Road2CPS

Strategic action for future CPS through roadmaps, impact multiplication and constituency building
Road2CPS

Results from a Strategic Roadmap in Cyber-Physical Systems

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Road2CPS in a nutshell

- **Road2CPS**: Strategic action for future CPS through roadmaps, impact multiplication and constituency building

- Support Action, co-financed by the EC - H2020 - ICT 1-2014: Smart Cyber-Physical Systems

- 7 Partners from 4 European countries

- Coordinator: Steinbeis-Europa-Zentrum, Germany, Dr. Meike Reimann
  EC Project Officer: Dr. Werner Steinhögl

- Project duration: February 2015 - January 2017, 24 months

- Total EC contribution: EUR 832,894

- GA No.: 644164

- Web: www.road2cps.eu

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<tr>
<th>Steinbeis-Europa-Zentrum Germany (Coordinator)</th>
<th>Loughborough University United Kingdom</th>
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<td>Newcastle University United Kingdom</td>
<td>Commissariat à l'énergie atomique et aux énergies alternatives France</td>
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<td>Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Germany</td>
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<td>AnySolution S.L. Spain</td>
<td>ATOS Spain SA Spain</td>
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Cyber-Physical Systems

- The term Cyber-Physical System (CPS) describes **hardware-software systems** which tightly **couple the physical world and the virtual world**
- CPS are ‘**Embedded Intelligent ICT Systems**’ that make products smarter, more interconnected, interdependent, collaborative and autonomous (ARTEMIS – SRA 2016)
- In the future world of CPS, a huge number of **devices connected to the physical world** will be able to **exchange data** with each other, access web services, and **interact with people** (EC)
- In future information systems will **sense, monitor and even control** the physical world via Cyber-Physical Systems and the Internet of Things (HiPEAC Vision 2015)
## Road2CPS - Aims and Objectives

### Impact Analysis & Dissemination
- Impact analysis
- Gap analysis
- Identify exploitation & business opportunities
- Disseminate programme achievements
- Raise awareness of CPS

### Roadmapping & Recommendations
- CPS roadmap
- Case studies
- Recommendations for future research priorities and innovation strategies

### Community Building & Task forces
- Build CPS community
- Bring key players together: across domains, along the value chain, industry and academia
- Task forces
- Clustering events

To collect expert opinions of a broad community to give recommendations to the EC
Road2CPS – Key Outputs

- Impact assessment & gap analysis
- Custom made *project analysis tool*
- Catalogue of *programme achievements* (ICT-1)
- CPS *case studies* e-book targeted at SMEs
- CPS *technology, application and strategy roadmap*
- Recommendations for *research priorities, innovation strategies and business opportunities*
- Workshops, clustering *events* & associated reports
- Final publication
Road2CPS - Approach

- Road2CPS is designed to gather opinions and perspectives from a wide experts community, to analyse them and give recommendations to the European Commission and overall community.

- Road2CPS specifically provides recommendations in the field of Cyber-Physical Systems and for 'Digitizing Europe'.
The Road2CPS Way....

Road2CPS - Strategic action for future CPS through roadmaps, impact multiplication and constituency building
TRENDS, NECESSITIES, BARRIERS
Trends

Megatrends

- Demographic change
- Climate change
- Urbanisation
- Globalisation
- Crisis...

(Mega) trends related to CPS, IoT & FoF

- Digitisation of economy & increasing connectivity
- Rise of the individual, personalisation, customisation
- Sustainability, green thinking, circular economy (sharing global responsibility)
- Knowledge as a key enabler (global knowledge society)
- ...towards a smarter, hyper-connected world
Emerging Trends & Vision Statements

- **IT addicts**, dependence of society on IT systems, vulnerability
- **Openness**, open data, open innovation
- **Business models** decoupled from ownership, servitisation, data driven economy, crowd funding, blockchain
- **Political crisis**, international conflicts, migration, destabilisation, change
- **T-shape education**, life-long learning, digital divide
Emerging Trends & Vision Statements

- **Intuitive systems**, human machine collaboration, humanoid robots
- Wearable systems, implantable, decision support
- **Neurocognitive systems**, brain inspired computing
- **Secure, legal & ethical** by design CPS
Customers involvement in collaboratively / co-designed products will increase massively

Open, modular platforms will boost involvement of SMEs

Ad hoc collaboration in virtual factories will lead to new business models, radically new services based on data will emerge

Innovative entrepreneurs as well as suitable (legal) frameworks are urgently needed
Manufacturing ecosystems: interoperability “from network to community-driven networks”

Picture: Fraunhofer IPA
Needs from Application Domains

Common requirements to be addressed for a better market adoption of CPS technologies:

- **Regulatory frameworks** for the different domains
- **(Re)skill people** and attract talent to the EU
- **Open solutions** and **standards** to enhance interoperability and facilitate the integration of SMEs and innovators into the **ecosystem**
- Adress **security and privacy** issues providing technological tools and legal frameworks
- Fostering new **business models** and a culture of innovation and entrepreneurship
- **Demonstrations, test beds** and **success stories**
Barriers

- Concerns regarding **security, safety and privacy**
- Lack of **interoperability**, standards and reference architectures
- High **implementation costs**: Cost is too high to be adapted broadly by SMEs
- Unclear economic benefits, concerns regarding multiple ownership, missing **business model** development
- **Conservativism** of decision makers, resistance to change, risk aversion
- **Social acceptance** of pervasive IT systems
RECOMMENDATIONS FOR RESEARCH PRIORITIES AND INNOVATION STRATEGIES
Technological Priority Themes

- Seamless **integration** of systems and components
- Interoperability, standardisation, **reference architectures** and tools
- Open (vertical and horizontal technology) **platforms**
- Acquisition and use of **(big) data in real time** & handling of **complexity**
- Visualisation, virtualisation, situational awareness, **decision support**
- **Modelling** and **simulation**
- Ubiquitous **autonomy**, AI, cognitive CPS
- **HMI**, Human and machine **awareness**
- **Safety**, reliability, resilience
- **Security**, **privacy**, trust
- **SoS**, distributed MGT and emergence
- **CPS Engineering** (requirements, design)
- **CPS Science**
Non-Technology Priority Themes

- Education, Training, Skills
- Business Models
- Regulation, Legal Issues, DSM
- Open Data, Open Innovation
- Community Building, Networks
- Collaboration (across domains; value chains; regional/national/EU/global)
- Demonstrators, Test Beds
- Human in the Loop
- Societal Dialogue, Awareness
- Ethics
Recommendations for Innovation Strategies
Facilitation of Business and Ecosystems

- Invest not only on the supply side, but on the demand side
- Collaboration between all stakeholders is needed from the beginning for balanced decision-making
- Citizen engagement is needed as a result of the impact of new technologies (ex. wearables) where privacy could be breached
- Don’t over-regulate and adapt to the evolution of the markets in an agile way
- Promote “real” DSM (standard data models, APIs) to allow SMEs to scale
- Openness should be promoted not only in theory to new business models, even if they disrupt existing business and require hard work by regulators
- Harmonise ICT-related regulation, and sector-specific regulatory environments (free flow of data, data ownership and legal frameworks (e.g. liability
- Coordinate skills development efforts and engage digital innovation hubs
Recommendations for future funding strategies

- Invest in **Research Priorities**
- Fund **platforms** (organisational, technological, operational, customer,..) and reference architectures & tools (interoperability / standardisation)
- Facilitate funding to **SMEs** & inclusion of **start-ups** (Digital Innovation Hubs)
- Support **innovation take-up** action & accelerate **ecosystem** development, **de-fragmentation** & cross-fertilization
- Fund **demonstration**, test beds, show cases, (large scale) pilots, living labs
- Fund **CSAs, NoE, competence centres, DIHs, task forces, working groups**
- Raise **awareness**, promote societal **dialogue**
- Invest in training and **education**
Outlook...
Creating the CPS Vision, Strategy, Technology Building Blocks and Supporting Ecosystem for Future CPS Platforms


www.Platforms4CPS.eu
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Platforms4CPS in a nutshell

Platforms4CPS:
Creating the CPS Vision, Strategy, Technology Building Blocks and Supporting Ecosystem for Future CPS Platforms

Coordination and Support Action, co-financed by the EC - H2020 - ICT 1-2016: Smart Cyber-Physical Systems

7 Partners from 4 European countries

Coordinator: THALES Research & Technology, France, Dr. Charles Robinson
EC Project Officer: Dr. Werner Steinhögl

Project duration: November 2016 - October 2018, 24 months

Total EC contribution: EUR 998,900,00

GA No.: 731599

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Contact and Material

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www.road2CPS.eu
Thank you!