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## WORKSHOP 3

# Integrated Linux Internals and Advanced Programming Training Workshop

**Course Duration :** Three Full Days

**Course Fee :** Rs. 3500/- (+ Tax)

### Course Outline

#### Kernel Internals

- **Introduction to Kernel**
  - History of Linux
  - Types of Kernel
  - The Linux kernel
  - Kernel Facilities
  - Kernel Architecture
  - Kernel Version Numbers
  - Configure, Compile Kernel
- **The File System**
  - Virtual File system & its role
  - Files associated with a process
  - System Calls
- **Process management**
  - Process Defined
  - Process Descriptor Structures in the kernel
  - Process States
  - Process Scheduling
  - Process Creation
  - System calls related to process management
- **Memory Management**
  - Defining and Creating secondary memory areas

- Memory allocation & deallocation system calls malloc, calloc, alloca, free
- Demand Paging defined
- Process Organization in Memory
- Virtual Memory Management
- Address Translation and page fault handling
- Buddy System Algorithm
- Slab Allocator
- Swapping Memory Areas
- Memory Mapping
- Zones and Pages
- Address Space
- Block Device Caching
- High Memory
- Paging
  
- **Interrupts**
  - About Interrupts
  - Interrupt Handlers
  - Softirqs
  - Tasklets
  - Work Queues
  
- **Time and Timers**
  - HZ and Jiffies
  - Time of Day
  - Delayed Execution
  - Kernel Timers
  
- **Device Drivers**
  - Character Device Drivers
  - Block Device Drivers
  - Network Device Drivers
  
- **Kernel Configuration and Compilation**
  - Kernel Building System
  - Patching the Kernel
  - Kernel Configuration
  - Compiling the Linux Kernel
  
- **Kernel Parameters**
  - Build-Time Parameters
  - Boot-Time Parameters
  - Run-Time Parameters
  - System Tuning
  -
  
- **Kernel Synchronization**
  - UP vs SMP Issues
  - Atomic Operations

- Semaphores
- Spin Locks
- **Boot Process - understanding Power ON to login prompt process**
  - BIOS Level
  - Boot Loader
    - Setup, startup\_32 functions
    - Available Bootloaders – GRUB, UBoot, etc.
    - Role of a Bootloader
    - Bootloader Phase
  - Kernel Initialisation Phase
    - The start\_kernel() function
  - System Initialisation Phase
    - Understanding Runlevels
    - Various initialization scripts & customizing them
    - Kernel Command-Line Boot Parameters

## Linux Advanced Programming

- **Arguments , the environment, and popular system functions**
  - Arguments to a program.
  - Retrieving information from the environment.
  - How to use getopt() effectively.
  - Discovering the date and time
  - Getting system information.
- **File I/O**
  - Library functions and system calls for I/O
  - Getting file status information with stat()
  - Processing directories and directory entries.
- **Shell Commands & Shell Scripting**
  - Basic Shell commands
  - Bash Shell Essentials
- **Creating Makefiles**
  - Makefile basics
  - Creating make files for single or multiple source files project
- **Creating Libraries**
  - Creating Static Library
  - Creating Shared Library
- **Multi Process Programming**
  - Creating child processes
  - fork(), vfork(), exec()
  - Parent synchronization with child

- **Multi Thread Programming**
  - Creating multiple threads
  - Parent synchronization with other Threads
  
- **Inter Process Communication**
  - Pipes, FIFO's,
  - Signals
  - System-V IPC's
  - Message queues
  - Shared memory
  - Semaphores
  
- **Introduction to Sockets**
  - An Overview
  - System calls related to TCP and UDP sockets
  - Using Wireshark for network sniffing
  
- **Network Programming**
  - TCP Server Client Programming
  - UDP Server Client Programming
  - Lab exercises
  
- **Programming & Debugging Tools**
  - Debugging and Analysis Tools
  - strace : Tracing System calls
  - ltrace : Tracing Library calls
  - Using gdb and ddd utilities
  - Core Dump Analysis etc
  
- **Applications Development and Debugging**
  - Application Development
  - Source Code Management
  
- **Source Code Version Control**
  - Understanding need of Version Control System
  - cvs
  - svn
  - git

### **Pre-Requisites :**

Basic C programming

Familiar with Linux OS, but not essential.

### **Advantages of Levana Technologies**

- 100% Practical Oriented Workshops

- Comprehensive Course Material Provided
- 1:1 Hardware Provided
- Industry Experienced Faculty
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- Linux Advanced Programming training Workshop
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- Embedded Linux and Device Driver Programming training Workshop
- J-Tag and Advanced Debugging in Embedded Linux
- Unix / Linux Shell Scripting Workshop with sed and awk
- Embedded Qt Programming
- Network Programming on Linux
- ARM, 8051 Programming
- C & C++ Programming

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