

Systems & Automotive WG

Philipp Ahmann, Etas GmbH (Bosch)



ELISA
Enabling **Linux** in
Safety Applications

Aerospace · Automotive · Linux Features

Medical Devices · OS Engineering Process

Safety Architecture · Space Grade Linux · Systems · Tools

Light on Automotive WG

Automotive is currently operated as part of Systems WG *(due to capacity reasons)*

Automotive topics within Systems WG:

- HPC, ECU centralization & mixed-criticality
- Regular participation from AGL
- Exchange with Eclipse SDV towards collaboration



Light on Automotive WG

Considered topics for a standalone Automotive WG *(in case of additional capacity)*

- Update meta-elisa to latest AGL release and migrate from QT to Flutter
- New use case fitting demands of SDV
- Add new reference hardware
- System analysis and workload tracing
- Closer collaboration with AGL



SO MUCH OF "AI" IS JUST FIGURING OUT WAYS TO OFFLOAD WORK ONTO RANDOM STRANGERS.

<https://xkcd.com/1897/>



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Systems WG



Systems WG Definition

- The Systems WG aims to enable other working groups within ELISA
- Put the other WGs safety claims towards Linux in a wider system context.
- Build a reproducible example system based on real-world architectures,
- Implemented fully based on open source technologies.

The Systems WG encourages interactions with other projects, which either also help enable safety use cases with OSS or plan to make use of mixed-criticality system elements as a base for their product lines.

Linux in Safety Critical Systems

***“Assessing whether a system is safe,
requires understanding the system sufficiently.”***

- Understand Linux within that system context and how Linux is used in that system.
- Select Linux components and features that can be evaluated for safety.
- Identify gaps that exist where more work is needed to evaluate safety sufficiently.



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Achievements 2024



2024 In a Nutshell



Major work items:

- Qemu enhancements
- Embedded World showcase ★
- HBOM discussions
- Presented example system at ZAL.aero
- Provided OSS records on similar system architectures ★

Ongoing activities:

- Started OSS good practices ★
- Initiated tiny config discussion (LFSCS)
- GitHub CI & SBOM for cont. Compliance
- Eclipse Automotive Process SIG exchange

Photo by [Dave Avram](#) on [Unsplash](#)

Example System - At Embedded World

- Runs Xen, Zephyr, Linux
- Runs on Xilinx ZCU102
- Detailed documentation available
- Software built in ELISA CI
- Focus on reproducibility
- Examples provided as base for extension
- Qemu version also exists
- Look for new hardware in 2025 with candidates: ARM-qemu, Xilinx Kria, Raspberry Pi5, ... (open for suggestions)



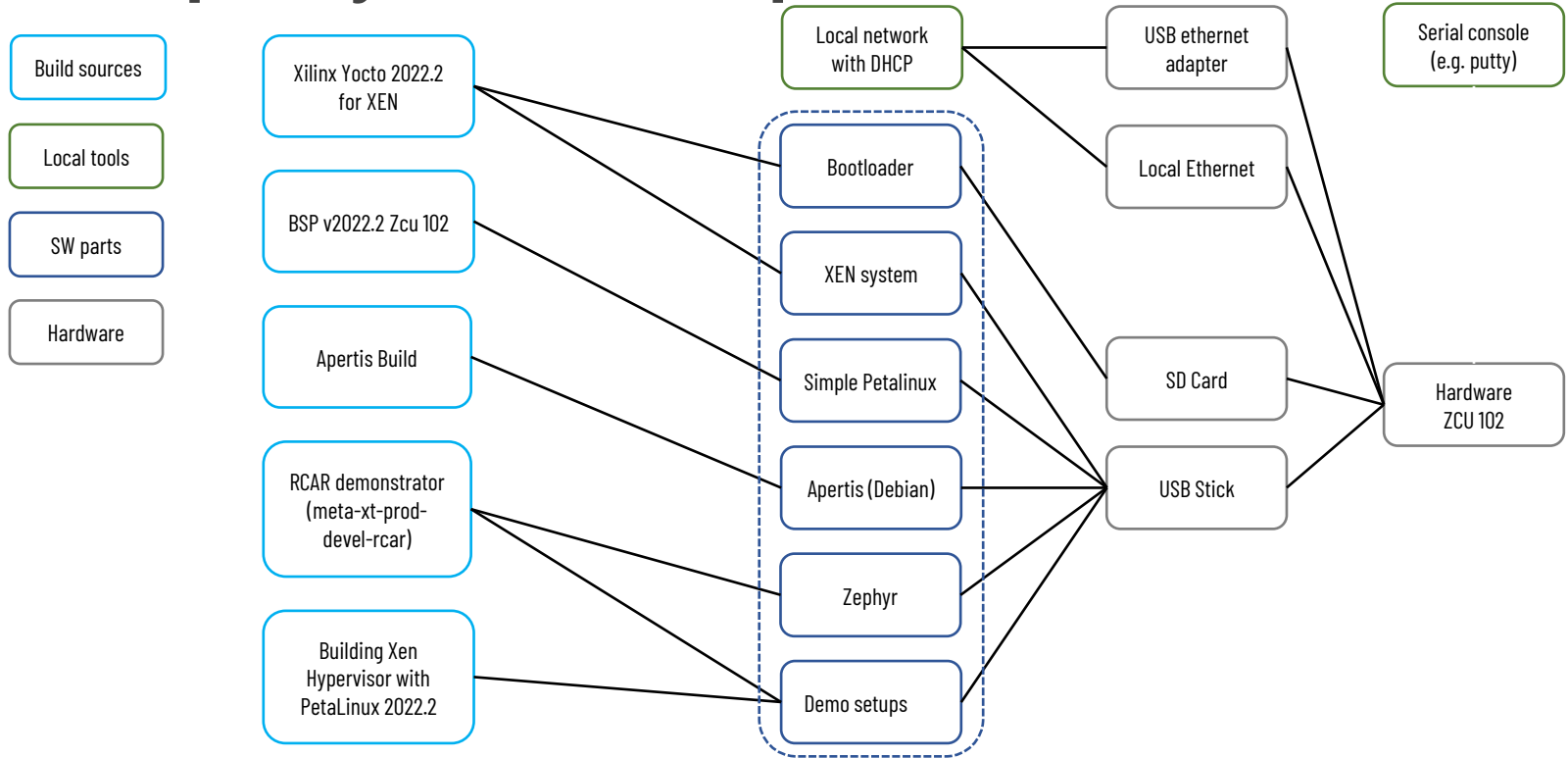
<https://elisa.tech/blog/2024/04/09/elisa-project-at-embedded-world/>

Example System - Used hardware

- Board ZCU102 ([link](#) to description)
 - Reference manual ([link](#))
 - SD card 16GB for boot loader
 - USB Stick 16GB for demonstrator setup
 - USB-Ethernet-Adapter (DLINK)
- Environment for setup
 - Local DHCP server (VM with system networkd)
 - Putty for serial console
 - USB Keyboard (for TTY console)
 - HDMI screen



Example System - Composition



Example System - Reproducibility & Documentation

wg-systems / Documentation / xen-demo-zcu102 / Readme.md

mtt2hi contents.md changed to Readme.md

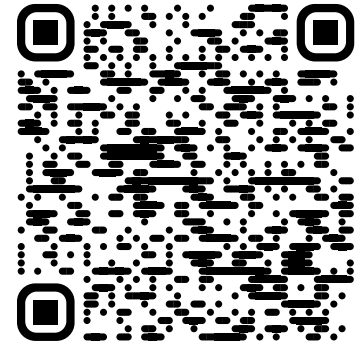
Preview Code Blame 40 lines (20 loc) · 1.01 KB

Table of Contents

Setup

- [Overview to all parts of XEN demo](#)
- [Setup of XEN demo image for USB stick or SD card \(restricted function\)](#)
- [Setup of XEN boot image for SD card](#)
- [Build parts of Domain-0 with XEN](#)
- [Create XEN demo and boot images with a simple script](#)
- [Setup Qemu system with demo and boot image](#)

<https://github.com/elisa-tech/wg-systems/blob/main/Documentation/xen-demo-zcu102/Readme.md>



Similar System Architectures

Choices from EOSS 2024

- [build heterogenous system using yocto project](#) (AMD)
- [amp virtio a new virtio transport for amp systems with focus on zephyr linux and xen](#) (Linaro)
- [display sharing in heterogeneous systems using linux as high level operating system](#) (Texas Instruments)

Older examples

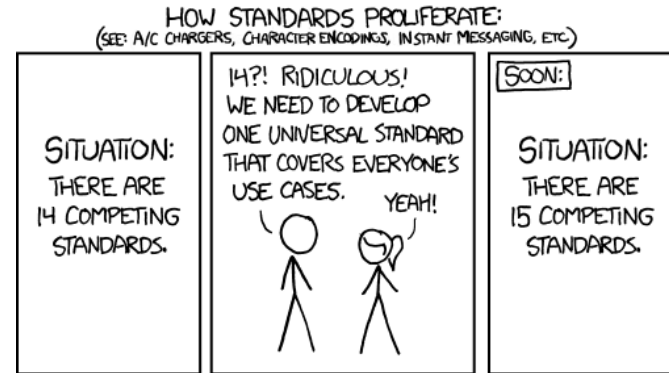
- [Virtualization with Zephyr & Xen for Embedded Safety Systems](#) (epam, 2022)
- [Hypervisor-less Virtio: Assembling Multi-OS Systems ...](#) (Wind River, 2022)
- [Linux and Zephyr “Talking” to Each Other in the Same SoC](#) (Embarcados, 2018)

Systems WG base

- [Static Partitioning with Xen, LinuxRT, & Zephyr: A Concrete End-to-end Example](#) (AMD, 2022)

Open Source Good Practices – Yet Another Standard

- Standards are based on v-model
- Nobody is strictly following v-model. 🤖
- ASPICE or CMMI are main argumentation for quality management in Automotive
- Quality management can be entry point to safety standards
- No existing standard matches decent software development practices!
(code-centric, CI driven and agile focus)



<https://xkcd.com/927/>

Open Source Good Practices - Goal

*The goal of this project is to
evaluate and document
established open source
development best practices*

&

*to provide an assessment guide
for the user to rate the quality
of open source projects.*



Photo by [Paul Skorupskas](#) on [Unsplash](#)

Open Source Good Practices - Overview

Phases

1. Determination of status quo
2. Definition of practices
3. Assessment of pilot projects

Contribution

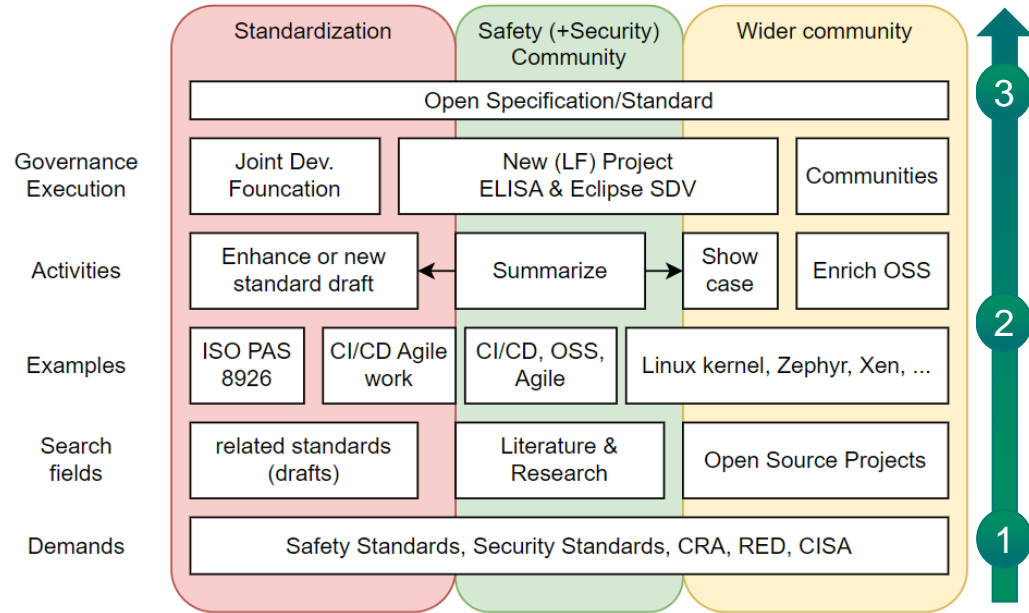
- Academia, Public sector, OSS communities
- Industries: Medical, Robotics, Avionics, Automotive, Railway, Automation, ... (SME to industry leaders)

Funding

- Funded project considered (requires interest)
- Public funded project for wider outreach

Next steps:

- Prepare Survey & Press Release
- OSS NA submission (& promotion?)



CHA²OSS

SDV
Eclipse Software Defined Vehicle

JOINT DEVELOPMENT FOUNDATION

OPENCHAIN



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Plans 2025



2025 Plans in a Nutshell

Systems WG focus:

- Formally start "Good practices in Open Source" specification/standard
 - Involve other communities like CHAOSS, Eclipse SDV, OpenChain, JDF, ...
 - Reach out to companies, academia, public sector, standardization bodies...
- New system setup on ARM + new hardware
 - Incl. System BOM
 - Continuous compliance
(First things to experience at Embedded world?)



Interaction with other WG:

- Add the tiny config to the CI
(input from LFSCS)
- Add Kernel requirements & tools to the CI
(input from Arch WG)
- "Good practices" spec/standard
(involves OSEP WG)

(Major) Community Engagements



2025 example: CHAOSScon

- Brought „good open source“ practices as unconference session to Brussels.
- Interaction with CHAOTICs brought in new perspectives.
 - Stronger involvement of foundations
 - Involve standard authorities
 - Enhance not add efforts
 - Funding of persons to implement efforts
 - Get the burden on those who get paid for it
 - CRA and relation to cyber-security can be even more relevant than thought
 - Existing scorecards can help to define metrics



Get Involved

- System WG meets Mondays 16:00 UTC
(15:00 UTC during DST)
<https://elisa.tech/community/meetings/>
- Mailing list(s)
<https://lists.elisa.tech/g/systems/>
<https://lists.elisa.tech/g/automotive/>
- Issues (or even better PRs) welcome!
<https://github.com/elisa-tech/wg-systems/>



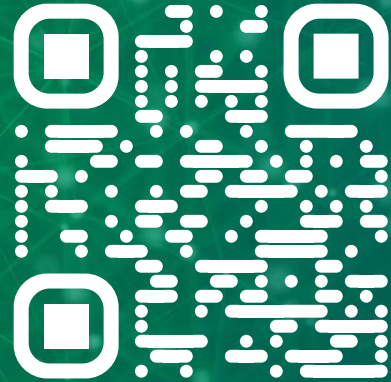
Photo by Hannah Busing on Unsplash



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Thank you!



<https://elisa.tech>

JOIN THE COMMUNITY

Our infrastructure and tools are open by default, so jump in and introduce yourself, ask questions and share ideas. Please consider this your invitation to participate.



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