website don't just serve as an excellent opportunity to learn directly from Linux professionals, but also offer a chance to get training. This website provide free Linux training[4] for developers, system administrators and engineering managers on the latest in Linux methods. This website is the nonprofit consortium dedicated to fostering the growth of Linux [5]. Our comprehensive Linux courses include the real-world experience and first-hand knowledge of what it takes to be a successful Linux developer or system administration professional that our Linux experts bring to training with them. The courses also include hands-on components and rigorous programming or administration lab exercises. This paper combines the broad, foundational

knowledge with the networking opportunities that attendees need to thrive in their careers today.

### IV. CONCLUSION

The demand for remote hands-on labs has been rising rapidly while the budget has not been increased proportionally. To deal with this challenge, we have implemented Linux shell without install any software on client machine. This paper implements cost-effective ways of delivering hands-on education online.

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