

GL-120: Linux Fundamentals

Course Length: 4 days

Course Description: The GL120 is a challenging course that focuses on the fundamental tools and concepts of Linux and Unix. Students gain proficiency using the command line. Beginners develop a solid foundation in Unix, while advanced users discover patterns and fill in gaps in their knowledge. Like all Guru Labs courses, the course material is designed to provide extensive hands-on experience. Topics include: basic file manipulation; basic and advanced filesystem features; I/O redirection and pipes; text manipulation and regular expressions; managing jobs and processes; vi, the standard Unix editor; automating tasks with shell scripts; managing software; secure remote administration; and more.

Prerequisites: Students should be comfortable with computers. No familiarity with Linux or other Unix operating systems is required.

Distributions: Red Hat Enterprise Linux 8

Course Outline

1. WHAT IS LINUX?

1. Unix and its Design Principles
2. FSF and GNU
3. GPL – General Public License
4. The Linux Kernel
5. Linux Kernel and Versioning
6. Components of a Distribution
7. Slackware
8. SUSE Linux Products
9. Debian
10. Ubuntu
11. Red Hat Linux Products
12. Oracle Linux

2. LOGIN AND EXPLORATION

1. Logging In
2. Running Programs
3. Interacting with Command Line
4. The X Window System
5. Starting X
6. Gathering Login Session Info
7. Gathering System Info
8. uptime
9. got root?
10. Switching User Contexts
11. sudo
12. Help from Commands and Documentation
13. whereis
14. Getting Help Within the Graphical Desktop
15. Getting Help with man & info

LAB TASKS

1. Login and Discovery
2. Help with Commands
3. Switching Users With su

3. THE LINUX FILESYSTEM

1. Filesystem Support
2. Unix/Linux Filesystem Features
3. Filesystem Hierarchy Standard

4. Navigating the Filesystem
5. Displaying Directory Contents
6. Filesystem Structures
7. Determining Disk Usage With df and du
8. Determining Disk Usage (GUI)
9. Disk Usage with Quotas
10. File Ownership
11. Default Group Ownership
12. File and Directory Permissions
13. File Creation Permissions with umask
14. SUID and SGID on files
15. SGID and Sticky Bit on Directories
16. Changing File Permissions
17. User Private Group Scheme

LAB TASKS

1. Navigating Directories and Listing Files
2. Disk and Filesystem Usage
3. File and Directory Ownership and Permissions

4. MANIPULATING FILES

1. Directory Manipulation
2. File Manipulation
3. Deleting and Creating Files
4. Physical Unix File Structure
5. Filesystem Links
6. File Extensions and Content
7. Displaying Files
8. Previewing Files
9. Producing File Statistics
10. Displaying Binary Files
11. Searching the Filesystem
12. Alternate Search Method

LAB TASKS

1. Manipulating Files and Directories
2. File Examination & Search Commands

5. SHELL BASICS

1. Role of Command Shell
2. Communication Channels
3. File Redirection
4. Piping Commands Together
5. Filename Matching
6. File Globbing and Wildcard Patterns
7. Brace Expansion
8. Shell and Environment Variables
9. Key Environment Variables
10. Which and Type
11. General Quoting Rules
12. Nesting Commands

LAB TASKS

1. Redirection and Pipes
2. Wildcard File Matching
3. Shell Variables
4. Shell Meta-Characters
5. Command Substitution

6. ARCHIVING AND COMPRESSION

1. Archives with tar
2. Archives with cpio
3. The gzip Compression Utility
4. The bzip2 Compression Utility
5. The XZ Compression Utility
6. The PKZIP Archiving/Compression format
7. GNOME File Roller

LAB TASKS

1. Archiving and Compression

7. TEXT PROCESSING

1. Searching Inside Files
2. The Streaming Editor
3. Text Processing with Awk
4. Replacing Text Characters
5. Text Sorting
6. Duplicate Removal Utility
7. Extracting Columns of Text
8. Combining Files and Merging Text
9. Comparing File Changes

LAB TASKS

1. Processing Text Streams
2. Text Processing

8. REGULAR EXPRESSIONS

1. Regular Expression Overview
2. Regular Expressions
3. RE Character Classes
4. Regex Quantifiers
5. RE Parenthesis

LAB TASKS

1. Pattern Matching with Regular Expressions
2. Extended Regular Expressions
3. Using Regular Expressions With sed

9. TEXT EDITING

1. Text Editing
2. Pico/GNU Nano
3. Pico/Nano Interface
4. Nano configuration
5. Pico/Nano Shortcuts
6. vi and Vim
7. Learning Vim
8. Basic vi
9. Intermediate vi

LAB TASKS

1. Text Editing with Nano
2. Text Editing with Vim

10. MESSAGING

1. System Messaging Commands
2. Controlling System Messaging
3. Internet Relay Chat
4. Instant Messenger Clients
5. Electronic Mail
6. Sending Email with sendmail
7. Sending and Receiving Email with mailx
8. Sending and Receiving Email with mutt
9. Sending Email with Pine
10. Evolution

LAB TASKS

1. Command Line Messaging
2. Messaging with talkd
3. Command Line Email
4. Alpine

11. COMMAND SHELLS

1. Shells
2. Identifying the Shell
3. Changing the Shell
4. Configuration Files
5. Script Execution
6. Shell Prompts
7. Bash: Bourne-Again Shell
8. Bash: Configuration Files
9. Bash: Command Line History
10. Bash: Command Editing
11. Bash: Command Completion
12. Bash: "shortcuts"

13. Bash: prompt
14. Setting Resource Limits via ulimit

LAB TASKS

1. Linux Shells
2. Bash History
3. Aliases
4. Bash Login Scripts
5. The Z Shell

12. INTRODUCTION TO SHELL SCRIPTING

1. Shell Script Strengths and Weaknesses
2. Example Shell Script
3. Positional Parameters
4. Input & Output
5. Doing Math
6. Comparisons with test
7. Exit Status
8. Conditional Statements
9. Flow Control: case
10. The for Loop
11. The while and until Loops

LAB TASKS

1. Writing a Shell Script

13. PROCESS MANAGEMENT AND JOB CONTROL

1. What is a Process?
2. Process Lifecycle
3. Process States
4. Viewing Processes
5. Signals
6. Tools to Send Signals
7. nohup and disown
8. Managing Processes
9. Tuning Process Scheduling
10. Job Control Overview
11. Job Control Commands
12. Persistent Shell Sessions with Screen
13. Using screen
14. Advanced Screen

LAB TASKS

1. Job Control Basics
2. Process Management Basics
3. Screen Basics
4. Using Screen Regions

14. AT AND CRON

1. Automating Tasks
2. at/batch
3. cron
4. The crontab Command
5. crontab Format
6. /etc/cron.* Directories
7. Anacron

LAB TASKS

1. Creating and Managing User Cron Jobs
2. Adding System cron Jobs

15. MANAGING SOFTWARE

1. Downloading with FTP
2. FTP
3. lftp
4. Command Line Internet – Non-interactive
5. Command Line Internet – Interactive
6. Managing Software Dependencies
7. Using the Yum command
8. YUM package groups
9. Configuring Yum
10. yumdownloader

11. Popular Yum Repositories
12. Using the Zypper command
13. Zypper Services and Catalogs
14. The dselect & APT Frontends to dpkg
15. Aptitude
16. Configuring APT

LAB TASKS

1. Command Line File Transfers
2. Using Yum
3. Using Zypper
4. Managing Yum Repositories
5. Managing Zypper Repositories
6. Using APT
7. Adding an APT repository

16. THE SECURE SHELL (SSH)

1. Secure Shell
2. ssh and sshd Configuration
3. Accessing Remote Shells
4. Transferring Files
5. Alternative sftp Clients
6. SSH Key Management
7. ssh-agent

LAB TASKS

1. Introduction to ssh and scp
2. SSH Key-based User Authentication
3. Using ssh-agent

17. MOUNTING FILESYSTEMS & MANAGING REMOVABLE MEDIA

1. Filesystems Concept Review
2. Mounting Filesystems
3. NFS
4. SMB
5. Filesystem Table (/etc/fstab)
6. AutoFS
7. Removable Media

LAB TASKS

1. Accessing NFS Shares
2. On-demand filesystem mounting with AutoFS

18. PRINTING

1. Legacy Print Systems
2. Common UNIX Printing System
3. Defining a Printer
4. Standard Print Commands
5. Format Conversion Utilities
6. enscript and mpage

LAB TASKS

1. Printing
2. Configuring Print Queues

A. THE X WINDOW SYSTEM

1. X Modularity
2. X.Org Drivers
3. Configuring X Manually
4. Automatic X Configuration
5. Xorg and Fonts
6. Installing Fonts for Modern Applications
7. Installing Fonts for Legacy Applications
8. The X11 Protocol and Display Names
9. Display Managers and Graphical Login
10. Starting X Apps Automatically
11. X Access Control
12. Remote X Access (historical/insecure)
13. Remote X Access (modern/secure)
14. XDMCP
15. Remote Graphical Access With VNC and RDP
16. Specialized X Servers

LAB TASKS

1. Remote X with XDMCP
2. Configure X Security
3. Configure a VNC Server
4. Configure a VNC Server
5. Configure a VNC Server
6. Launching X Apps Automatically
7. Secure X

B. EMACS

1. Emacs
2. The Emacs Interface
3. Basic Emacs
4. More Emacs Commands

LAB TASKS

1. Text Editing with Emacs