

# GL120: Linux Fundamentals



**Days:** 5

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

**Audience:** This course is ideal for those who need to gain proficiency in Linux and Unix.

**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.

## OUTLINE:

### I. WHAT IS LINUX?

- Unix and its Design Principles
- FSF and GNU
- GPL General Public License
- The Linux Kernel
- Linux Kernel and Versioning
- Components of a Distribution
- Slackware
- SUSE Linux Products
- Debian
- Ubuntu
- Red Hat Linux Products
- Oracle Linux

### II. LOGIN AND EXPLORATION

- Logging In
- Running Programs
- Interacting with Command Line
- Desktop Environments
- GNOME
- Starting X
- Gathering Login Session Info
- Gathering System Info
- uptime and w
- got root?
- Switching User Contexts
- sudo
- Help from Commands and Documentation
- whereis
- Getting Help Within the Graphical Desktop
- Getting Help with man and info

### LAB TASKS

- Login and Discovery
- Help with Commands
- Switching Users with su

# GL120: Linux Fundamentals

## III. THE LINUX FILESYSTEM

- Filesystem Support
- Unix/Linux Filesystem Features
- Filesystem Hierarchy Standard
- Navigating the Filesystem
- Displaying Directory Contents
- Filesystem Structures
- Determining Disk Usage with df and du
- Determining Disk Usage (GUI)
- Disk Usage with Quotas
- File Ownership
- Default Group Ownership
- File and Directory Permissions
- File Creation Permissions with umask
- SUID and SGID on files
- SGID and Sticky Bit on Directories
- Changing File permissions
- User private group scheme

### LAB TASKS

- Navigating Directories and Listing Files
- Disk and Filesystem usage
- File and Directory Ownership and Permissions
- Introduction to Troubleshooting Labs
- Troubleshooting Practice: Filesystem

## IV. MANIPULATING FILES

- Directory Manipulation
- File Manipulation
- Deleting and Creating Files
- Managing Files Graphically
- Drag and drop with Nautilus
- Physical Unix File Structure
- Filesystem Links
- File Extensions and Content
- Displaying Files
- Previewing Files
- Producing File Statistics
- Displaying Binary Files
- Searching the Filesystem
- Alternate Search Method

### LAB TASKS

- Manipulating Files and Directories
- File Examination and Search Commands

## V. SHELL BASICS

- Role of Command Shell
- Communication Channels
- File redirection
- Piping Command Together
- Filename Matching
- File Globbing and Wildcard Patterns
- Brace Expansion
- Shell and Environment Variables
- Key Environment Variables
- Which and Type
- General Quoting Rules
- Nesting Commands

### LAB TASKS

- Redirection and Pipes
- Wildcard File Matching
- Shell Variables
- Shell Meta-Characters
- Command Substitution

## VI. ARCHIVING AND COMPRESSION

- Archives with tar
- Archives with cpio
- The gzip Compression Utility
- The bzip2 Compression Utility
- The XZ Compression Utility
- The PKZIP Archiving/Compression format
- GNOME File Roller

## VII. TEXT PROCESSING

- Searching Inside Files
- The Streaming Editor
- Text Processing with Awk
- Replacing Text Characters
- Text Sorting
- Duplicate Removal Utility
- Extracting Columns of Text
- Combining Files and Merging Text
- Comparing File Changes

### LAB TASKS

- Processing Text Streams
- Text Processing

# GL120: Linux Fundamentals

## VIII. REGULAR EXPRESSIONS

- Regular Expression Overview
- Regular Expressions
- RE Character Classes
- Regex Quantifiers
- RE Parenthesis

### LAB TASKS

- Pattern Matching with Regular Expressions
- Extended Regular Expressions
- Using Regular Expressions With sed

## IX. TEXT EDITING

- Text Editing
- Pico/GNU Nano
- Pico/Nano Interface
- Nano configuration
- Pico/Nano Shortcuts
- vi and Vim
- Learning Vim
- Basic vi
- Intermediate vi

### LAB TASKS

- Text Editing with Nano
- Text Editing with Vim

## X.MESSAGING

- System Messaging Commands
- Controlling System Messaging
- Internet Relay Chat
- Instant Messenger Clients
- Electronic Mail
- Sending Email with sendmail
- Sending and Receiving Email with mailx
- Sending and Receiving Email with mutt
- Sending Email with Pine
- Evolution

### LAB TASKS

- Command Line Messaging
- Messaging with talkd
- Command Line Email
- Alpine

## XI. COMMAND SHELLS

- Shells
- Identifying the Shell
- Changing the Shell
- Configuration Files
- Script Execution
- Shell Prompts
- Bash: Bourne-Again Shell
- Bash: Configuration Files
- Bash: Command Line History
- Bash: Command Editing
- Bash: Command Completion
- Bash: "shortcuts"
- Bash: prompt
- Setting Resource Limits via ulimit

### LAB TASKS

- Linux Shells
- Bash History
- Aliases
- Bash Login Scripts
- The Z Shell

## XII. INTRODUCTION TO SHELL SCRIPTING

- Shell Script Strengths and Weaknesses
- Example Shell Script
- Positional Parameters
- Input and Output
- Doing Math
- Comparisons with test
- Exit Status
- Conditional Statements
- Flow Control: case
- The for Loop
- The while and until Loops

### LAB TASKS

- Writing a Shell Script

# GL120: Linux Fundamentals

## XIII. PROCESS MANAGEMENT AND JOB CONTROL

- What is a Process?
- Process Lifecycle
- Process States
- Viewing Processes
- Signals
- Tools to Send Signals
- nohup and disown
- Managing Processes
- Tuning Process Scheduling
- Job Control Overview
- Job Control Commands
- Persistent Shell Sessions with Screen
- Using screen
- Advanced Screen

### LAB TASKS

- 15. Job Control Basics
- 16. Process Management Basics
- 17. Screen Basics
- 18. Using Screen Regions
- 19. Troubleshooting Practice: Process Management

## XIV. AT AND CRON

- Automating Tasks
- at/batch
- cron
- The crontab Command
- crontab Format
- /etc/cron.\* / Directories
- Anacron

### LAB TASKS

- Creating and Managing User Cron Jobs
- Adding System cron Jobs
- Troubleshooting Practice: Automating Tasks

## XV. MANAGING SOFTWARE

- Downloading with FTP
- FTP
- lftp
- Command Line Internet Non-interactive
- Command Line Internet Interactive
- Managing Software Dependencies
- Using the Yum command
- Using Yum history
- YUM package groups
- Configuring Yum
- yumdownloader
- Popular Yum Repositories
- Using the Zypper command
- Zypper Services and Catalogs
- The dselect and APT Frontends to dpkg
- Aptitude
- Configuring APT

### LAB TASKS

- Command Line File Transfers
- Using Yum
- Using Zypper
- Managing Yum Repositories
- Managing Zypper Repositories
- Using APT
- Adding an APT repository

## XVI. THE SECURE SHELL (SSH)

- Secure Shell
- ssh and sshd Configuration
- Accessing Remote Shells
- Transferring Files
- Alternative sftp Clients
- SSH Key Management
- ssh-agent

### LAB TASKS

- Introduction to ssh and scp
- SSH Key-based User Authentication
- Using ssh-agent

# GL120: Linux Fundamentals

## XVII. MOUNTING FILESYSTEMS AND MANAGING REMOVABLE MEDIA

- Filesystems Concept Review
- Mounting Filesystems
- NFS
- SMB
- Filesystem Table (/etc/fstab)
- AutoFS
- Removable Media

### LAB TASKS

- Accessing NFS Shares
- On-demand filesystem mounting with AutoFS

## XVIII. PRINTING

- Legacy Print Systems
- Common UNIX Printing System
- Defining a Printer
- Standard Print Commands
- Format Conversion Utilities
- `enscript` and `mpage`

### LAB TASKS

- Printing
- Configuring Print Queues

## APPENDIX

### A. THE X WINDOW SYSTEM

- The X Window System
- X Modularity
- X.Org Drivers
- Configuring X Manually
- Automatic X Configuration
- Xorg and Fonts
- Installing Fonts for Modern Applications
- Installing Fonts for Legacy Applications
- The X11 Protocol and Display Names
- Display Managers and Graphical Login
- Starting X Apps Automatically
- X Access Control
- Remote X Access (historical/insecure)
- Remote X Access (modern/secure)
- XDMCP
- Remote Graphical Access With VNC and RDP
- Specialized X Servers

### LAB TASKS

- Remote X with XDMCP
- Configure X Security
- Configure a VNC Server
- Configure a VNC Server
- Configure a VNC Server
- Launching X Apps Automatically
- Secure X

### B.EMACS

- Emacs
- The Emacs Interface
- Basic Emacs
- More Emacs Commands

### LAB TASKS

- Text Editing with Emacs