Uni Web Topics Presentation

Felix Pojtinger

October 28, 2021

```
IIILIOUUCLIOII
   Contributing
   License
Overview
Development
Distribution
   Basic Distribution Principles
   Packaging Overview
   Distribution to RedHat Enterprise Linux
   Distribution to Debian GNU/Linux
   Distribution to Linux (universal)
   In Comparison: Distribution to Android, Windows and macOS
   Distribution to Kubernetes/the Cloud
   Distribution to WebAssembly
Operation
```





Contributing

These study materials are heavily based on professor Heuzeroth's "Spezielle Themen für Web-Anwendungen" lecture at HdM Stuttgart.

Found an error or have a suggestion? Please open an issue on GitHub (github.com/pojntfx/uni-webtopics-notes):



Figure 1: QR code to source repository

If you like the study materials, a GitHub star is always appreciated



License



Figure 2: AGPL-3.0 license badge

Uni Web Topics Presentation (c) 2021 Felix Pojtinger and contributors

SPDX-License-Identifier: AGPL-3.0



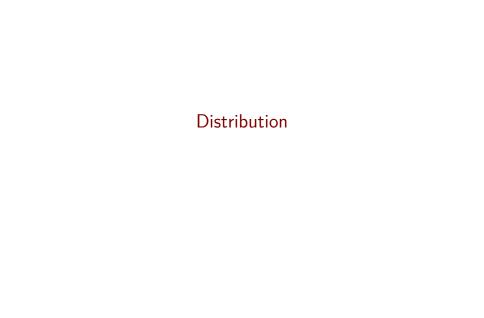
Overview

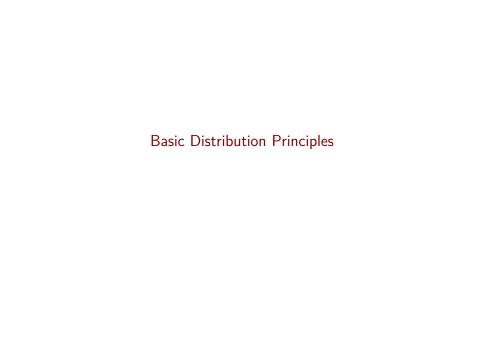
- ▶ What is DevOps?
- ▶ Which parts of the software lifecycle does it cover?
 - Development
 - Distribution (I will focus on this today)
 - Operation
- ▶ What is "cloud native"?
- Why are "traditional" distribution methods still relevant?



Development

- DevOps: Also includes development!
- Modern development should not be bound to any client attributes
- It should not matter if the client is a RISC-V Linux machine, a locked-down Windows workstation or an Android phone
- Development should be possible from any platform, for any platform
- ▶ The only truly cross-platform application framework is the web
- ► PWAs make it possible for web apps to have all the features native apps have
- ▶ PWAs work offline by default
- Why not make our development environments PWAs?
- ➤ Virtual machines and user-friendly hypervisors and containers make it possible to run the editor's backend locally too





Basic Distribution Principles

- Binaries
 - Compiled forms of software
 - On Linux: ELF binaries, PE binaries on Windows and MACH-O binaries on macOS
 - ▶ Binaries can be statically or dynamically linked
 - ➤ Statically linked: Since the Linux ABIs are stable, one can depend on them not changing this allows not linking against any specific C library and makes the resulting binary portable across distributions. It also allows including all external dependencies into the binary, effectively making it a "single-file" distribution method
 - Dynamically linked: Thanks to dlopen and package management, dynamic linking can also be used. Most of the time (especially on non-Linux OSes), at least the C library and external dependencies (i.e. SQLite) thus need to be available in LD_LIBRARY_PATH at runtime; if they are not, the application can't continue. This makes the binaries non-portable across distributions; for example, if a binary is built on a Debian 11 host, it most probably won't run on a Debian 10 host due to the different versions of the GNU C library used. This does however also have a few big



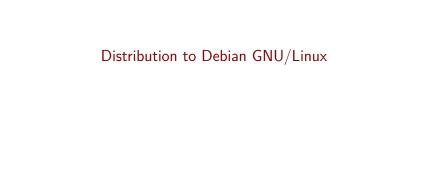
Packaging Overview

- ▶ What is a package?
 - Includes the binary, assets, metadata and signature
 - Is self-describing
 - Mostly some form of archive (i.e. RPM, .tar.gz) in combination with a metadata file and signature
- What is a package manager?
 - Can install, remove and update packages
 - Mostly two components: Low-level tool to install and remove package files (dpkg on Debian, rpm on Fedora) and a high-level tool to search, download, install and resolve dependencies (apt on Debian, dnf on Fedora)
 - Can resolve and install runtime and build-time dependencies (i.e. dependency on C library, SQLite, SDL2, headers for cURL etc.)
 - Can check GPG signatures of
- Repository
 - Can serve packages and their metadata (i.e. versions)

Distribution to RedHat Enterprise Linux

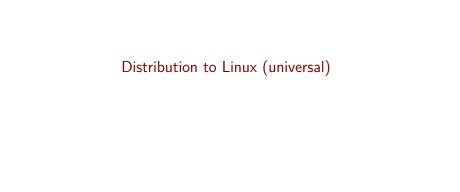
Distribution to RedHat Enterprise Linux

- RHEL is a very popular distribution and serves as the upstream of many other distros (CentOS, Rocky Linux etc.)
- Fedora Linux is its upstream
- ▶ Is based on the RPM package format and the DNF package manager
- Commercial
- ▶ Very long support cycles (at least ten years per major release)
- RPM package format: Demo
- DNF package manager and repositories: Demo



Distribution to Debian GNU/Linux

- Debian is another very popular distribution that also serves as the upstream of many other distros (Ubuntu, Linux Mint, Pop!_OS etc.)
- Is based on the DEB package format and the APT package manager
- ► Community-Driven, completely Free Software
- 5 years support per major release
- DEB package format: Demo
- ► APT package manager and repositories: Demo



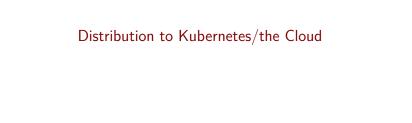
Distribution to Linux (universal)

- ► Flatpak overview
- ► Flatpak's build system and differences to traditional packages
- ► Flatpak repository

In Comparison: Distribution to Android, Windows and macOS

In Comparison: Distribution to Android, Windows and macOS

- APKs in F-Droid repository
- ▶ MSI package with auto-updates
- DMG package with auto-updates



Distribution to Kubernetes/the Cloud

- Docker
- Kubernetes
- Helm
- Skaffold



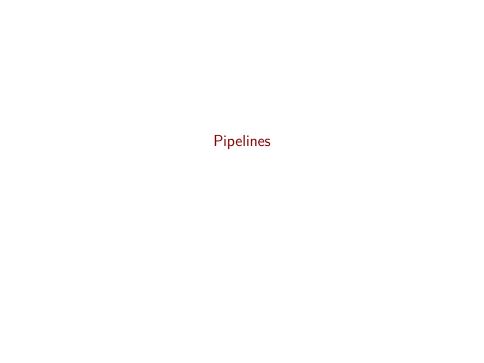
Distribution to WebAssembly

- ► WASM-Binary
- ► WASI/wasm_exec equivalents



Operation

- Sentry
- OpenTelemetry
- ▶ Prometheus
- Grafana



Pipelines

- Bagop
- Hydrun
- ► GitHub Actions
- ▶ Semantic Release