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RHD251 Red Hat Linux Programming Course Summary

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.

Topics

- GCC GNU Compiler Collection
- · Building Software with Make
- The GNU C Library and System Calls
- Program Arguments and Environment
- Building Libraries
- Time Functions
- Process Management
- Memory Operations
- Debugging
- Basic File Operations
- Communicating with Pipes
- Managing Signals
- Programming with Threads
- Advanced File Operations
- Interprocess Communication (IPC)
- Basic Network Programming
- · Working with the Linux Community

Audience

This course is designed 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

- Experience in C programming
- RH133 or equivalent UNIX or Linux workstation user skills for developers
- Shell scripting in a UNIX or Linux environment
- · Experience with editors such as vi, emacs

Duration

Five days

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Course Outline

I. GCC - GNU Compiler Collection

- A. GNU Compiler Collection
- B. History of GCC
- C. Four Stages of GCC
- D. Interrupting the Compiler
- E. Compiling a C Program
- F. Preprocessor Features
- G. Predefined Preprocessor Symbols
- H. Warnings and Extensions
- I. Optimization
- J. Linking

II. Building Software with Make

- A. Introducing make(1)
- B. How make Works
- C. Makefile Rule Syntax
- D. Example: Makefile First Steps
- E. Makefile Improved
- F. Implicit Rules
- G. Example: Simpler Is Better Makefile
- H. Variables
- I. Defining Variables
- J. Example: Makefile with Variables
- K. Automatic Variables
- L. Special Targets
- M. Defining Useful Phony Targets

III. The GNU C Library and System Calls

- A. Library Goals
- B. Library Standards
- C. GNU C Library glibc
- D. Library Functions vs. System Calls
- E. Using System Calls
- F. Handling Errors with errno
- G. Making Sense of errno
- H. Using strace

IV. Program Arguments and Environment

- A. Program Startup
- B. Using argc/argv
- C. Handling Options with getopt()
- D. Handling Options with getopt_long()
- E. Environment
- F. Manipulating the Environment
- G. Program Exit
- H. Registering Exit Handlers

V. Building Libraries

- A. Why Use Libraries?
- B. Static Versus Shared
- C. Static Library Benefits
- D. Shared Library Benefits
- E. Creating a Static Library
- F. Using Static Libraries
- G. Creating a Shared Library
- H. Using Shared Libraries
- I. Shared Library Management
- J. Library Locations
- K. Ldconfig

VI. Time Functions

- A. When Does Time Begin?
- B. Time Data Types
- C. Determining Real Time
- D. Converting time_t
- E. Converting tm Structure
- F. Process Time
- G. Time arithmetic
- H. Second Resolution Timers
- I. Fine-Grained Timers
- J. Real Time Clock (RTC)
- K. Process Management
- L. What a Process Is
- M. Process Relationships
- N. Create a Child Process
- O. Doing Something Else
- P. Related execve() Functions
- Q. Wait For a Child
- R. More Precise Waiting
- S. Changing Priority/Nice
- T. Real Time Priority

VII. Memory Operations

- A. Allocating/Freeing Memory
- B. Memory Alignment
- C. Locked Memory
- D. Memory Copy/Initialization
- E. Memory Comparison/Search

VIII. Debugging

- A. What Is My Program Doing?
- B. Source Level Debugging
- C. Invoking adb

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Course Outline (cont'd)

- D. Getting Started with gdb
- E. Examining and Changing Memory
- F. Debuginfo Libraries
- G. Using gdb with a Running Process
- H. Using gdb to Autopsy a Crash
- I. Debugging Libraries ElectricFence
- J. Debugging with valgrind
- K. Profiling for Performance

IX. Basic File Operations

- A. Stream vs. System Calls
- B. Opening/Closing Streams
- C. Stream Input/Output Functions
- D. Stream Status/Errors
- E. Stream File Positioning
- F. Stream Buffering
- G. Temporary/Scratch Files
- H. Opening/Closing File Descriptors
- I. File Descriptor I/O
- J. Repositioning File Descriptors
- K. Stream/File Descriptor Conversions
- L. cat using ANSI I/O
- M. cat using POSIX I/O

X. Communicating with Pipes

- A. Introduction to Pipes
- B. Standard I/O: popen()/pclose()
- C. Using popen()/pclose()
- D. System Call: pipe()
- E. Using pipe()
- F. Named Pipes
- G. Using Named Pipes
- H. For Further Reading

XI. Managing Signals

- A. What Signals Are
- B. Blocking/Checking Signals
- C. Working with Signal Sets
- D. Example of Blocking Signals
- E. Handling Signals with sigaction()
- F. sigaction() Example
- G. Handling Signals with signal()
- H. Sending Signals
- I. Real-Time Signals

XII. Programming with Threads

- A. Introducing Threaded Programming
- B. Applications Suited to Threads
- C. Building Threaded Programs
- D. Creating Threads
- E. Thread Identity
- F. Synchronizing by Joining
- G. Detaching Threads
- H. Stopping Threads
- I. Synchronizing with Mutexes
- J. Using Mutexes
- K. Read/Write Locks
- L. Conditional Variables
- M. Using Conditional Variables
- N. A Conditional Variable Gotcha
- O. For Further Reading

XIII. Advanced File Operations

- A. Directory Operations
- B. File System Operations
- C. Multiplexed I/O with select()
- D. Miscellaneous I/O Functions
- E. Memory Mapped I/O
- F. Using Memory Mapped I/O
- G. File Locking

XIV. Interprocess Communication (IPC)

- A. Interprocess Communication (IPC)
- B. POSIX IPC Overview
- C. POSIX Shared Memory
- D. POSIX Semaphores
- E. POSIX Message Queues
- F. System V IPC Overview
- G. System V IPC Shared Memory
- H. System V IPC Semaphore ArraysI. System V IPC Message Queues

XV. Basic Network Programming

- A. Linux Networking Overview
- B. Getting Started with socket()
- C. Client Functions
- D. Specifying IPv4 Addresses
- E. Host Versus Network Byte Order
- F. Example TCP/IP Client
- G. Address Conversion Functions
- H. Using getaddrinfo()

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Course Outline (cont'd)

- I. Server Functions
- J. Example TCP/IP Server
- K. Datagram Communication with UDP

XVI. Working with the Linux Community

- A. Getting in Touch with the Community
- B. General Considerations
- C. Building a Community
- D. Licenses
- E. GPL
- F. LGPL
- G. BSD
- H. Creative Commons