Introduction to Linux: **Overview**

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Introduction

About us

- Pius & Philipp
- Studied CS back in 2019
- First time lecture this year
  - We need your feedback!

About you

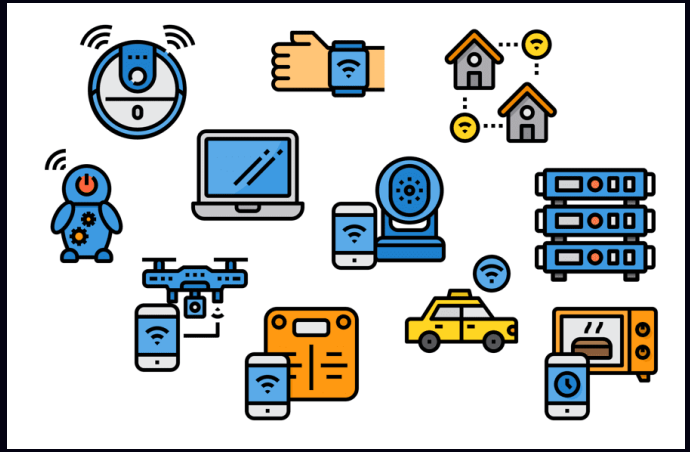
Quickly introduce yourself:

- Who are you?
- Which Operating Systems did you use previously
  - Windows, MacOS, Linux? Or only mobile devices?

Organizational

- 5 lectures between 2 and 4.5 hours
- Mostly hands-on
  - You'll need your own Linux system
- Introduction into Linux system components
  - Installation
  - Basic & advanced terminal commands
  - Building applications and containers
- Practical lab work submissions

What is Linux?



https://img.devrant.com/devrant/rant/r_1578772_VbG6J.jpg | Icons by flaticon.com

Advantages of Linux

- Runs (almost) everywhere
  - From low-power to high performance computing
- Open Source
- Customizable
- Free of charge

Components of a Linux system

Component	Example	Description
Bootloader	grub, systemd-boot	Starts the system
Kernel	Linux	Interfaces with hardware
Init System	systemd / openrc	Launches all other programs
Display Server	X11, Wayland	Renders the graphical user interface (GUI)
Display Manager	GDM, LightDM	Graphical login screen
Desktop Environment	Gnome, KDE, XFCE	Defines how your GUI looks like
GUI app libraries	GTK, QT, Electron	Allows building GUI apps with different look and feel
Security Module	SELinux, AppArmor	Enhanced security regulation

What is a Linux Distribution?

- Windows, MacOS, etc. only have a single OS with different Versions
  - Windows 10, Windows 11, ...
- Linux has a much greater varierty of system components
  - Different Desktops, different init systems, different apps
- A Linux Distro bundles certain components together:
  - Different kernel versions, different desktops, different package repositories
- Distros are opinionated
  - Software selection based on certain preferences
  - Some distros only ship open source software components (Debian, Fedora)
  - Some distros compile everything from source (Gentoo)
  - Different out-of-the-box security configuration (SELinux, AppArmor, Firewall frontends)
  - Different package managers and package formats
  - Desktop vs Server focus
  - etc ...

Which Linux Distros are there?

https://upload.wikimedia.org/wikipedia/commons/1/1b/Linux_Distribution_Timeline.svg

A couple to point out:

- Slackware is one of the oldest distros, but nowadays almost obsolete
- Debian is a very stable (mostly server) distro which focuses on free software (community driven)
- Ubuntu is a newcomer friendly distro based on Debian, owned by Canonical
- Fedora is a community driven distro that focuses on modern software and security
- ArchLinux, community driven, focuses on customization and has bleeding edge software
- Gentoo is a source based distro --> software is compiled locally
- NixOS is a declaratively configurable distro
- RedHat and SUSE offer Enterprise Linux
  - Alma and Rocky are community editions of RedHat Enterprise Linux (RHEL)
- Kali / ParrotOS are targeted towards pentesting/security auditing (no daily-driving)
- Alpine is a minimal Linux distro focusing on minimal overhead (e.g. resource-constraint hardware/containers)

Which Linux Distros are there?

Package Managers

Linux filesystem explained

```
/
├── bin -> usr/bin
├── boot
├── dev
├── etc
├── home  # contains user directories
├── lib -> usr/lib
├── lib64 -> usr/lib64
├── media
├── mnt
├── opt
├── proc
├── root
├── run
├── sbin -> usr/sbin
├── srv
├── sys
├── tmp
├── usr
└── var
```

Drivers on Linux

How do I install my own distro?

Thank you for your attention!

Don't forget the feedback