Topic ICT 1 – 2014
"Smart Cyber-Physical Systems"
Overview of selected projects

CONNECT/A3

Complex Systems & Advanced Computing
Area Coverage

The area to be covered is **Cyber Physical Systems (CPS)**:

Embedded Systems (ES) that are connected and collaborating through the Internet of Things (IoT) and providing citizens and businesses with a wide range of innovative applications and services.

**Research and Innovation Actions (RIA)** are targeting:
- Modelling and integration frameworks
- Smart, cooperative and open CPS

**Innovation actions (IA)** are targeting:
- Towards platforms and ecosystems
- Towards a "Smart Everywhere Society"

**Support actions (CSA)** are targeting:
platform-building, structuring of constituencies and road-mapping, dissemination, collaboration agenda for pre-competitive research with the US and consensus building related to non-technical issues.
## Overview of selected projects

<table>
<thead>
<tr>
<th>Topic</th>
<th>Coverage</th>
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<tr>
<td><strong>ICT1.a RIA</strong>&lt;br&gt;Research &amp; Innovation Actions</td>
<td><strong>8 RIA projects</strong>&lt;br&gt;Good coverage in terms of technologies and use cases</td>
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<td><strong>ICT1.b IA</strong>&lt;br&gt;Innovation Actions</td>
<td><strong>4 IA projects</strong>&lt;br&gt;Both areas &quot;platforms&quot; and &quot;smart anything everywhere&quot; are well covered</td>
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<td><strong>ICT1.c CSA</strong>&lt;br&gt;Support Actions</td>
<td><strong>3 CSA projects</strong>&lt;br&gt;2 road-mapping projects (with USA)&lt;br&gt;1 community building project will organise a CPS conference</td>
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Portfolio of Research and Innovation Actions

• **8 projects on "Science of CPS-Integration":** Co-simulation/modelling of all of system levels including circuits, communication networks, firmware, operating system, system architecture and software layers

• **Vision:** entire design will be model-based to build cutting-edge cyber-physical systems (CPS)
  - Radically saving development cost and time
  - Reducing complexity
  - Making it easier for innovators to realise new systems

• Work is exemplified in a **broad range of use cases**

• The selected projects support more fundamental and longer term research issues than projects supported by ARTEMIS or targeted by ECSEL
Short description of the 8 selected RIA

**TAPPS: Trusted Apps for open CPS**
- **Area:** development of a platform for open CPS Apps with high security standards
- **Challenges:** extensibility, pervasive trusted environment
- **Use cases:** health (based on a smart trolley as a hub for monitoring devices from the patient’s room or hospital wards), automotive (control of electrical motorbike’s internals throughout an App)
- **Coordinator:** FORTISS GMBH
- **EU contribution:** € 3,885,484

**SAFURE: SAFety and secURity by design for interconnected mixed-critical cyber-physical systems**
- **Area:** safety and security by construction, for mixed-critical systems. Design and run-time
- **Challenges:** thermal aware scheduling, safe access to shared resources
- **Use cases:** automotive (low level), telecommunications
- **Coordinator:** TECHNIKON FORSCHUNGS UND PLANUNGSGESELLSCHAFT MBH
- **EU contribution:** € 5,231,375
Short description of the 8 selected RIA

**UnCoVerCPS:**
Unifying Control and Verification of Cyber-Physical Systems
- **Area:** modeling, verification, conformance testing, code generation, tool chain
- **Challenges:** integrated runtime control and verification
- **Use cases:** automotive (self driving cars), smart grids, wind turbines, manufacturing with robots
- **Coordinator:** TECHNISCHE UNIVERSITAET MUENCHEN
- **EU contribution:** € 4,932,902

**U-TEST:** Testing Cyber-Physical Systems under Uncertainty:
Systematic, Extensible, and Configurable Model-based and Search-based Testing Methodologies
- **Area:** building dependable CPS, testing for uncertainty
- **Challenges:** dealing with uncertainty in CPS
- **Use cases:** Sports (athlete health monitoring), Handling and logistics
- **Coordinator:** OSLO MEDTECH FORENING
- **EU contribution:** € 3,713,233.75
Short description of the 8 selected RIA

**AXIOM: Agile, eXtensible, fast I/O Module for the cyber-physical era**

- **Area:** HW/SW techniques to allow easy programmability of multi-core multi-board systems
- **Challenges:** convergence between HPC (high performance computing) and Embedded computing (EC)
- **Use cases:** smart video surveillance (coordination of multiple cameras towards a single event), smart living/home (new smart thermostat)
- **Coordinator:** UNIVERSITA' DEGLI STUDI DI SIENA
- **EU contribution:** € 3,945,937.50

**IMMORTAL: Integrated Modelling, Fault Management, Verification and Reliable Design Environment for Cyber-Physical Systems**

- **Area:** Reliable design and real time fault management in multi core CPS
- **Challenges:** Minimisation of verification efforts, speeding up fault detection, maintaining system stability with part of the resources failing
- **Use cases:** Aerospace (satellite control)
- **Coordinator:** TALLINNA TEHNIKAULIKOOL
- **EU contribution:** € 3,996,652.50
Short description of the 8 selected RIA

INTO-CPS: INtegrated TOol chain for model-based design of CPSs

- **Area**: Integrated tool chain for comprehensive model-based design of CPS.
- **Challenges**: support for co-model construction and co-simulation: model, software, hardware in the loop
- **Use cases**: automotive, agricultural, railway and building automation
- **Coordinator**: AARHUS UNIVERSITET
- **EU contribution**: € 7,956,804.25

COSSIM:
A Novel, Comprehensible, Ultra-Fast, Security-Aware CPS Simulator

- **Area**: open-source framework to simulate the networking and the processing parts of the CPS more accurate, faster and including security and CPS simulation
- **Challenges**: performance and accuracy of the simulation
- **Use cases**: smart Grids, visual search
- **Coordinator**: SYNELIXIS LYSEIS PLIROFORIKIS AUTOMATISMOU & TILEPIKOINONION MONOPROSOPI EPE
- **EU contribution**: € 2,882,030
### Overview RIA use cases

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<th>System</th>
<th>Aerospace</th>
<th>Automotive</th>
<th>Telecommunication</th>
<th>Health</th>
<th>Surveillance</th>
<th>Smart Buildings</th>
<th>Logistics</th>
<th>Smart grids</th>
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Portfolio of Innovation Actions

- Two projects address "Towards Platforms and Ecosystems":
  - EoT (Eyes of Things) that will develop an ultra-low power/low-cost vision platform
  - CP-Setis will harmonise technical work on the interoperability specifications (IOS) performed in relevant ARTEMIS, ECSEL and EU research and innovation projects.

- Two projects address "Towards a Smart Everywhere Society":
  CPSElabs and EuroCPS will both bootstrap a "network of design centres" which aims at bringing CPS technologies to SMEs and new sectors. SMEs are encouraged through open calls for third parties to do experiments with novel CPS technologies in new applications including in "low tech" sectors as well as emerging Smart X fields. While both cover large parts of the value chain, proposals are complementary and offer a high potential for collaboration to overcome current siloing: CPSElabs is very strong on cyber-physical systems and applications, whereas EuroCPS has a centre of gravity on microelectronics and microsystems for novel embedded and cyber-physical systems and the IoT.
Short description of the 4 selected IA

EUROCPSES: European Network of competencies and platforms for Enabling SME from any sector building Innovative CPS products to sustain demand for European manufacturing
• Challenges: boosting and initiating synergies between SMEs, major CPS-platforms and competency providers to capture the emerging markets of IoT products
• 3 Open calls: 30 industrial experiments initiated and led by SMEs.
• Coordinator: COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES
• EU contribution: € 8,186,834.01

CPSELABS: CPS Engineering Labs - expediting and accelerating the realization of cyber-physical systems
• Challenges: provide an open forum for sharing platforms, architectures and SW tools for the engineering of dependable and trustworthy CPS.
• 3 Open calls: 20 focussed and fast-track experiments
• Coordinator: FORTISS GMBH
• EU contribution: € 7,437,655.00
Short description of the 4 selected IA

**EOT: Eyes of Things**
- **Challenges:** build a ultra-low power and low cost vision platform
- **Use cases:** Surveillance, augmented reality/wearable, cloud computing, perceptual computing
- **Coordinator:** UNIVERSIDAD DE CASTILLA - LA MANCHA
- **EU contribution:** € 3,734,830.00

**CP-SETIS: Towards Cyber-Physical Systems Engineering Tools**
**Interoperability Standardisation**
- **Area:** International Open Standard for development tool
- **Challenges:** to conceive and set up a sustainable organizational structure as a platform joining all stakeholders to coordinate and harmonise all Interoperability Specification (IOS) related activities
- **Use cases:** automotive, aerospace, rail, health
- **Coordinator:** SafeTRANS e.V.
- **EU contribution:** € 698,895.00
Portfolio of Coordination and Support Actions

- The selected Coordination and Support Actions focus on:
  - Developing technology, application and innovation strategy roadmaps for CPS to serve as a catalyst for early adoption of CPS technologies
  - International (EU-US) collaboration on the foundations of modelling and simulation for Cyber-Physical Systems
Short description of the 3 selected CSA

Raod2CPS: Strategic action for future CPS through roadmaps, impact multiplication and constituency building

- **Challenges:** Developing technology, application and innovation strategy roadmaps for CPS to serve as a catalyst for early adoption of CPS technologies. Impact multiplication. Constituency building.
- **Coordinator:** STEINBEIS INNOVATION GGMBH
- **EU contribution:** €832,893.50

TAMS4CPS:
Trans-Atlantic Modelling and Simulation For Cyber-Physical Systems

- **Challenges:** to lay the foundations for concrete EU-US collaboration in modelling and simulation for cyber-physical systems.
- **Coordinator:** LOUGHBOROUGH UNIVERSITY
- **EU contribution:** €399,649.75
Short description of the 3 selected CSA

**CPS-SUMMIT: Towards Cyber-Physical Systems Engineering Tools Interoperability Standardisation**

- **Challenges:** to facilitate and to create an enduring and sustainable collaboration campaign on CPS research and development between Europe and the US
- **Coordinator:** FORTISS GMBH
- **EU contribution:** €181,250.00