INFOSOFT IT SOLUTIONS

Training | Projects | Placements

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Embedded Linux

Introduction to Embedded Linux

1. Overview of Embedded Systems and Embedded Linux
2. Characteristics and Advantages of Embedded Linux
3. Embedded Linux vs. Desktop Linux
4. Embedded Linux Market Trends and Applications

Setting Up the Development Environment

1. Installing Linux on Host Machines (Ubuntu, CentOS, etc.)
2. Cross-Compilation Toolchains (GCC, Buildroot, Yocto Project)
3. Setting Up Virtualization for Embedded Development (QEMU)

Linux Kernel Basics

1. Understanding the Linux Kernel Architecture
2. Kernel Configuration and Compilation
3. Kernel Modules and Device Drivers
4. Debugging Techniques for Kernel Development

Bootloader and Boot Process

1. Overview of Bootloaders (U-Boot, GRUB)
2. Bootloader Configuration and Customization
3. Boot Process of Embedded Linux Systems
4. Hands-on: Flashing Bootloaders and Booting Linux

File Systems and Storage

1. Introduction to File Systems (EXT4, F2FS, UBIFS)
2. Creating and Mounting File Systems
3. Flash Memory Management Techniques
4. Persistent Storage Solutions for Embedded Systems

Building Embedded Linux Systems with Buildroot

1. Introduction to Buildroot
2. Configuring and Compiling Embedded Linux with Buildroot
3. Customizing Root Filesystem and Package Management
4. Building and Deploying Applications with Buildroot

Building Embedded Linux Systems with Yocto Project

1. Introduction to Yocto Project
2. Understanding Yocto Layers and Recipes
3. Creating Custom Embedded Linux Distributions
4. Deploying and Managing Images with Yocto

Device Tree and Hardware Abstraction

1. Introduction to Device Tree
2. Writing and Compiling Device Tree Source (DTS) Files
3. Device Tree Overlays and Dynamic Device Trees
4. Integrating Device Tree with Kernel and Bootloader

System Integration and Testing

1. System Integration Strategies
2. Testing Methodologies for Embedded Systems
3. Continuous Integration (CI) for Embedded Linux
4. Hands-on: System Integration and Testing Exercises

Networking and Connectivity

1. Configuring Networking in Embedded Linux (Ethernet, Wi-Fi)
2. Implementing IoT Protocols (MQTT, CoAP)
3. Security Considerations for Embedded Networking
4. Hands-on: Setting Up Network Connectivity

Real-time Aspects in Embedded Linux

1. Introduction to Real-time Operating Systems (RTOS)
2. Real-time Patching and Configurations in Linux Kernel
3. Using PREEMPT-RT Patch for Real-time Applications
4. Performance Monitoring and Tuning for Real-time

Power Management and Optimization

1. Power Management Techniques for Embedded Systems
2. Implementing Dynamic Voltage and Frequency Scaling (DVFS)
3. Optimizing Power Consumption in Embedded Linux

4. Hands-on: Power Management and Optimization Exercises

Security in Embedded Linux

1. Embedded Linux Security Challenges
2. Securing Boot Process and Bootloaders
3. Implementing Secure Communication (TLS/SSL)
4. Hardening Embedded Linux Systems

Case Studies and Industry Applications

1. Case Studies of Embedded Linux Deployments
2. Industry Applications and Use Cases
3. Lessons Learned and Best Practices
4. Future Trends in Embedded Linux Development

Project Work and Capstone

1. Group or Individual Projects on Embedded Linux Development
2. Project Presentation and Evaluation
3. Code Reviews and Feedback
4. Final Q&A and Recap