VIRTUAL LAB TO TEACH LINUX ON WEB

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Abstract: 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 provide you the basics of Linux with the interactive sessions and student forum. The goal of this laboratory is to increase the student’s knowledge and practice of basic but essential tasks of systems administration. Our first 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 application.

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

I. 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 administer 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.

III. 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.

IV. 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.
Operating Environment

Operating System : Windows XP/7/8
Application Server : Tomcat 5.0/6.0
Front End : HTML, Java, Jsp
Server side Script : Java Server Pages.
Database : My sq1
Database Connectivity : JDBC.

V. ALGORITHM USED

A. 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.

5.1 Rounds and Transformation Stages:
The round function consists of four transformation stages.
- SubBytes()
- ShiftRows()
- MixColumns()
- AddRoundKey()

B. E-web miner
E-web miner algorithm is the efficient web mining algorithm. In information centric network designs, web analysis inefficiently done by E-web miner. E-web miner has lower complexities of time and space.

We are implementing E-Web Miner algorithm to provide the recommendation to the user about what things their other friends has surf during their session, so that the current user can find the same things very easily.
E-Web Miner may take into consideration the support and the confidence of any sequential pattern of web pages of users

Steps-
Step 1: Arrange the IP of different users in increasing order,
Step 2: Store all web IP and dataset of user in string array A.
Step 3: Frequency =0, MAX=0;
Step 4:

FOR i=1 to n
FOR j=0 to (n-1)
IF substring (A[i], A[j])
Frequency=frequency+1;
END IF
B[i]=Frequency;
END FOR
IF Max <= Frequency;
Max=Frequency;
END IF
END FOR
Step 5: Find all position in Array B where value is equal to Max and select the corresponding Substring from A.
Step 6: Produce output of all substrings with their position which is the desired output.

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.

REFERENCES

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Fig. web miner framework

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