ELISA
Enabling Linux in Safety Applications

WORKSHOP

Ask Me Anything about ELISA or Use of OSS in Safety Critical Applications

November 18-20, 2025
Co-hosted with Red Hat

Linux ecosystem
our focus for the next days

Linux

- Largest community, largest open code base
- High rate of change.
- Made for flexibility and wide set of use cases.
- Spread over whole world and in space.
- Safety Collaborations: SIL2LinuxMP → ELISA
- Gaining momentum for use in high performance products (e.g. SDV*)

SDV: Software-Defined-Vehicle

ELISA Enabling Linux in Safety Applications

WORKSHOP

Clash of worlds

(or what is often considered unsafe by safety experts):

- Memory management
- Dynamic memory allocation
- Caches
- Interrupt handling
- Non Real time scheduling
- Non functional aspects like: Development process & tools
- …

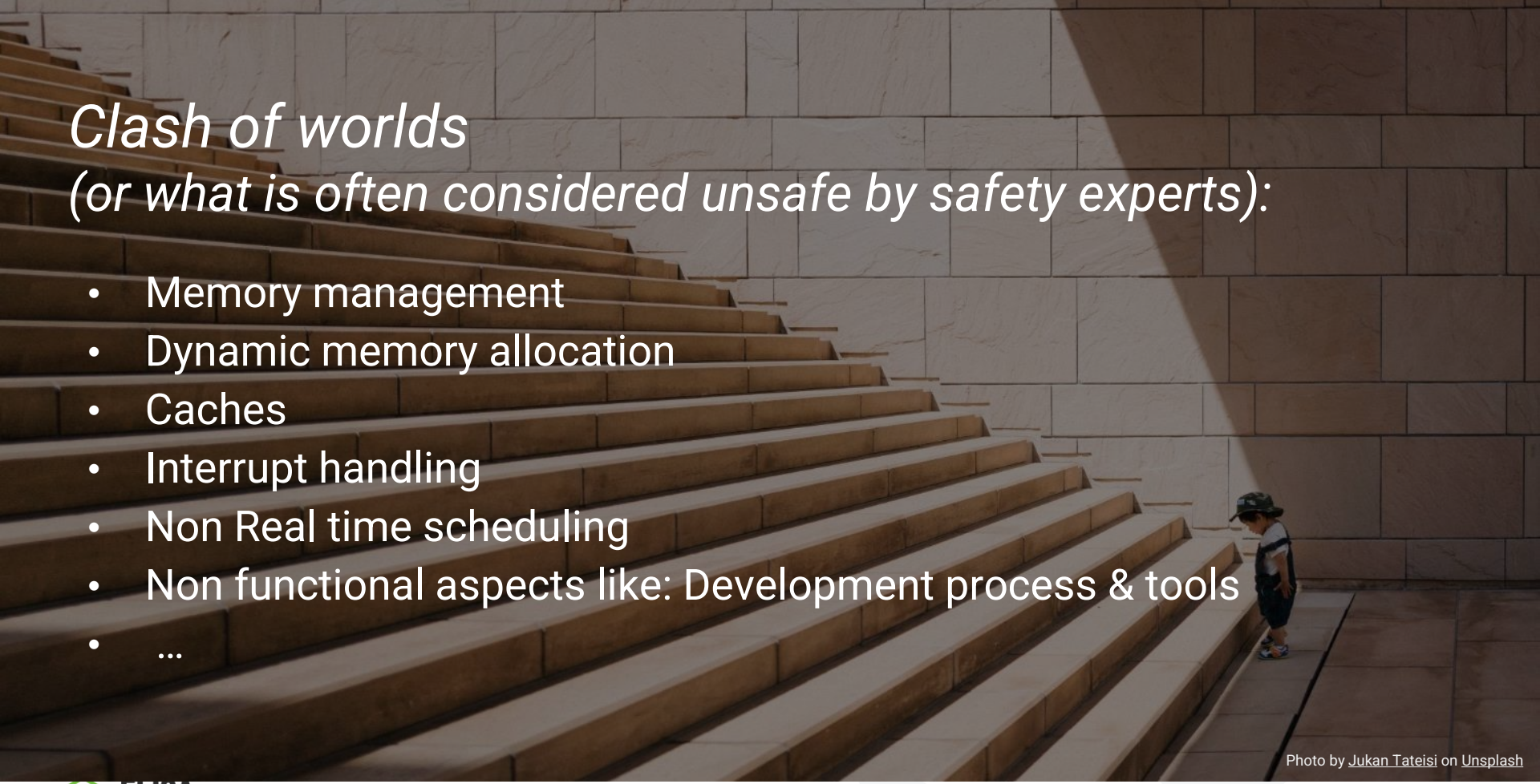
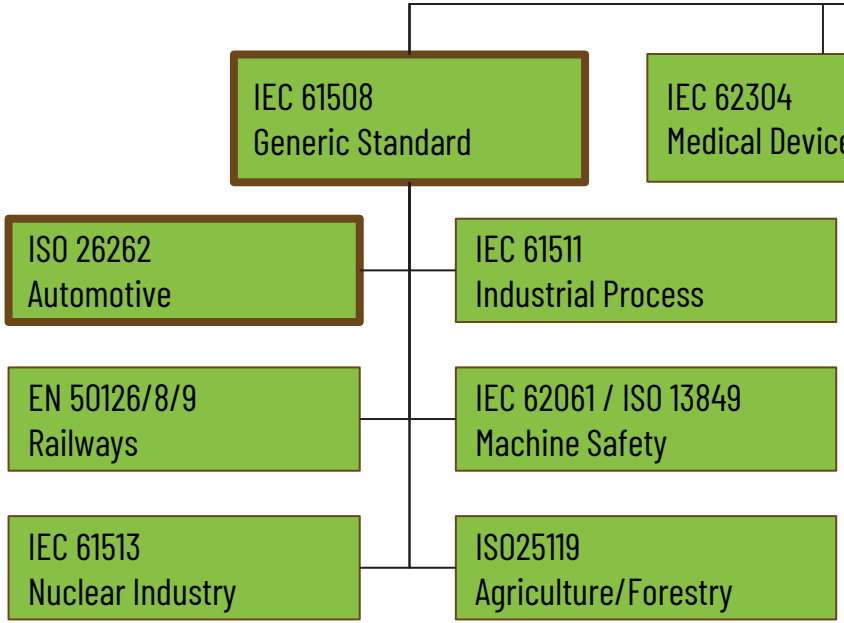


Photo by Jukan Tateisi on Unsplash

A bit on standards and processes

Samples of safety (integrity) standards



- Standards represent industry best practice
  and recommend to use these practices
- Share similar demands...
  requirements, documentation, testing
- Rigor on measures/demands may differ
- All system parts need to be known, tested and managed
- IEC 61508 and ISO 26262 are mostly referred to in Automotive

ELISA
Enabling Linux in Safety Applications

WORKSHOP

Route to Safety Certification

- IEC 61508 Route 3S for pre-existing software
- ISO 26262-8 clause 12 approach for simple automotive pre-existing SW
- ISO PAS 8926 as a bridge for complex software → migrates into ISO 26262
- Challenges increase with increased system complexity
  (like Linux systems)

Introduction & Motivation

- Safety integrity standards need to adopt to increasing complexity of products
- Safety requires a robust fundament based on processes, technical measures and statistical analysis
- Growing industry interest in open source for safety-certified applications
- Current challenges in integrating open-source solutions with safety standards

(China is already making heavy use of Open Source e.g. in Automotive systems)

Project Orientation

ELISA Project

- Enabling **Safety-critical applications** with **Linux** (beyond Security)
- Increase **dependability & reliability** for whole Linux ecosystem
- **Various use cases**: Aerospace, Automotive, Medical & Industrial
- Supported by major **industrial grade Linux distributors** known for mission critical operation and various industries representatives
- Close community collaboration with **Xen, Zephyr, SPDX, Yocto & AGL** projects
- **Reproducible system** creation from specification to testing
- SW **elements**, engineering **processes**, development **tools**

ELISA : Architecture Processes Features Tools Systems

ELISA
Enabling Linux in Safety Applications

WORKSHOP

"The mission of the project is to define and maintain a common set of elements, processes and tools that can be incorporated into Linux-based, safety-critical systems amenable to safety certification."

from the technical charter

ELISA
Enabling Linux in Safety Applications

WORKSHOP

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.

STOP - Limitations! The collaboration ...

- *cannot* engineer your system to be safe.
- *cannot* ensure that you know how to apply the described process and methods.
- *cannot* create an out-of-tree Linux kernel for safety-critical applications.
  (continuous process improvement argument!)
- *cannot* relieve you from your responsibilities, legal obligations and liabilities.

But...

ELISA provides a path forward and peers to collaborate with!

Premier Members

BOEING

Red Hat

General Members

AISIN

arm

BOSCH

Canonical

CodeThink

Elektrobit

EMQ

HONDA
The Power of Dreams

HUAWEI

LINUTRONIX
LINUX FOR INDUSTRY

LYNX
SOFTWARE TECHNOLOGIES

NISSAN
MOTOR CORPORATION

SAIC 上汽集团 SAIC MOTOR

WNDRVR

Associate Members

AUTOMOTIVE GRADE LINUX

AFST
INSTITUT FÜR FLUGZEUG-SYSTEMTECHNIK

KernelCI

OTH OSTBAYERISCHE TECHNISCHE HOCHSCHULE REGENSBURG

Industry Support

CIVIL INFRASTRUCTURE PLATFORM

OSADL
Open Source Automation Development Lab eG

UL

ELISA
Enabling Linux in Safety Applications

WORKSHOP

Working Groups (WGs) - Horizontal

Safety Architecture

Red Hat

Open Source Engineering Process

CodeThink

Linux Features

Red Hat

Systems

BOSCH

Tool investigation & Code Improvement

paused

THE LINUX FOUNDATION

Photo by Mike Kiev on Unsplash

Working Groups (WGs) - Verticals

Aerospace

BOEING

Automotive

BOSCH

Medical Devices

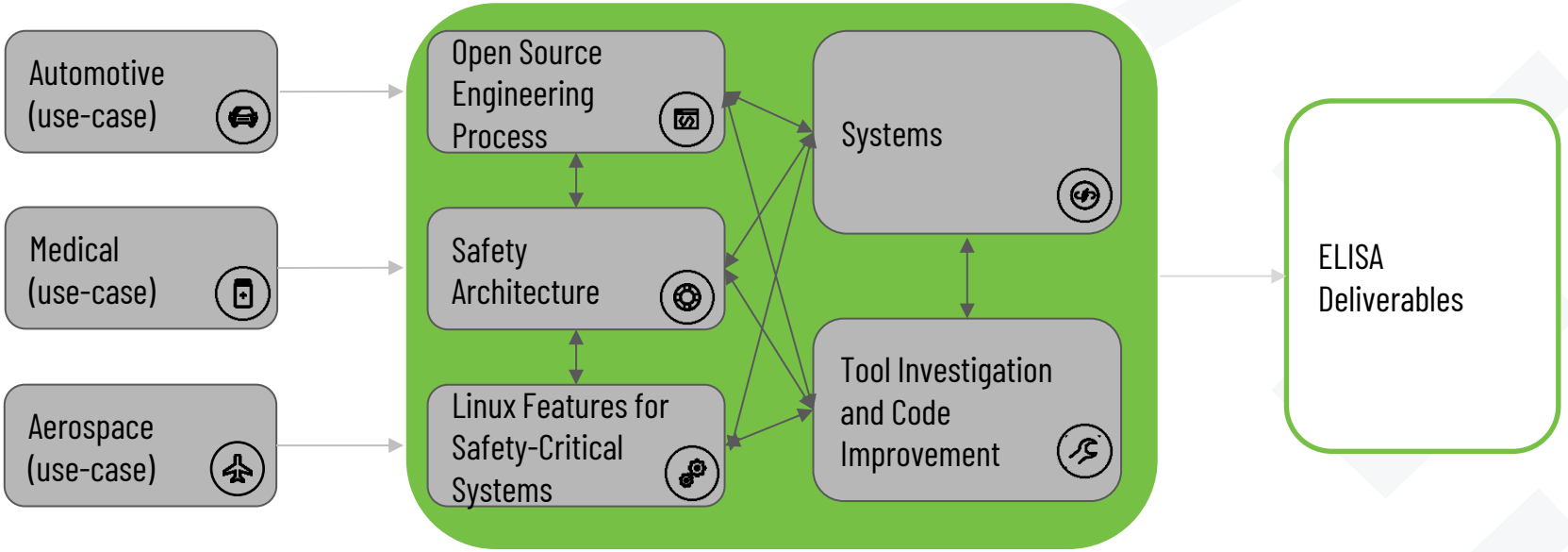
paused

THE LINUX FOUNDATION

ELISA Enabling Linux in Safety Applications

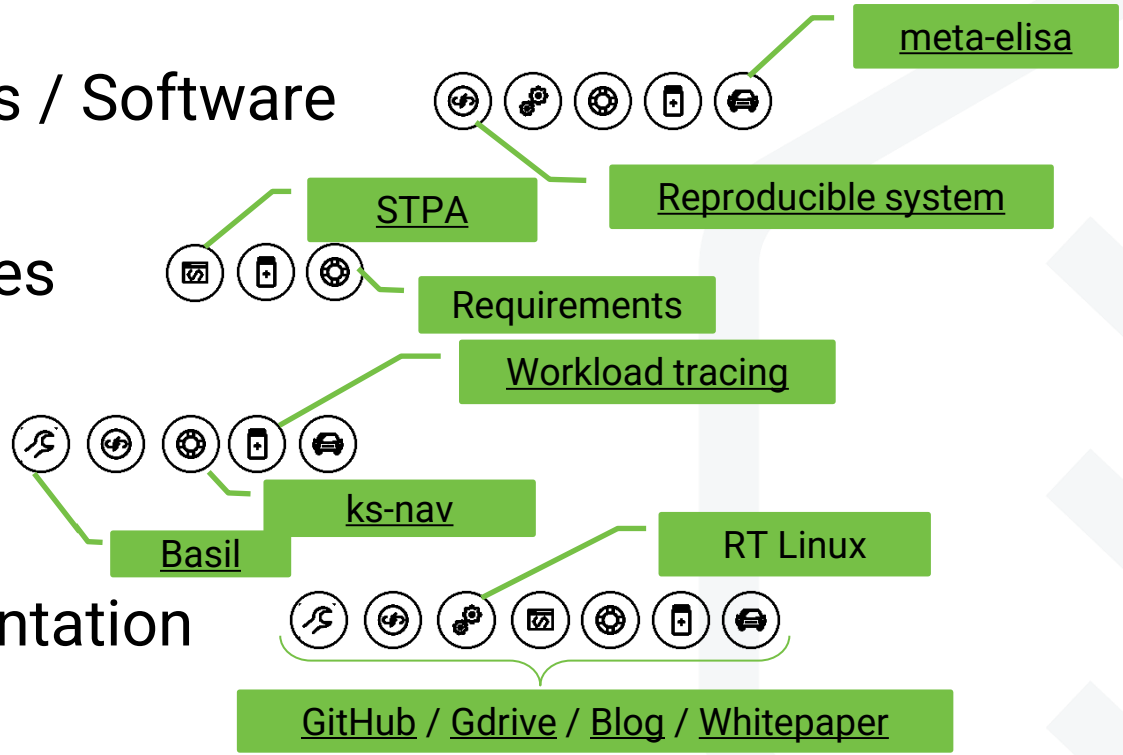
WORKSHOP

Relation Between Working Groups



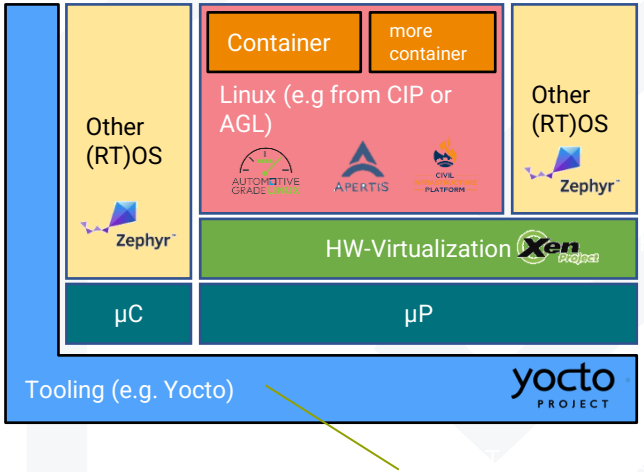
ELISA Working Groups - Deliverables

- Elements / Software
- Processes
- Tools
- Documentation



ELISA Working Groups - Fit in an Exemplary System

- **Linux Features**, **Architecture** and Code Improvements should be integrated into the reference system directly.
- **Tools** and **Engineering process** should serve the reproducible product creation.
- **Medical, Automotive, Aerospace** and future WG use cases should be able to strip down the reference system to their use case demands.



ELISA Enabling Linux in Safety Applications

WORKSHOP

Interactions Between the Communities

- Open source projects focusing on safety-critical analysis

- Open source projects with safety-critical relevance and comparable system architecture considerations

- Further community interactions

"If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple
But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas

— George Bernard Shaw

Attend Events

Workshops

Bi-annual technical collaborative event

Aimed at accelerating knowledge sharing, collaboration, and problem solving to advance the use of open source in safety-critical systems

Most attend in person and can accommodate virtual attendees

Materials made available to registrants

Workshop Series https://elisa.tech/workshop-series/

ELISA Enabling Linux in Safety Applications

WORKSHOP

Seminar Series

Have held 19 seminars since launch in 2023

Topics range from IOS-PAS, SPDX, Xen, Yocto, State of Art of Certifying Linux, Rust Compiler, and Enabling Linux towards Meeting Avionics Safety Standards, SEooC and more

Average live attendees 50-60 ppl

Materials made available to registrants and promoted to the broader community

Seminar Library: https://elisa.tech/seminar-series/

ELISA Enabling Linux in Safety Applications

WORKSHOP

Safety Critical Software Summit now Open Source Summits

Major sponsor and community members are key participants at Critical Software Track at Open Source Summit Events world wide

Engaging Open Source Community on topic of enabling open source to be used in safe systems.

Started in EOSS Seattle June 2024 and in 2025 now a part of all OSS events in NA, EU, Korea, Japan.

Check out the upcoming Sessions (filter by Safety Critical Software) at OSS Korea in November 2025

ELISA Enabling Linux in Safety Applications

WORKSHOP

Safe Usage of Linux Micro-conference at Linux Plumbers Conference

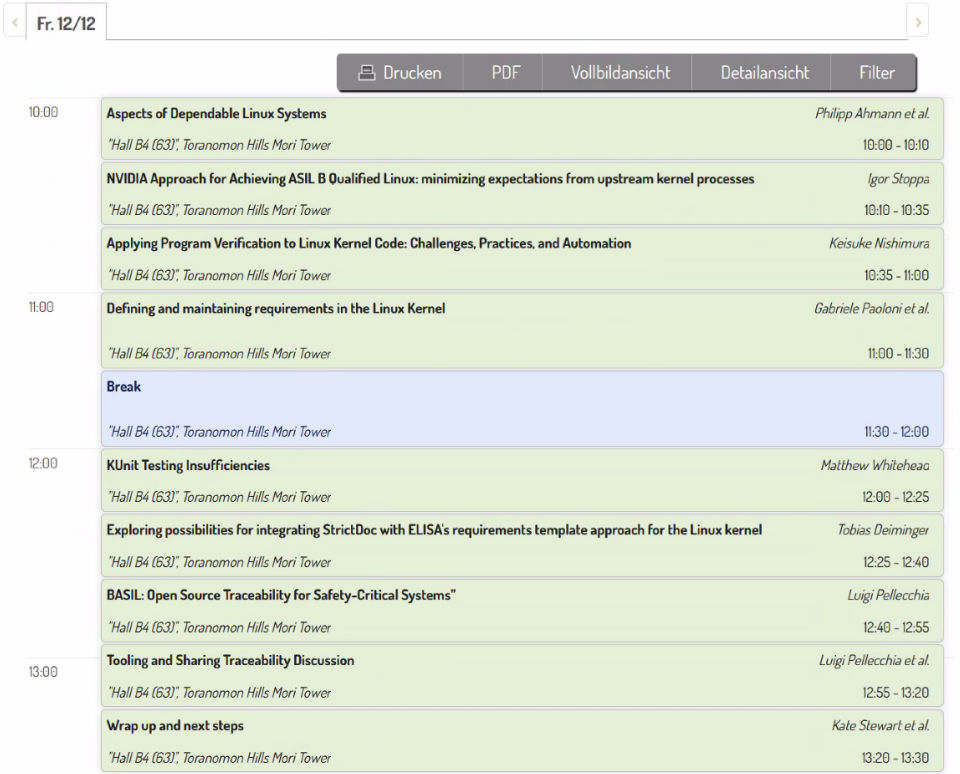
Collaboration, discussions, and problem solving with Linux kernel community

How can we establish consistent linkage between code, tests, and the requirements that the code satisfies?

This MC addresses critical challenges in requirements tracking, documentation, testing, and artifact sharing within the Linux kernel ecosystem.

First MC held at LPC in Vienna, September 2024

Next one at LPC Japan, December 2025



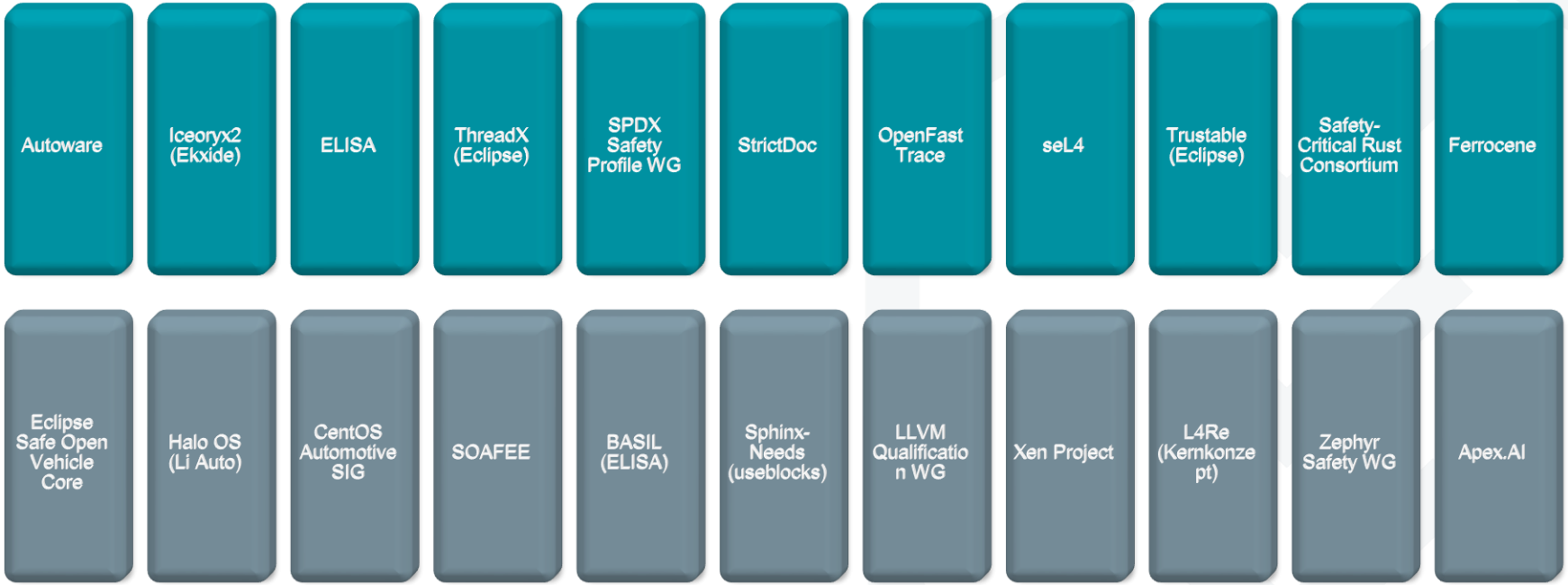
ELISA Enabling Linux in Safety Applications

WORKSHOP

Glimpse on safety critical OSS ecosystem

WORKSHOP

Example of the safety open source landscape
It is not all about Linux … spot check



ELISA Enabling Linux in Safety Applications

WORKSHOP

Procedural Requirements for Safety

- Structured documentation of requirements
- Test-to-requirement traceability
- Keeping documentation synchronized with code
- Achieving maintainability over decades
- (And of course all the technical things needed to create a system)

Community Challenges For All Projects

- Argument of „OSS development is not organized like commercial software“
- Less influence on maintainers
  (positive & negative – no traditional supplier management)
- Harder to train/direct developers
- Liability of a community?
  (but commercial provider may be liable – insurance)
- Development process: Requirements, traceability, v-model,…
  mapping safety integrity standards

Summary – The storyline for the next 2 days. 😉

- Linux for safety critical systems in Aerospace, Automotive, Railways (~5)
- System architectures & composition (~5)
- Testing & Tracing (~6)
- Requirements & their tools (~5)
- Standards and OSS processes (~4)
- Tools (~5)
- Touching the Linux Kernel (~3)
- Going beyond project boundaries towards adjacent communities (~9)

A lot of topics will be discussed
during the WS, but now...
it is time to ask questions
and get you on board!