

Linux Kernel Overview

**Advanced Embedded Linux
Development**
with **Dan Walkes**



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Learning objectives:

Understand high level Linux Kernel functions.

Overview of Linux Kernel Source

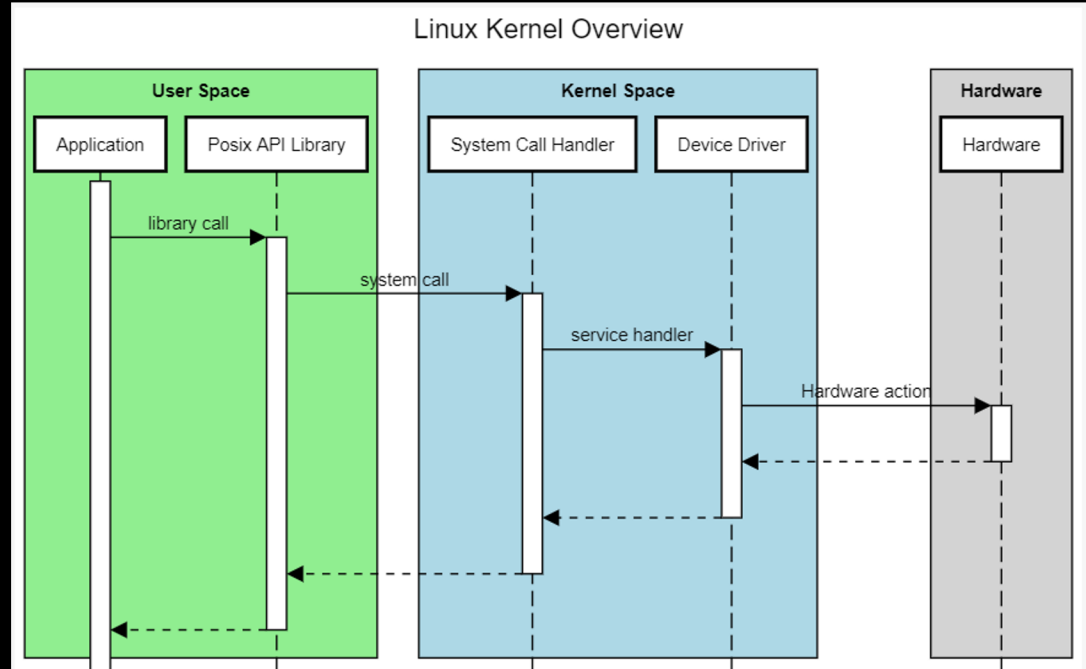
Kernel Overview

- Kernel Main Jobs:
 - Manages Resources
 - Interfaces with Hardware
 - Provides an API for user space programs.
- Typically tailored for specific hardware to some extent

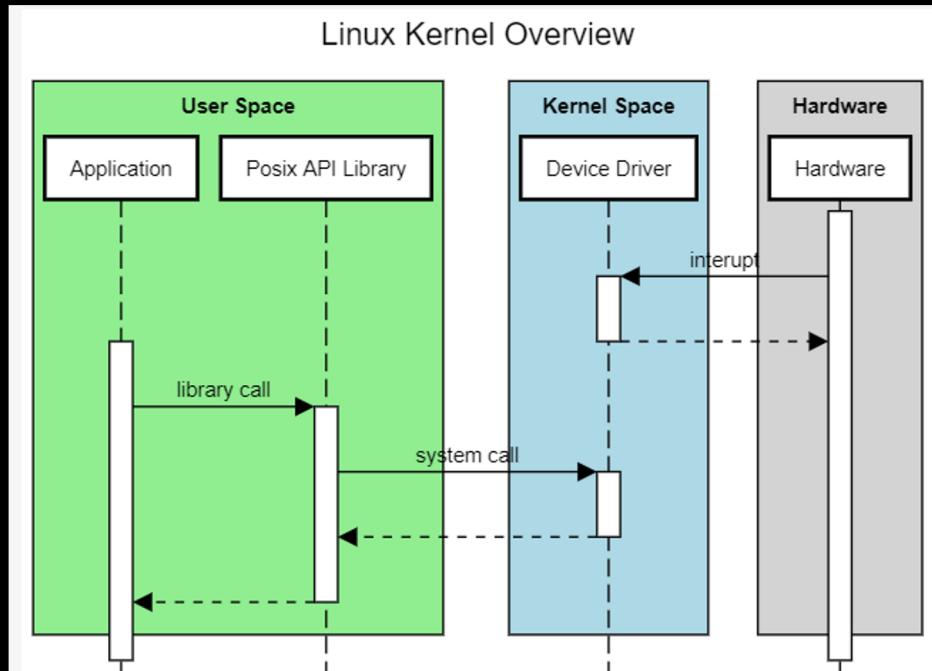
Kernel Overview

- The Kernel runs at a high CPU privilege level
 - Access to all memory addresses
 - Access to all CPU registers
- Entry point into the kernel can be system calls from user space or interrupts from hardware

Kernel entry - syscalls

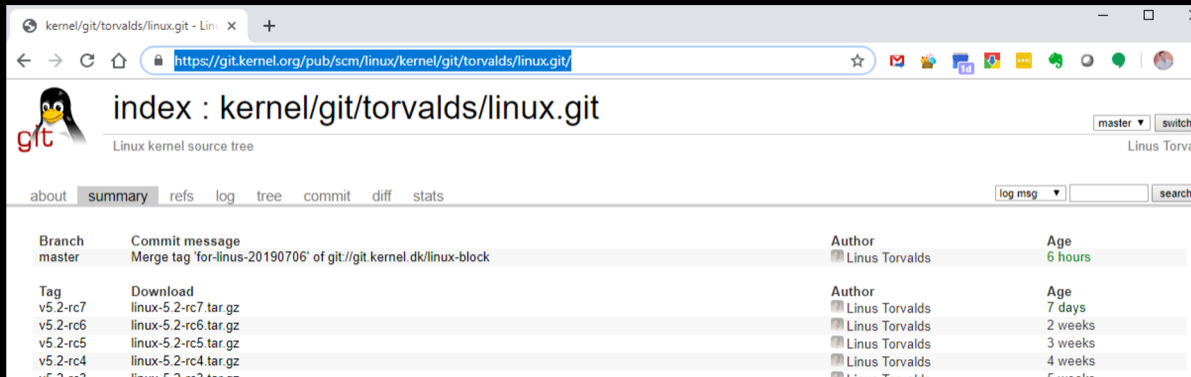


Kernel Entry - Interrupts



Linux Kernel Development

- Linus Torvalds' Kernel tree:
<https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/>
- 57,000 files, 14 million lines of code



The screenshot shows the GitHub interface for the Linux kernel source tree. The browser address bar displays the URL <https://git.kernel.org/pub/scm/linux/kernel/git/torvalds/linux.git/>. The page title is "index : kernel/git/torvalds/linux.git" and the subtitle is "Linux kernel source tree". The "master" branch is selected. The "summary" tab is active, showing a table of recent commits and tags. The table has columns for Branch, Commit message, Author, and Age. The "about" tab is also visible.

Branch	Commit message	Author	Age
master	Merge tag 'for-linux-20190706' of git://git.kernel.dk/linux-block	Linus Torvalds	6 hours
Tag			
v5.2-rc7	linux-5.2-rc7 tar.gz	Linus Torvalds	7 days
v5.2-rc6	linux-5.2-rc6 tar.gz	Linus Torvalds	2 weeks
v5.2-rc5	linux-5.2-rc5 tar.gz	Linus Torvalds	3 weeks
v5.2-rc4	linux-5.2-rc4 tar.gz	Linus Torvalds	4 weeks
v5.2-rc3	linux-5.2-rc3 tar.gz	Linus Torvalds	5 weeks

Linux Kernel Source/Licensing

- Do all kernels come from Kernel.org?
 - No, may come from SoC vendors as well
- Can SoC vendors have a closed source Linux kernel?
 - Not legally
- What if I don't change the source, do I still need to make source code available?
 - Yes, legally you do

Linux Kernel Source/Licensing

- What if I make a custom kernel module, do I need to share my source?
 - Probably
 - If you don't need/want to share your source get legal help to review.
 - Don't expect help from the community in this case.

Overview of Kernel Source Directories

- arch
 - Architecture specific files
- Documentation
- drivers
 - Hardware support, loadable modules
- fs
 - filesystem

Overview of Kernel Source Directories

- include
 - `#include` from user/kernel space
- init
 - System initialization
- kernel
 - Core functions - scheduling, locking, timers

Overview of Kernel Directories

- mm
 - Memory Management
- net
 - Network protocols
- scripts
- tools