

# C-DAC's Certified Professional in Linux Kernel Programming & Device Drivers

## Areas of Concentration

### Module 1 : Introduction to Linux kernel & Module Programming

- Kernel Classifications
  1. Monolithic Kernels
  2. Micro Kernels
- The User space & Kernel space
- Tool Chains, Libraries, The Makefile
  1. GNU toolchain
  2. Creation of Static & Dynamic Libraries
  3. Portability support in the kernel
- The Linux Kernel
  4. Getting the sources
  5. Configuring the kernel
  6. Diff and Patching utilities
  7. Compiling the kernel
  8. Installing & Booting the kernel
- Step by Step demystification of Linux Boot Procedure
  - Module Programming
    - The HelloWorld Module
    - Module Stacking
    - Module Parameters
  - System Calls
    - Registering a System Call
    - System Call Handler
    - Service Routines

### Module 2 : Character Drivers

- Device Numbers
  - Major and Minor Numbers
  - Registering and Unregistering
  - Static and Dynamic allocations
- Important Structures
  - File Operations
  - File
  - Inode
- Character Devices
  - cdev structure
  - Adding, Allocating, Initializing and Deleting
  - User Space Applications and Device Driver mapping
  - Access methods within the driver, open, read, write and close
- Advanced Character Drivers
  - IOCTL
  - Wati Queues

### **Module 3 : Kernel Synchronization**

- Critical Sections, Race Conditions
- Concurrency and its Sources
- Mechanisms for Kernel Synchronization
  - Semaphores
  - Reader Writer Semaphores
  - Spinlocks
  - Reader Writer Spinlocks
  - Completions
  - Sequential locks
  - Barriers
  - Read Copy Update
- Atomic Operations
- Memory Allocation in the kernel

### **Module 4 : Debugging the Kernel**

- Printk, Traces and Watches
- Oops
  - ksymoops
  - kallsyms
- gdb, kgdb, kdb
- User Mode Linux
- Qemu
- Proc & Sys File Systems

### **Module 5 : Time Delays Deferred Execution**

- HZ & Jiffies, Delays
- Kernel Timers
- Tasklets
- Work Queues
- Kernel Data Types

### **Module 6 : Interrupts**

- Handling I/O
  - I/O Architecture
  - I/O Mapped I/O
  - Memory Mapped I/O
- Interrupts & Interrupt Handlers

### **Module 7 : Device Drivers**

- Parallel Port Driver
- Serial Port Driver
- Block Drivers
- USB Drivers
- Network Drivers
- PCI Drivers
- tty Subsystem