

The background features a futuristic, dark environment with glowing blue and white light trails. A large, stylized arrow shape is visible, pointing towards the right. In the background, a city skyline is visible at night, with lights reflecting on a body of water. The overall aesthetic is high-tech and modern.

# Luxoft

think.  
create.  
accelerate.

## Safe Rendering: Maximum cost saving approach

09.05.2019 Arwed Richert

# Introduction

## Luxoft Automotive?

All about SW

3.000+ employees

40+ clients (>40 % OEMs)

139 MUSD revenue (FY 2018)

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## Arwed Richert?

Started 1997

Leading R&D teams HMI Platform & Tools / Safety

# Introduction – ISO 26262

## ISO 26262 – automotive Safety Standard – ensuring drivers life

Goal: increase quality / reduce failure rate SW & HW

- Beyond normal ASPICE processes
- Adds methodologies, like
  - Static code analysis
  - MISRA C
  - 100 % test coverage

Standard includes risk classification scheme (ASIL-Levels):

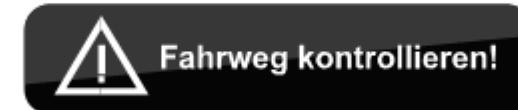
- ASIL A (lowest integrity requirements)
- ...
- ASIL D (highest ones)

Telltale use case = ASIL B

DISPLAY OF THE GEAR INDICATOR  
AND GEAR SHIFT INDICATOR



DISPLAY OF WARNING TEXT MESSAGES\*

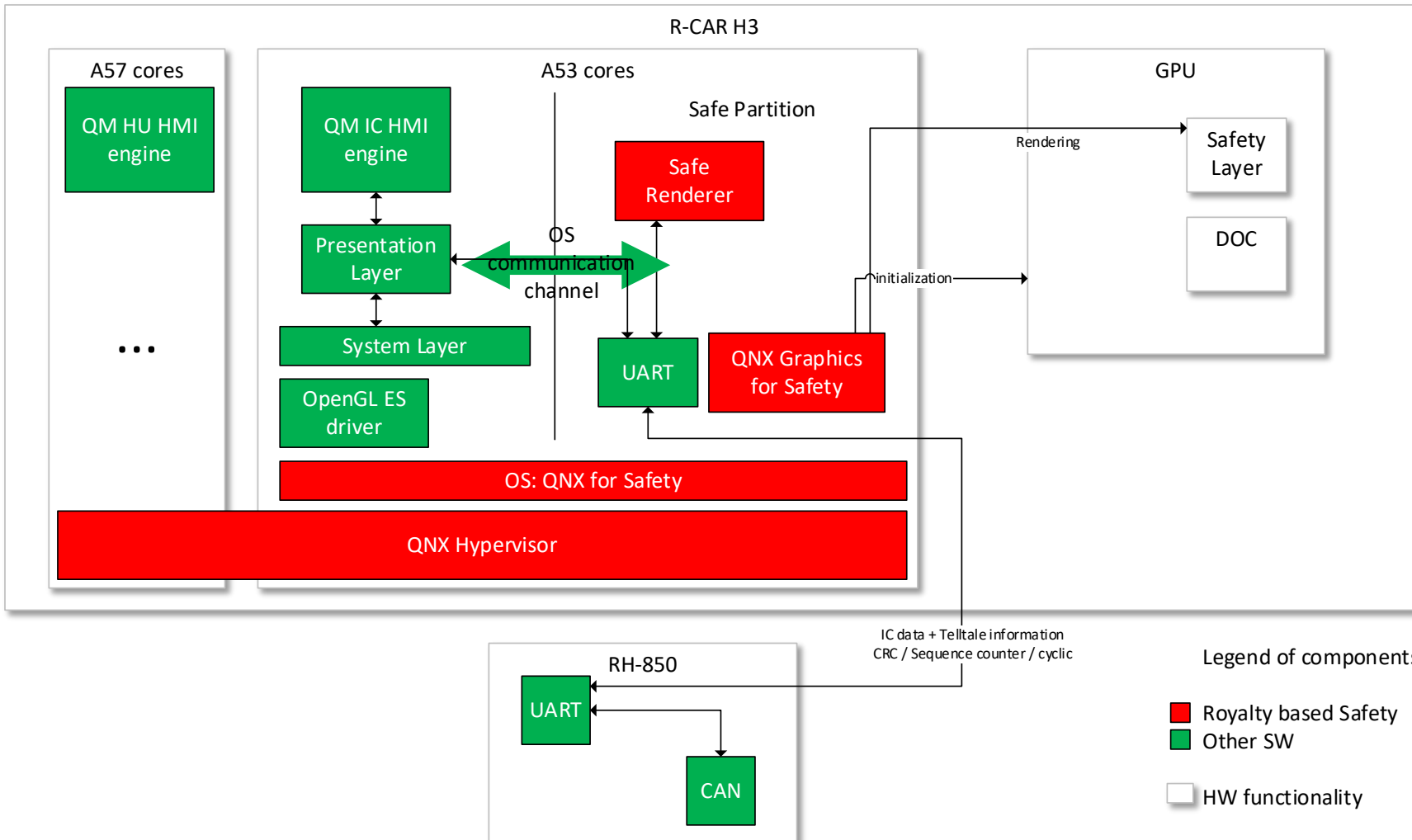


DISPLAY OF WARNING/NOTIFICATION TELLTALES



# Safe Rendering as cost driver

Typical Safe Rendering System architecture (IVI + IC) – with Safety partition



Royalties for:

- Safe Renderer
- QNX Graphics for Safety
- QNX OS for Safety
- QNX Hypervisor

Royalties for Safe components higher due to more dev efforts

Legend of components:

- Royalty based Safety
- Other SW
- HW functionality

# Major challenges



- Safe Renderer (SR) itself
- Safe BSP (graphics drivers)
- Safe RTOS
- Safe Hypervisor

Problem:  
Royalties of Safety certified  
components



## Rendering Synchronisation

- Variants (e.g. day / night)
- Animations
- 3D

Problem:  
2 HMI instances rendering  
on the same screen



## Reusability

- Multiple HMI FWs
- Multiple OS
- Multiple MCUs
- Specific Requirements

Problem:  
Platform Dependency

# Possibilities to overcome

## Cost Driver

### Royalties for

- Safe Renderer (SR) itself
- Safe BSP (graphics drivers)
- Safe RTOS
- Safe Hypervisor

### Possible solution

- Use a royalty free one (e.g. LSR<sup>1</sup>)
- Don't use GPU driver
- Dedicated Core (Baremetal) & Open Source OS
- As above & Open Source Hypervisor

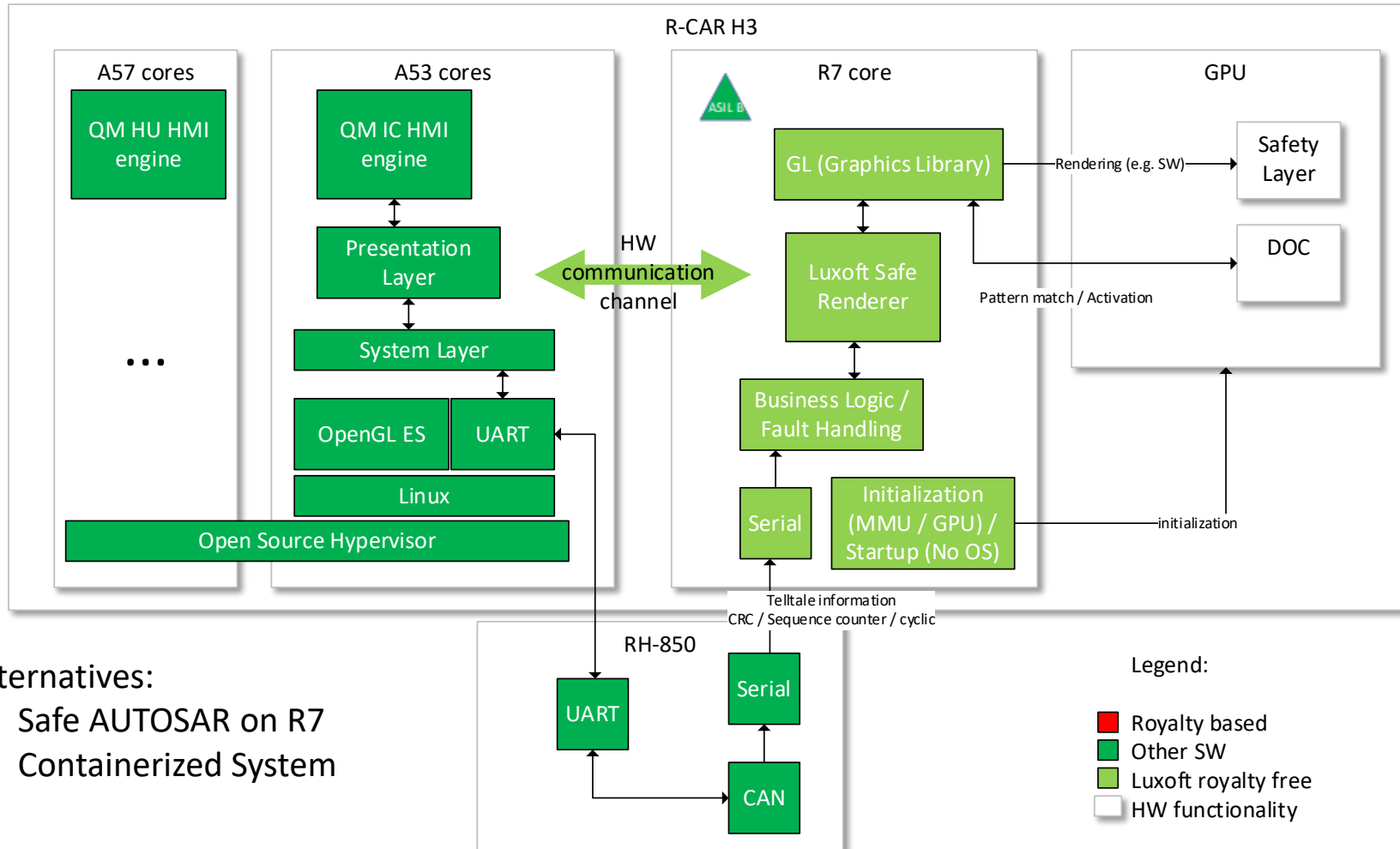
### Result / Remark

- All additional royalties for Safe SW eliminated
- Depends on platform (e.g. dedicated core)
- Shifts part of OS to SR (e.g. MMU / GPU config)

<sup>1</sup> LSR = Luxoft Safe Renderer

# Possibilities to overcome

Suggested System Architecture: Maximum achievable Royalty cost elimination – Safety on a dedicated core



Cost reductions by:

- Open source Hypervisor
- Linux
- No QNX Graphics for Safety
- Open source Luxoft Safe Renderer

→ Maximum achievable royalty savings realized

Alternatives:

- Safe AUTOSAR on R7
- Containerized System

# Possibilities to overcome

## Rendering Synchronisation & Reusability



### Possible solution



### Result / Remark

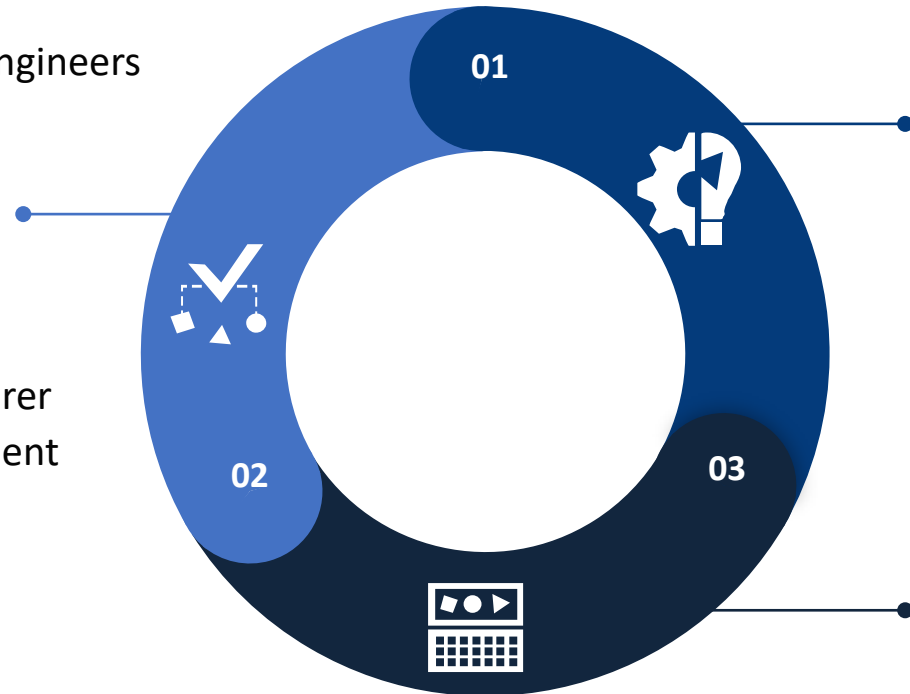
- 
- |  |   |  |
|--|---|--|
| <ul style="list-style-type: none"><li>• 2 HMI engines rendering on 1 screen (QM HMI + Safe Renderer)</li><li>• Multiple OS / Multiple MCUs</li><li>• Multiple HMI Frameworks</li><li>• Specific Requirements</li></ul> | <ul style="list-style-type: none"><li>• Let QM HMI render also Safety critical content</li><li>• SR need to consist of a core library and a platform adaptation layer (e.g. SEooC)</li><li>• SR should not be coupled to a specific toolchain</li><li>• SR should be flexible</li></ul> | <ul style="list-style-type: none"><li>• 3D / animated telltales get possible</li><li>• Style switching issues solved</li><li>• Dependency on platform eliminated</li><li>• Increased Reusability</li></ul> |
|--|---|--|



# Luxoft capabilities

## Engineering Services

- Teams of Safety Certified engineers available
  - Safety Managers
  - SW Engineers
  - Testers
  - ...
- Porting of (any) Safe Renderer
- Complete Safety Development



## Coworking / Consulting

- System Architecture
- Safe Communication Path
- Safety Requirements
- Safety Management

## Luxoft Safe Renderer IP

- Open Source
- Royalty free
- Works with any main QM HMI
- Maximum cost saving approach (dedicated core) or traditional mode
- Advanced functionality (Animations, ...)





Thank you!

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