ITEA3 Project: ACOSAR
Advanced Co-Simulation Open System Architecture

FMI User Meeting 2017

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Prague, 15/05/2017

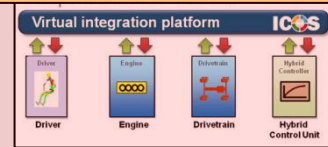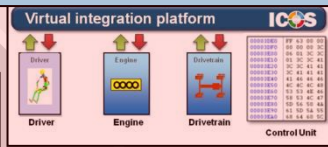# Rationale of the project …

Requirements
(Word, DOORS, …)

Simulation Model Interface is addressed by FMI

System modeling
Co-simulation configuration
(ICOS, SystemDesk, XML, …)

Hardware-in-the-loop (HiL)
Hardware validation

Software-in-the-loop (SiL)
Software validation

Model-in-the-loop (MiL)
System simulation

Module
Level

Component Level

Problem:
Efficient integration of RT-Systems?

- **Standardized**
- **Methodology**
- **Distributed**

Rationale of the project …

Requirements
(Word, DOORS, …)

Simulation Model Interface is addressed by FMI
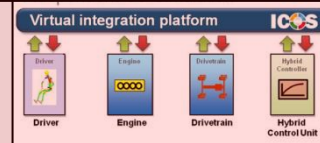
System modeling

Hardware-in-the-loop (HiL)

Differentiation to FMI and added value:
- **Distributed Co-Simulation** by integrating tools
- **Interactive Co-Simulation** without model export
- **Integration** of (multiple) **testbeds and simulations**
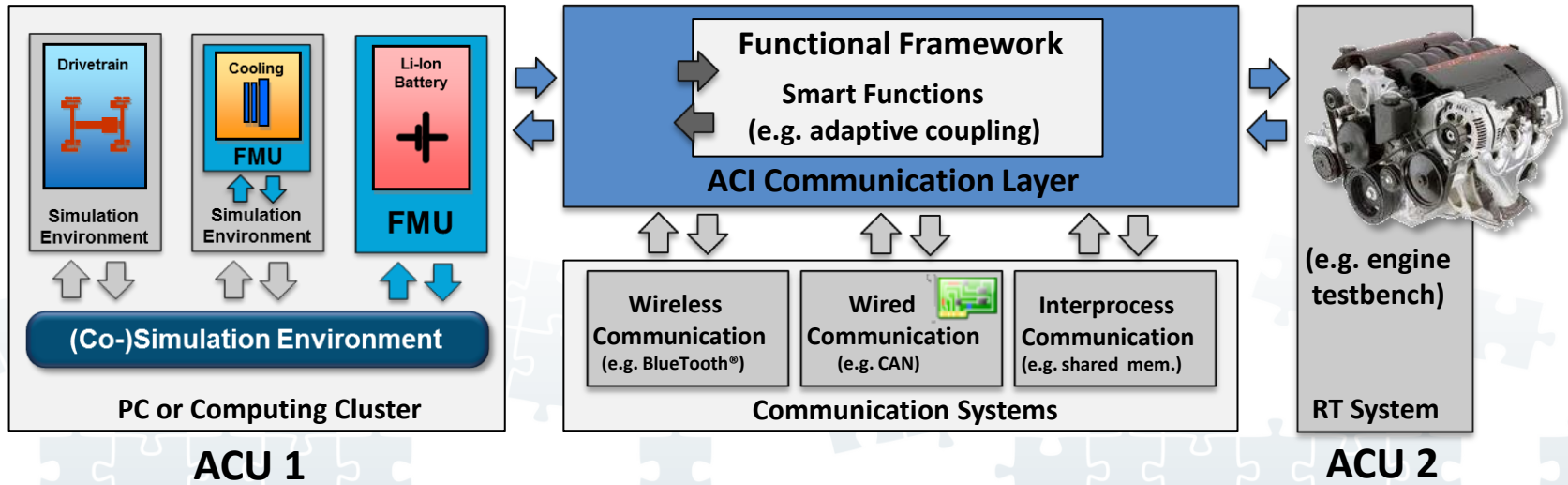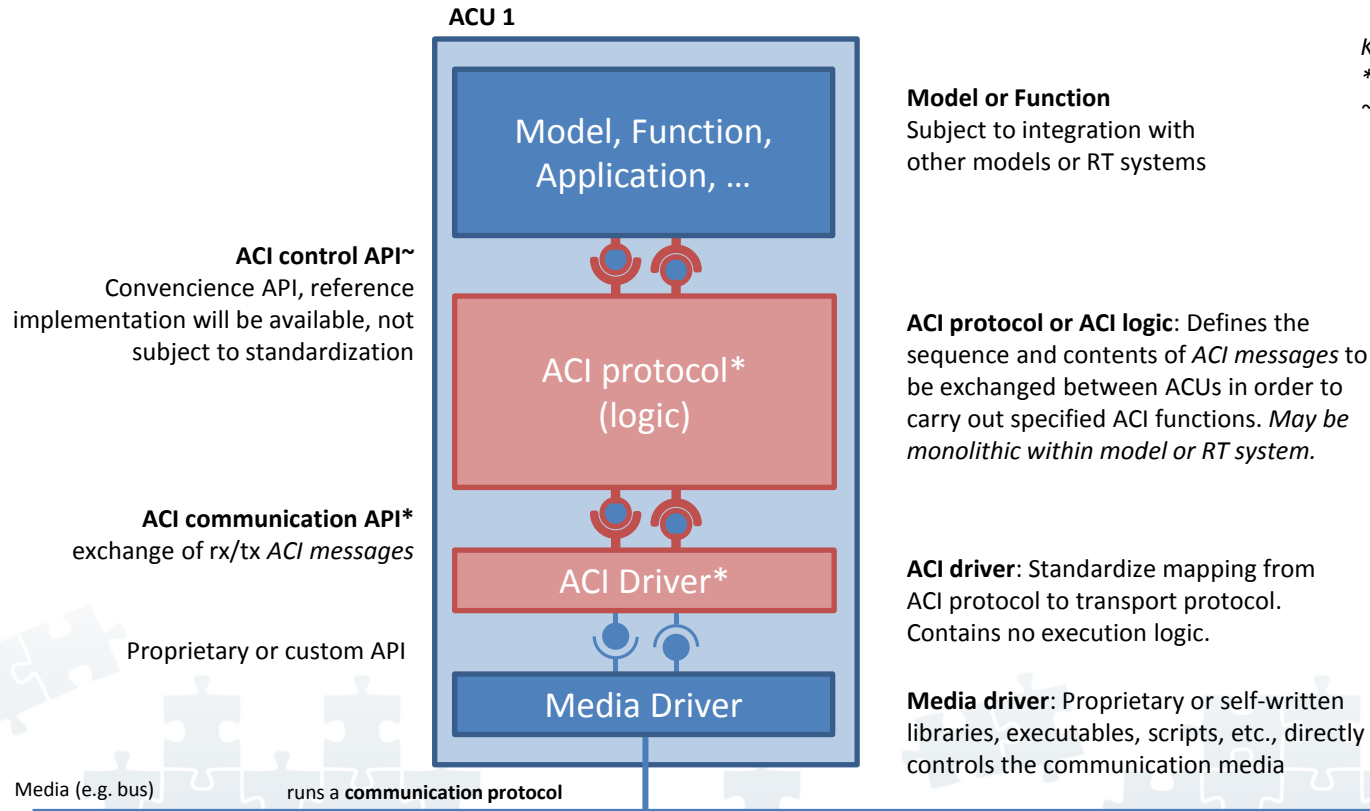
System simulation

Virtual integration platform   ICOS

| Driver | Engine | Drivetrain | Hybrid Controller |

Driver   Engine   Drivetrain   Hybrid Control Unit

Efficient integration of RT-Systems?
- **Standardized**
- **Methodology**
- **Distributed**

ACI Specification as Innovation

ACI integrates real-time systems and simulation environments

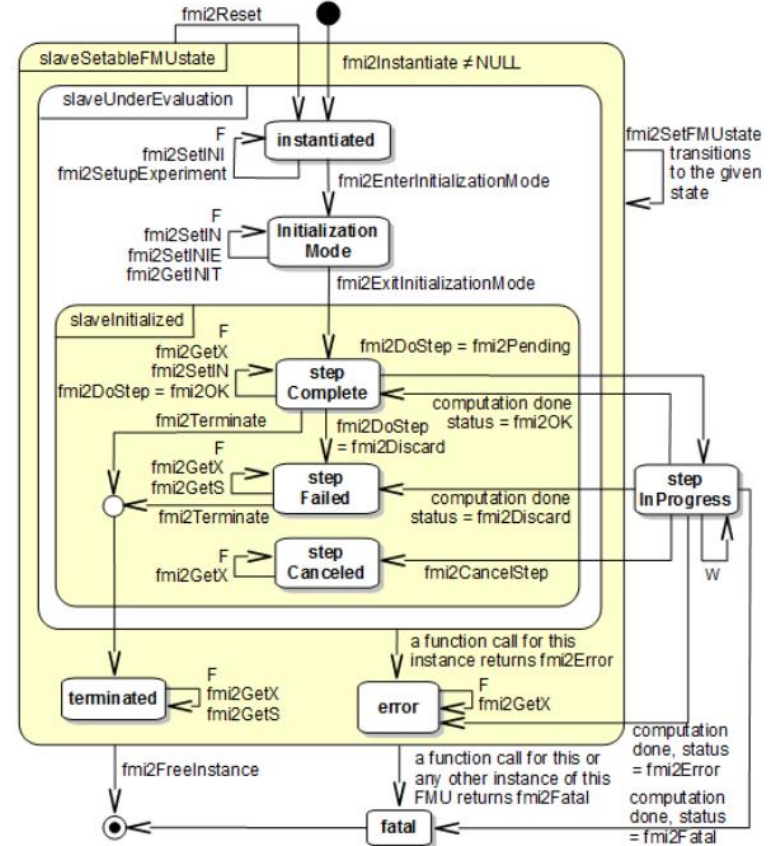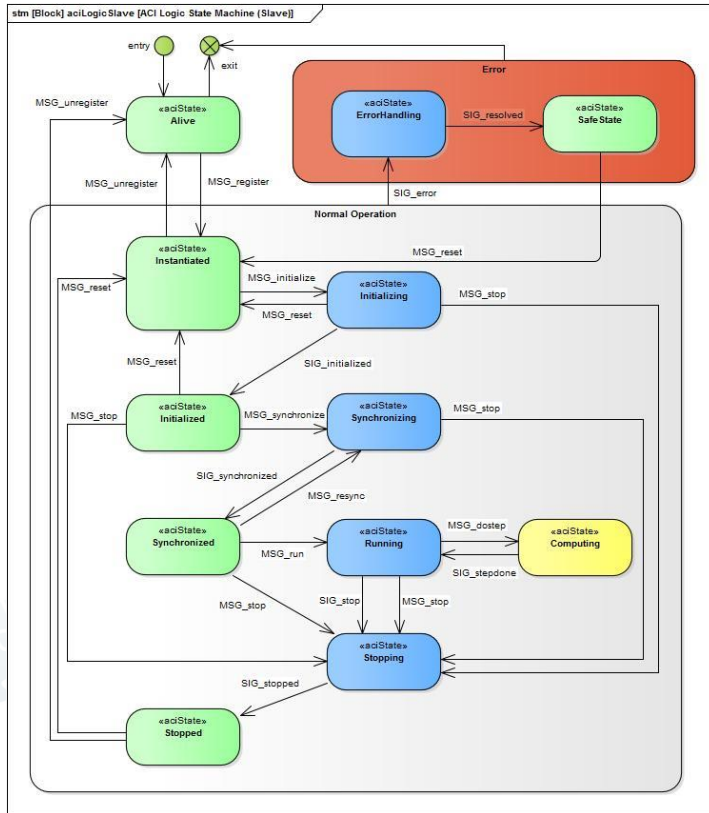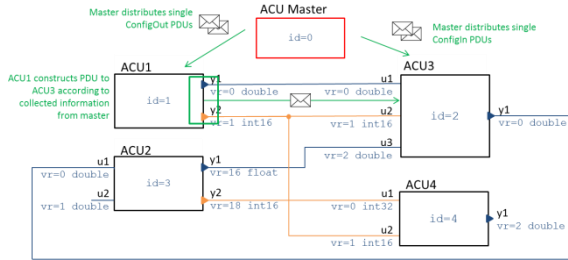*ACI … Advanced Co-Simulation Interface*

ACU … Advanced Co-Simulation Unit

ACI Architecture

ACU 1

Model, Function, Application, …

ACI protocol* (logic)

ACI Driver*

Media Driver

ACI control API~
Convencience API, reference implementation will be available, not subject to standardization

ACI communication API*
exchange of rx/tx *ACI messages*

Proprietary or custom API

Media (e.g. bus)   runs a **communication protocol**

Model or Function
Subject to integration with other models or RT systems

ACI protocol or ACI logic: Defines the sequence and contents of *ACI messages* to be exchanged between ACUs in order to carry out specified ACI functions. *May be monolithic within model or RT system.*

ACI driver: Standardize mapping from ACI protocol to transport protocol. Contains no execution logic.

Media driver: Proprietary or self-written libraries, executables, scripts, etc., directly controls the communication media

ACU 2

Key
* Subject to standardization
~ Specification but no standardization

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Source: FMI 2.0 Specification

The Status Quo …

Data Exchange

Communication Protocol
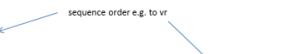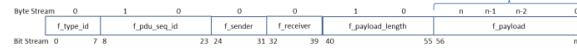
Proposal: Network Byte Order (BigEndian, tbd)

ACI Specification

State Machine
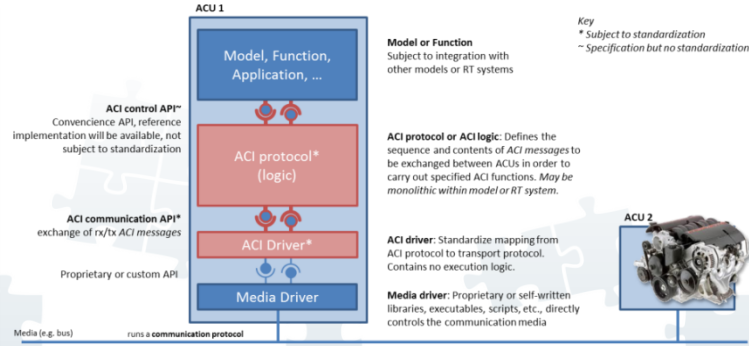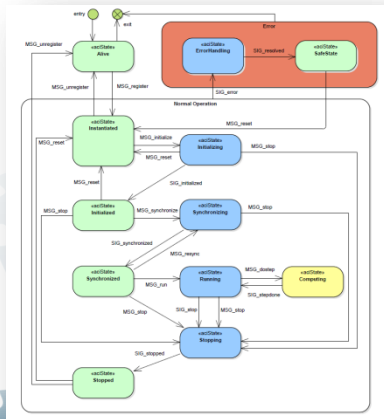
First Demonstrators
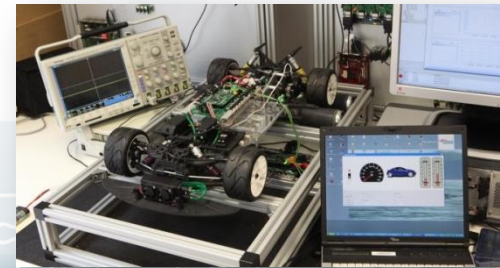
… a follow-up initiative called ACOSAR

- ITEA3 Project ACOSAR
  - **Advanced Co-simulation Open System ARchitecture**
  - Setting a global standard for integration of RT systems
- Motivation
  - Fast integration of RT Systems
  - Tool neutral standard for distributed co-simulation
- 9 Automotive Use-Cases
  - Test system integration
  - Distributed development

Facts

Framework:	ITEA3 (Call1)
Duration:	09/2015 – 08/2018
Overall Budget:	7.9 M€
Countries:	AT, DE, FR; 15 Partners
Coordinator:	VIRTUAL VEHICLE (AT)

www.acosar.eu

Community ...

www.acosar.eu

You are welcome to join

the ACOSAR initiative!

subscribe

Open Questions?

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