LINUX TRAINING

Linux Kernel Internals And Development

Dive deep into the Linux kernel. Learn to develop, debug, and optimize kernel modules for robust system performance.

DURATION
2 hours

LEVEL
Intermediate

FORMAT
Instructor-Led

- Globally Recognized Certification
- Expert-Led Hands-On Training
- Flexible Scheduling

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COURSE OVERVIEW

Dive deep into the heart of the Linux operating system with the 'Linux Kernel Internals And Development' course. This intermediate-level program offers a comprehensive exploration of the kernel's fundamental architecture, core components, and the intricate mechanisms that govern system operations. You will gain an unparalleled understanding of process scheduling, memory management, inter-process communication, file systems, and the crucial role of device drivers. This course is designed for IT professionals, developers, and system administrators who aspire to master the intricacies of Linux at its deepest level, moving beyond user-space programming to direct kernel interaction. Through practical examples and theoretical insights, you'll learn how the kernel manages resources, handles system calls, and interacts with hardware. This foundational knowledge is essential for anyone looking to optimize system performance, develop robust embedded systems, or contribute to kernel-level projects. By demystifying the kernel's inner workings, you will acquire the expertise to diagnose complex system issues, enhance security, and build highly efficient and reliable Linux-based solutions. Mastering these concepts will elevate your technical capabilities and open doors to advanced roles in system development and engineering.

Duration	2 hours
Level	Intermediate
Vendor	Linux

COURSE CURRICULUM

01 Module 1: Introduction to Linux Kernel Architecture

- Overview of Kernel Components and Subsystems
- Kernel Space vs. User Space
- System Calls and Interrupts
- Kernel Build Process and Configuration (Kconfig, Makefiles)
- Kernel Modules: Loading, Unloading, and Communication
- Kernel Development Environment Setup

02 Module 2: Process and Scheduling Management

- Process Representation (task_struct)
- Process Creation and Termination
- Process States and Transitions
- The Linux Scheduler (CFS - Completely Fair Scheduler)
- Scheduling Policies and Priorities
- Synchronization Primitives: Mutexes, Semaphores, Spinlocks

03 Module 3: Memory Management

- Virtual Memory and Physical Memory
- Memory Zones and Paging
- Kernel Memory Allocators (kmalloc, vmalloc)
- Page Faults and Demand Paging
- Swapping and OOM Killer
- Caching and Buffer Management

04 Module 4: Interrupts and Device Drivers Fundamentals

- Interrupt Handling Mechanisms
- Interrupt Request (IRQ) Flow

- Top Halves and Bottom Halves (SoftIRQs, Tasklets, Workqueues)
- Introduction to Device Driver Architecture
- Character Device Drivers: Basics and File Operations
- Accessing Hardware from the Kernel

05 Module 5: File Systems and I/O Subsystem

- Virtual File System (VFS) Layer
- Common File System Operations
- Block Device Drivers and Request Queues
- Caching and Buffering in File Systems
- Direct I/O vs. Buffered I/O
- Introduction to Network Stack Fundamentals

06 Module 6: Kernel Debugging, Tracing, and Security

- Kernel Debugging Techniques (printk, KGDB, crash utility)
- Tracing Tools (ftrace, perf)
- Kernel Panics and Oops Messages Analysis
- Kernel Security Features (SELinux, AppArmor overview)
- Patching and Contributing to the Linux Kernel
- Performance Tuning and Profiling

CAREER PATHWAYS

Graduates of this program are prepared for the following roles:

> **Embedded Linux Developer**

> **Kernel Engineer**

> **Senior Systems Programmer / Architect**

FREQUENTLY ASKED QUESTIONS

Q: What practical skills will I gain specifically for kernel-level programming after completing this course?

Upon completion, you will be proficient in designing, developing, and debugging Linux kernel modules and basic device drivers. You'll gain practical experience with kernel memory allocation, process synchronization, interrupt handling, and using kernel debugging tools like `ftrace` and `perf`. This course will equip you to read and understand kernel source code, contribute to open-source kernel projects, and implement low-level system optimizations.

Q: What are the prerequisite knowledge and skills required to succeed in this intermediate-level Linux Kernel Internals course?

To get the most out of this course, participants should have a solid foundation in C programming, including pointers, data structures, and memory management. Strong familiarity with Linux operating system fundamentals, command-line tools, and basic shell scripting is also essential. Prior experience with system programming concepts and a basic understanding of computer architecture will be highly beneficial.

Q: How will this course enhance my ability to troubleshoot complex system issues or develop custom hardware drivers?

This course provides an in-depth understanding of how the Linux kernel manages resources, schedules processes, and interacts with hardware at a fundamental level. This knowledge is crucial for diagnosing elusive system issues that originate deep within the OS, such as memory leaks, race conditions, or performance bottlenecks. For hardware driver development, you'll learn the core APIs and architectural patterns for creating robust character and block device drivers, enabling you to integrate new hardware or optimize existing device interactions effectively.

ABOUT COMPUTER PRIDE

East Africa's Premier IT Training Center

With over 15 years of excellence, Computer Pride delivers globally recognized certification programs from leading technology vendors. Located on Kenyatta Avenue in Nairobi's CBD, our state-of-the-art facilities and expert instructors have empowered thousands of professionals across East Africa.

15+	10,000+	50+
Years of Excellence	Professionals Trained	Vendor Certifications

READY TO ENROL?

Take the next step in your technology career.

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