Kernel Components

Objectives:

At the end of this episode, I will be able to:

1. Describe the Linux kernel and identify its components.
2. Locate and utilize the Linux kernel documentation.

> Additional resources used during the episode can be obtained using the download link on the overview episode.

- Operating System Kernels

    - Allow software to access hardware
    - Allocate hardware resources to fulfill software requests
    - Handle multitasking events
    - Acts as a traffic cop to resources

- The Linux Kernel

    - Developed by Linus Torvalds

        - Designed to emulate UNIX

    - Independent
    - Open source
    - Combined with resources from countless contributers to form Linux

- The kernel's job

    - Not the kernel

        - Applications
        - Window Managers
        - GNU Tools
        - Init Systems

    - The kernel

        - Memory manager
        - Process manager
        - Hardware control
        - Disk file systems

- The Kernel

    - Typically stored in `/boot`
    - Many possible filenames
    - Uncompressed kernel names

        - `kernel`
        - `vmlinux`

    - Compressed kernel names

        - `vmlinuz` (The most common)
        - `zImage`
        - `bzImage`

    - Compression is normally GNU Zip (gzip)

- Monolithic kernels

  - Monolithic kernels run as one large process
  - Micro-kernels split the kernel up into multiple processes
  - Linux is monolithic
  - The Linux kernel supports loadable modules that expand its function

    - Typically found in `/lib/modules`
    - `/lib/modules/5.8.0-45-generic/kernel`

- Kernel Documentation

  - May already be installed

    - `/usr/src/linux/Documentation/`
    - `/usr/share/doc/linux-doc/`

  - Installing the documentation

    - `sudo apt install linux-doc`
    - `sudo apt install linux-source`

  - Written in reStructuredText using Sphinx

    - `make htmldocs`
    - `make pdfdocs`

  - Or view it online

    - [https://www.kernel.org/doc/html/latest (https://www.kernel.org/doc/html/latest)](https://www.kernel.org/doc/html/latest)

- Kernel Headers

  - Minimum files needed to compile modules
  - Used to validate function calls against the kernel

    - Does the produced output match what the function would expect?

  - Much smaller than the full kernel source