

LINUX

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/training/etc

The Art of Knowledge.

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Linux

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Course Description: This is the first in a series of courses focusing on the Linux Operating System. It is vendor neutral with an emphasis on the latest version of RedHat Linux. A comprehensive study of Linux is undertaken. Topics include Linux evolution, graphical environments, terminal interfaces and bash, file system, file manipulation commands, data manipulation commands, editors, software tools, networking tools, and system administration tools. The course is supplemented with many hands-on exercises that reinforce the lectures.

Who Should Attend: This course is intended for programmers, end users, managers, and future system administrators.

Prerequisites: Students are required to have some familiarity with an operating system such as DOS or Windows.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand the relationship between UNIX and LINUX.
- Log in and out of the system.
- Use the various components of the GNOME desktop.
- Perform work using terminal shell windows.
- Navigate through the file system.
- Get help using the on-line manual.
- Use the bash shell for a wide variety of functions.
- Edit files using the 'vi' editor.
- Use various file manipulation utilities.
- Use the rich set of common Linux filters.
- Locate important network configuration files.
- Use the rich set of LINUX file management utilities.
- Use network utilities including ssh, scp, and ftp.
- Write fundamental bash scripts.
- Kill processes through knowledge of the process tree.
- Modify bash startup files.
- Launch and control jobs.
- Understand the role of the system administrator.
- Be able to perform simple system administration functions.
- Use the robust set of software tools including ar and make.
- Launch applications graphically.

Course Outline:

An Introduction

Operating Systems
History of UNIX/Linux
UNIX History
Richard Stallman and the GNU Project
Linus Torvalds and Linux
GNU, FSF, and the GPL
Commercialization of Linux

Getting Started

Logging in to Linux
Working in Linux
The X Server
The Gnome Display
Terminal Windows
Nautilus
Gnome Applications
Terminal Window Interface
Shell Command Lines
Getting Help
The man Command
The info Command
Linux Architecture

The Linux Filesystem

Filesystems
Top Level Directories
Home Directories
Complete vs. Relative Path Names
Directory Commands
The /etc/passwd File
The /etc/group File
The newgrp Command
The su Command
File and Directory Permissions
chmod
umask
passwd
Special Permissions
sudo

Shell Fundamentals

Shell Functionality
Shell Variables
The PATH Variable
The Command Line

Command History
Command Line Shortcuts
Command Substitution
Filename Expansion Characters
The Standard Output
The Standard Error
The Standard Input
Pipes
Aliases
Functions
Quoting
Control Sequences
Other Special Characters
Other Shell Features

File Manipulation Commands

cat
ls
cp
mv
ln
rm
wc
find
Linux Editors
vi Commands
aspell

Linux Filters

Perspective
grep
sort
head and tail
tr
cut
od
paste
split
uniq
sed
gawk
more and less
tee
lp

Processes

What is a Process?
Characteristics of a Process
Process Creation
ps
Job Control
Signals
kill
nohup

Shell Programming

Shells
Scripting Rationale
Scripting Prerequisites
Creating a bash Script
bash Startup Scripts
A Script's Environment
Exporting Variables
Exit Status
Programming the Shell
Parameter Passing
Operators
Decision Making - if
Complex Decisions
Arithmetic
Looping Constructs - for
Input and Output
Looping Constructs - while
Interrupts

Networking Applications

TCP/IP
IP Addresses
Network Configuration Files
Client/Server Computing
telnet
ping
ftp
ssh
scp

Software Tools

Building a Linux Utility
Creating a Utility
The C Compiler
Libraries
Static vs. Shared Libraries

make
Software Configuration Management
Revision Control
Data Compression

System Administration

Duties of the System Administrator
Bringing Up the System
Setting the Date
Shutting Down the System
Adding Users
Ownerships
The /dev Directory
mount File Systems
df - Free Disk Space
du - Disk Usage
find - Find Files
tar - Backup Files
Managing Services
at - Schedule Command
crontab - Schedule Commands
Managing Software
rpm - Managing Software
yum - Managing Software

Course Description: This course describes the standard Linux shell, bash. All facets of the bash shell are discussed: bash productivity features, bash as the user interface, bash user customization, and bash as a programming language. The programming features of bash are emphasized. Many hands-on labs are given to reinforce the lectures.

Who Should Attend: The course is intended for LINUX programmers, end users, managers, and current or future system administrators.

Prerequisites: Students should have completed an introductory course in Linux or some version of UNIX (Solaris/AIX/HPUX/etc.) or have equivalent knowledge.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Write shell scripts to solve a wide variety of problems.
- Customize your environment to suit your personal preferences.
- Increase productivity by using many bash special features including: the history mechanism, command line editing, creating aliases, and writing functions.
- Use bash arithmetic operators.
- Use powerful programming constructs.
- Use the debugging capabilities of bash.
- Use bash job control features.

Course Outline:

Bash Fundamentals

User Interfaces
Shell History
Shell Functions
Startup Files
Changing Directories
Command Line Formats
The File System
Filename Expansion Characters
Input and Output Characters
Quoting
Other Special Characters
Getting Help
Control Keys

Command Line Features

Introduction
Aliases
The set Command
Shell Variables
Exporting Variables
Hashing
Functions
Function Parameters

Command Line Editing

Introduction
bash History
Editing With vi
Editing With emacs
Textual Completion

Fundamentals Of Shell Scripts

Introduction
Writing a Script
Special Shell Variables
Local Variables
Variable Syntax
Pattern Matching
Command Substitution

Decision Making Constructs

Introduction
Exit Status
The return Statement
The if Statement
Compound Tests
Arithmetic Tests
String Tests
File Tests
The test Command
elif
case

Iterative Constructs

Looping Constructs
The for Loop
The while Loop
The until Loop

Bash Arithmetic

Introduction
expr
bash Arithmetic
Typed Variables
Arrays

Miscellaneous Features

Introduction
shift
getopts
read
here documents
select
Processes
Signals
trap
Command Line Processing
printf

Course Description: This course focuses on some of the intermediate level features of the Linux Operating System. Topics include an overview of Linux, system administration, job control, shell programming, software tools, system processes, system startup and shutdown, software package administration, kernels, networking, the Network File System, and naming services. The course is supplemented with many hands-on exercises that reinforce the lectures.

Who Should Attend: This course is intended for programmers and/or end users and all those who wish to become Linux System Administrators.

Prerequisites: Students are expected to have completed the Introduction to Linux course or have equivalent experience.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand the responsibilities and the tools of the system administrator
- Use awk and sed to solve system administration tasks
- Backup and restore all or parts of the system
- Perform system administration tasks including adding and deleting users, adding devices, partitioning the disk, and other administrative functions
- Use job control features of the shell
- Write simple shell scripts
- Effectively use the software tools
- Perform various Linux system processes
- Carry out startup and shutdown procedures
- Understand the RedHat Package Manager (RPM)
- Configure, install, and build the Linux kernel
- Perform networking tasks
- Use the Network File System (NFS)
- Use the Domain Name System (DNS)

Course Outline:

Introduction to Linux

History of Unix
Contemporary Products
Advantages of Linux
Components of the Linux Environment
Important Parts of the Kernel
Shells with Red Hat Linux
Major Linux Services
Organization of the Red Hat Filesystem
Responsibilities of a System Administrator
Getting Help

What You Should Already Know

Beginning Linux Topics
Shell Variables
The PATH Variable
Exporting Variables
The Command Line
The PS2 Variable
Command History
Command Substitution
cut, paste
expand, fmt, unexpand
head, tail, nl, od
wc, split
pr, tac, tr
xargs, join
sed
Directory Manipulation Commands
File Manipulation Commands - cp
File Manipulation Commands - mv
File Manipulation Commands - rm, touch
Using Filename Expansion Characters
Special I/O Files
Standard I/O Files
Pipes
Process Management
ps, pstree
top
Signals
Job Control
nice, renice
Regular Expressions
Shells

Shell Variables
Shell Aliases
Functions
Startup Files
Key Mappings
Writing Shell Scripts
Executing Your Script
A Script's Environment
Exit Status
Programming the Shell

System Administration

Duties of the System Administrator
Bringing up the System
Multi-User Mode
Shutting Down the System
Adding Users
The /dev Directory
The awk Language
awk Scripts
awk Odds and Ends
The sed Command
Special sed Characters
The find Command
Backing up Files
cpio
tar
File System Commands
The at Command
The crontab Command

Job Control

Processes
Parent and Child Processes
System Startup
Shell Initialization
Foreground vs. Background
ps Command
The kill Command
Suspending Jobs
jobs Command
fg and bg Commands

Shell Programming

Shells
Scripting Rationale
Creating a bash Script
bash Startup Files
A Script's Environment
Exporting Variables

Exit Status
Programming the Shell
Parameter Passing
Operators
if
Arithmetic
Looping Constructs
Input and Output
Interrupts

Software Tools

C Language and Linux
A Little History of the Linux C Compiler
Creating Programs in C
Creating a Library
Using the Library
Static vs. Shared Libraries
make
Revision Control
Concurrent Versioning System (CVS)
Other Languages

Linux System Processes

Linux Process Components
Linux Process Creation
The ps (Process Status) Command
The top (Top Jobs) Command
The kill Command
The at Command
How to Execute the at Command
Scheduling Tasks Using cron
The crontab File Format
Creating a cron Entry

System Startup and Shutdown

Introduction to the Boot Process
Stages of the Boot Process
Linux System Runlevels
Linux System Initialization Scripts (/etc/init.d)
Red Hat Linux ntsysv and serviceconf Tools
The chkconfig Command
xinetd
X Windows

Shutting Down the System

Software Package Administration

The RedHat Package Manager (RPM)
Standard Commands and Options
Installing Packages
Naming Conventions for RPM Packages
Installing a Package
Upgrading Packages
Uninstalling Packages
Querying Packages
Verifying Packages
Installing Packages with Package Manager

Kernel Configuration

Overview of the Linux Kernel
Configuring the Linux Kernel
Configuration Options
Building and Installing the Kernel
Building the Kernel
Installing a New Kernel
Configuring your Boot Manager
Troubleshooting the New Kernel
Troubleshooting and Recovery

Network Basics

Network Terminology
LAN Characteristics
LAN Topology
Network Transmission Media
Network Access Methods
Network Hardware
Standards and Protocols
Packets
The ISO/OSI Model
TCP/IP Network Model
IPv6
IPSec Security Example
Why Move to IPv6?
Transitioning to IPv6
Mixing IPv4 and IPv6
Using a Secure Tunnel
Network Configuration
IPv6 Addresses
Example IPv6 Commands
Special IPv6 Addresses

Unix Network Applications

Secure Shell (SSH)
Trusted Hosts
Example ssh Session
ftp and sftp
scp
vsFTP
The telnet Command
Simple telnet Session
The r* Commands
The Extended Internet Services Daemon
sendmail
Filesystems
Network File System /etc/exports
NIS

The Network File System (NFS)

Introduction to NFS
The NFS Server
TCP Wrappers
The NFS Client
Configuring the NFS Environment

Naming Services

Naming Services Overview
The Domain Name Service (DNS)
Installing a DNS Server with Red Hat
Configuring a DNS Server Using bind-config
The NIS+ Environment
The NIS Environment
NIS Servers and Clients
NIS Components
Installing the Software
Configuring a NIS Master Server
Configuring a NIS Client
Configuring an NIS Slave Server
Name Service Switch Configuration File

Course Description: This course will help Linux and UNIX Systems Administrators in making their systems and networks as secure as possible from intruders and improper action of the users. It covers both quick and simple solutions, and some more involved solutions to eliminate possible vulnerability.

Who Should Attend: Everyone

Prerequisites: Students should have Linux Systems Administration experience. Basic Network knowledge is a plus.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand hacking techniques and countermeasures
- Solve common security problems
- Understand and prevent wireless hacking
- Setup Security Policy
- Understand and implement access control
- Determine who to trust and when to trust
- Understand Firewall vulnerabilities and implement countermeasures
- Utilize VPN (Virtual Private Networks) for secure connections
- understand Host Hardening techniques
- Secure subsystems
- Scan systems
- Find and repair damage

Course Outline:

Introduction

Introduction
 What Are You Trying To Protect?
 In the Beginning
 Somebody@Somewhere
 The Underlying Problem in Today's TCP/IP
 The TCP/IP Model Layers
 Future is More Secure With IPv6
 IPSec
 Who Are the Enemies and What Do They Want?
 Type of Attacks
 Technical Attacks
 Social Attacks
 Physical Attacks
 Wireless Attacks
 Most Common Mistakes
 Weak Passwords
 Open Network Ports
 Outdated Software
 Badly Configured and Insecure Programs
 Obsolete or Benign Accounts
 I'll Do It Tomorrow
 Viruses and Linux
 Detecting an Intrusion and Preventing Further Attacks
 Tripwire

Understanding the Hacking Techniques

Understanding Hacking Techniques
 Footprinting
 Search Engines
 Domain Registrars
 Regional Internet Registries
 DNS Reverse-Lookups
 Mail Exchange
 Zone Transfers
 Traceroute
 Scanning and Identification
 Ping and Ping Sweeping
 TCP Pinging
 Port Scanning
 Fingerprinting
 Remote Hacking
 Ports at Risk

Technical Attacks Explained

Technical Attacks Explained
 Attack Paths
 Rootkit Attacks
 Packet Spoofing
 SYN Flood Attack
 TCP Sequence Spoofing
 Packet Storms, Smurf Attacks, and Fraggles
 Buffer Overflows or Stamping on Memory With gets()
 Man-in-the-Middle Attack
 Wireless Attacks Explained

Wireless Standards
 WEP, WPA, and WPA 2
 Probing & Network Discovery
 Surveillance
 DOS Attacks
 Impersonation
 Man in the Middle and Rouge AP

Access Control

Introduction
 The Highest Security
 Access Control
 Identification and Authentication
 Access Control Types
 Access Control Models
 SSL Certificates
 Authenticating with PAM
 Password Management
 Hardware Password Protection
 Password Protecting the GRUB Boot Loader
 Advanced Password Methods
 Different Functions of Different Algorithms
 MD5 Passwords
 Password Aging
 Use `sudo` to Protect Root Access
 File Protection
 The `chattr` Program and the Immutable Bit
 Cryptography
 Protect Files With GPG
 Using Encrypted Keys
 Default Setting For Single User Mode
 Login Simulators
 Warning Banners
 Add Security to `/bin/login`
 User Startup Files
 Useful Tools
 Account Controls
 Restrict `at` and `cron` Access
 More Default Settings
 Protocol Switches in The Kernel
 Logging Environment

Security Policy

Setup Security Policy
 Standards and Regulations
 Why Your Organization Needs Security Policies
 Security Policy Basics
 Administrative Policies vs. Technical Policies
 Administrative Security Policy Samples
 Technical Security Policy Samples

Network Access Security

Network Access Security
 Ring Security
 Modem Access
 X Security

TCP-wrappers
 Virtual Private Networks (VPN)
 Protecting Network Connections - SSH2
 Install and Configure SSH
 Restricting Host Access - SSH Server
 SSH Authentication
 OpenSSH Client and OpenSSH Server
 Authenticate Between an SSH2 Client and an OpenSSH Server
 Tunneling with SSH
 Ports at Risk
`ifconfig`
`xinetd` and `inetd`
 Adding New Services `xinetd` `inetd`
 Restricting Remote User Access
 Restricting Remote Host Access `xinetd`
 Restricting Remote Host Access - `xinetd` with `libwrap`
 Defending Against Denial of Service (DoS) Attacks
 Harden `inetd` and `xinetd` Configurations
 Firewalls
 Firewalls with `iptables`, `ipchains` and `DMZ`
 Tunneling Through Firewalls
 Egress Filtering

Host Hardening

Host Hardening
 SELinux - NSA Security-Enhanced Linux (SELinux)
 AppArmor
 LDAP
 Postfix
 Qpopper
`sendmail`
 BIND (DNS)
 Apache
 Samba
 NFS

Scanning Your Own System

Scanning Your Own System
 Top 20 Security Tools
 The Nessus Security Scanner
 Wireshark (Ethereal)
 Snort Attack Detector
`netcat`
 John the Ripper
 Crack
 Store the RPM Database Checksums
 Finding and Repairing the Damage
 Information Systems' Security Response to Intrusions
 The IT Response to Intrusions
 The Law Enforcement Response to Intrusions
 Information to Determine Damages or Loss

Course Description: This course is an introduction to fundamental end-user and administrative tools in Red Hat Enterprise Linux, designed for students with little or no command-line Linux or UNIX experience.

Who Should Attend: This course is for IT professionals who want to build user-level skills before learning Linux System and Network Administration.

Prerequisites: User-level experience with any computer system, including the use of mouse, menus, and any graphical user interface, is required.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand the Linux file system.
- Install software and configure the network.
- Configure authentication and install and configure various services using graphical tools.
- Perform common file maintenance tasks.
- Use and customize the GNOME interface.
- Open, edit, and save text documents using the vi editor.
- File access permissions.
- Customize X Window System.
- Effectively use, customize and script a Red Hat Enterprise Linux system for common command line processes.
- Use basic network utilities.

Course Outline:

Unit 1 - Linux Ideas and History

An Introduction to Linux and Open Source: what are the central ideas behind the Linux phenomenon and where do they come from?

Unit 2 - Linux Usage Basics

Logging into the system, changing users and editing text files.

Unit 3 - Running Commands and Getting Help

How to use built-in and online documentation to enhance your experience.

Unit 4 - Browsing the Filesystem

Understanding the locations of important directories on a Red Hat Enterprise Linux system and navigating them from the command line and using the graphical Nautilus browser.

Unit 5 - Users, Groups and Permissions

Reading and setting permissions on files and directories.

Unit 6 - Using the bash Shell

Basic tips and tricks to make Red Hat Enterprise Linux's default shell work for you. Topics include tab completion, history and an introduction to shell scripting.

Unit 7 - Standard I/O and Pipes

The ins-and-outs of redirecting output between programs and files.

Unit 8 - Text Processing Tools

An introduction to some of the most useful text-processing utilities in Red Hat Enterprise Linux, including grep, cut, sed, sort, diff and patch.

Unit 9 - vim: An Advanced Text Editor

How to get the most out of the powerful and flexible vim text editor.

Unit 10 - Investigating and Managing Processes

Listing, terminating and scheduling program executions on a Red Hat Enterprise Linux system.

Unit 11 - Basic System Configuration Tools

Using Red Hat Enterprise Linux's graphical and text-based configuration tools to manage networking, printing and date/time settings.

Unit 12 - Finding and Processing Files

In-depth coverage of using the find command and related utilities to locate and act upon files based on arbitrary criteria .

Unit 13 - Network Clients

An overview of network tools available in Red Hat Enterprise linux, from web browsers to email clients and diagnostic utilities.

Unit 14 - Advanced Topics in Users, Groups and Permissions

A deeper discussion of how user and group identities are stored on a Red Hat Enterprise Linux system, as well as the introduction of advanced filesystem permissions like SetUID and SetGID.

Unit 15 - The Linux Filesystem In-Depth

The nuts-and-bolts of how Red Hat Enterprise Linux deals with filesystems. Topics include partitions, inodes, linking and archiving tools.

Unit 16 - Essential System Administration Tools

An introduction to fundamental system administration topics such as installing Red Hat Enterprise Linux, managing software packages, and enhancing security with SELinux and the netfilter firewall.

Unit 17 - So... What Now?

Exposure to further options for training and involvement in the larger open-source community.

Course Description: This class is for users of Linux (or UNIX) who want to start building skills in systems administration on Red Hat Enterprise Linux 5, to a level where they can attach and configure a workstation on an existing network.

Who Should Attend: This course is for Linux or UNIX users, who understand the basics of Red Hat Linux, that desire further technical training to begin the process of becoming a system administrator.

Prerequisites: Students should have taken RH033 Red Hat Linux Essentials or have equivalent experience with Red Hat Linux.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Install, configure, and attach a new Red Hat Linux workstation to an existing network.

Course Outline:

Administrative Access

Configure and access various consoles directly, remotely with ssh, and with virt-manager.
Configure privilege escalation with sudo.

Package Management

Manage software on system using yum, Red Hat Network, and rpm.

System Services and Security

Configure and manage system logging, time synchronization, printers, and task automation.
Troubleshoot SELinux.

System Initialization

Define boot process, recover system, and manage service startup.

Kernel Monitoring and Configuration

Explore kernel modules and variants, tune kernel parameters, manage devices, and monitor processes and resources.

Network Configuration

Configure dynamic and static network settings for IPv4 and filter packets.

Filesystem Administration

Review filesystem management concepts, removable media and configure NFS shares with autoifs.

Additional Storage

Expand storage by adding new filesystems and swap space.

User Administration

Create, modify and delete users, groups, and policy.
Protect users and groups with quotas.

Filesystems for Group Collaboration

Establish collaborative group directories.
Protect users and groups with ACLs.

Centralized User Administration

Revisit user administration by connecting to network directory services like NIS and LDAP.

Software RAID

Manage filesystems using Software RAID and recover an array.

Logical Volume Management

Manage filesystems using Logical Volume Management.
Resize filesystems and protect them with LVM Snapshots.

Virtualization and Automated Installation

Perform automated installations of Red Hat Enterprise Linux.
Create para-virtualized user domains in Xen.

Troubleshooting with Rescue Mode

Explore troubleshooting methodologies.
Utilize the rescue environment of anaconda.

Course Description: This is a course for users of Linux (or UNIX) who want to start building skills in systems administration on Red Hat Enterprise Linux to a level where they can attach and configure a workstation on an existing network. This course provides intensive hands-on training on Red Hat Enterprise Linux 5.4, and includes the RHCT Certification Lab Exam on the last day.

Who Should Attend: Linux or UNIX users who understand the basics of Red Hat Linux and desire further technical training to begin the process of becoming a system administrator will benefit from this course.

Prerequisites: Students should have taken RH033 Red Hat Linux Essentials or have equivalent experience with Red Hat Linux.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Prove competency by passing the RHCT Exam, a realistic performance-based lab exam.
- Install, configure, and attach a new Red Hat Linux system to an existing production network.

Course Outline:

Unit 1 - Administrative Access

Configure and access various consoles directly, remotely with ssh, and with virt-manager.
Configure privilege escalation with sudo.

Unit 2 - Package Management

Manage software on system using yum, Red Hat Network, and rpm.

Unit 3 - System Services and Security

Configure and manage system logging, time synchronization, printers, and task automation.
Troubleshoot SELinux.

Unit 4 - System Initialization

Define boot process, recover system, and manage service startup.

Unit 5 - Kernel Monitoring and Configuration

Explore kernel modules and variants, tune kernel parameters, manage devices, and monitor processes and resources.

Unit 6 - Network Configuration

Configure dynamic and static network settings for IPv4 and filter packets.

Unit 7 - Filesystem Administration

Review filesystem management concepts, removable media and configure NFS shares with autofs.

Unit 8 - Additional Storage

Expand storage by adding new filesystems and swap space.

Unit 9 - User Administration

Create, modify and delete users, groups, and policy.
Protect users and groups with quotas.

Unit 10 - Filesystems for Group Collaboration

Establish collaborative group directories.
Protect users and groups with ACLs.

Unit 11 - Centralized User Administration

Revisit user administration by connecting to network directory services like NIS and LDAP.

Unit 12 - Software RAID

Manage filesystems using Software RAID and recover an array.

Unit 13 - Logical Volume Management

Manage filesystems using Logical Volume Management.
Resize filesystems and protect them with LVM Snapshots.

Unit 14 - Virtualization and Automated Installation

Perform automated installations of Red Hat Enterprise Linux.
Create para-virtualized user domains in Xen.

Unit 15 - Troubleshooting with Rescue Mode

Explore troubleshooting methodologies.
Utilize the rescue environment of anaconda.

Course Description: Troubleshooting is both an art and a science, an instinct (typically informed by experience) and a technique. In RH142 Linux Troubleshooting Techniques and Tools, participants will learn techniques for troubleshooting a Linux system and will learn to use a variety of troubleshooting tools available on Red Hat Enterprise Linux. RH142 Linux Troubleshooting Techniques and Tools is a 4 day heavily lab-oriented class designed to help participants learn (or improve) their troubleshooting skills using tools available in Red Hat Enterprise Linux. Labs will offer a range of problems from RHCT level and up to allow participants to extend their knowledge and techniques. Participants will have the opportunity to debug live systems, exercising their new troubleshooting skills on a working system so that they can start to (or continue to) develop troubleshooting experience.

Who Should Attend: This course is for Linux system administrators who understand how to install and configure a Red Hat Enterprise Linux system and who wish to deepen their understanding of troubleshooting on Linux.

Prerequisites: Students must have successfully completed RH131 or RH133 or hold a current RHCT certification, or have equivalent system administration knowledge under Red Hat Enterprise Linux.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Identify, diagnose, and resolve problems on a Red Hat Enterprise Linux system.
- Take preventative action to avoid problems.

Course Outline:

Unit 1 - Troubleshooting Techniques

An introduction to troubleshooting methods, best practices, and tools.

Unit 2 - Common Troubleshooting Tools

Analysing log files; monitoring file changes; Rebuilding the RPM database.

Unit 3 - Troubleshooting Boot Issues

Working with advanced GRUB features; rescue and GRUB CDs; advanced ext2/ext3 filesystem repair; rescuing RAID and LVM volumes.

Unit 4 - Revision control

An example to track configuration changes with a revision control system.

Unit 5 - Hardware

Preempting hardware failures (looking for the signs); protecting against hardware failures; redundant configurations; tools to help identify hardware failures and intermittent problems.

Unit 6 - Applications

An overview of tools and techniques for troubleshooting applications. Some common application problems and how to solve them.

Unit 7 - Network

Manual configuration of network cards, troubleshooting advanced setups (bonded interfaces, virtual interfaces); connectivity issues; network diagnostic tools.

Unit 8 - Security

Working effectively with (and not against) security tools, including SELinux, SSL, and authentication.

Unit 9 - Red Hat Resources and Reporting Problems

Support options; Knowledgebase; certified training; initiating support calls; TAM support; developer support; bugzillas; support workflow; diagnostic and information-gathering tools.

Course Description: Virtualization--the ability for a single system to act as multiple systems--is becoming a key technology in the data center. Virtualization permits more efficient allocation of hardware resources, keeping costs in control while maintaining the security that comes with placing key applications in separate computer silos.

The RH184 Red Hat Enterprise Linux Virtualization course teaches system administrators how to deploy virtualized versions of Red Hat Enterprise Linux, thus taking greater advantage of hardware and other resources.

Who Should Attend: This course is for Linux system administrators who understand how to install and configure a Red Hat Enterprise Linux system and who wish to learn to install, configure, and manage Red Hat Enterprise Linux 5 in a virtualized environment.

Prerequisites: Students should have system administration knowledge under Red Hat Enterprise Linux equivalent to RH131, RH133, or RHCT certification. This knowledge includes: installation, service management (using service and chkconfig, for example), basic system monitoring (using ps and top, and perhaps meminfo and the /proc filesystem), filesystem management (using fdisk and mkfs), and basic troubleshooting (including managing log files, understanding dmesg, and perhaps the use of hardware probing tools such as ethtool and lspci).

Benefits of Attendance: Upon completion of this course, students will be able to:

- Install, configure, and manage virtual hosts on Red Hat Enterprise Linux 5.

Course Outline:

Introduction

Red Hat Enterprise Linux
Classroom Network
Course Objectives
Audience and Prerequisites
Caveats

Introduction to Virtualization

What is virtualization?
Why is virtualization important?
Types of virtualization
Basic architecture of Xen virtualization

Basic Paravirtualized Domain Installation

Preparing for domain installation
Basic installs using virt-manager
Configuring domains to automatically start at boot

Virtual Machine Management

Using generic libvirt-based utilities
Using native Xen utilities

Advanced Installation and Configuration

Syntax of Xen domain configuration files
Virtual Block Devices and types of block storage
Xen and bridged networking
Manual and command-line domain installation

Live Migration

Live migration of Xen paravirtualized domains
Advanced configuration of xend
Live migration issues

Troubleshooting

Differences from a standard environment
Viewing hypervisor log messages and log files
Accessing domain virtual block devices
Common issues

Hardware-assisted Virtualization

Fully-virtualized vs. paravirtualized domains
Installing unmodified OSes

Course Description: This course teaches Linux and/or UNIX systems administrators how to build skills at configuring common network services and security administration using Red Hat Linux. This course is updated for building skills on Red Hat Enterprise Linux 4!

Who Should Attend: Linux or UNIX system administrators who already have some real world experience with Red Hat Linux systems administration and want a first course in networking services and security will benefit from this course.

Prerequisites: Students should have taken RH133 Red Hat Linux System Administration or have equivalent experience with Red Hat Linux. Students should also have LAN/WAN fundamentals or equivalent and Internetworking with TCP/IP or equivalent.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Setup a Red Hat Linux server.
- Configure common network services and security at a basic level.

Course Outline:

Introduction To Network Services

Red Hat Linux Network Components
Connecting Networks
Service Management
chkconfig
xinetd Services
The xinetd Daemon
Fault Analysis

Organizing Networked Systems

DNS Basics
Internet DNS Hierarchy
Name Server Hierarchy
Client-side DNS
Server-side DNS
Berkeley Internet Name Domain (BIND)
Configuring BIND
Configuration File Basics
Address Match Lists and acl
RNDNC
Zone Files
Main Record Types
Delegating Subdomains
Caching-only Name Server
BIND Utilities
BIND Syntax Utilities
Configuring the DHCP server

Network File Sharing Services

Configuring NFS services
Configuring FTP services
Samba Services
Samba Daemons
Configuring Samba
Configuring File and Directory Sharing
Printing to the Samba Server
Authentication Methods
Samba Client Tools: smbclient and smbmount

Electronic Mail Services

sendmail Features
Security and "Anti-Spam" Features
An Email Review
Simple Operational Overview
Main Configuration Files
sendmail Configuration with the m4 Macro Language
sendmail Client Configuration
Blacklisting Recipients
Debugging sendmail
Postfix
Using Postfix
Additional postfix Configuration Files
procmail Local Delivery

The HTTP Service

Apache Features
Apache Configuration
Apache Server Configuration
Virtual Hosts

Apache Namespace Configuration
CGI
Apache Encrypted Web Server
Squid Web Proxy Cache

Security Concerns And Policy

Security Terms
Basic Network Security
Which Services Are Running?
Remote Service Detection
Definitions of Security
Security Policy
Backup Policies

Authentication Services

Authentication Basics
Service Profile: PAM
PAM Operation
Core PAM Modules
Authentication Modules
Password Security
Password Policy
Resource Limits
User Access Control
Single User Mode
Authentication Troubleshooting
NIS Overview
NIS Server Topology
Configuring an NIS Server
NIS Client Configuration
NIS Troubleshooting

System Monitoring

Introduction to System Monitoring
File System Analysis
Set User and Group ID Permissions
Typical Problematic Permissions
EXT2 Filesystem Attributes
Monitoring Data Integrity with tripwire
Configuring tripwire
System Log Files
syslogd and klogd configuration
Advanced syslogd configuration
Log File Analysis
Monitoring and Limiting Processes
Monitoring Processes with top
Monitoring Processes Graphically
System Activity Reporting
Process Accounting Tools

Securing Networks

Packet Filtering Capabilities
Netfilter Architecture
Netfilter Packet Flow
Chain Operations
Rule targets
Rule Matching
Network Address Translation(NAT)
Connection Tracking

Rule persistence
The "Bastion Host"

Securing Services

SystemV Startup Control
Securing the Service
tcp_wrappers Configuration
Daemon Specification
Client Specification
Advanced Syntax
xinetd-based security
xinetd Access Control
Host Patterns
Advanced Security Options

Securing Data

The Need For Encryption
Cryptographic Building Blocks
Random Numbers
One-Way Hashes
Symmetric Encryption
Asymmetric Encryption
Public Key Infrastructures
Digital Certificates
Generating Digital Certificates
OpenSSH Overview
The OpenSSH
OpenSSH Authentication
Protecting Your Keys
Applications: RPM

Course Description: RH290 Red Hat Enterprise Linux for Solaris Administrators quickly and efficiently covers many of the hands-on, practical skills needed when migrating from Solaris to Red Hat Enterprise Linux. Focusing on the differences between the two operating systems, the course covers Red Hat Enterprise Linux equivalents to Solaris-specific technologies, such as applying software patches, automated deployment with Jumpstart, and advanced filesystem features. In addition, the course demonstrates how to use RPM, yum, the Red Hat Network (RHN), and Kickstart to manage your environment. You will acquire and set Linux kernel tunables, explore and configure the many supported hardware devices available from multiple vendors, and secure your users and services. Upon completion of this course, you will have the knowledge and skillset to take RH253, Red Hat Linux Networking and Security Administration, or the RH300 Rapid Track Course.

Who Should Attend: This course is for experienced Solaris system administrators transitioning to a Red Hat Enterprise Linux platform, Solaris administrators who are contemplating a migration to Red Hat Enterprise Linux and want to understand the difference in skillset that will be required, and Solaris administrators who want to quickly expand their skillsets to include Red Hat Enterprise Linux.

Prerequisites: Students should have experience in Solaris at the power user, network operations, or system administrator level. Students should also have two years of Solaris experience installing server operating system and software, troubleshooting servers, and configuring and securing servers and services.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Apply Red Hat Enterprise Linux equivalents to Solaris-specific technologies.
- Acquire and set Linux kernel tunables.
- Explore and configure the many supported hardware devices available from multiple vendors.
- Secure your users and services.

Course Outline:

System overview

Important differences between Solaris and RHEL, including their directory structures and commands

Where to get more documentation

System configuration

Configure and access various consoles for local and remote administration

Hands-on interaction with new tools

System initialization, services, and shutdown

Explore the x86 boot process, kernel modules and initialization

Manage service startup and shutdown

Software and update management

Manage software lifecycle with yum, Red Hat Network, and rpm

How to manage Solaris machines from Red Hat Network

Special devices

Understand and modify the partition table, character devices, and block devices

Create and manage software RAID, logical volumes, and iSCSI

Filesystems

Expand storage by adding new or reconfiguring existing filesystems and swap space

Configure autofs for on-demand network storage

Set up space and file quotas for users and groups

Security and authentication

Connect to network directory services like NIS and LDAP

Securely access systems and services using the NetFilter kernel-level firewall

Enforce security with SELinux

System monitoring

Collect system information, monitor system activity, and generate reports

Set up system auditing, centralized logging, and kernel monitoring and profiling

Enterprise deployment

Perform automated installations of Red Hat Enterprise Linux using Kickstart

Save kernel crash dumps to disk and over the network

Course Description: This Red Hat Certified Engineer course is designed for UNIX and Linux experienced users, networking specialists, and system administrators. This 5-day course provides intensive hands-on training on Red Hat Enterprise Linux 4, and includes the RHCE Certification Lab Exam on day 5.

Who Should Attend: This course is for UNIX or Linux system administrators who have significant real-world experience with UNIX or Linux systems administration and some experience setting up key networking services such as HTTP, DNS, NIS, and DHCP. The course is also for those wanting a fast-track course to prepare for the RHCE Exam.

Prerequisites: Students should have taken RH033, RH133, RH253 or have equivalent experience with UNIX, LAN/WAN fundamentals, Internetworking with TCP/IP, knowledge or experience setting up NFS, HTTP, DNS, FTP, NIS, DHCP, and other networking services, and security are also required.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Install and configure Red Hat Enterprise Linux.
- Understand limitations of hardware.
- Configure networking and file systems.
- Configure the X Window System.
- Configure security, set up common network (IP) services, carry out diagnostics and troubleshooting, and perform essential Red Hat Enterprise Linux system administration.

Course Outline:

Hardware And Installation

Hardware Compatibility
CPU and Memory
Devices
Bus Support
The Red Hat Installer
Configuring Hard Drives and Filesystems
Software RAID and LVM
Security Configuration: Firewalls and SELinux
Post-installation Configuration
Validating the Installation

The Boot Process

Sequence of the Boot Process
BIOS Initialization
The GRUB Boot Loader
Kernel Initialization
init and /etc/inittab
Run Levels
Controlling Services

Linux Filesystem Administration

Partitioning Hard Disks
Creating Filesystems
Understanding Journaling Filesystems
Mounting Filesystems: The mount Command and /etc/fstab
The Automounter
ext2/3 Filesystem Attributes
Access Control Lists
Understanding and Controlling SELinux

User Administration

Creating User Accounts
Maintaining User Accounts
Creating and Maintaining Groups
The User Private Group Model
Creating Group Directories: the SGID Mode
The Initial User Environment
Pluggable Authentication Modules
Network Authentication Configuration: NIS and LDAP
Configuring Quotas

System Administration Tools

Configuring the Network with ifup and ifdown
Interface Configuration Files
The CUPS Printing System
Queue Management Using CUPS
Automating System Administration: The cron Subsystem
Understanding, Maintaining, and Monitoring System Logs
Network Installation Servers
Using Kickstart to Automate Installations

Kernel Services And Configuration

Understanding Kernel Modules
The /proc Filesystem
Advanced partitioning: Software RAID

Advanced partitioning: Logical Volume Management
Converting LVM1 Partitions to LVM2

The HTTP Service

The Apache Web Server
Virtual Hosts
Apache Access Configuration
The Squid Web Proxy Cache

Network File Sharing Services

Configuring an NFS Server
Client-side NFS
The File Transfer Protocol and vsftpd
Samba Services
Configuring File and Print Services with Samba
Samba and Security: Authentication Methods and Passwords
Samba Client Tools

Domain Name Service

Understanding DNS: Zones, Domains, and Delegation
The Berkeley Internet Name Domain (BIND)
Running BIND in a chrooted Environment
Zone Creation and Zone Files
Delegating Subdomains
BIND Utilities

Electronic Mail

Understanding E-mail: Mail Transport Agents, Mail Delivery Agents, and Mail User Agents
Sendmail Configuration Files
Using the m4 Macro Language to Create The sendmail.mc File
Debugging Sendmail
Using alternatives to Select an E-mail System
Postfix: an Alternative Mail Transport Agent
Configuring Postfix

Xinetd, OpenSSH, And DHCP

Understanding the xinetd Daemon
Configuring the xinetd Daemon
Configuring xinetd-based Services
The OpenSSH Server
The DHCP Server

The X Window System

X11 and the Server/Client Relationship
The Xorg Server Design and Configuration
Xorg Server Startup
Xorg Server Configuration Utilities
Running Remote Applications

Securing Services

Using tcp_wrappers to Secure Services
Daemon and Client Specifications for tcp_wrapper Rules
Packet Filtering Using netfilter
Firewalling and Data Flow

Creating netfilter Rules
Connection Tracking
Network Address Translation
netfilter Rule Persistence

Troubleshooting

Troubleshooting Strategies
Things to Check
Filesystem Corruption and Checking
Recovery Runlevels
The Rescue Environment

Course Description: Virtualization allows users to make the most out of their IT environments by allowing a single server to run multiple server or desktop operating systems. As a leader in open source software, Red Hat has expanded choice in the virtualization industry with Red Hat Enterprise Virtualization—an open virtualization alternative for enterprises. The Red Hat Enterprise Virtualization course (RH318) arms professionals with the knowledge and skills needed to deploy and manage Red Hat Enterprise Virtualization technologies. This extensive hands-on training course explores the virtualization features of Red Hat Enterprise Linux with the advanced Red Hat Enterprise Virtualization platform*. This class includes the EX318 Red Hat Certified Virtualization Administrator (RHCVA) exam on the last day.

With hands-on labs and a deep dive into the technology, this training course is the perfect first step for any enterprise planning or executing a virtualization deployment strategy.

Who Should Attend: This class is for experienced Linux system administrators responsible for managing enterprise servers who are interested in learning how to manage large numbers of servers or virtual machines using Red Hat Enterprise Virtualization.

Prerequisites: Students should have taken Red Hat Linux Essentials (RH033) and Red Hat Linux System Administration (RH131) or have equivalent experience with Linux. System administration experience on Microsoft Windows operating systems is beneficial but not required.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Effectively create, deploy, manage, and migrate Linux and Microsoft Windows virtual machines hosted on either Red Hat Enterprise Linux servers or dedicated hypervisor nodes using Red Hat Enterprise Virtualization Manager.

Course Outline:

Overview of Red Hat Enterprise Virtualization platform

Install and manage Red Hat Enterprise Virtualization Hypervisor nodes

Install, use, and maintain the web-based Red Hat Enterprise Virtualization for Servers management console

Create and manage virtual images and NFS or iSCSI storage pools storing guest images and snapshots

Deploy, manage, and support Red Hat Enterprise Virtualization, including VDSM, log collector, and upgrading the system

Deep dive into advanced virtualization capabilities

Open lab environment

Course Description: This course is for Linux and/or UNIX systems administrators who want to configure and maintain a secure Apache Web Server.

Who Should Attend: Linux or UNIX system administrators who desire to obtain intensive hands-on training on configuration and management of an Apache Web Server will benefit from this course.

Prerequisites: Students should have taken RH253 Red Hat Linux Network Services and Security, or RH300 RHCE Rapid Track Course, or have equivalent experience with UNIX or Linux. Students should also have experience creating web pages using HTML. Some experience with Perl or Python or shell scripting/programming is recommended but not required.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Configure and maintain an Apache web server running under Red Hat Linux.
- Incorporate CGI handlers, SSL security, dynamic content, and customization via modules.

Course Outline:

Introduction And Basic Apache Configuration

httpd overview: client/server topology, transactional overview
History of web servers: NCSA, Apache evolution, The Apache Organization
Apache today: usage, extensibility, process model, Red Hat's Apache packages
Basic configuration: configuration files and options, basic daemon control

Apache Virtual Hosts

Understanding Virtual hosts: IP-based, name-based
Configuration directives and syntax checking
Using Apache to serve virtually hosted web servers
Web server log files: formats, configuration, use and analysis
Server MIME types

CGI And Server Side Includes

Understanding CGI: Definition, mechanics, limitations, common CGI languages
Basic CGI requirements
Useful CGI tasks: form processing, database manipulation, custom-built tasks
SSI: similarities to CGI, .shtml implementation, Xbithack directive, examples
CGI security: proper programming; suEXEC: file placement issues, configuration

Database Backends

Available Databases
Postgres: installation, administration, creating and loading a table; pgaccess
Query and insert with SQL
Implementations of query and insert in CGI
Perl CGI.pm; DBD/DBI.pm

Apache Customization Through Modules

Concepts
mod_perl
mod_php
mod_status
mod_usertrack
mod_rewrite
other modules

Security And Authentication

Basic access control by host/domain/network
Apache security strategies
Implementing Web-based password authentication
Authentication scenarios

Advanced Security With SSL

Basic Cryptography and SSL concepts
SSL Certificates
Obtaining a website certificate
Implementing SSL with Apache

Course Description: Red Hat Enterprise Deployment and Systems Management is a 5-day intensive hands-on lab course in skills and methods critical to large-scale deployment and management of mission-critical Red Hat Enterprise Linux systems; network service failover and load-balancing; CVS for system administrators; construction of custom RPMs. The EX401 exam is administered on the 5th day.

Who Should Attend: RH401 is aimed at senior Red Hat Enterprise Linux system administrators and other IT professionals working in enterprise environments and mission-critical systems.

Prerequisites: RH401 requires RHCE-level skills. The RHCE certificate on 7.1 or higher is recommended but not required. Prerequisite skills can be evidenced by passing the RHCE Exam in either RH302, RH300, or by taking RH253 or comparable skills and knowledge.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Deploy and manage Red Hat systems to enterprise standards of reliability, availability, scalability and manageability (RASM).
- Implement and manage Red Hat Enterprise Linux deployments efficiently and effectively in ways that make the entire enterprise deployment manageable by a team.

Course Outline:

Installation Of A Red Hat Network Satellite Server

Features of the RHN Satellite Server
RHN Satellite Server topologies
RHN Satellite Server hardware requirements
Understanding Channels
Installing an RHN Satellite Server
Populating an RHN Satellite Server
Troubleshooting an RHN Satellite Server installation

Construction Of Custom RPM Packages

Pros and cons of building custom RPM packages
Setting up a non-privileged build directory
Using RPM macros
Writing custom spec files
Using rpmbuild to create and sign RPMs
RPM construction best practices

Use Of CVS To Manage Configuration Files

Basics of CVS for system administrators
Implementing local and remote repository access
CVS and security
Structuring a CVS project
Using CVS to track, log, and reverse configuration changes

Red Hat Network Satellite Server Management

Types of RHN users
Configuring a client to use an RHN Satellite Server
Creating and managing custom channels

Red Hat Network Management And Provisioning: Deployment

Elements of a deployment system
Use of custom channels in a deployment system
Using configuration channels to maintain system configuration
Automating installations through kickstart

Software Management With Red Hat Network Proxy Server

Hosted RHN versus Proxy Server
Proxy Server software and hardware requirements
Installing RHN Proxy Server
Configuring clients to use a RHN Proxy Server
Deploying locally built RPMs through custom RHN channels

High-availability Network Load Balancing Clusters

Implementing load balancing network service clusters with Piranha
Using the Piranha configuration interface
Handling complex services with persistence and firewall marks

High-availability Application Failover Clusters

Understanding the Red Hat Cluster Manager
Cluster hardware requirements
Implementing a two-node failover cluster
Implementing NFS, Samba, and custom failover services
Failover domains: Active/Active and Active/Passive configurations
Monitoring and maintaining cluster operation
Integrating failover and load balancing clusters

Course Description: Red Hat Enterprise Directory Services and Authentication is an intensive course that provides four days of instruction and labs on cross-platform integration of directory services to provide authentication or information service across the enterprise using the Red Hat Directory Server. An exam is administered on the last day.

Who Should Attend: RH423 is aimed at senior Red Hat Enterprise Linux system administrators and other IT professionals who need to provide enterprise-wide authentication or information services or who desire training in the management of LDAP-based directory services and customization of Linux authentication using the Red Hat Directory Server.

Prerequisites: RH423 requires RHCE-level skills. The RHCE certificate on Red Hat Linux 7.1 or later is recommended but not required. Prerequisite skills can be shown by passing the RHCE Exam in either RH302 or RH300, or by taking RH253 or by possessing comparable skills and knowledge. DHCP, and other networking services, and security are also required.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand the basic concepts, configuration, and management of LDAP-based services.
- Understand PAM, the Pluggable Authentication Modules system, and how it is integrated with services that require authentication and authorization.
- Integrate standard network clients and services with the directory service in order to take advantage of its capabilities.

Course Outline:

Introduction To Directory Services

What is a directory?
LDAP: models, schema, and attributes
Object classes
LDIF

Active Directory servers
Linux as a client
Active Directory and NSS
OpenLDAP
Winbind

The LDAP Naming Model

Directory information trees and Distinguished Names
X.500 and "Internet" naming suffixes
Planning the directory hierarchy

Red Hat Directory Server: Basic Configuration

Installation and setup of Red Hat Directory Server
Using the Red Hat Console
Using logging to monitor Red Hat Directory Server activity
Backing up and restoring the directory
Basic performance tuning with indexes

Red Hat Directory Server: Authentication And Security

Configuring TLS security
Using access control instructions (ACI's)
ACI's and the Red Hat Console

Searching And Modifying The LDAP Directory

Using command line utilities to search the directory
Search filter syntax
Updating the directory
Using graphical LDAP client utilities

Linux User Authentication With NSS And PAM

Understanding authentication and authorization
Name service switch (NSS)
Advanced pluggable authentication modules (PAM) configuration

Centralized User Authentication With LDAP

Central account management with LDAP
Using migration scripts to migrate existing data into an LDAP server
LDAP user authentication

Kerberos And LDAP

Introduction to Kerberos
Configuring the Kerberos key distribution center (KDC) and clients
Configuring LDAP to support Kerberos
Access control with Simple Authentication and Security Layer (SASL)

Directory Referrals And Replication

Referrals and replication
Single master configuration
Multiple master configuration
Planning for directory server availability

Authenticating Windows Clients

Windows networking overview
Configuring a Samba primary domain controller (PDC) using LDAP

Windows Domain Authentication And Linux Clients

Course Description: Red Hat Enterprise Storage Management provides intensive hands-on experience with the emerging Shared Storage technology delivered by Red Hat Global File System™ (GFS). This 4-day course focuses on the implementation of native Red Hat Enterprise Linux technologies included in Cluster Suite and GFS. An exam is administered on the final day of class.

Who Should Attend: RH436 is aimed at senior Red Hat Enterprise Linux system administrators and other IT professionals working in enterprise environments and mission-critical systems.

Prerequisites: Participants in RH436 should already be familiar with Red Hat Enterprise Linux. Recommended minimum competency level is completion of the RHCE or equivalent knowledge.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Deploy and manage highly available storage data to the mission-critical enterprise computing environment.

Course Outline:

Review Red Hat Enterprise Linux Storage Management Technologies

Data Storage Design: Data Sharing

Analyze Storage Dynamics
SNIA Shared Storage Model(SSM)
Volume Management + File System Management = Data Management

Cluster Suite Overview

Define Cluster Suite Implementation in the SSM
Explain Cluster Suite Configuration
Implement Cluster Suite; HA NFS

Global File System(GFS) Overview

Define GFS Implementation in the SSM
Explain GFS Configuration
Explain Pools and Distributed Storage
Introduce Fencing
Explain Fencing Procedures
Implement Fencing Methods

Describe GFS Management

Describe GFS journals
Explain GFS Modification
Single/Redundant GFS Lockmanagers(SLM/RLM)
Increasing Data Storage Capacity

Modify The On-line GFS Environment: Managing Data Capacity

Monitor GFS

Implement GFS Modifications

Migrating Cluster Suite NFS From DAS To GFS

Re-visit Cluster Suite Using GFS

Course Description: This course is designed to teach the methodology of performance tuning and capacity planning for Red Hat Enterprise Linux. This class will cover: a discussion of system architecture with an emphasis on understanding the implications of system architecture on system performance, methods for testing the effects of performance adjustments (benchmarking), open source benchmarking utilities, methods for analyzing system performance and networking performance, tuning configurations for specific application loads. Where possible, emphasis will be placed on using tools that are provided as part of Red Hat Enterprise Linux and Red Hat Network. The EX442 exam will be administered on the 5th day.

Who Should Attend: RH442 is aimed at senior Red Hat Enterprise Linux system administrators and other IT professionals working in enterprise environments and mission-critical systems.

Prerequisites: Participants in RH442 should already be familiar with Red Hat Enterprise Linux. Recommended minimum competency level is completion of the RHCE or equivalent knowledge.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand the implications of system architecture on system performance.
- Use methods for testing the effects of performance adjustments (benchmarking).
- Use open source benchmarking utilities.
- Understand and use methods for analyzing system performance and networking performance.
- Use tuning configurations for specific application loads.

Course Outline:

Architecture

Overview of System Components and Architecture as They Related to System Performance
Performance Characteristics of current Standard PC Hardware
Translating Manufacturers' Hardware specifications Into Useful Information

Monitoring

Using Standard Monitoring Tools Effectively
Gathering and Analyzing Trend Information

SNMP

Basics of SNMP
Using SNMP to Gather Performance Related Data
Graphing SNMP Based Information with MRTG

Benchmarking

Using Open Source Benchmarking Utilities
Benchmarking Systems as a Holistic Entity
Application/Resource Specific Benchmarking Utilities

Tuning

Using /proc to Tune Operating System Characteristics
Module Level Tuning
Tuning Device Drivers (NIC's SCSI, etc.)
Network Performance Tuning
Application Performance Tuning Considerations
Tuning for Specific Configurations
Evaluating ext3 Performance
Tuning for SMB/CIFS Servers
Tuning for Compute Servers
Tuning for File Servers
Tuning to Tune for Database Servers

Course Description: This intensive course rapidly trains programmers to develop applications and programs on Red Hat Enterprise Linux. Over the span of five days, you'll get hands-on training, concepts, and demonstrations with emphasis on realistic labs and programming exercises. Learn concepts and skills essential to programming and software development for Linux-based applications and products.

Who Should Attend: The course is for experienced C programmers who want to learn key skills for creating applications and programs on Red Hat Enterprise Linux. This course is also useful for Windows and UNIX programmers migrating their programs to Linux.

Prerequisites: Students should have experience in C programming, RH133 or equivalent UNIX or Linux workstation user skills for developers, shell scripting in a UNIX or Linux environment, and experience with editors such as vi, emacs.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Develop applications and programs on Red Hat Enterprise Linux.

Course Outline:

GNU Compiler Collection

make

Red Hat Developer Studio/Eclipse

System Calls

Program Arguments

Shared, Static, and Dynamic Libraries

Time Functions

Process Control

Debugging

Memory Operations

IPC

Signals

POSIX Threads

File Operations

Security Issues

Network Communications

Working with the Linux Community

Course Description: Red Hat Linux continues to enjoy an ever-expanding role in providing enterprise-level solutions. As companies migrate from proprietary to open source platforms, technical staff must leverage their existing expertise by learning the tools and techniques of the world of open source. Red Hat's RHD256 course provides a succinct introduction to new application development, as well as providing insight into porting existing applications, into the Red Hat Linux environment.

Who Should Attend: RHD256 allows an experienced programmer, who is already familiar with development on a proprietary UNIX-like system such as Sun Solaris, SGI IRIX, or Hewlett-Packard HP-UX or another Linux distribution, to gain equivalent skills for the Linux environment in a timely manner. The combination of lecture and hands-on lab exercises is designed to illustrate the unique features of Red Hat Linux development and provide contrasts with proprietary systems.

Prerequisites: Application development skills on any UNIX-like platform, including proprietary offerings and other Linux distributions. Attendees are expected to be familiar with common shells and command line utilities such as the C compiler, a linker utility, and the make(1) program.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Compile and debug application programs using the GNU Compiler Collection and DDD.
- Understand how commonly-used enterprise file systems affect the application development effort.
- Write, install, and control system services.
- Understand how Linux multithreaded applications are built.
- Use the "/proc" filesystem to obtain system information.
- Debug, trace and optimize software for better speed and memory usage.

Course Outline:

Open Source Vs. The Proprietary Model

The Common Open Source Software Licenses & How They Affect Software Development Strategy

Components Of The Red Hat Linux Development Environment

Packaging Software With RPM And TAR

The CVS And Subversion Version Control Systems

Functional Differences Between Linux Command-line Tools & Proprietary-system Counterparts.

Using Red Hat Linux System Libraries, And Creating Your Own Libraries

Issues To Be Concerned With When Porting Applications To Red Hat Linux

Linux Security Features Such As PAM And OpenSSH

Advanced Linux Features, Such As Asynchronous I/O

Building Software With Autoconf

The Eclipse Integrated Development Environment

Course Description: Red Hat Enterprise Linux has gained considerable momentum as the operating system of choice for deploying network services such as web, ftp, email, and file sharing. Red Hat's RHCE curriculum provides training in deploying these services and on the essential elements of securing them.

Who Should Attend: The audience for this course includes system administrators, consultants, and other IT professionals responsible for the planning, implementation, and maintenance of network servers. While the emphasis is on running these services on Red Hat Enterprise Linux, and the content and labs will assume its use, system administrators and others using proprietary forms of Unix may also find many elements of this course relevant.

Prerequisites: RH253, RH300, or RHCE certification or equivalent work experience is required for this course. Course participants should already know the essential elements of how to configure the services covered, as this course will be focusing on more advanced topics from the outset.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Master basic service security.
- Understand cryptography.
- Log system activity.
- Secure BIND and DNS.
- Improve NFS security.
- Manage FTP access.

Course Outline:

Mastering Basic Service Security

Review of Host Security
Advanced TCP Wrappers Configuration
Advanced xinetd Configuration

Understanding Cryptography

Overview of Cryptographic Techniques
Management of SSL Certificates

Logging System Activity

Clock Synchronization with NTP
Configuring Centralized syslog Management

Securing Bind And DNS

Name Server Topology and "Views"
Configuration of Appropriate recursion and Response Policies
Using TSIG Authentication Keys
Running BIND in a chroot Environment

Network User Authentication Security

Managing portmap and NIS Risks
Using Kerberos Authentication

Improving NFS Security

NFS Security Limitations
Configurations to Avoid

The Secure Shell: OpenSSH

Protocol and Service Security
Protecting Public-key Authentication
Port-forwarding and X11-Forwarding Issues

Securing E-mail With Sendmail And Postfix

User Mail Spool Access Issues
Overview of Postfix Configuration
Access Control and STARTTLS
Anti-Spam Features
Introduction to Procmail

Managing FTP Access

Controlling Local and anonymous Users

Apache Security

User Authentication and Access Control
Common Misconfigurations
Containing CGI Risks

Basics Of Intrusion Response

Monitoring for Suspicious Activity
Verifying Suspected Intrusions
Recovering From an Intrusion

Course Description: This hands-on course provides an intensive and low-level examination of the Linux kernel architecture, including process scheduling, memory management, and I/O. Topics covered in this course are useful for understanding more advanced performance tuning concepts, like those presented in RH442 Red Hat Enterprise System Monitoring and Performance Tuning. You will also gain an understanding of how device drivers interact with the kernel.

Who Should Attend: This class is for experienced developers who want to gain a thorough understanding of the Linux architecture, including the newest kernels.

Prerequisites: Students should have familiarity with basic tools, such as vi, Emacs, and file utilities. Knowledge of systems programming in a UNIX or Linux environment (register-level hardware programming knowledge is recommended but not required). They should also have some previous experience running Linux, compiling and installing kernels, and so forth, in addition to having experience writing device drivers and kernel modules.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand and use more advanced performance tuning concepts.
- Understand how device drivers interact with the kernel.

Course Outline:

User and Kernel Mode

Kernel Compilation

Kernel Initialization

Kernel Modules

Introduction to Device Drivers

Kernel API Overview

Kernel Debugging

System Tap

Process Management

Scheduling

Real Time and RHEL RT

Introduction to Virtualization

Kernel Threads

Timing

Interrupts

Locking

Memory

Storage

Networking

Working with the Linux Community

Course Description: RHD362 teaches experienced programmers how to develop device drivers specifically for Linux systems. By the end of this course, you will understand the Linux architecture, hardware and memory management, modularization, and the layout of the kernel source. You also will have practiced key concepts and skills for the development of character, block, and network drivers.

Who Should Attend: This course is for experienced C programmers with a good understanding of the Linux kernel who want to learn how to develop device drivers for Linux systems.

Prerequisites: Experience in C programming is required. Students should also have taken RHD143 - Red Hat Linux Programming Essentials or have equivalent experience.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Develop device drivers specifically for Linux systems.
- Understand the Linux architecture, hardware and memory management, modularization, and the layout of the kernel source.
- Grasp key concepts and skills for the development of character, block, and network drivers.

Course Outline:

Device Driver Basics

udev

Writing to a Device

/proc Entries

Module Parameters and /sys

Module Dependencies

Licensing

Dynamic Module Loading

ioctl

mmap

DMA and Asynchronous Transfers

Interrupts

HAL

Locking

Driver Updates

Driver Packaging

Power Management

User Space Drivers

Contributing to the Entropy Pool

PCI

Block Devices

Network Devices

Course Description: RHS429 introduces advanced system administrators, security administrators, and applications programmers to SE Linux policy writing. Participants in this course will learn how SE Linux works; how to manage SE Linux; and how to write an SE Linux policy. This class culminates in a major project to scope out and then write policies for previously unprotected services.

Who Should Attend: RHS429 is designed for computer security specialists and other system administrators responsible for setting and implementing security policies on a Linux computer. Applications programmers also may consider taking the course to understand how to provide a set of SE Linux policies for third party applications. Participants need not have in depth knowledge of SE Linux, but should have a basic understanding of the SE Linux security layer. For example, SE Linux information as taught in RH133 or RH300 is sufficient.

Prerequisites: RHS429 requires RHCE-level skills. Prerequisite skills can be shown by passing the RHCE Exam in either RH302 or RH300, or by taking RH253 or by possessing comparable skills and knowledge.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand how SE Linux operates within the Red Hat targeted policy.
- Understand how policies are written, compiled, and debugged.
- Create a set of policies from scratch for a previously unprotected service.
- Analyze the service, determining its security needs.
- Design and implement a set of policies.
- Test and fix the policies.
- Document the service's new policies so that others can effectively administer the service.

Course Description: Red Hat Enterprise Certificate Management is an intensive course that provides four days of instruction and labs for Linux and UNIX administrators who want to learn to manage and validate certificates using the Red Hat Certificate System.

Who Should Attend: This course is designed for systems engineers, consultants, or other technical personnel responsible for operating a Public Key Infrastructure (PKI) using the Red Hat Certificate System. This course is useful for system administrators managing Enterprise Linux systems running versions 2.1 or 3 and migrating to version 4.

Prerequisites: This course requires RHCE-level skills. Students should have taken RH253 or possess comparable skills and knowledge. In addition, students should be familiar with SSL, X.509 certificate generation, and LDAP. It is useful, but not required, to have taken RH423 Red Hat Enterprise Directory Services and Authentication. Although this class will teach audience members the basics of public key infrastructures, it is nonetheless important for audience members to understand the purposes of a PKI in advance.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Setup and manage the Red Hat Certificate System.
- Revoke their certificates.
- Confirm the validity of other certificates.
- Understand certificate management.
- Use LDAP in a CMS.
- Understand key management and Certificate Authority management.
- Perform troubleshooting.

Course Description: Linux has risen in popularity because it is Open Source technology. This means that customers are no longer locked into any one particular vendor's software. The rise in popularity of Linux has resulted in various Linux distributions. SuSE Linux is now capturing an increasing market share of Linux users. With legions of developers contributing to Linux, it is safe to assume that Linux is here to stay and that Linux will only continue to grow in popularity.

This course is divided between lectures and hands-on exercises. If you are taking this course in a classroom setting, rest assured that your instructor is not only a Linux expert, but is ready and willing to answer any and all of your classroom questions.

Who Should Attend: This course is intended for programmers, end users, managers, and future system administrators.

Prerequisites: Students are required to have some familiarity with an operating system such as DOS or Windows.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Understand the relationship between UNIX and LINUX.
- Log in and out of the system.
- Use the various components of the GNOME desktop.
- Perform work using terminal shell windows.
- Navigate through the file system.
- Get help using the on-line manual.
- Use the rich set of LINUX file management utilities.
- Edit files using the 'vi' editor.
- Use network utilities including ftp and telnet.
- Use the bash shell for a wide variety of functions.
- Write fundamental bash scripts.
- Kill processing through knowledge of the process tree.
- Launch and control jobs.
- Understand the role of the system administrator.
- Use the robust set of software tools.
- Use the Nautilus graphical shell.
- Launch applications graphically.

Course Outline:

An Introduction

Brief UNIX History
Linux + GNU
Commercialization of Linux
UNIX/Linux Time Line
GNU, FSF, and the GPL
Linux Advantages

Getting Started

Logging in to Linux
Working in Linux
The Gnome Display
Terminal Windows
Nautilus
Gnome Applications
Terminal Window Interface
Shell Command Lines
The man Command
Linux Architecture

The Linux Filesystem

Filesystems
Top Level Directories
Home Directories
Directory Commands
The /etc/passwd File
The /etc/group File
File and Directory Permissions
chmod
umask

Shell Fundamentals

Shell Functionality
Shell Variables
The PATH Variable
The Command Line
Command History
Command Substitution
Filename Expansion Characters
The Standard Output
The Standard Error
The Standard Input
Pipes
Aliases

Functions
Quoting
Control Sequences
Other Shell Features

File Manipulation Commands

cat
ls
cp
mv
ln
rm
wc
find
The vi Editor
vi Commands

Linux Filters

Perspective
grep
sort
head and tail
tr
cut
od
paste
split
uniq
xargs
sed
awk
more and less
tee
lp

Processes

What is a Process?
Properties of a Process
Process Creation
ps
Job Control
Signals
kill
nohup

Shell Programming

Shells
Scripting Rationale
Creating a bash Script
bash Startup Files
A Script's Environment
Exporting Variables
Exit Status
Programming the Shell
Parameter Passing
Operators
if
Arithmetic
Looping Constructs
Input and Output
Interrupts

Networking Applications

TCP/IP
Client/Server Model
Ports
DNS
NFS
ping
ftp
telnet
ssh

Software Tools

C Language and UNIX
Creating Programs in C
Creating a Library
Using the Library
Static vs. Shared Libraries
make
Revision Control
CVS
Other Languages

System Administration

Duties of the System Administrator
Bringing Up the System
Shutting Down the System

Adding Users
The /dev Directory
The find Command
Backing Up Files
cpio
tar
Filesystem Commands - mount
Filesystem Commands - df
Filesystem Commands - du
at and crontab
Managing Software

Using the Graphical Environment

The X Window System
A Picture of Several X Clients
XFree86! and Xorg
The GNOME Desktop Environment
Window Managers
Window Operations
Nautilus
The Linux File Manager
A Graphical Depiction of Nautilus
Launching Applications through Nautilus
Office Applications

Mail Systems

Mail Systems
mail Command
mail Customization
pine Command
Features of pine
Using pine
Main Menu in pine
Help in pine
Compose Message in pine
Message Index in pine
Folder List in pine
Address Book in pine
Setup in pine

Course Description: This is the first course in a series of courses in the SuSE Linux Curriculum. This course places emphasis on Linux developers. Topics include: Linux principles, a detailed view of the file system, the vi editor, fundamental Linux commands including awk, sed, and grep, a detailed view of the bash shell including its function as a programming language, other programming languages such as C, and Perl, software tools such as make and rcs, and related system administration topics. The course is supplemented with many hands-on exercises that reinforce the lectures.</dd>

Who Should Attend: This course is intended for current Unix and Linux developers and those who wish to gain similar knowledge.

Prerequisites: Students are required to have some development experience.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Log in and out of the system.
- Navigate through file system.
- Manipulate files using the rich set of Linux utilities.
- Create and modify files using the 'vi' editor.
- Use the Linux shell for a wide variety of functions.
- Launch and control jobs.
- Use the rich set of software tools provided by Linux.
- Write non-trivial Perl scripts.
- Use the Linux command set to solve standard problems.
- Write non-trivial shell scripts.
- Understand simple C programs.
- Understand the role of the system administrator.

Course Outline:

An Introduction

Brief UNIX History
Linux + GNU
Commercialization of Linux
UNIX/Linux Timeline
GNU, FSF, and the GPL
Linux Advantages

Getting Started

Logging in to Linux
Working in Linux
The KDE Display
Terminal Windows
Konqueror
KDE Applications
Terminal Window Interface
Shell Command Lines
The man Command
Linux Architecture

Directories

Filesystems
Top Level Directories
Home Directories
Directory Commands
The /etc/passwd File
The /etc/group File
The newgrp command
The su Command
File and Directory Permissions
chmod
umask

Shell Fundamentals

Shell Functionality
Shell Variables
The PATH Variable
The Command Line
Command History
Command Substitution
Filename Expansion Characters
The Standard Output
The Standard Error
The Standard Input
Pipes
Aliases
Functions
Quoting
Control Sequences
Other Shell Features

File Manipulation Commands

cat
ls
cp
mv
ln
rm
wc
find
The cmp command
Exit Values
The vi Editor
vi Commands

Linux Filters

Perspective
grep
sort
head and tail
tr
cut
od
paste
split
uniq
xargs
sed
awk
more and less
tee
lp

Processes

What is a Process?
Properties of a Process
Process Creation
ps
Job Control
Signals
kill
nohup

Shell Programming

Introduction
Shell as a Programming Language
An Example Shell Script
Passing Arguments to Shell Scripts
Relational Operators
Making Decisions
Logical Operators
File Operators
Looping Constructs
Arithmetic Calculations

The test Command
Altering Loop Control

Networking Applications

TCP/IP
Client/Server Model
Ports
DNS
NFS
ping
ftp
telnet
ssh

Software Tools

C Language and SuSE
Simple C Programs
Making Libraries
Shared Libraries
Compression Utilities
The file Command
make
Revision Control
CVS
Other Languages

System Administration

Duties of the System Administrator
Bringing Up the System
Shutting Down the System
Adding Users
The /dev Directory
The find Command
Backing Up Files
cpio
tar
Filesystem Commands - mount
Filesystem Commands - df
Filesystem Commands - du
at and crontab
Managing Software

A Tutorial Introduction to Perl

What is Perl?
The First Perl Program
Perl Variables
IO in Perl
Control Flow Constructs
Control Flow Constructs - if
Control Flow Constructs - loops
Statement Modifiers
Altering Loop Control Flow - last

Altering Loop Control Flow - redo
Array Principles
Array Functions
Arrays and STDIN
Associative Arrays
The Special Built In Variable \$_
Regular Expressions
Writing Your Own Functions

Course Description: This course equips participants with the necessary tools to insure the well being of a LINUX system. Lab sessions include the installation, troubleshooting, backup and recovery and administrative maintenance of a LINUX system.

Who Should Attend: The course is intended for those people who will be responsible for the operation and management of a Linux system.

Prerequisites: Participants are expected to have completed the course entitled Introduction to UNIX or have equivalent experience.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Carry out startup and shutdown procedures
- Perform system administration tasks including adding and deleting users, adding devices, partitioning the disk, and other administrative functions
- Use the administrator files and commands in the /etc directory
- Manage disk space and file- systems
- Provide user guidance
- Backup and restore all or parts of the system
- Monitor system performance
- Establish and maintain network connectivity

Course Outline:

Introduction To Linux

History Of Unix
Contemporary Products
Advantages Of Linux
Components Of The Linux Environment
Important Parts Of The Kernel
Shells With Linux
Major Linux Services
Organization Of The Linux Filesystem
Responsibilities Of A System Administrator
Getting Help
Exercises

What You Should Already Know

Beginning Linux Topics
Shell Variables
The PATH Variable
Exporting Variables
The Command Line
The PS2 Variable
Command History
Command Substitution
Cut, Paste
Expand, Fmt, Unexpand
Head, Tail, NL, Od
Wc, Split
Pr, Tac, Tr
Xargs, Join
Sed
Directory Manipulation Commands
File Manipulation Commands - Cp
File Manipulation Commands - Mv
File Manipulation Commands - Rm, Touch
Using Filename Expansion Characters
Special I/O Files
Standard I/O Files
Pipes
Process Management
Ps, Pstree
Top
Signals
Job Control
Nice, Renice
Regular Expressions
Shells
Shell Variables
Shell Aliases
Functions
Startup Files
Key Mappings
Writing Shell Scripts

Executing Your Script
A Script's Environment
Exit Status
Programming The Shell

System Startup And Shutdown

Introduction To The Boot Process
Stages Of The Boot Process
Linux System Runlevels
Linux System Initialization Scripts (/Etc/Init.D)
Suse Linux's Runlevel Service Tool
Suse Linux's Runlevel Service Tool
The Chkconfig Command
X Windows
Shutting Down The System
Exercises

System Security

Important System Files... /Etc/Passwd
Important System Files ... /Etc/Shadow
Important System Files... /Etc/Group
The Superuser (Root) Account
The Su Command
How To Use The Su Command
The Whoami And Id Commands
The Who Command
File And Directory Permissions
Types Of Permissions
Changing Permissions
The Octal Mode
Special File Permissions ... Suid And Sgid
Special File Permissions ... Sticky Bit
Adminstrating Ownership
Exercises

Adding Users

Manually Creating A User Account
The Chsh Command
Additional Commands
Adding A User
Deleting A User
Exercises

Software Package Administration

RPM
Standard Commands And Options
Installing Packages

Naming Conventions For RPM Packages
Installing A Package
Upgrading Packages
Uninstalling Packages
Querying Packages
Verifying Packages
Installing Packages Through Yast Control Center
Exercises

Linux System Processes

Linux Process Components
Linux Process Creation
The Ps (Process Status) Command
The Top (Top Jobs) Command
The Kill Command
The At Command
How To Execute The At Command
Scheduling Tasks Using Cron
The Crontab File Format
Creating A Cron Entry
Exercises

Kernel Configuration

Overview Of The Linux Kernel
Configuring The Linux Kernel
Configuration Options
Building And Installing The Kernel
Building The Kernel
Installing A New Kernel
Configuring Your Boot Manager
Troubleshooting The New Kernel
Troubleshooting And Recovery
Exercises

Disk Management

Disk Drive Geometry
Introduction To Partitions
Devices And Drivers
Linux Standard Naming Conventions
Partitioning A Disk
Using Fdisk
The Mke2fs Command
The E2fsck Command
Introduction To Mounting File Systems
Mount Options
Mounting A File System
Exercises

Backup And Restore

Backup Devices And Media

Backup Strategies
Example Of A Backup Strategy
The Pax Command
The Mkisofs Command
The Cdrecord Utility
The Tar Command
The Cpio Command
Exercises

Printing

Overview Of Printing
Printer Configuration
Print Commands
CUPS
Exercises

Network Basics

Network Terminology
LAN Topology
Network Transmission Media
Network Access Methods
Network Hardware
Standards And Protocols
Packets
The ISO/OSI Model
TCP/IP Network Model
Network Configuration
Exercises

Unix Network Applications

The Extended Internet Services Daemon
Ftp
Vsftpd
The Telnet Command
Simple Telnet Session
The R* Commands
Trusted Hosts
Sendmail
Filesystems
Network File System
/Etc/Exports
NIS
Exercises

The Network File System (Nfs)

Introduction To Nfs
The NFS Server
TCP Wrappers
The NFS Client
Configuring The NFS Environment
Exercises

Naming Services

Naming Services Overview
The Domain Name Service (DNS)

Installing A DNS Server
Configuring A DNS Server Using Yast2 Dns-Server
The NIS+ Environment
The NIS Environment
NIS Servers And Clients
NIS Components
Installing The Software
Configuring A NIS Master Server
Configuring An NIS Client
Configuring An NIS Slave Server
Name Service Switch
Configuration File
Exercises

Installation Of Suse Linux

Optimization Of Usage
Server Installation
The Installation Process
Getting Started
Installation
Partitioning
Boot Loader And Network Configuration

Course Description: This course takes Linux System Administrators to the next level of maintaining Linux systems and implementing advanced levels of security and administration.

Who Should Attend: The course is intended for those people who will be responsible for the operation and management of LINUX systems.

Prerequisites: Participants are expected to have completed the Linux System Administration Course or have equivalent experience.

Benefits of Attendance: Upon completion of this course, students will be able to:

- Create and manage Linux filesystems.
- Manage user and group accounts.
- Add and remove devices.
- Install and compile new Linux kernels.
- Perform administrator level networking tasks.
- Setup and manage access to network services such as ftp, telnet, and NTP.
- Enable or disable services according to runlevel.
- Setup and configure sendmail.
- Setup and configure apache.
- Setup and configure NFS.
- Setup a DHCP server and manage client access.
- Manage network security.
- Learn basic firewall configuration.
- Perform network Linux installations.

Course Outline:

What You Should Already Know

Booting Linux
LILO
GRUB
Modules.conf
dmesg
/var/log/messages
System Runlevels
/etc/inittab
Overview of Red Hat Printing
Printer Configuration
CUPS
Filesystems
Kinds of Partitions
Device Naming Conventions
The root Filesystem
Partitioning Disks
Creating Filesystems
Introduction
The /etc/passwd File
The /etc/group File
The useradd Program
The /etc/shadow File
Scheduling Automatic Job Execution
Backups
tar
The mt Command
cpio
dd
dump and restore
The dump Command
The restore Command
Naming Services Overview
The NIS+ Environment
The NIS Environment
NIS Servers and Clients
NIS Components

Devices, Filesystems, And The Filesystem Hierarchy Standard

Maintaining the Integrity of Filesystems
Monitoring Free Disk Space and Inodes
The df Command
The du Command
The fsck Command
Controlling Filesystem Mounting and Unmounting
The mount Command and /etc/fstab
Unmounting Filesystems
Setting and Viewing Disk Quotas
Using Quotas
Controlling Access to Files
Establishing Permissions for Files and Directories
umask
Special Permissions
chmod
Managing File Ownership

Creating Hard and Symbolic Links
Soft Links
Preserving Links and Finding Links
The Linux Filesystem Structure
Specific Filesystems
Helpful Commands Used to Locate Files
Troubleshooting

Administrative Tasks

User Administration Commands
More on useradd
Group Management
Tuning the User Environment
Using System Log Files
Linux Time
NTP

Documentation

Paginators
man
Organization of man Pages
Creating Your Own man Pages
Other Documentation
info
Finding Information on the Internet
Communicating with Users

Kernel

Kernel Modules
The lsmod Command
The insmod Command
The rmmod Command
The modprobe Command
The modinfo Command
Installing a Custom Kernel
Configuring the Linux Kernel
Installing a Custom Kernel
Configuring your Boot Manager
Installing a Kernel RPM

Linux Networking Fundamentals

Introduction
Network Models
The TCP/IP Model
TCP/IP Protocols
Packets
Internet Addresses
Subnets
CIDR
Ports
Domain Name System
dig
host
whois
ftp
vsFTP
telnet

ping
ifconfig
route
netstat
tcpdump
traceroute
Miscellaneous Commands

Configuring Networking Services

Networking Services
Enabling Services
xinetd
DHCP
Configuring a DHCP Server
The dhcpd.conf File
DHCP Clients
sendmail
Configuring sendmail
Configuring Apache
The Network File System (NFS)
DNS
Secure Shell
PPP
Samba Configuration

Security

TCP Wrappers
Finding Executable SUID Files
Verifying Packages
Host-Level Security
ulimit
Security Announcements
The proc Filesystem
Network Security Applications
tcpdump
nmap
netcat

Firewalls

Introduction
iptables
Logging
iptables Logging
The nat Table
nat
The mangle Table

Network Installation

Introduction
Server Setup
FTP and HTTP Installation
NFS Installation
The Kickstart File
Editing The Kickstart File
Installation