Virtual Lab To Teach Linux On Web

Shakshi Panwar, Nani Yalu, Kashmira Sakunde, Madhuri Sanap

Guided By: Prof. K.D Yeshugade, Bharati Vidyapeeth's College of Engineering for Women's, Pune, Dhankawadi, Maharashtra-411043.
s.panwar12@gmail.com, yalunani01@gmail.com, kasmirasakunde@gmail.com, sanapmadhura@gmail.com

Abstract: Nowadays, there is a shortage of experimental platforms needed for learning IT systems in a hands-on way is one reason for the lack of quality education in the area of IT/CS. For most students who have access to a PC, their ability to experiment on that machine is limited by the risk of possible irrecoverable damage their experimentation may cause to the equipment. So to avoid this irrecoverable damage to the system we are introducing a "virtual lab to teach Linux on web". This lab will provides you the basics of Linux with the interactive sessions and student forum. The goal of this laboratory is to give the students a platform through which they can learn the essentials of Linux. Here student can interact with the virtual instance of Linux machine through a web browser on his machine. Major advantage of this lab is that we don't need to install the Linux OS on our system, without installing Linux OS also we can use it. We can also execute the Linux commands on the prompt. The lab consists of a suite of experiments designed as web applications.

Keywords: AES, SSH, AJAX, Authentication, VM, Encryption.

1. Introduction

Over the past few years, the concept of cloud computing and virtualization has gained much momentum and has become a more popular phrase in information technology. Many organizations have started implementing these new technologies to further reduce costs through improved machine utilization, reduced administration time and infrastructure costs. Cloud computing is the environment that enables customers to use applications on the Internet such as storing and protecting data while providing a service. Our project aims to perform set up of private cloud and use cloud APIs to manage infrastructure of virtual machines. This system will help users for provisioning and configuring virtual machines. A portal would be implemented from where users can request for a Virtual Machine (VM) and use it. Portal will contain two parts – one for clients requesting the computer resources and another for administrator. Administrator will approve the requests and upon approval, provisioning takes place. The goal of this laboratory is to increase the student's knowledge and practice of basic but essential tasks of systems administration. The lab consists of a suite of experiments designed as web applications. The students interact with a remote virtual instance of a Linux machine via a web browser. This exempts the students from having a Linux machine and prevents the fear of risking their system in learning Linux. Thus the virtual laboratory provides a safe platform for the student to learn basic system administration.

2. EXISTING WORK

In the Existing Linux Lab, There is necessity of all the systems must have Linux installed in it. Providing such infrastructure requires maintenance of machines which may lead to irrecoverable damage due to experimentation by beginners. The maintenance requires the administrators to be patient enough to recover the machines every time damage occurs. Then concept of virtual laboratory was involved which provide Distance Learning, where all the processes, academic and administrative, are carried out in a virtual environment .A virtual laboratory that will allow multiple institutions to share one physical laboratory or multiple users to share the same server.

3. PROPOSED WORK

In this project we are trying to improve the awareness among students about the Linux Operating System and its administration. Our first goal of this laboratory is to increase the student's knowledge and practice of basic but essential tasks of systems administration. The lab consists of a suite of experiments designed as web applications. The students interact with a remote virtual instance of a Linux machine via a web browser. This exempts the students from having a Linux machine and prevents the fear of risking their system in learning Linux. Thus the virtual laboratory provides a safe platform for the student to learn basic system administration.

- The Virtual Lab for Systems and Software will consist of a suite of experiments each designed as a web application.
- We have initially focused on building a virtual lab for teaching the elementary Linux and system administration tasks such as:
    1) File Management
    2) Process Control
    3) User Management
    4) Basics Networking Concepts

MODULES TO DEVELOP

Module 1:
Develop the Web Application with Registration/Login module for Admin and Student.

Module 2:
Through the Admin Module, Admin can upload/update the Tutorials/Videos. Student Module is responsible to use the uploaded tutorials/videos also download the same.

Module 3:
Develop the Quiz section for Student. Also Develop the Discussion forum so that student can discuss with student and also with Admin.

Module 4:
Develop the Experiment module, through which student can experiment different Linux Commands from his non-Linux

machine, and see the result back from server to his window.

More features are:
• Live streaming facility.
• User may request for the Linux for particular period, then we must give Linux to that user for that time span only, for example: If user request for the Linux for one hour then we must provide Linux to that user for 1 hr and after 45 minutes we must display a message that "15 minutes is remaining" onto the screen.
• We are providing authentication by making one Admin Login. So that no unauthenticated person can use the Linux on Virtual Machine.

4. SYSTEM ARCHITECTURE

• The student communicates with a server through the browser on his system.
• This communication between the server and the student machine happens via HTTP requests and responses.
• The server runs virtual instances of operating system (Linux) depending on the server's hardware capabilities.
• When the user executes a command on the command line interface of the web application, AJAX request is sent to the server.
• This request received onto the server is processed and sent to the virtual instance of Linux machine. The communication between the server and the virtual instance happens through SSH.
• The output of the response is sent from the virtual instance to the server.
• The server then sends back the received response to the browser on the host system in the form of a HTTP response.

Objectives of the Study
1. To identify and design virtual lab situations from the available resources with the help of which the above identified concepts and principles can be developed.
2. To Study the effectiveness of achievement of above identify concepts and principles through virtual lab compared to real lab.
3. Virtual Lab also, is used in the system aiming to replace physical machine with virtual machines on one host server.

Operating Environment
Operating System   : Windows XP/7/8
Application Server   : Tomcat 5.0/6.X
Front End   : HTML, Java, Jsp
Server side Script   : Java Server Pages.
Database   : My sql
Database Connectivity   : JDBC.

5. AES ALGORITHM
To provide security Advanced Encryption Standard (AES) is used. The Advanced Encryption Standard (AES) is a symmetric-key block cipher published by the National Institute of Standards and Technology (NIST) in December 2001.
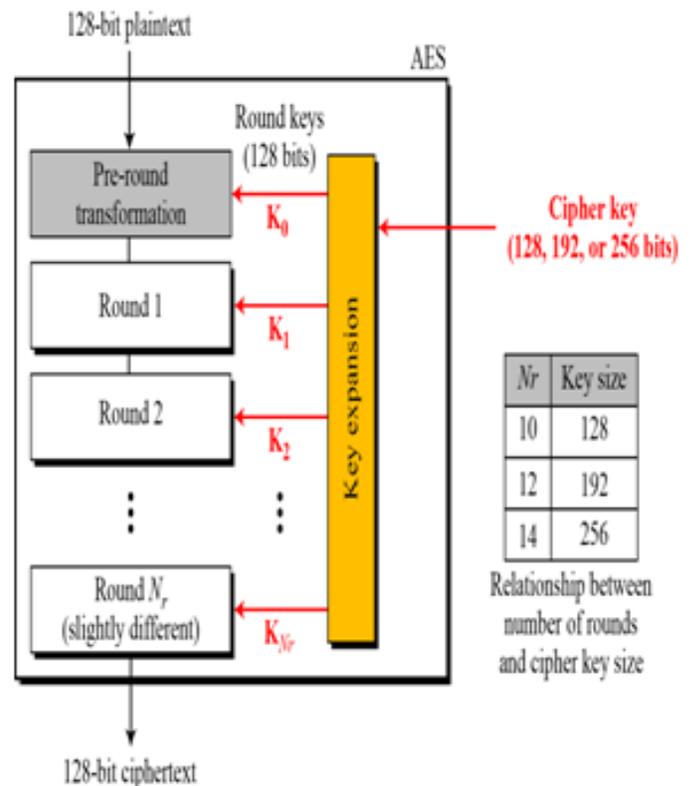

N_r	Key size
10	128
12	192
14	256

Relationship between number of rounds and cipher key size

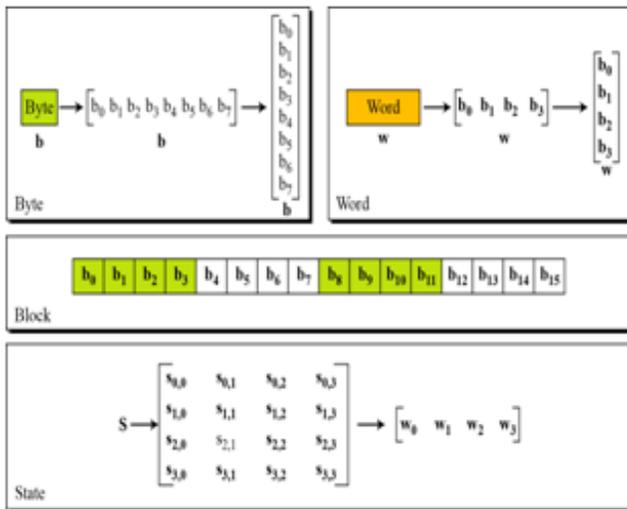**Fig: General design of AES encryption cipher**
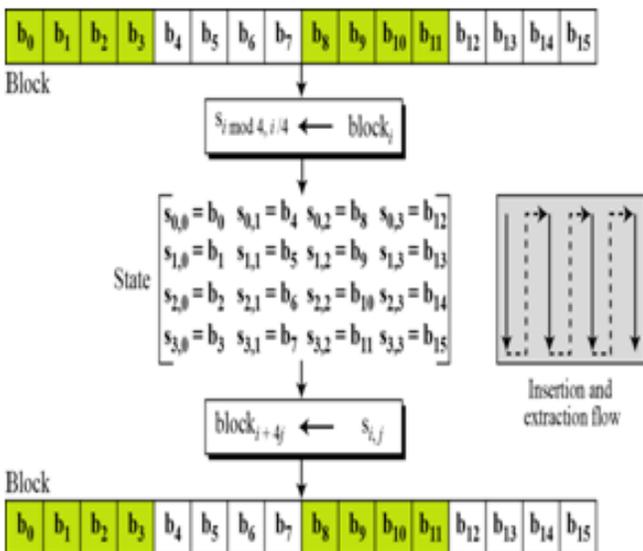
Fig: Data units used in AES

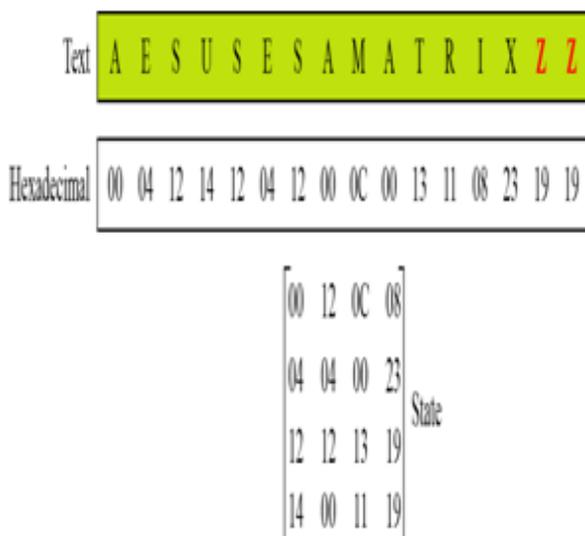**Fig: Block-to-state and state-to-block transformation**

Fig: Changing plaintext to state

5.1 Rounds and Transformation Stages:

The round function consists of four transformation stages.
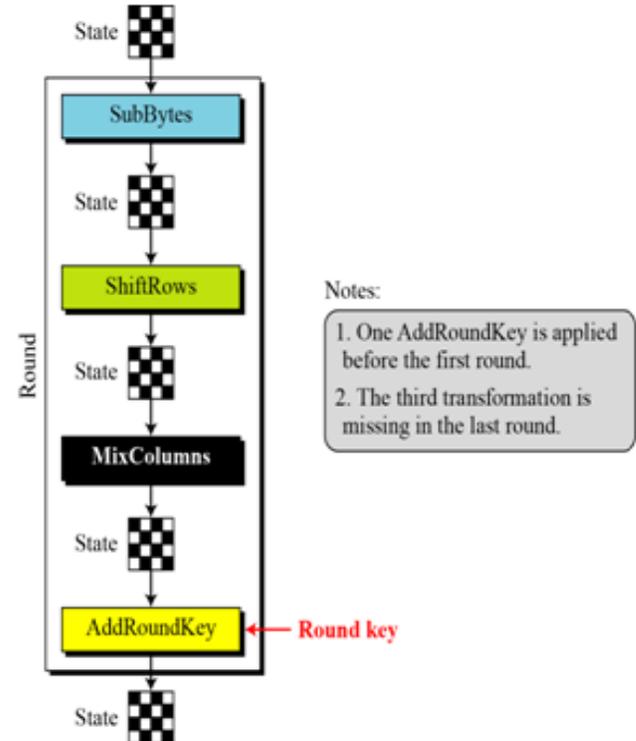- SubBytes()
- ShiftRows()
- MixColumns()
- AddRoundKey()

Notes:
1. One AddRoundKey is applied before the first round.
2. The third transformation is missing in the last round.

Fig: Structure of each round at the encryption site

6. CONCLUSION

The objectives of this project are to generate a new teaching tool in secure web development. We have initially focused on building a virtual lab for teaching the elementary Linux and system administration tasks such as File Management, Process Control, Basic Networking and Version Control using Subversion. Each of these concepts is presented to the user as an Web experiment. We will provide the live streaming facility. The user is given access to a remote Linux machine to be able to experiment and perform the tasks of the experiment via a command line interface presented via the browser. We also provide the time span facility also. The student is expected to have reached a good understanding of the concept involved. This system provides some advantages and they are:

- Require less memory.
- Several virtual machines can run simultaneously, connected through a virtual network connection.
- Providing a Linux environment that is safe, easy to learn and understand.
- One system can provide the Linux to multiple non-Linux systems.
- Student can attend the Lab from anywhere and anytime.
- Student can see the all Linux tutorials at one place.

7. REFERENCES

[1].   www.computer.org/csdl/proceedings/t4e/2011/45
34/00/4534a212-abs

[2].   Virtual Labs, MHRD http://vlab.co.in

[3].   Systems and Software Virtual Lab. http://virtual-labs.ac.in/labs/cse09/

[4].   Andrew McElroy, David Miani Try Ruby! - Beta a hands-on tutorial http://tryruby.org/

[5].   Jianxin Wang, BeiPeng, and Weijia Jia (2004), "Design and implementation of virtual computer network lab based on NS2 in the internet".

[6].   JosepPrieto-Blazquez (2005), "A virtual laboratory structure for developing programming labs".

[7].   Federico Milano (2008), "The open source power system virtual laboratory: The PSAT case and experience".