

# IDENTIFYING AND VISUALIZING ARCHITECTURAL DEBT AND ITS EFFICIENCY INTEREST IN THE AUTOMOTIVE DOMAIN: A CASE STUDY

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Modern cars are complex distributed software in moving, safety-critical, mechatronic systems.

# 100+ ECUS

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# ABSTRACTION LEVELS



## High-Level Architecture

- The high-level architecture is documented in a big UML-model
- Generate parts of an architecture description
- Complemented with text

# ABSTRACTION LEVELS



High-Level Architecture

- Detailed-architecture is stored in a proprietary tool
- Contains (almost) all the details
- Used to generate Simulink-shells and Autosar XML-files used for integration

Detailed Architecture and Design

# ABSTRACTION LEVELS



High-Level Architecture

- Implementation done in Simulink inside the generated shells

Detailed Architecture and Design



Implementation

# OUR FOCUS



High-Level Architecture



Architecture Technical Debt

Detailed Architecture and Design

# ECU - LAC - LC

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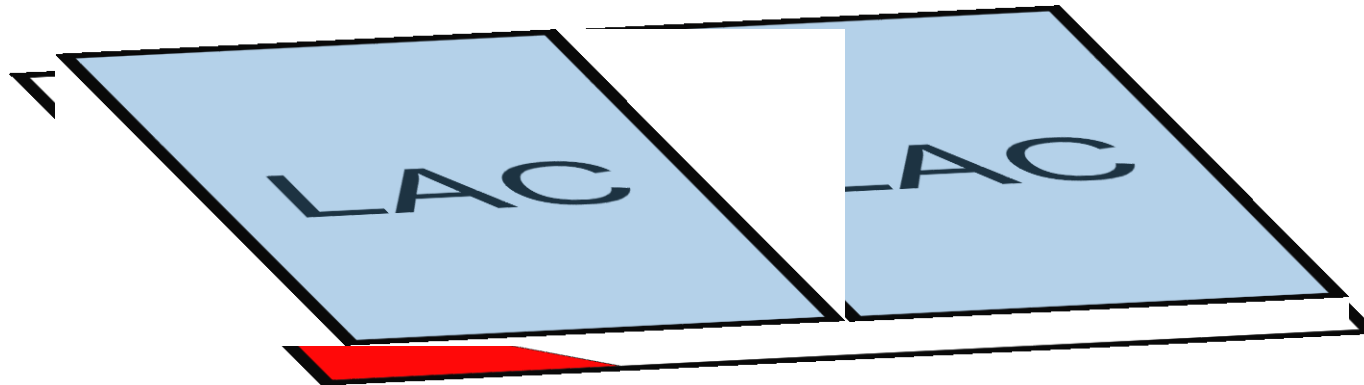


# ECU - LAC - LC

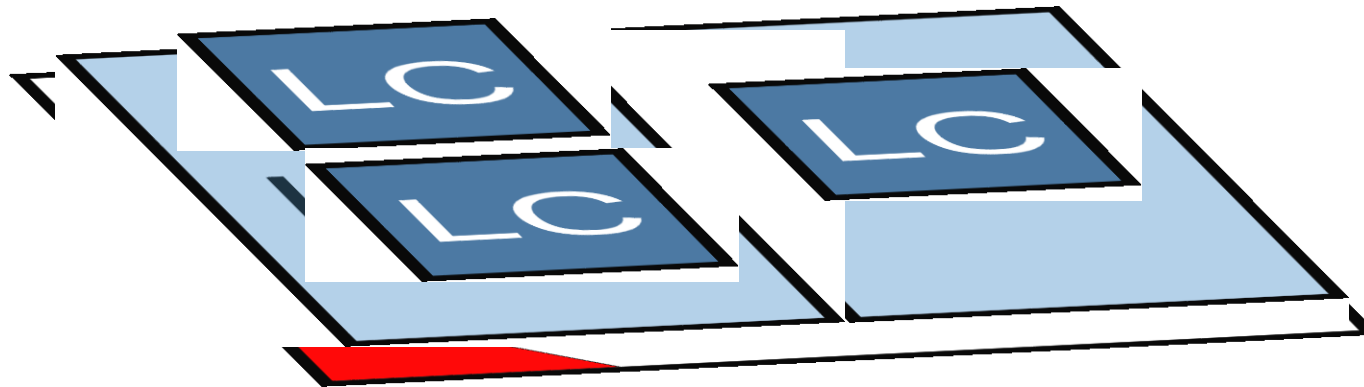
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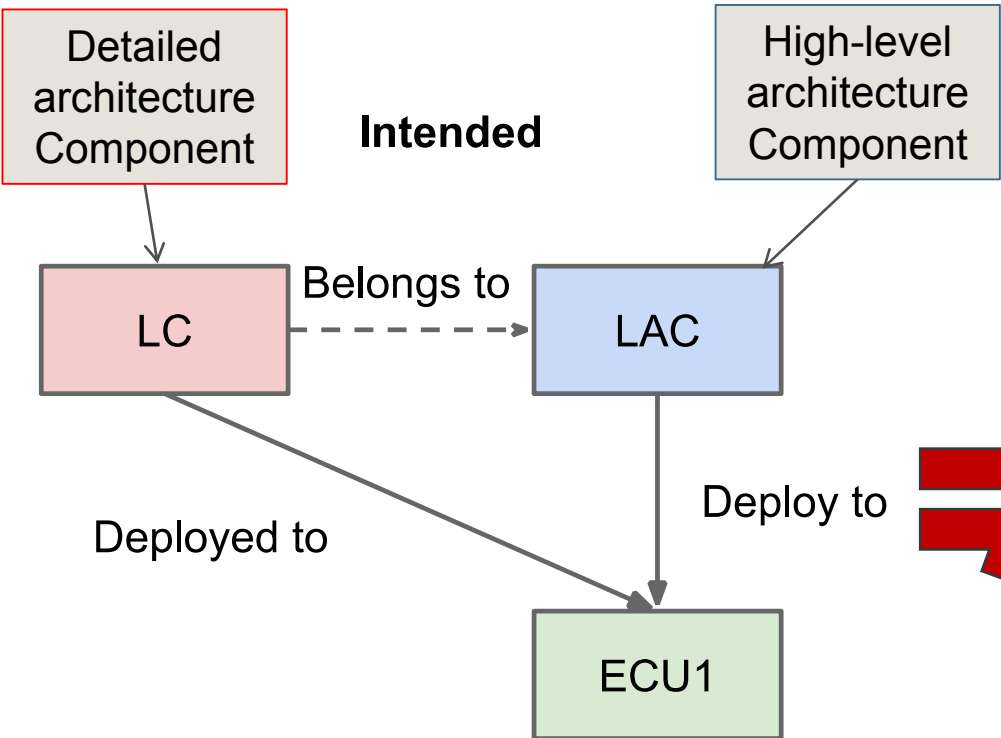
# ECU - LAC - LC



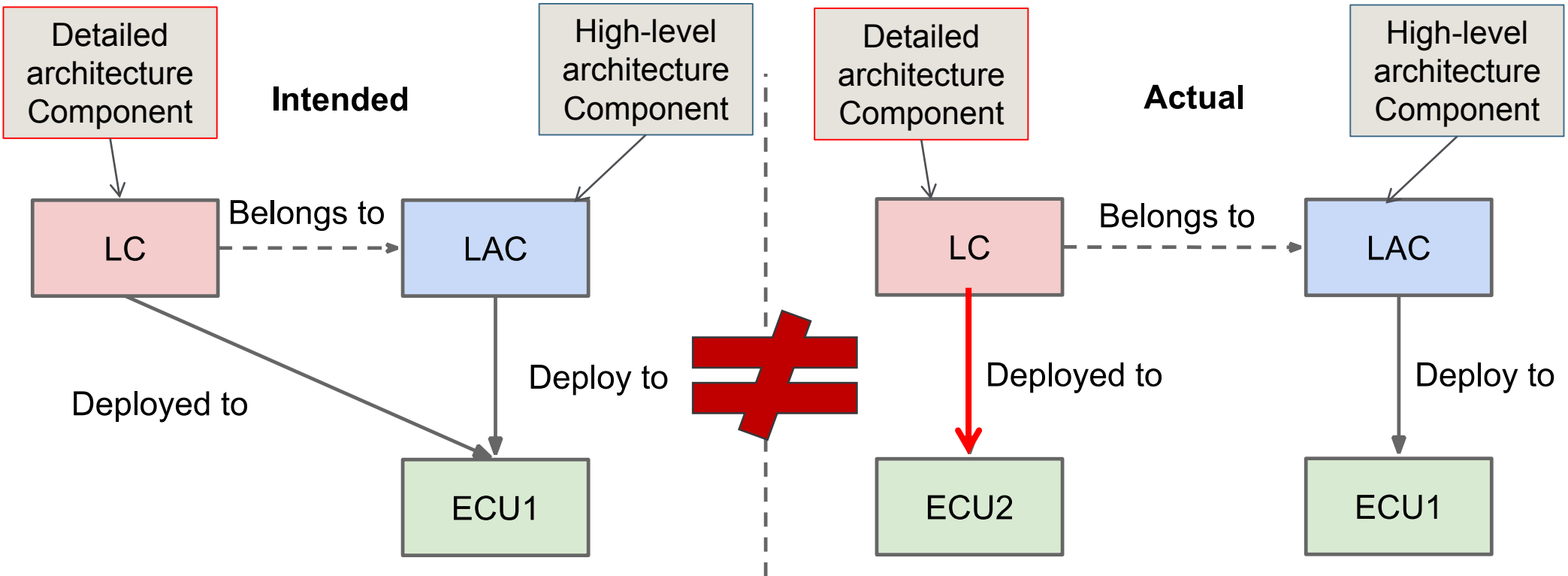
# ECU - LAC - LC



# ARCHITECTURE TECHNICAL DEBT



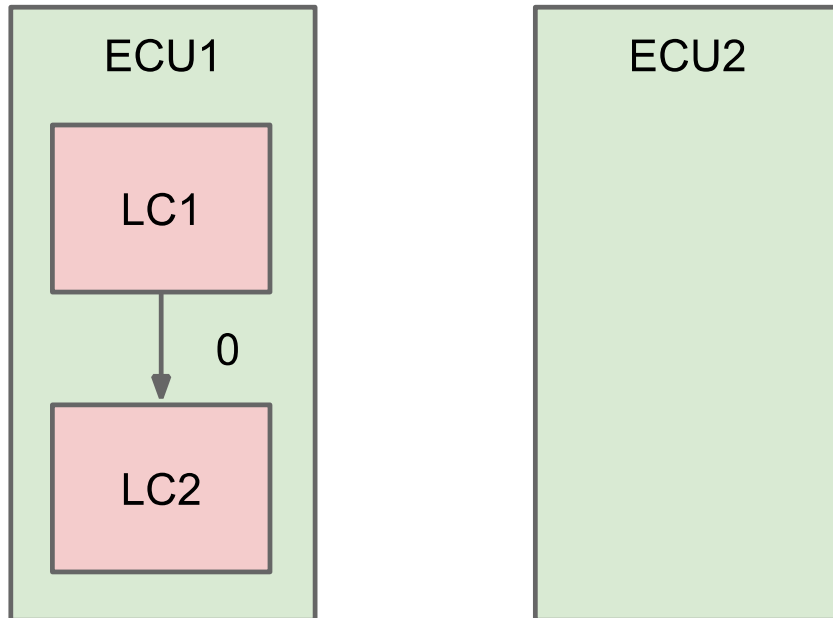
# ARCHITECTURE TECHNICAL DEBT



# INTEREST



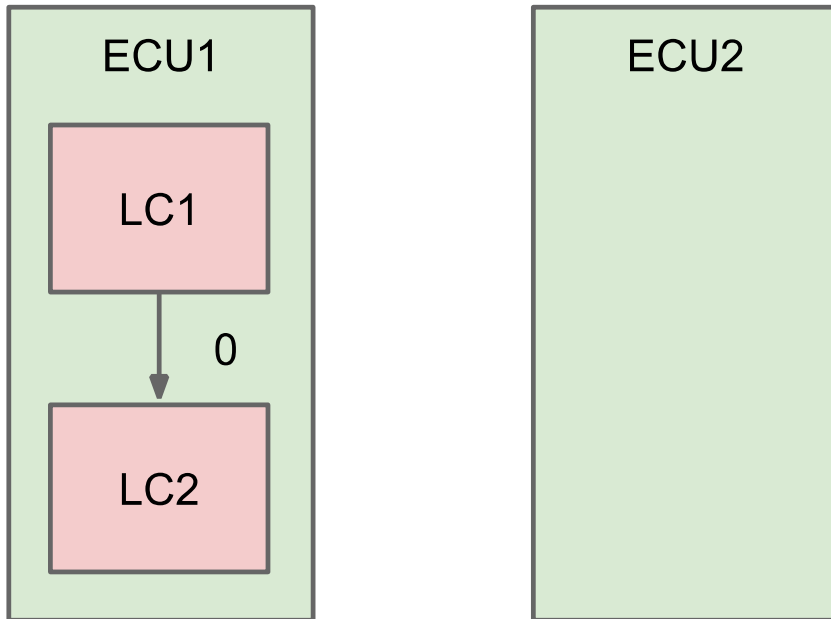
## Intended



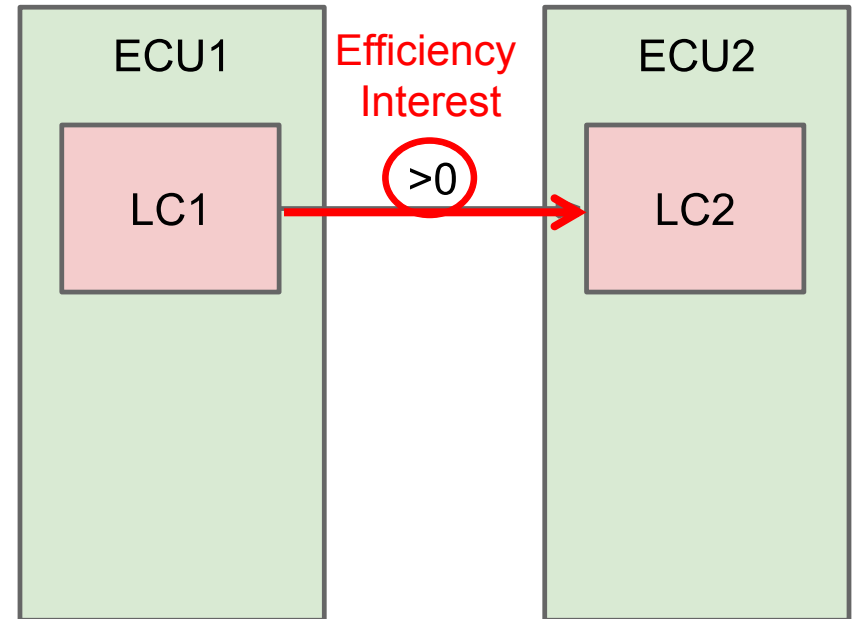
# INTEREST



## Intended



## Actual



# VISUALIZATION OF DEBT AND INTEREST





# CONSIDERATIONS AND QUESTIONS

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- Refactoring is not an option in Cars Manufacturing
  - Technical Debt prevented or learnt for next project
  - Analysis of the debt evolution in this project
  
- Is the high level or the detailed architecture that has debt?
  - Does it depend on the interest?
  - Who “owns” the debt? The developers or the architects? Who should fix/prevent it?
  
- What other factors should we consider as interest?
  - The impact (interest) is not only paid in “maintenance”
  - The interest should be considered altogether...
    - Need for integrating different data