

GL250: Enterprise Linux System

Administration



Days: 5

Prerequisites: Students should already be comfortable working in a Linux or Unix environment. Fundamentals such as the Linux filesystem, process management, and how to edit files will not be covered in class. An understanding of network concepts, and the TCP/IP protocol suite is helpful. These skills are taught in the GL120 "Linux Fundamentals" course.

Audience: IT Professionals

Description: The GL250 is an in-depth course that explores installation, configuration and maintenance of Linux systems. The course focuses on issues universal to every workstation and server. Like all Guru Labs courses, the course material is designed to provide extensive hands-on experience. Topics include: installation and configuration; the boot process; user and group administration; filesystem administration, including quotas, ACLs, RAID and LVM; task automation; client networking; SELinux; software management; log files; troubleshooting; and more.

OUTLINE:

I. LINUX KERNEL & DEVICES

- Hardware Discovery Tools
- Configuring New Hardware with hwinfo
- Kernel Hardware Info /sys/
- /sys/ Structure
- udev
- Managing Linux Device Files
- List Block Devices
- SCSI Devices
- USB Devices
- USB Architecture
- Kernel Modules
- Configuring Kernel Components and Modules
- Handling Module Dependencies
- Configuring the Kernel via /proc/
- Console
- Virtual Terminals
- Keyboard & locale configuration
- Serial Ports
- Random Numbers and /dev/random

LAB TASKS

- Adjusting Kernel Options
- Linux Kernel Driver Compilation
- Introduction to Troubleshooting Labs
- Troubleshooting Practice: Kernel Modules

II. SYSTEMD OVERVIEW

- System Boot Method Overview
- systemd System and Service Manager
- systemd Targets
- Using systemd
- Linux Runlevels Aliases
- Legacy Support for SysV init

LAB TASKS

- Managing Services With Systemd's systemctl
- Creating a systemd unit file

GL250: Enterprise Linux System

Administration

III. GRUB2/SYSTEMD BOOT PROCESS

- Booting Linux on PCs
- GRUB 2
- GRUB 2 Configuration
- GRUB 2 Security
- Boot Parameters
- Initial RAM Filesystem
- init
- Systemd local-fs.target and sysinit.target
- Systemd basic.target and multi-user.target
- Legacy local bootup script support
- System Configuration Files
- RHEL7 Configuration Utilities
- SLES12 Configuration Utilities
- Shutdown and Reboot

LAB TASKS

- Boot Process
- Booting directly to a bash shell
- GRUB Command Line
- Basic GRUB Security
- Troubleshooting Practice: Boot Process

IV. SOFTWARE MAINTENANCE

- Managing Software
- RPM Features
- RPM Architecture
- RPM Package Files
- Working With RPMs
- Querying and Verifying with RPM
- Updating the Kernel RPM
- Dealing With RPM & Yum Digest Changes
- Yum Plugins & RHN Subscription Manager
- YUM Repositories
- YUM Repository Groups
- Compiling/Installing from Source
- Manually Installed Shared Libraries
- Rebuilding Source RPM Packages

LAB TASKS

- Managing Software with RPM
- Creating a Custom RPM Repository
- Querying the RPM Database
- Installing Software via RPM & Source and Rebuilding SRPMs
- Troubleshooting Practice: Package Management

V. LOCAL STORAGE ADMINISTRATION

- Partitioning Disks with fdisk & gdisk
- Resizing a GPT Partition with gdisk
- Partitioning Disks with parted
- Filesystem Creation
- Persistent Block Devices
- Mounting Filesystems
- Resizing Filesystems
- Filesystem Maintenance
- Managing an XFS Filesystem
- Swap
- Filesystem Structures
- Determining Disk Usage With df and du
- Configuring Disk Quotas
- Setting Quotas
- Viewing and Monitoring Quotas
- Filesystem Attributes

LAB TASKS

- Creating and Managing Filesystems
- Hot Adding Swap
- Setting User Quotas

GL250: Enterprise Linux System

Administration

VI. LVM & RAID

- Logical Volume Management
- Implementing LVM
- Creating Logical Volumes
- Activating LVM VGs
- Exporting and Importing a VG
- Examining LVM Components
- Changing LVM Components
- Advanced LVM Overview
- Advanced LVM: Components & Object Tags
- Advanced LVM: Automated Storage Tiering
- Advanced LVM: Thin Provisioning
- Advanced LVM: Striping & Mirroring
- Advanced LVM: RAID Volumes
- gnome-disk-utility
- SLES Graphical Disk Tool
- RAID Concepts
- Array Creation with mdadm
- Software RAID Monitoring
- Software RAID Control and Display

LAB TASKS

- Creating and Managing LVM Volumes
- Troubleshooting Practice: LVM
- Creating and Managing a RAID-5 Array

VII. REMOTE STORAGE ADMINISTRATION

- Remote Storage Overview
- Remote Filesystem Protocols
- Remote Block Device Protocols
- File Sharing via NFS
- NFSv4+
- NFS Clients
- NFS Server Configuration
- YaST NFS Server Administration
- Implementing NFSv4
- AutoFS
- AutoFS Configuration
- Accessing Windows/Samba Shares from Linux
- SAN Multipathing
- Multipath Configuration
- Multipathing Best Practices
- iSCSI Architecture
- Open-iSCSI Initiator Implementation
- iSCSI Initiator Discovery
- iSCSI Initiator Node Administration
- Mounting iSCSI Targets at Boot
- iSCSI Multipathing Considerations

LAB TASKS

- Using autofs
- NFS Server Configuration
- iSCSI Initiator Configuration
- Multipathing with iSCSI

GL250: Enterprise Linux System

Administration

VIII. USER/GROUP ADMINISTRATION

- Approaches to Storing User Accounts
- User and Group Concepts
- User Administration
- Modifying Accounts
- Group Administration
- Password Aging
- Default User Files
- Controlling Login Sessions
- RHEL DS Client Configuration
- SLES DS Client Configuration
- System Security Services Daemon (SSSD)

LAB TASKS

- User and Group Administration
- Using LDAP for Centralized User Accounts
- Troubleshooting Practice: Account Management

IX. PLUGGABLE AUTHENTICATION MODULES (PAM)

- PAM Overview
- PAM Module Types
- PAM Order of Processing
- PAM Control Statements
- PAM Modules
- pam_unix
- pam_nologin.so
- pam_limits.so
- pam_wheel.so
- pam_xauth.so

LAB TASKS

- Restricting superuser access to wheel group membership
- Using pam_nologin to Restrict Logins
- Setting Limits with the pam_limits Modules
- Using pam_limits to Restrict Simultaneous Logins

X. SECURITY ADMINISTRATION

- Security Concepts
- Tightening Default Security
- SuSE Security Checker
- Security Advisories
- Fine Grained Authorizations with Polkit
- File Access Control Lists
- Manipulating ACLs
- Viewing ACLs
- Backing Up ACLs
- File Creation Permissions with umask
- User Private Group Scheme
- Alternatives to UPG
- AppArmor
- SELinux Security Framework
- SELinux Modes
- SELinux Commands
- Choosing an SELinux Policy
- SELinux Booleans
- Permissive Domains
- SELinux Policy Tools
- SUSE Basic Firewall Configuration
- FirewallD

LAB TASKS

- User Private Groups
- Using Filesystem ACLs
- Exploring AppArmor
- Exploring SELinux Modes
- SELinux File Contexts

GL250: Enterprise Linux System

Administration

XI. BASIC NETWORKING

- IPv4 Fundamentals
- TCP/UDP Fundamentals
- Linux Network Interfaces
- Ethernet Hardware Tools
- Network Configuration with ip Command
- Configuring Routing Tables
- IP to MAC Address Mapping with ARP
- Starting and Stopping Interfaces
- NetworkManager
- DNS Clients
- DHCP Clients
- SUSE YaST Network Configuration Tool
- Network Diagnostics
- Information from ss and netstat
- Hardware and System Clock
- Managing Network-Wide Time
- Continual Time Sync with NTP
- Configuring NTP Clients
- Useful NTP Commands

LAB TASKS

- Network Discovery
- Basic Client Networking
- NTP Client Configuration

XII. ADVANCED NETWORKING

- Multiple IP Addresses
- Configuring a DHCP server
- IPv6
- Interface Aggregation
- Interface Bonding
- Network Teaming
- Interface Bridging
- Tuning Kernel Network Settings

LAB TASKS

- Multiple IP Addresses Per Network Interface
- Configuring IPv6
- Troubleshooting Practice: Networking

XIII. LOG FILE ADMINISTRATION

- System Logging
- systemd Journal
- systemd Journal's journalctl
- Secure Logging with Journal's Log Sealing
- gnome-system-log
- Rsyslog
- /etc/rsyslog.conf
- Log Management
- Log Anomaly Detector
- Sending logs from the shell

LAB TASKS

- Using the systemd Journal
- Setting up a Full Debug Logfile
- Remote Syslog Configuration
- Remote Rsyslog TLS Configuration

XIV. MONITORING & TROUBLESHOOTING

- System Status Memory
- System Status I/O
- System Status CPU
- Performance Trending with sar
- Determining Service to Process Mapping
- Realtime Monitoring of Resources Cgroups
- Troubleshooting Basics: The Process
- Troubleshooting Basics: The Tools
- strace and ltrace
- Common Problems
- Troubleshooting Incorrect File Permissions
- Inability to Boot
- Typos in Configuration Files
- Corrupt Filesystems
- RHEL7 Rescue Environment
- SUSE Rescue Environment

LAB TASKS

- System Activity Reporter
- Cgroup for Processes
- Recovering Damaged MBR