Linux Kernel Training Content

part of MMS StarCamp 2021

Base Litarature: https://lwn.net/Kernel/LDD3/

Agenda:

Week 1

- Introduction
- Distribution
- Command line
    - Ctrl+D
    - Auto-complete
- Text editor
- ELF vs Shell vs Python. Shebang.
- Userspace vs kernel space.
- Navigating around - ls, cd, ps, pwd.
- su, sudo.
- root etc.
- Unix Shell
    - environment vs shell variables
    - echo
    - PATH
    - Job control - bg, fg, &
    - Pipes. stderr, stdout, stdin.
    - cat, echo, less
    - cp, mv, mkdir
    - ln - soft and hard.
    - man
    - find
    - xargs
    - grep
    - pgrep
    - lsusb, lspci

    - Creating a script that keeps track of new USB devices
- Linux OS setup
    - Boot process. BIOS, bootloader, kernel, init process.
    - /usr, /home, /lib, /bin, /etc
    - Shared libraries - basics.
    - Package managers.
    - ssh, scp - why it's useful to be comfortable with the command line.
- Userspace Programming in C:
    - Creating "Hello World" in C and Make, from scratch.
    - Build system fundamentals - targets, dependencies, build rules.
    - Debugging with GDB.
    - Pthread. Spawning workers. PGID vs PID.
    - mmap. Trace how it works for a regular file.
    - Developing a programme that with N working threads calculates a simple sum of all bytes from a large file.

Week 2

- Linux Kernel Programming - Intro
    - Kernel vs userspace.
    - Syscalls.
    - In-kernel vs module drivers.
    - Character vs block device drivers.
    - Linux Device driver model.
    - DeviceTree.
    - Why DeviceTree is not needed for USB or PCI devices?
- Chapter 11: Data Types in the Kernel
- Chapter 14: The Linux Device Model
- Chapter 2: Building and Running Modules

Week 3

- Chapter 3: Char Drivers
- Chapter 4: Debugging Techniques
- Chapter 5: Concurrency and Race Conditions

Week 4

- Chapter 6: Advanced Char Driver Operations

- Chapter 7: Time, Delays, and Deferred Work
- Chapter 8: Allocating Memory
- Character Device Driver
    - Workqueues. Deferring actions
    - kfifo
    - Making userspace wait. poll
    - Userspace program to test blocking and non-blocking I/O

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