Training: The Linux Foundation
LFD445 Linux Kernel Debugging

THE LINUX FOUNDATION AUTHORIZED TRAINING PARTNER

TRAINING GOALS:

Gaining expertise in Linux kernel debugging will position you as a more versatile, knowledgeable and valuable asset to any organization while opening new career doors and helping you participate more actively in the open source community.

What You'll Learn

- You will learn techniques for local debugging by configuring a system (physical or virtual) for remote debugging from a second system and working with the basic components of the Linux kernel that underlie the built-in debugging frameworks.

Who Is It For

- This course is designed for current or aspiring kernel developers, device driver developers, and anyone interested in shortening the development cycle by taking advantage of existing tools and facilities.

CONSPECT:

- Introduction
  - Objectives
  - Who You Are
  - The Linux Foundation
  - Linux Foundation Training
  - Certification Programs and Digital Badging
  - Linux Distributions
  - Platforms
  - Preparing Your System
  - Using and Downloading a Virtual Machine
  - Things change in Linux

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- Documentation and Links
- Preliminaries
  - Procedures
  - Kernel Versions
  - Kernel Sources and Use of git
- How to Work in OSS Projects **
  - Overview on How to Contribute Properly
  - Stay Close to Mainline for Security and Quality
  - Study and Understand the Project DNA
  - Figure Out What Itch You Want to Scratch
  - Identify Maintainers and Their Work Flows and Methods
  - Get Early Input and Work in the Open
  - Contribute Incremental Bits, Not Large Code Dumps
  - Leave Your Ego at the Door: Don’t Be Thin-Skinned
  - Be Patient, Develop Long Term Relationships, Be Helpful
- Kernel Features
  - Components of the Kernel
  - User-Space vs. Kernel-Space
  - What are System Calls?
  - Available System Calls
  - Scheduling Algorithms and Task Structures
  - Process Context
  - Labs
- Kernel Deprecated Interfaces
- Printk
- Monitoring and Debugging
  - Debuginfo Packages
  - Tracing and Profiling
  - sysctl
  - SysRq Key
  - oops Messages
  - Kernel Debuggers
  - debugfs
  - Labs
- Ftrace
  - What is ftrace?

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- ftrace, trace-cmd and kernelshark
- Available Tracers
- Using ftrace
- Files in the Tracing Directory
- Tracing Options
- Printing with trace printk()
- Trace Markers
- Dumping the Buffer
- trace-cmd
- Labs

- Kernel and git Bisection
- Kernel Development Tools
- Perf
  - What is perf?
  - perf stat
  - perf list
  - perf record
  - perf report
  - perf annotate
  - perf top
  - Labs
- kprobes
  - kprobes
  - kretprobes
  - SystemTap **
  - Labs
- eBPF
  - BPF
  - eBPF
  - Installation
  - bcc Tools
  - bpftrace
  - Labs
- QEMU
  - What is QEMU?
  - Emulated Architectures

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- Image Formats
- Third Party Hypervisor Integration
- Labs

- gdb Kernel Scripts
- Linux Kernel Debugging Tools
  - Linux Kernel (built-in) tools and helpers
  - kdb
  - qemu+gdb
  - kgdb: hardware+serial+gdb
  - Labs
- Crash
  - Crash
  - Main Commands
  - Labs
- kexec
  - kexec
  - Kernel Configuration
  - kexec-tools
  - Using kexec
  - Labs

REQUIREMENTS:

To make the most of this course, you should:

- Be proficient in the C programming language.
- Be familiar with basic Linux (UNIX) utilities such as ls, grep and tar.
- Be comfortable using any of the available text editors (e.g. emacs, vi, etc.).
- Experience with any major Linux distribution is helpful but not strictly required.
- Have experience equivalent to having taken Linux Kernel Internals and Development (LFD420).

Difficulty level

CERTIFICATE:

The participants will obtain certificates signed by The Linux Foundation.

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TRAINER:

The Linux Foundation Certified Trainer

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