Road2CPS Roadmapping Workshop

Energy and Transport

Short Domain Presentation

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Smart Energy

- Key sector: 20% is electric, **energy mix** ahead (CO2 reduction commit.)
- Infrastructures and business models in large **mutation**

- Asymmetrical and centralized network **no longer adequate**
- **New landscape**: distributed small/med. size renewable energy sources
- Need for more reliable short-term **balancing** of supply and demand
- **Storage** means, low-volume energy buffers
- Shift from a supply- to a demand-side management of the grid

- **CPS benefits**: support cross-organizational processes (including individual households and communal distributors) which are key to scale systems to support self-adaption to load-changes
- **Challenges in Europe**: storage, interoperability and standards, regulatory prerequisites; interdependency with transport and production
Smart Mobility

- Key sector: 5% GDP, 10M employees, decisive for citizen lives
- Infrastructure of growing complexity in-par with US/China

- Need for tight interconnection between services, inter-modal transport
- Smart logistics (switch: provision of vehicles -> mobility as service)
- Demand for automated forms of transport (goods, passengers)
- Societal demand for safety and environment friendlier transportation

- CPS benefits: support the scenario of automated control and coordination, enabling cooperative logistic processes across individual vehicles or even organizations; optimization enabler
- Challenges in Europe: safety, autonomy, legal conditions, cross-border issues, maintenance of railways/roads/signs infrastructures
Domains in a nutshell

- Smart transportation: ever increasing demand for individual transport of goods and people in a sustainable and safe way: mobility as a service
- Smart energy: decentralized and cooperative coordination of the electrical grid, facilitating stable integration of renewable energy resources, and enabling new, sustainable added-value services for operators and end customers

CPS enable to control and coordinate physical and organizational processes on a local and a global scale via the use of information and communication technology.
CPS benefits in a nutshell

- Complexity is caused by the need to simultaneously address the often contradicting requirements of physical and organizational as well as local and global processes.

- **smart traffic systems** encompassing the velocity control and distance measurement in the individual vehicle up to the traffic management of a large-scale telematic system

- **smart energy systems** encompassing the monitoring and control of a single household device or photovoltaic installation up to the trading of production and consumption volumes of complete regions at the spot market

- Additional dimensions: liveness (online reconfiguration, migration, evolution), self-X (optimization, healing)