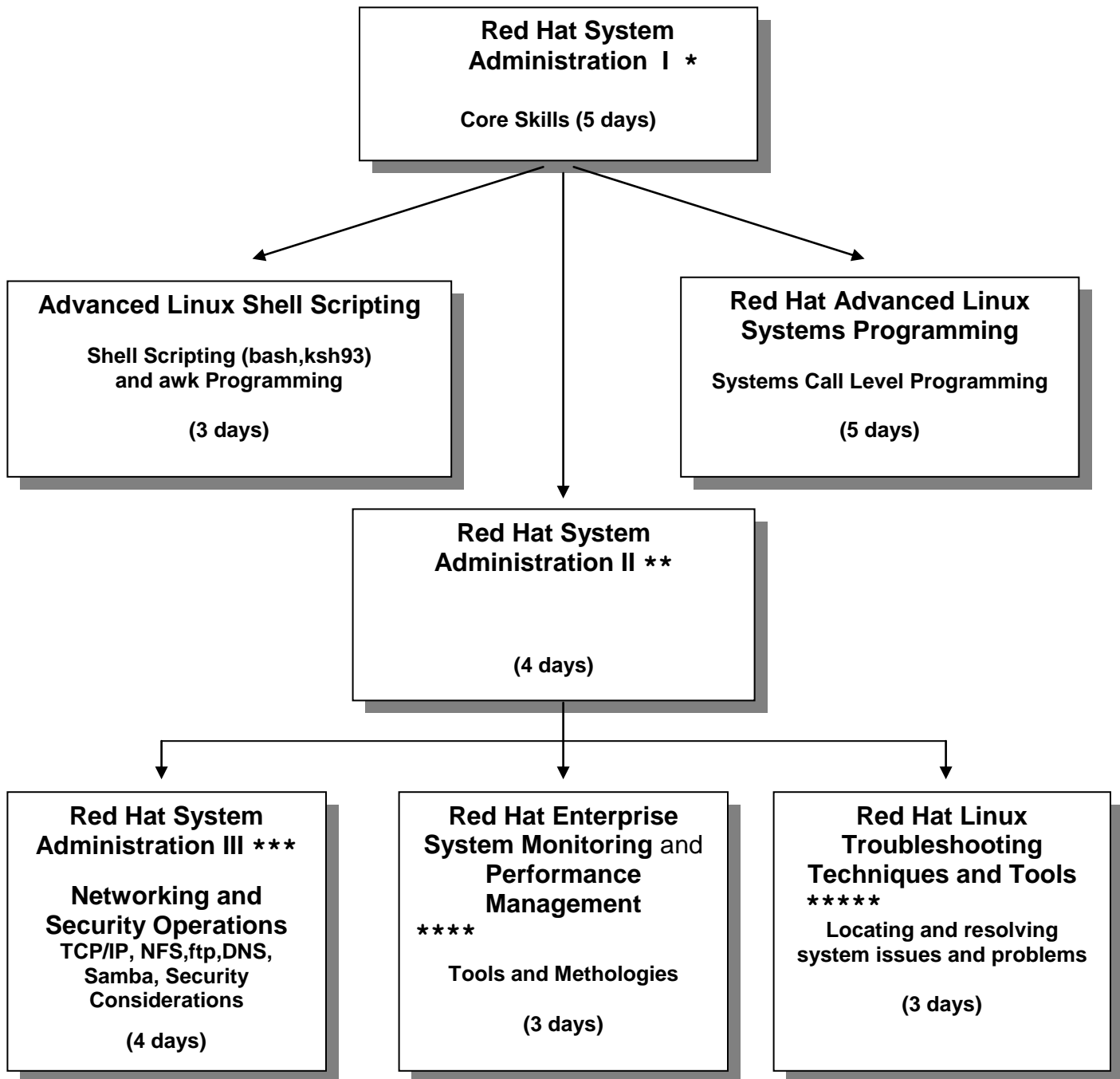


## Red Hat Enterprise Linux (RHEL 6) Courses

*Our Experts Can Cover Any and All Topics—Topics Can Be Added or Deleted per Customer needs.*



- equivalent to Red Hat courses: \*(124) \*\*(134) \*\*\*(254) \*\*\*\*\*(442) \*\*\*\*\*(142)
- all participants use their own virtualized RHEL 6 system for hands-on and lab exercise

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## Red Hat System Administration I—Five (5) days, 50% lecture, 50% lab

This course teaches basic working environment of a **Linux** system. It introduces commonly required operations that can be performed by entering commands interactively in a command terminal, along with functions available in the **K** Desktop Environment (**KDE**) and **Gnome**. This course will concentrate on **Red Hat Enterprise Linux (RHEL), version 6 (all update levels)**.

Course is **equivalent** of Red Hat course **124**, with **additional shell scripting topics**.

**COURSE OBJECTIVES**—Each participant will be able to use **RHEL 6 Bash Shell** techniques and commands to maintain collections of files, create files using interactive editor utilities, create and execute basic command procedures, communicate with other users, and tailor the interactive environment to meet their needs. Basic administrative features to setup a functioning **RHEL6** system will also be shown.

### COURSE TOPICS

#### **Understanding the User Environment**

- RHEL 6 System Overview
- Process Concepts
- The Graphical Environment GUIs (**KDE**, **Gnome**)
- Using **GUIs** remotely
- Customizing the Graphical Environments

#### **Getting Started with the Command Language**

- Logging Into an **RHEL 6** System
- Bash** Shell Syntax Rules
- Documentation via **man** and **info**
- Command Line Editing
- Basic Network Operations

#### **Managing Files**

- File Specification Syntax
- Device Specifications
- Directory Specifications
- Regular Expressions and Special Characters
- RHEL 6** Commands to Manipulate Files
- File Protection Mechanisms

#### **Creating and Editing Text Files: Part 1**

- Using GUI-based editors (**kedit**, **gedit**) **vi** Editor
- ex** Editor (commands within **vi**)
- Alternative editors (**vim**, **nedit**)

#### **Creating and Editing Text Files: Part 2**

- Advanced Features of the **vi** Editor
  - abbreviations
  - mapping keys

**Red Hat System Administration I**—Five (5) days, 50% lecture, 50% lab (Continued)**Improving the User Interface**

- Saving History Commands
- Creating Command Aliases
- Redirection of Input and Output
- Using Hard and Symbolic Links
- Process Control Commands

**Shell Script Procedures**

- Rules for Creating Procedures
- The **.bash\_profile** procedure
- The **.bashrc** procedure

**Print and Batch Mechanisms**

- The **lp** command and options
- The **at** command and options
- The **crontab** command and options

**User Level Tape Operations**

- tar** utility syntax
- tar** commands for product access
- Using compression/uncompression commands **gzip** / **gunzip**

**Writing Bash and Korn Shell Scripts**

- Bash / Korn** Shell environment variables
- User-defined variables
- Substitution of variables
- Command substitution in variables
- Decision statements
- Looping statement constructs
- Formatting variable values for output (**printf**)
- typesetting** integer variables
- Generating menus and processing with **case**
- using and defining functions
- special parameter/variable substitutions
- defining and using **indexed arrays**

**System Installation and Updating**

- Installation types and methods
- Installing the **RHEL 6** operating system
- Maintaining the system via patches
- Managing system software

**Startup and Shutdown**

- Components involved in the **Linux** boot
- Grub** loader stages and configuration

**Red Hat System Administration I**—Five (5) days, 50% lecture, 50% lab (Continued)

Default bootstrap  
Boot to single-user mode  
**Linux** startup methods, tools, and procedures  
Understanding **run levels**  
Adding procedures to the startup mechanisms  
Shutdown methods and control

**Managing of System Users**

**UID** and **GID** concepts  
Creation of a user account  
Security through **password aging**  
Controlling access by groups

**Managing Printer Queues**

Creation of an execution print queue  
Commands to manipulate queues  
Commands to manipulate jobs in queues

**Managing Disk and Tape Volumes**

Commands to manipulate disks/filesystems  
partitioning disk surfaces with **fdisk**  
creating **ext2/ext3/ext4** file systems (**mkfs**)  
manipulating file system structures  
verifying file system structures (**fsck**)  
making file systems available to software (**mount**)  
configuring swap space(s)  
Logical Volume Management (**LVM**)

**Network Setup and Configuration**

**TCP/IP** address selection  
Host names and related files  
Configuring network devices  
Network testing with **ping**  
Network utilities: **telnet, rlogin, rcp, rsh, ssh**

**Maintaining System Integrity**

Login and user accounting  
Command/process level accounting  
Using **cron** tables

**Basic Server Setups (Procedures and Mechanisms)**

**DNS (client)**  
**FTP / Mail / Web (Apache) / Samba**

**COURSE PREREQUISITES**—This course is considered to be the basic **Red Hat** course.  
Experience with any interactive system is helpful.

## Advanced Linux Shell Scripting—Three (3) days, 50% lecture, 50% lab

This course teaches the **Linux / Unix** computer professional (user, systems administrator, application/system programmer) the techniques needed to develop advanced shell and reporting type procedures. The techniques shown are applicable to all **Linux** system variants.

### COURSE OBJECTIVES

Each participant will be able to use **bash** shell, **Korn** shell , and **awk** capabilities to maintain collections of files, manipulate data, implement process communication, synchronization, and data sharing. Brief comparisons in techniques and performance considerations with **Perl** will also be shown.

### COURSE TOPICS

#### Review of Shell Scripting Features

- Importance of signatures
- Methods of script execution
- Debugging shell scripts
- Variable types
- Looping statement constructs
- Decision statements

#### Advanced Techniques in Shell Scripts

- Alternative script execution methods
- Defining a **trap** step debugger
- Here Document** data
- Defining and using functions
- Using string pattern expressions
- Indexed array creation and access
- Option processing with **getopts**

#### Advanced Techniques in Korn Shell Scripts

- Availability of variable data
- Defining and using **nameref** variables
- Active variables (and tied functions)
- Features of **Associative arrays**
- Direct control of file **I/O (exec, read, print)**
- User-defined file descriptors
- Interprocess communication/synchronization
  - Co-processes
  - Reassignment of file descriptor paths
- TCP** and **UDP** port access
  - Attaching to network listener processes

## Advanced Linux Shell Scripting—Three (3) days, 50% lecture, 50% lab Continued

### awk Scripting Features

- Importance of signatures
- Methods of script execution
- Patterns and actions
- Output formatting
- Defining and using associative arrays
- the **getline( )** function
- awk** supplied function features
  - string handling
  - information
  - callouts for system features
  - arithmetic operations
- Defining and using functions
- Passing arguments to functions

### Introduction to Perl Scripting

- History, versions, ports
- Perl** capabilities
- Comparison with shell scripts

**COURSE PREREQUISITES**—This is an advanced **Linux / Unix** course. It is assumed that participants either have attended a **Red Hat Linux Essentials** course, or have equivalent command line experience with the **bash** and/or **Korn** shells.

**Red Hat Advanced Linux Systems Programming—Five (5) days, 50% lecture, 50% lab**

Course introduces participants to system level programming in the **C language** in a **RHEL 6** environment. Focuses on **RHEL 6** system calls and library functions, how to use them, and their underlying mechanisms. Deals with many facets of **RHEL6** operating system, including: introduction to **RHEL6** kernel structure, I/O, Signals, Signal handlers, Timers, Processes, Multi-Tasking, Inter-Process Communication (**IPC**) Pipes, Shared memory, Message Queues, Semaphores, Networking, Sockets, using **TCP/IP** and **UDP/IP**. Throughout the course information presented is related to participant through: execution of common **RHEL 6** user/administrator commands, writing, compiling, and executing example **C language** programs which demonstrate use of system routines and accessing system data structures on a live **RHEL 6** system.

**COURSE OBJECTIVES**—Upon completion of this course the participant will be able to:

- Explain the programmable mechanisms in a **RHEL6** environment
- Write applications using standard **RHEL6** system calls and library functions

**COURSE TOPICS****System Programming Environment of the RHEL 6**

Environment of a **C** language program  
System level programming requirements:  
    **C** compiler issues  
    Header files and libraries  
    Special data types used  
    Useful functions  
    Error handling (basic)  
    Documentation  
    Security Issues

**File Systems**

Types of file I/O  
File I/O structures  
File I/O access types  
Dealing with STDIN, STDOUT, STDERR  
Creating and using temporary files  
Directory file access and manipulation  
Permissions

**Process Creation and Control**

Attributes (username, UID, PID, Groups)  
Creation methods  
Multi-tasking  
Shells  
Synchronization  
An introduction to threads



**Red Hat Advanced Linux Systems Programming**—Five (5) days, Continued  
50% lecture, 50% lab

**Synchronization and System Information**

Time issues:

how time is maintained

timers

General synchronization

semaphores

mutexes

spinlocks and barriers

signals (generation and handling)

System information:

uname

hostname

load averages

**Interprocess Data Communication Facilities**

Overview of **RHEL 6** IPC Facilities

Memory Mapped files

Pipes and Named Pipes

Messages Queues

Creating and Using Shared Memory structures

**Sharing Code Between Processes**

Building shared object (libraries)

Static Linking

Dynamic Linking

**Networking**

Concepts and basic requirements

Socket creation and usage

TCP/IP level connections

UDP/IP level connections

**COURSE PREREQUISITES**—Participant should have a solid background in basic **RHEL 6** utilities and editors (such as **vim**), and a working knowledge of the **C** (or **C++**) programming language(s).

## Red Hat System Administration II—Four (4) days, 60% lecture, 40% lab

This course will teach the commands and methods needed to setup and manage a **RHEL 6** system. Course will also use a problem solving approach in the lab exercises to teach system administrators advanced topics, for long-term management of system.

Course is the **equivalent to Red Hat course 134**, and is a continuation and companion to **Red Hat course 124**, and is the second preparation course for the **RHCSA** certification examination. Systems: **Red Hat Enterprise Linux Version 6 (all update levels)**

**COURSE OBJECTIVES**—On completion of this course, a systems administrator should be able to install, update, and boot the **RHEL 6** operating system; set up user accounts and directories; prepare queues for use; perform backups for integrity and performance reasons; monitor the system for performance and do basic setup of network software and capabilities.

### COURSE TOPICS

#### **Advanced System Concepts for System Administrators**

- Linux** history and timelines

- Process concepts

- Bash Shell** command usage and review

- Optimizing system help information

- System administrator functions

- Using the **root** account

- root** access via **sudo**

- Using the **RHEL 6** administrative graphical interfaces

- Manipulating system default environment files

- Installing and using **webmin** for remote administration

#### **System Installation and Updating**

- Installation types and methods (review)

- Installing the **RHEL 6** operating system via **kickstart**

- Package management via **yum** (repositories)

- Reconfiguring the **Linux** kernel (modules)

#### **Startup and Shutdown**

- Controlling kernel operations via boot time arguments

- Grub** loader manipulation

  - alternative menu entries

  - password protections

- Boot time troubleshooting

- Upstart **init** service

#### **Managing of System Users and Files**

- Security through **PAM password aging**

- Group level password controls

**Red Hat System Administration II—Four (4) days, 60% lecture, 40% lab Continued**

Access Control Lists (**ACLs**)

Files

directory (defaults)

Process priorities

**Managing Printer Queues**

Creation of an execution print queue

Commands to manipulate queues

Commands to manipulate jobs in queues

**Managing Disk and Tape Volumes**

Commands to manipulate partitions

**fdisk**

**partprobe**

encrypting file systems

verifying file system structures with **fsck**

Commands to manipulate archival volumes:

**tar** utility

**cpio** utility

**dump** and **restore** utilities

**LVM** snapshots

**Monitoring System Activity**

**Informational** Utilities

The **vmstat** utility

The **iostat** utility

The **sar** utility

The **netstat** utility

Maintaining swap and paging space(s)

Using the **top** facility

**Maintaining System Integrity**

**SELinux** basics

Pluggable Authentication Module (**PAM**) basics

Log file control (**logrotate**)

**COURSE PREREQUISITES**—Participant has successfully completed the **Red Hat System Administration I** course, or has equivalent system time as a user.

**Red Hat System Administration III—Networking and Security Operations****Four (4)** days, 60% lecture, 40% lab

Course teaches the commands and methods needed to setup and manage advanced networking, security, and performance management on a **RHEL 6** system. The course will also use a problem solving approach in the lab exercises to teach system administrators advanced topics, for long-term management of the system.

Course is the **equivalent** to **Red Hat** course **254**, is used for preparation for the **RHCE** certification examination.

Systems: **Red Hat Enterprise Linux Version 6 (all update levels).**

**COURSE OBJECTIVES**—On completion of this course, a systems administrator should be able to install, update, and boot the **RHEL 6** operating system; setup a **RHEL 6** system to act as a: **DNS** server (and client), **VSFTPD** server, **Apache** web server, email server, **SAMBA** host. Topics covering basic encryption, performance management tools, usage of **PAM**.

**COURSE TOPICS****Advanced RHEL 6 Networking Features**

- automated network attributes setup
- network address types
- network information files
- controlling **telnet** services
- controlling trusted host services
- TCP Wrappers**
- syslog** (and remote logging)
- logwatch**

**Domain Name System (DNS) Server / Client Setup**

- reasons for **DNS**
- DNS** layout and overview
- FQDN** (fully qualified domain (host) name)
- DNS** server types
- name resolution
- primary name server setup
- secondary and caching-only name server setup
- testing a primary name server
- resolver host setup
- controlling **named** (via **rndc**)

**RHEL 6 Server Setups****SAMBA / CIFS**

- SAMBA / CIFS** overview
- basic **SAMBA / CIFS** server installation
- accessing **SAMBA / CIFS** server shared files
- SAMBA / CIFS** shared printer setup and access

**Red Hat System Administration III—Networking and Security Operations—Continued**

Maintain Quality ♦ Value Added ♦ Superior Performance

**Sendmail / postfix**

- mail components
- daemons
- changing configuration files

**web server**

- Apache** Web Server packages
- configuration files changes
- virtual hosts
- secure hosts

- ftp—ftp** servers overview
- vsftpd** setup and security

**RHEL 6 Server Setups**

- NFS—NFS** server setup
- NFS** client
- automounter**

- DHCP—DHCP** client setup
- DHCP** server setup

**RHEL 6 Security****Unix types**

- Administrator responsibilities
- Basic security considerations
- Types of security and attacks
- Reacting to a security problem

- PAM** (Pluggable Authentication Modules)

- GnuPG** setup and control

- IPTABLES** (Netfilter firewall)

- Data encryption in **RHEL6 (files and filesystems)**

- SSH—Using SSH** tunnels for secure graphical connections

- GRUB** level security (boot files)

**Administrator Level BASH Shell Scripting**

- rules for writing shell scripts
- targeted procedures
- file systems
- system logging
- package management
- process control and monitoring
- documentation formatting

**COURSE PREREQUISITES**—Participant has successfully completed **Red Hat System Administration I (RH 124)** and **Red Hat System Administration II (RH 134)** courses, or has equivalent system time as a user and a working systems administrator.

## Red Hat Enterprise Linux Systems Administration

### Troubleshooting Techniques and Tools—Three (3) days, 60% lecture, 40% lab

Course teaches commands and methods needed to perform troubleshooting networking, security, along with performance issues on a functioning **RHEL 6** system. Course uses a problem solving approach in lab exercises to teach system administrators a **methodology** of: **discovery**, **analysis**, **tools**, and **solution** in each area that is covered.

Course is the **equivalent** to **Red Hat** course **142**.

Systems: **Red Hat Enterprise Linux Version 6 (all update levels)**

**COURSE OBJECTIVES**—On completion of this course, a systems administrator should be able to use a **methodology** to **analyze** and **solve problems** with system components, along with usage of tools to **proactively identify issues** as they occur (or before they occur).

### COURSE TOPICS

#### Review of System Concepts for System Administrators

- System administrator functions
- Using the **root** account
- root** access via **sudo**
- Using the **RHEL 6** administrative graphical interfaces
- Manipulating **root** account history files
- Installing and using **webmin** for remote administration

#### Overview of Troubleshooting Techniques

- methodologies
- available tools
  - in **RHEL 6** distributions
  - third party
  - freeware
  - system-specific ( "**home-grown**" )

#### Startup Time Issues and Resolutions

- review of boot time components
- troubleshooting **GRUB** problems
- building **GRUB** recovery boot media
- alternate** methods of **booting**
  - single user mode
  - recovery or installation media
- fixing problems with filesystem structures
- resolving issues with **LVM** boot file systems

#### RHEL 6 Hardware Configuration

- location of key files and descriptions
- tools to manipulate hardware configuration files
- understanding **hardware discovery** and drivers
- diagnostic tools to test hardware components

## Red Hat Enterprise Linux Systems Administration



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**Troubleshooting Techniques and Tools**—Three (3) days, 60% lecture, 40% lab Continued**RHEL 6 Software Configuration**

location of key files and descriptions  
tools to manipulate configuration files

**Networking Troubleshooting Considerations**

review of networking hardware / software components  
techniques to manually configure network interfaces  
software **IP** configuration / testing using **ifconfig**  
testing areas and tools  
network connectivity  
server configuration (files)  
**DNS, VSFTPD, DHCPD, SAMBA**  
available tools

**Security Issues**

review of security in all major component areas  
impact of selected **security level**  
**default** from installation  
**SELinux**  
via "**hardening**" tools

**PAM**

security role in **RHEL 6**  
functional areas  
files and configuration  
resolving issues with **PAM** controls  
security monitoring / troubleshooting tools

**Application Troubleshooting**

writing utilities to sense problems  
physical memory usage  
paging file  
disk and network **I/O** bandwidth

**Resources for Troubleshooting Information**

on-line searchable repositories  
available diagnostic tools (summary)  
**Red Hat** support options

**COURSE PREREQUISITES**—Participant has successfully completed **Red Hat System Administration I (RH 124)** and **Red Hat System Administration II (RH 134)** courses, or has equivalent system time as a user and a working systems administrator.



**Red Hat Enterprise Linux Systems Administration****System Monitoring Performance Management—Three (3) days, 60% lecture, 40% lab**

**Red Hat Enterprise Linux Systems Administration: System Monitoring and Performance Management** course introduces participants to performance management principles, monitoring utilities / tools, and analysis for the **RHEL 6** Operating Environment. The course includes a review of **RHEL 6** subsystems, along with the utilities provided to monitor system efficiency including **sar** and the **\*stat** family of tools. In each area of discussion, emphasis will be placed on writing tools for monitoring and analysis. These tools will include **Korn shell** scripts, **Perl** procedures, and **C language** programs.

This course is the **equivalent** to Red Hat course **442**.

Systems: **Red Hat Enterprise Linux Version 6 (all update levels)**

**COURSE OBJECTIVES**—On completion of this course, systems administrator should be able to:

- Describe performance management fundamentals
- Use the **RHEL 6** and third-party tools to analyze performance
- Write tools in various languages
- Use **RHEL 6** performance data extensions
- View and set kernel-based tuning parameters
- Monitor and report on process and thread activity
- Modify **CPU** scheduling and virtual memory operations
- Enable dynamic monitoring via **SystemTap** in all major areas

**Performance Basics**

Describe the principles of performance analysis  
 Describe the performance management process  
 Terms used to describe performance aspects  
 Factors affecting system performance  
 Performance metrics  
 Virtual system caching  
 Effects of computer architecture

**RHEL 6 Monitoring Capabilities**

Monitoring tools provided with **RHEL 6**  
 \***stat** family of programs  
**sar / sadc**  
 Third party / freely available tools  
**uptime**  
**ManageEngine**  
 tools from **Red Hat**  
 Introduction to **SystemTap**  
 Kernel tunables (viewing, changing via **sysctl**)

**Memory Management**

Memory layout and distribution  
 Memory usage by the kernel



**Red Hat Enterprise Linux Systems Administration****System Monitoring Performance Management—Three (3) days Continued**

Process creation  
 Process virtual address space  
 Buffer Cache (and allocation control)  
 Shared Memory / Page Caching  
 Paging and Swapping  
 Monitoring Tools

**CPU Management**

Software priorities concepts  
 Impact of the **nice** parameter  
 Priority boosting  
 Adjusting **CPU** scheduling mechanisms  
 Tuning (**Java**) threaded applications  
 Process states  
 Monitoring tools

**I/O Management**

Breakdown of disk I/O  
 Measuring Disk and I/O  
**ext3/ext4** performance  
   File system structure concepts  
   File system caching  
   Name Lookup (meta-data) caching  
   Tuning the cache sizes and algorithms  
   (Re-)Defining the **I/O** scheduler  
   File system performance statistics  
   **ext3** parameters to improve efficiency  
   Alternative write strategies to **ext3/ext4** buffering  
 Monitoring Tools

**Network Management**

**TCP/IP** Layers  
 Socket controls  
 Controlling network services  
 Setting network buffer values  
 Monitoring tools

**Summaries**

Memory management		CPU management
I/O management		Network management
User program management		

**COURSE PREREQUISITES**—Participant has successfully completed the **Red Hat System Administration I (RH 124)** and **Red Hat System Administration II (RH 134)** courses, or has equivalent system time as a user and a working systems administrator.