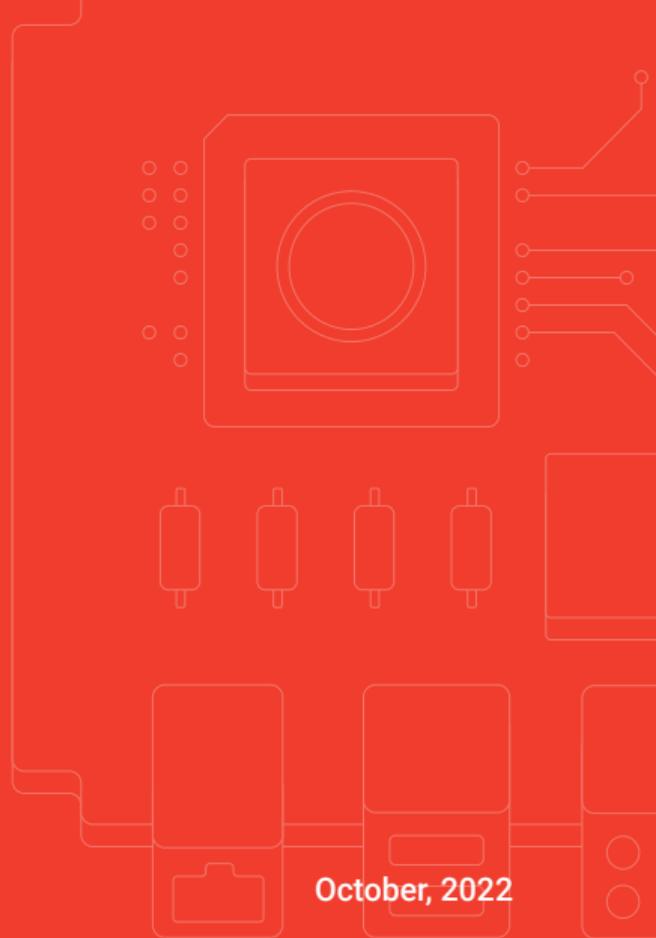


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REPLICA.ONE

Firmware build system for the Enterprise

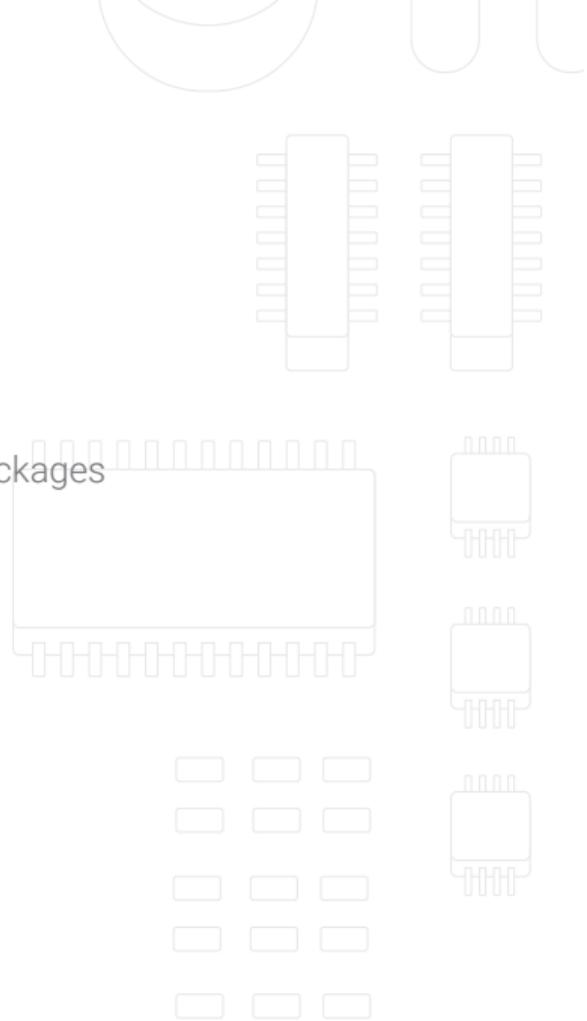
Emil Košić



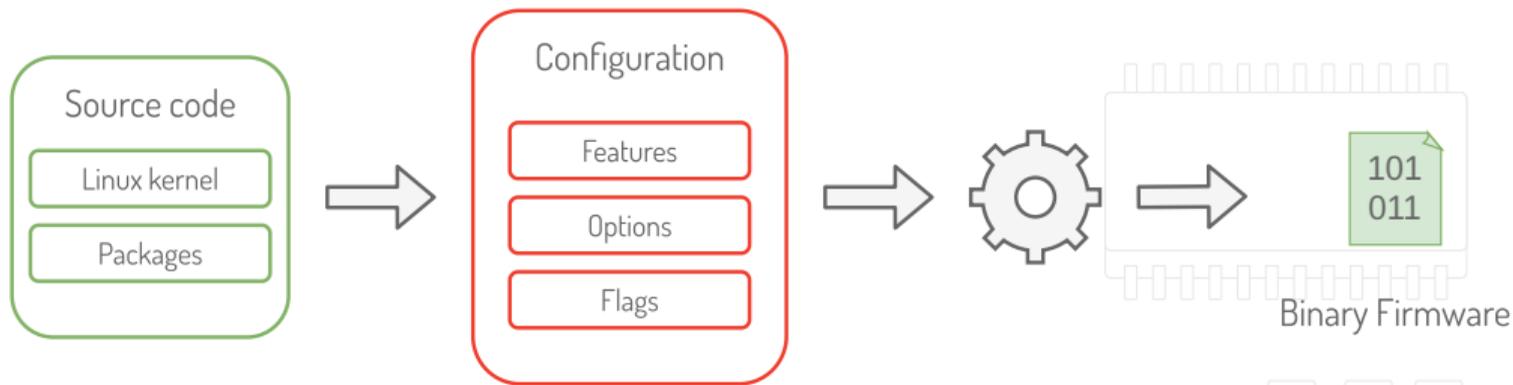
October, 2022

Introduction

- An overview of a Linux image-based build process
 1. Generate toolchain for cross-compilation
 2. Prepare, configure and build Linux kernel and user-space packages
 3. Integrate results into a *firmware* image
- Examples of existing open source build tools
 - *OpenWrt / Buildroot* – a set of makefiles
 - *OpenEmbedded / BitBake* – inspired by Gentoo's Portage
 - *Open Network Linux (ONL) build system*

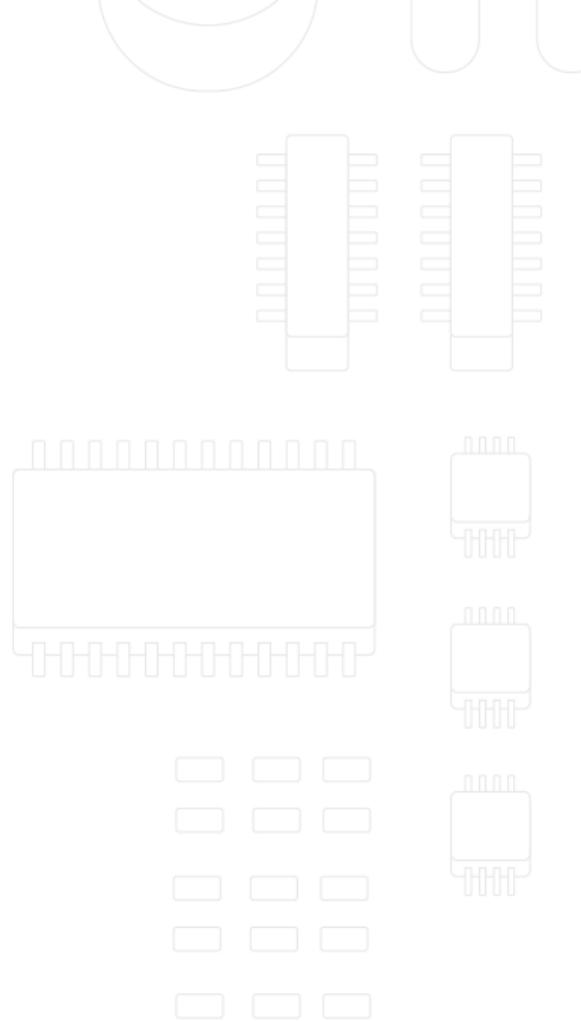


Ingredients



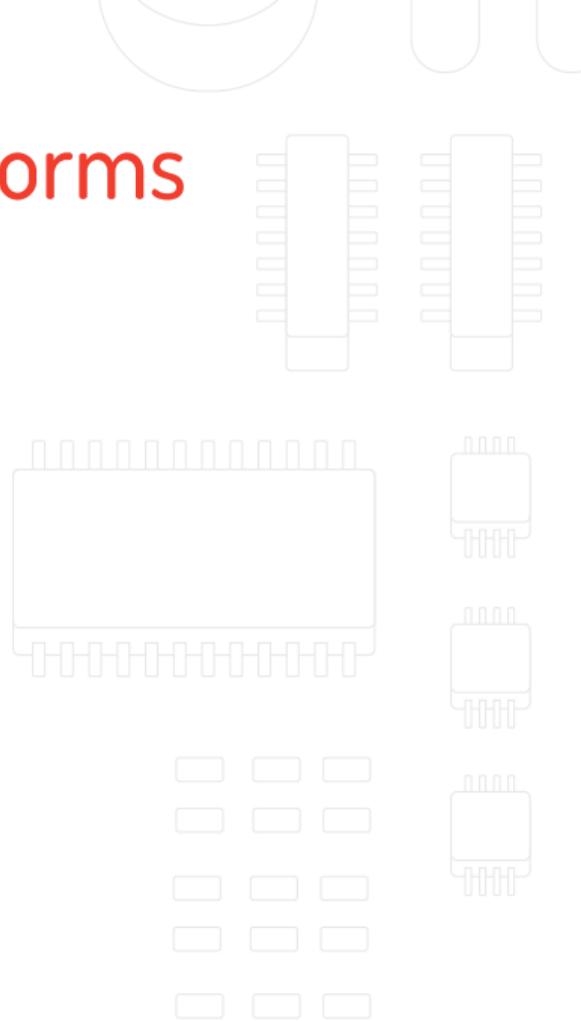
Obvious requirements

- Open Source and Linux-based
 - Utilize open source projects and resources
- Flexible configuration and build system
 - Extending base features with *value added* improvements
- Active project and community
 - Future-proof, robust and secure code



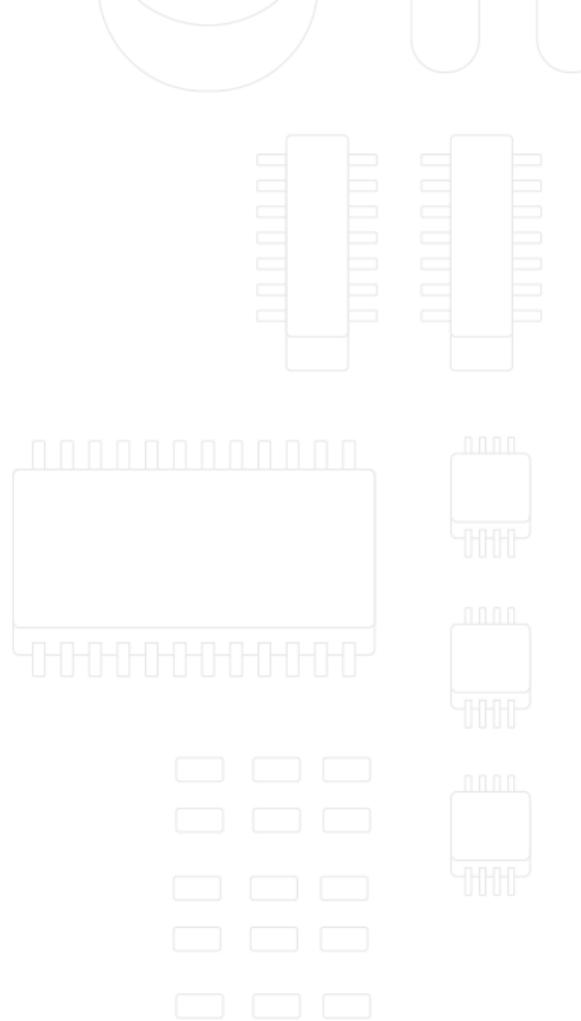
Challenges with existing platforms

- Limited scope of targeted devices
 - e.g. no support for bare-metal switches
- Non-standard or purpose-built solutions
 - e.g. system libraries and/or configuration frameworks
- Maintenance and/or integration burden
 - e.g. large amount of out-of-tree patches
 - e.g. distro-specific compile-time defaults

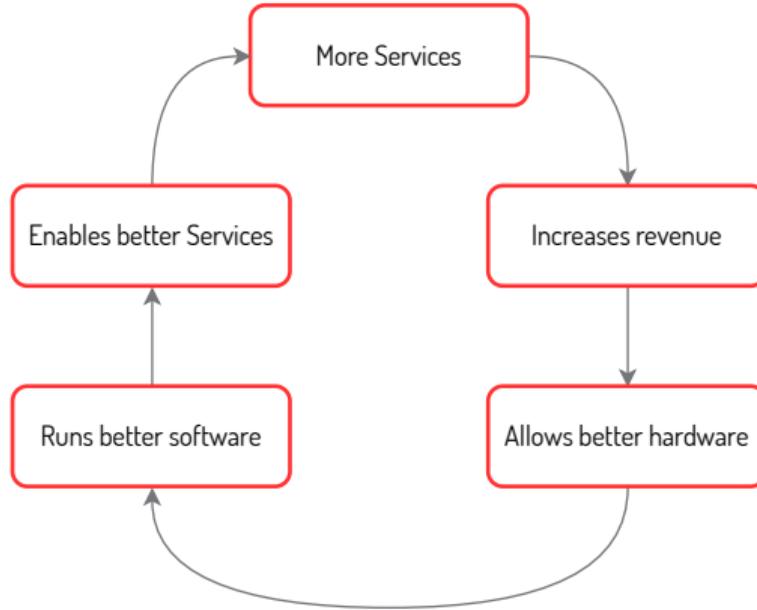


Our ideals

- A single, unifying platform for a wide range of devices
- Mainline or at least soon-to-be mainline platform support
- High degree of flexibility and integrability
- Manageable supply chain inspection

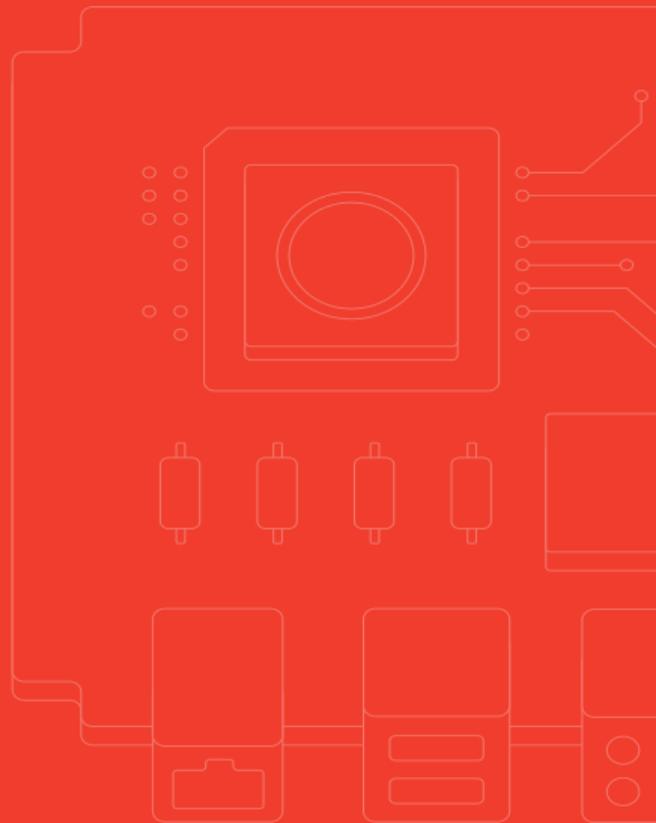


Service-based ecosystem



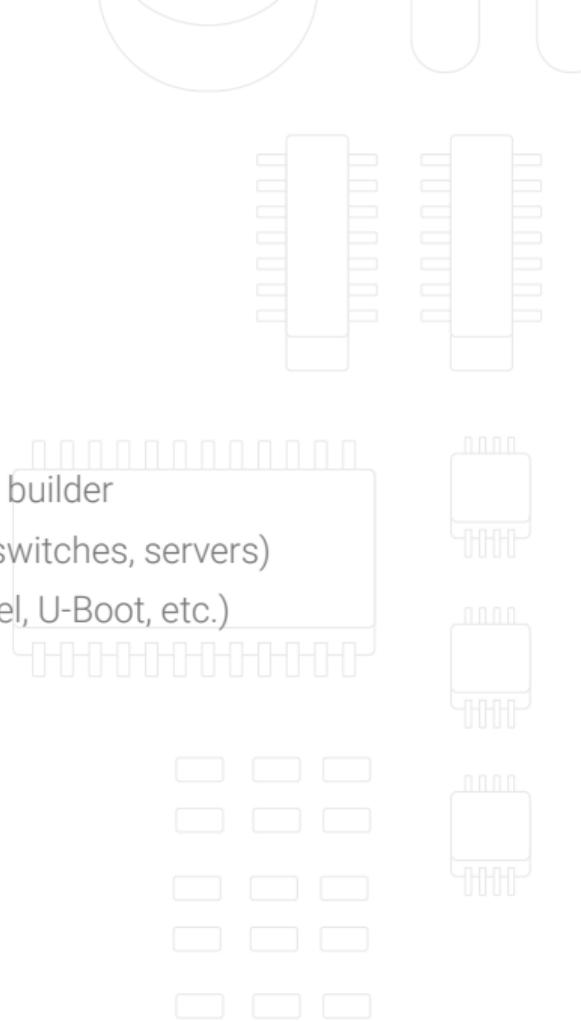
Replica.one

sartura



Replica.one

- An open source Gentoo-based firmware build system
 - Highly customizable, stripped-down Gentoo based firmware builder
 - A unified stack for wide range of devices (e.g. APs, routers, switches, servers)
 - Leveraging latest advancements from upstream (Linux kernel, U-Boot, etc.)
- *Like LEGO™ bricks, modular and maintenance free*



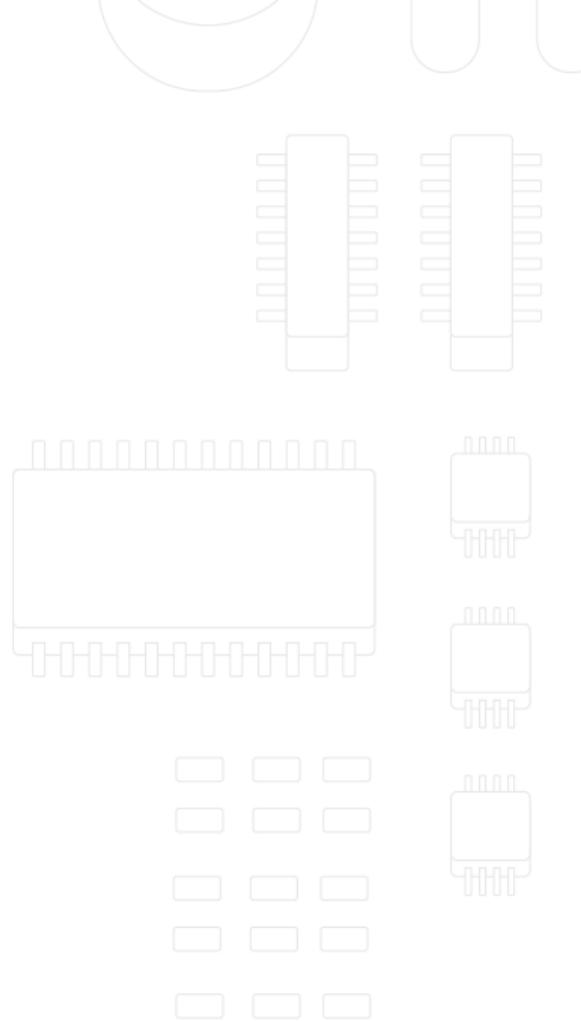
Best practices

- Resolve the maintenance issue
 - In-house board bring-up, driver support
 - Continuous upstreaming effort in coordination with the community
- Ensure a flexible, but easy-to-integrate system
 - Make use of the Gentoo's package manager – *Portage*
- Target wide range of devices
 - Leverage large existing support for boards and devices
 - Where possible, share board bring-up efforts with others



Already in production

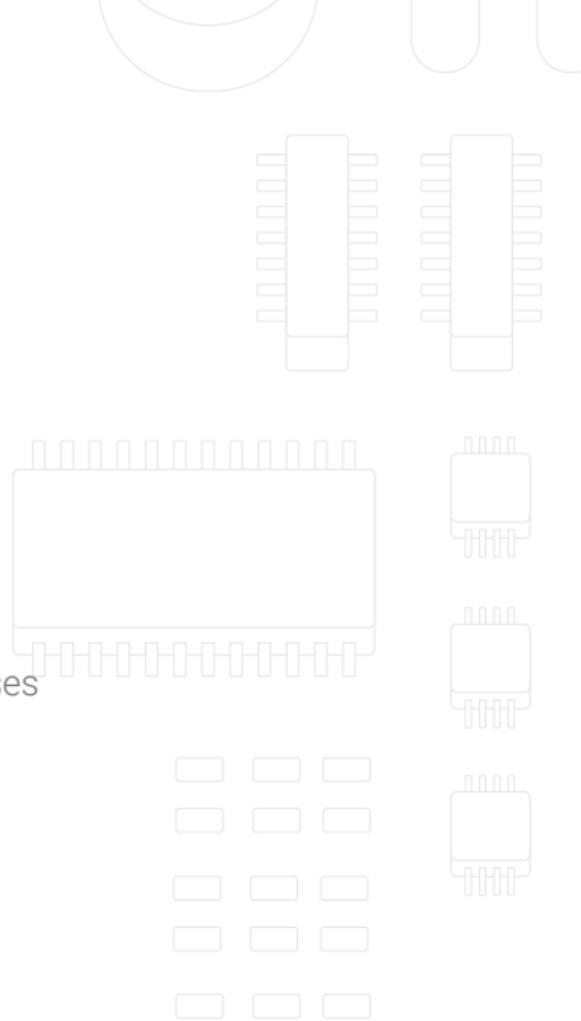
- WiFi AP and CPE
- Switch
- Core router
- Server and Compute infrastructure
- Service isolation
 - Containerization (LXC, LXN, systemd-nspawn, Docker)
 - Kernel-based Virtual Machine (KVM)





Takeaways & Highlights

- Virtually no maintenance requirements
 - Aligned with the upstream communities and projects
- Open Source platform to accelerate service ecosystem
 - Supporting Open Source & 3rd party applications
- Lightweight and programmable system fulfilling multiple use cases



REPLICA.ONE

Firmware build system for the Enterprise

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