Seamless Life-Cycle Collaboration for Safety-Critical Systems Engineering

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Today’s situation at industrial companies

Tool Layer

- **Fragmented IT**
- **High maintenance costs**

Industrial Workflows

- **High manual effort** to handle data
- **Impact on quality and safety**

ARTEMIS Joint Undertaking
The tool-integration problem

- Point-to-point Integrations don’t scale
- Monocultures lock you in
- Creating new integrations is unpredictable
- Past choices restrict present action and future vision
- Maintenance, management, and change costs go up over time
- Ongoing and unexpected costs drain resources

Seamless Lifecycle Collaboration
The CRYSTAL Vision

Industrial Workflows

Enable New Engineering Methods

Open Integration Platform

Tool Layer

Users get better ways of working

• Standardized Interoperability Specification
• Connect tools to expose & link data
Standardize tool interaction, but not a tool’s capabilities!

- Separate data from tool functions
- Apply the Interoperability Specification (IOS) as the central standard
Automotive Example (Public Use Case)

- Customer Requirement
- System Requirement
- Functional Safety Requirement
- Safety Goal
- System Specification
- Functional Safety Concept
- Parameter Mapping
- Requirement Simulation Results
- File Import
- OSLC
- ReqIF
- AVL VeVaT/Magic
- AVL Model.Connect
- Test Case
- Simulation Results

Seamless Lifecycle Collaboration
Road to a Successful Platform

- Build on a technically sound foundation
  - CRYSTAL is based on successful principles like the Linked Data principles defined by the W3C (World Wide Web Consortium)

- Reach a critical mass
  - CRYSTAL motivated a large group of stakeholders to make initial investments in the technology (AIPP and external stakeholders)

- Ensure openness & stability
  - CRYSTAL actively supported the creation of eco-systems that creates and govern open standards (e.g. OSLC, FMI, ASAM ...) based on the developed specifications

- Facilitate uptake by new stakeholders
  - CRYSTAL provides tools to ease the adoption of the technology
  - CRYSTAL provides reference solutions
  - CRYSTAL builds up an developer community
CRYSTAL has the critical mass to generate impact

- **68 partners** from **10 countries**
- **€82M** budget
- **European key players (competitors)** from different industrial domains
- Large companies developing embedded systems act as **technology users** and case providers
- Large tool providers, SMEs and researchers as **technology providers**

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<th>Country</th>
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Project Outcomes

- **CRYSTAL Interoperability Specification (IOS)**
  - Open specification
  - Enables seamless integration of tools and full traceability across the product life cycle

- **CRYSTAL IOS compliant Implementations**
  - Engineering Tools
  - SDKs for developing IOS adaptors
  - Tools for specifying and instantiating a System Engineering Environment (platform builder)

- **CRYSTAL Use-Cases as reference scenarios**
  - Demonstrators with high level of maturity

- **CRYSTAL IOS Developer Community**
  - Moderated implemener forum
Market Innovation

- Reduced system development costs due to **smart integration** of tools
- **Increased flexibility** for OEMs
  - Avoidance of vendor-lock-in
- New **market opportunities** for tool providers
  - Facilitate innovation and market entry
  - Great opportunities for SMEs
- Ensure Europe’s leading edge position in development of **safety-critical cyber-physical systems**
Thank you for your attention!

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