Suggested Teaching Guidelines for

Linux Programming and Cloud Computing
PG-DBDA September 2023

Duration: 28 Classroom hours + 22 Lab hours

Objective: To introduce Linux environment and hands on Linux commands.

Prerequisites: Knowledge of Computer Fundamentals

Evaluation method: Theory exam– 40% weightage

Lab exam – 40% weightage

Internal exam – 20% weightage

List of Books / Other training material

Reference:

1. Linux: The Complete Reference – Petersen/ TMH 6th Edition
2. The Linux Programming Interface: Linux and UNIX System Programming Handbook
3. Pro Bash Programming: Scripting the GNU/Linux Shell, Second Edition
4. Beginning Unix – Joe Marilino (Wrox Publication)
5. Linux Command Line and Shell Scripting Bible – Blum (Wiley – India)

Linux Programming
Session 1 & 2:
Lecture:
Linux History and Operation

- The Evolution of Linux
- The GNU Movement and the GPL
- Linux Operations as a Server
- The Architecture and Structure of Linux

Installing and Configuring Linux (Ubuntu and CentOS)

- Introduction to Installation and Media Types
- Performing a Custom Linux Server Installation
- Run Levels and the Startup/Shutdown Sequence
- Logging In and Out of a Linux System

Basic Commands

(ls, cp, mv, sort, grep, cat,head,tail, man, locate, find, diff, file, rm, mkdir, rmdir, cd, pwd, ln and ln –s, gzip and gunzip, zip and unzip, tar an its variants, touch, echo, who, whoami, ps, kill,makefile,etc.)

Assignment –Lab:

1. Getting Acquainted with the Linux Environment
2. Use various commands in Linux system.
3. As root, create a directory dbda and under it create a directory named test and create 100 files under it with name file1, file2..file100 - all this using a single command

Session 3
Lecture:
Gaining confidence with Linux

- Access control list and chmod command chown and chgrp commands
- Commands like telnet, ftp, ssh, and sftp
- Basic of I/O system with mount and unmount.

Vi/vim/gedit editior

- Features and different modes of vi editor
- Editing using vi editor
- Find and replace commands
- cut-copy-paste commands
- The set command
- Other related commands of vi

Assignment –Lab:

- Create the file /tmp/acl_file.
    1. Allow Larry and Curly to rwx the file.
    2. Don't allow moe to access the file (rwx).
    3. All members of group stooges (except moe) should be able to access the file (rw).

Session 4, 5, & 6
Lecture: Linux shell programming

- Introduction to Shells
    a. What is shell?
    b. Different types of Linux shells
    c. Bourne Again Shell (BASH)
    d. Shell variables (environment and user defined)
    e. Shell files (.bashrc, .profile, .bash_profile, .bash_logout)
    f. Positional parameters
- Get start with simple scripts (User variable, expr, multiple command)
- Wild cards (* and ?)
- Command line arguments
- Arithmetic in shell scripts
- *Read* and *echo* commands in shell scripts
- The *tput* command
- Taking decisions:
    - if-then-fi
    - if-then-else-fi
    - The test command (file tests, string tests)
    - Nested if-elses
    - The case control structure
- The loop control structure
    a. The while, until and for loop structures
    b. The break and continue statements
- Shell metacharacters
- Command line expansion
- Directory stacks manipulation
- Job control, history and processes
- Built-ins and functions
- Shell Files

Assignment –Lab:

- Change the shell of user 3 to 'nologin'. Now login as user4 and try to switch to user3. Observethe result
- Login as root, create a file 'filewithacl' and apply acl on it in such a way that only user5 is ableto read and write in to it. Note: root will do all its work under 'dbda' folder

Session 7:
Lecture

Git / GitHub

o Introduction to Version control systems
o Creating GitHub repository
o Using Git – Introduction to Git commands.

Lab Assignment:

o Create a GitHub repository from the command line

Cloud Computing
Reference:

1. Cloud Computing Black Book by Kailash Jayaswal, Dreamtech
2. Mastering Cloud Computing by Rajkumar/ McGraw Hill Education
3. Cloud Computing a practical Approach by AnthonyT Velte/ McGraw Hill Education
4. Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)
5. Cloud Computing
6. An Introduction to Parallel Computing : Design and Analysis of Algorithms (Authors: Vipin Kumar, Ananth Grama, Anshul Gupta, George Karypis)
7. High Performance Cluster Computing: Architectures & Systems (Volume-1) by Rajkumar Buyya, Pearson
8. Parallel Programming in C with MPI and Open MPI, Michael, TMH
9. High-Performance Computing on Complex Environments

Sessions 8:
Lecture

- o Introduction to cloud
- o What computing paradigms are there?
- o Characteristics and benefits
- o Understanding Cloud Vendors (AWS/Azure/GCP/Heroku)
- o Definition
- o Characteristics
- o Components

Lab Assignments:

- o Study about cloud and other similar configuration
- o Explore available solutions
- o Cloud Architecture

Session 9 & 10:
Lecture

- o Introduction to SaaS
- o Pros and Cons of SaaS Model
- o Traditional Packaged software Vs SaaS
- o SaaS examples
- o Introduction to IaaS

- Examples
- Introduction to virtualization
- Types and Uses of Virtualization
- Virtual Machine Provisioning
- Virtual Machine Migration Services
- Private Cloud Computing Deployment
- Introduction to PaaS
- Challenges of cloud environment
- Hypervisor
- Comparisons of web services
- Organizational Scenarios of Clouds

Lab Assignments:

- Provide a solution on cloud as SAAS using available systems.

Sessions 11 & 12:

Lecture

- Administering & Monitoring cloud services,
- benefits and limitations,
- Deploy application over cloud.
- Comparison among SAAS, PAAS, IAAS,
- Cloud Computing Basics,
- Cloud Products and Solutions,
- Cloud Pricing,
- Compute Products and Services,

Session 13 & 14:

Lecture

- Elastic Cloud Compute
- Dashboard
- Launching Linux VM
- Accessing Linux VM
- Launching & Accessing Windows server VM
- Introduction to AWS
- Introduction Virtual Private Cloud (VPC) Setup
- Services provided by AWS: EC2, Lambda, AWS storage services S3
- Introduction to Heroku
    - Heroku Platform(Heroku runtime, Heroku DX, Heroku Elements etc.)
    - Heroku Data Services(Heroku Postgres, Apache kafka, etc.)

Lab:

- Study about cloud and other similar configuration
- Exposure to big data technologies on cloud
- Create AWS EC2 instance
- Create AWS Lambda
- Create AWS storage services S3
- Create AWS VPC
- Deployment of application on AWS using GitHub
- Deployment of application on Heroku: GitHub, Heroku git