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Project Results

TIoCPS

Bringing digital trust for cyber-physical systems

The ITEA project TIoCPS (Trustworthy and Smart Communities of Cyber-Physical Systems) has developed tools and methods for enabling digital trust and smart communities for cyber-physical systems (CPS). This will open up new innovation possibilities, products and services that are predicted to boost the business of companies in relation to CPS.

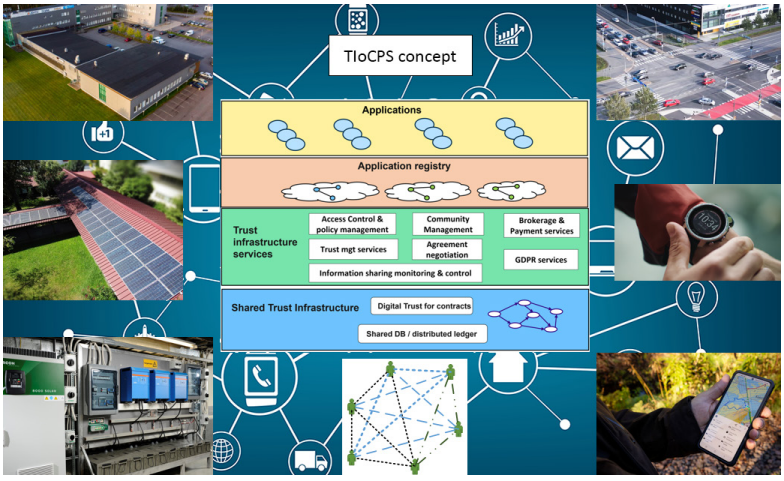
Information sharing between people, service systems and physical devices could lead to a variety of innovation possibilities for businesses that work with CPS, such as better application of energy-sensitive building resources to enable flexibility or new services based on wireless devices. However, a lack of digital trust seems to have prevented their establishment. Challenges include the smart use of exposed data and devices, the management of communities and the control of access rights, including in relation to the GDPR.

To enable novel solutions for industrial CPS, the TIoCPS project has focused on R&D on the TIoCPS concept for digital trust and on achieving a set of key enablers for this. Six novel enablers have been realised: (1) offline data sharing, (2) offline authentication, (3) access control/delegation, (4) energy community applications, (5) trust infrastructure and (6) AI-based optimisation. These have been successfully demonstrated in use-cases related to energy, buildings and mobility. It is expected that the key enabling solutions provided for digital trust can facilitate new products and services in a wide range of domains. Through the exploitation and further development of methods and tools for digital trust, the project has therefore helped to lay the technical foundation for the concept of smart, trustworthy communities for CPS systems.

Technology applied

The solutions for digital trust, which enable the secure sharing of CPS data/information, offer a number of benefits and impacts for industrial companies in the energy, buildings and mobility-related domains. In the energy use-case, a flexibility aggregation platform is now able to combine the flexibility potentials of the energy-sensitive resources of multiple buildings and trade them in an aggregated form on the energy flexibility markets. Such trade is then used to control the energy consumption in the buildings so that the energy demand can be lowered during the peak hours of a day. This can create significant cost benefits to be shared with the stakeholders involved. The buildings use-case, meanwhile, utilises building information modelling (BIM) as a semantic model for CPS, enabling smart energy management around heating, ventilation and air conditioning (HVAC). The control of this relies on innovative fuzzy inference/machine learning and a data inspection tool, allowing critical data to be encrypted where it is produced and securely transmitted to endpoints.

In the mobility use-case, new solutions have been developed for the optimisation of embedded products and safety on the move. To this end, the project's work on hunting safety is able to lower the risk of hunters accidentally killing people as they pick berries or cycle in the forest. This is enabled through the application of long-range Bluetooth Low Energy (BLE) to exchange presence and location information between devices. Finally, the mobile traffic use-case has created trajectory control as a service in which multiple traffic cameras can be applied by the municipality or police department for traffic follow-up and speed ticketing.



The TIoCPS conceptual solutions offer benefits for industrial companies to make impacts in their businesses in energy, buildings and mobility related domains.

Making the difference

The concrete results of TIoCPS are numerous, including 22 new products, 17 new solutions and six new systems. Bittium, for instance, has developed proxy server technology with access delegation tokens that can increase their

competitiveness via new use-cases, such as temporary access to buildings for maintenance workers. Similarly, trajectory control as a service allows Macq to now cover the complete value chain from camera to administration, providing a recurrent source of income from installation, maintenance and operation. In addition to new products and services, partners have been able to boost their existing solutions: Tracker, for example, has increased the active battery life of their animal tracking device from 10 to 40 hours, while Enerim has further developed the flexibility aggregation platform to enable third-party integrations. Following the purchase of Enerim's wholesale division by Volue, the technology for flexibility aggregation and market integration will be merged with their business to further accelerate profitable growth.

The TIoCPS concept for trustworthy communities for CPS systems still has space for further R&D and leaves the market ripe for exploitation. However, the project has targeted an essential disruption of society as a whole. In the face of rising cyber-threats, solutions for greater digital trust in CPS are crucial to the digital safety of both businesses and citizens – the latter of which can also benefit from the physical safety innovations. Sustainability has also played a significant role in the project, which enables smarter use of energy systems by flexibly and cost-effectively controlling energy consumption to avoid waste. Some of these benefits will be further explored in a proposed follow-up project on secure situational awareness for critical CPS. TIoCPS therefore represents an important step on the road to making CPS communities a reality in which involved stakeholders have trusted control over their data.

Major project outcomes

Dissemination

- 11 publications and conference presentations (e.g. EEEIC/I&CPS Europe, Energies journal, SMC, Energy reports journal) and 14 reported other disseminations.

Exploitation (so far)

22 new products, e.g.:

- Cyber Physical security platform and secure IoT gateway.
- Energy efficiency platform, energy management monitoring platform and energy community management software.
- Outdoor sporter person safety prototype devices, product platform for multi-sport watches and small dog tracking device platform.
- Offline authentication solution, secure data sharing solution and edge computing solution.

17 new services, e.g.:

- Participation in energy demand flexibility and energy consumption/condition reporting.
- Flexibility aggregation platform.
- Utilisation of open data in BMS systems and presentation of BMS data to users.
- Anomaly detection and alerting.
- IDS connector service.
- Portal for building automation and control room service.
- Hunting related data source and communication service.
- Person safety for several applications and animal safety service (dogs, reindeers).

6 new systems, e.g.:

- Energy management solution for energy communities.
- GDPR independent pilot environment for apartment automation.
- Experimental trust infrastructure for energy flexibility.
- Smart contracts system for data sharing.
- Delegatable access control mechanism.

Standardisation & Patents

- 5 contributions to standardisation or open source solutions, e.g. Get Phy support and Scan BLE long range scanning for flutter plugin (Google flutter).
- 2 patent applications filed.

ITEA is the Eureka R&D&I Cluster on software innovation, enabling a large international community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. ITEA is part of the Eureka Clusters Programme (ECP).

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TIoCPS

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Partners

Belgium

- Macq
- Sirris

Finland

- Bittium Safemove Oy
- Elvak Oy
- Enerim
- Optima Solutions Oy
- Polar Electro Oy
- Tracker Oy
- VTT Technical Research Centre of Finland Ltd.

Portugal

- Digitalmente, Novas Tecnologias Comunicação, Lda
- Instituto Superior de Engenharia do Porto (ISEP) - GECAD

Türkiye

- Acd Bilgi Islem ltd.sti.
- Alpata Technology
- ERARGE
- Inovasyon Muhendislik

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July 2020

Project end

October 2023

Project leader

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