E.ON Energy Research Center

ICT for Energy

A European Approach

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Outline

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- Introduction to ACS
- FI-PPP approach
- FINSENY – Future Internet for Smart ENergY
- FINESCE – Future INternEt Smart Utility ServiCEs
- Conclusion

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Automation of Complex Power Systems (ACS)

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Prof. Dr. Antonello Monti

- High-level integration of real-time communication systems in energy networks
- Distribution level automation
- Home energy systems and city quarters
- Agent based control for power systems
- Uncertainty simulation and control
- Multi-physics power hardware in the loop

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The RT Simulation Lab

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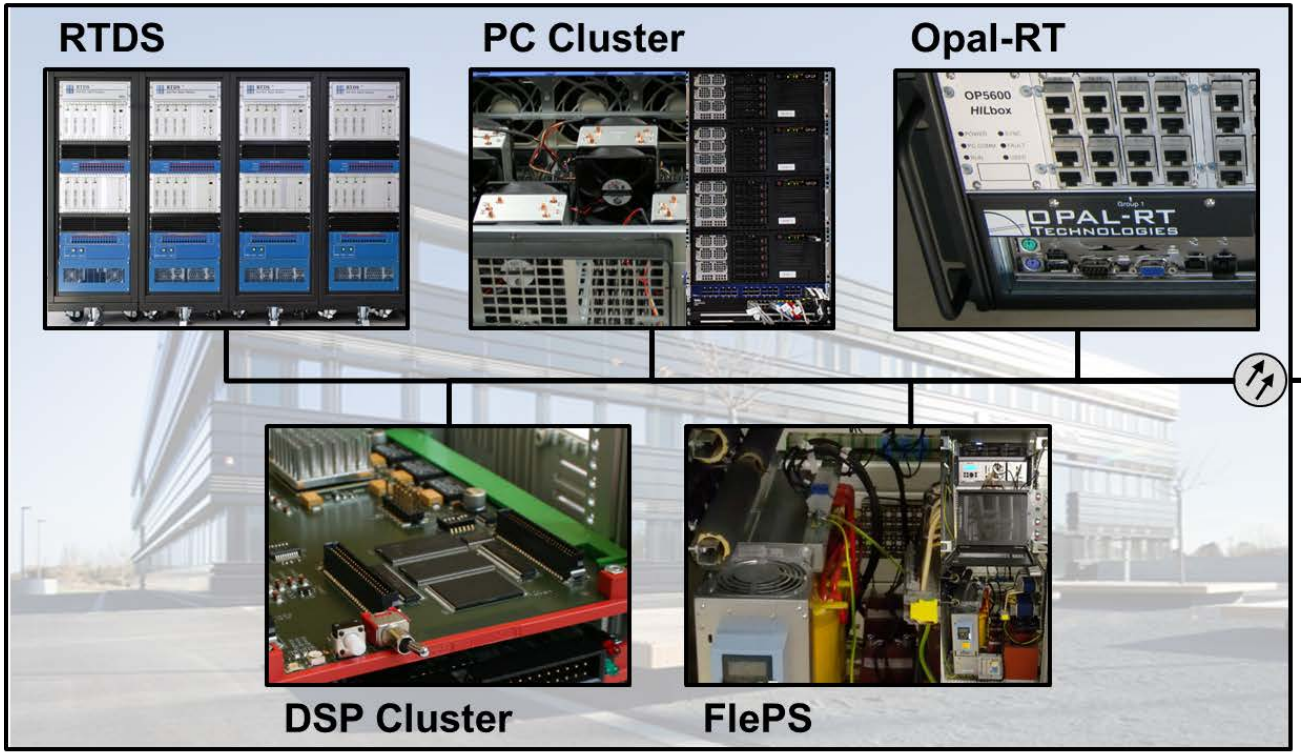
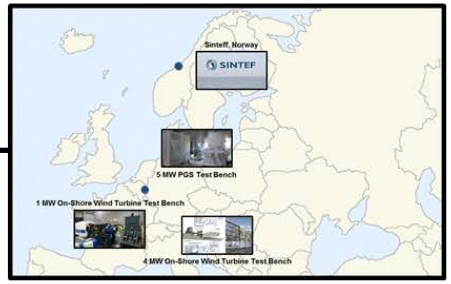


External Testing facility



Multi-Energy Approach to Neighborhood Systems

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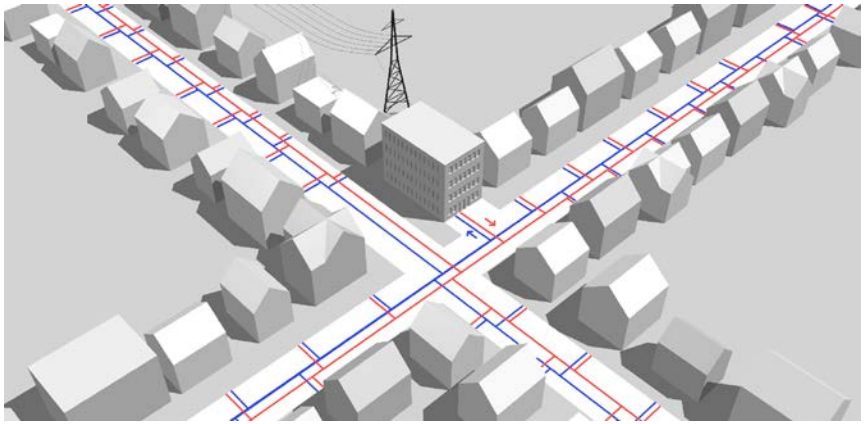
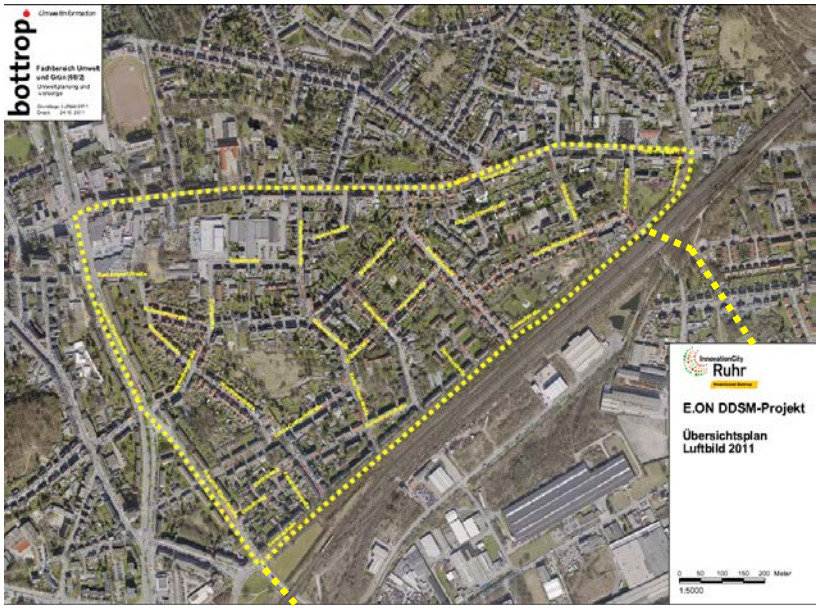
- Development of new concepts for local control of low voltage grid
- Integration of different grids: electrical, gas, heating
- Detailed simulation of city-quarters to check the proposed solution
- Development of plans for large on-field deployment of control concepts
- Example projects:
  - 2DSM
  - Welheimer Mark (BMWi)
  - FP7 Cooperate





Active Distribution Networks

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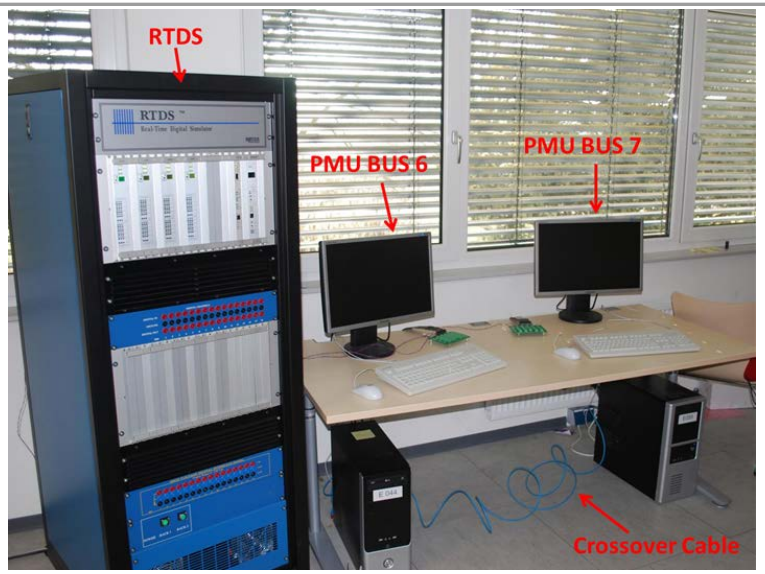
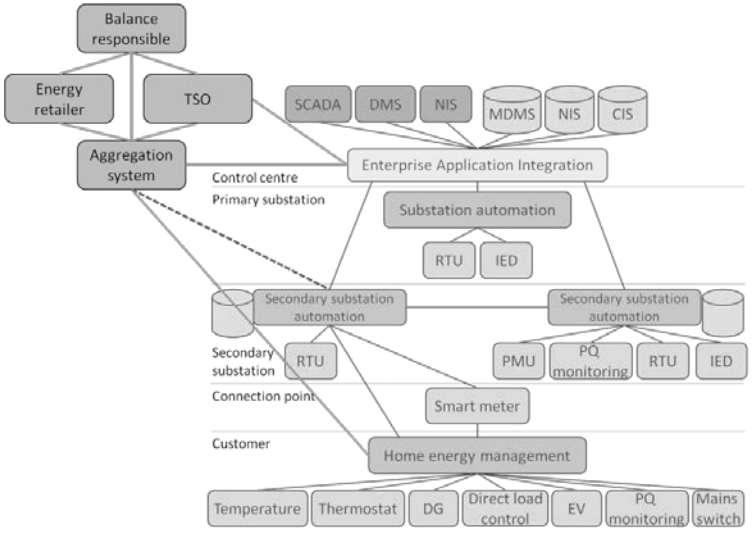
- Overall architecture definition for automation in Active Distribution Network
- Advanced approaches to grid monitoring (PMU 2.0)
- Significant field trials in real distribution network as part of the effort
- Involvement in the EEGI (Electrical Energy Grid Initiative of the EC)
- Example projects
  - FP7 IDE4L
  - FP7 GEYSER





Advanced ICT for Energy: Future Internet

- Collaboration among the most relevant players in Europe in the field of Energy and Communication as part of the Future Internet PPP
- Definition of the architecture of the Future Internet to support the business sector energy
- Field trial implementation across Europe on the way
- Example Projects:
  - FP7 FINSENY
  - FP7 FINESCE

FINESCE

Future Internet Smart Utility Services

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Can the Internet be useful for Smart Energy?

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- The Internet provides
  - A cost-efficient information and communication infrastructure with outstanding scalability and economy of scale
  - Well-proven Internet technologies (e.g. TCP/IP protocol suite) for re-use in private networks
  - Openness to new service providers and business models
- Limitations of today's Internet technology
  - No guaranteed high priority
  - Internet could introduce security gaps
  - Internet technology does not fulfil the short and deterministic latency requirements (e.g. for tele-protections)
- BUT the Internet is evolving fast, often at exponential rates, and adapting itself to users' demands

Critical features for Smart Energy

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Reliability	Minimal interruptions to supply at all customer levels
Safety	All members of society will be protected from dangerous occurrences
Security	Ensure compliance in the use of information and protect the network from unwanted intrusions whether physical or cyber systems
Adaptability	Be capable of operation with a wide mix of different energy sources and be self-healing through decision-making on a local level
Utilisation	Improved utilisation of assets through monitoring and control
Intelligence	The gathering and management of information relating to customers and assets throughout the network and using such information to deliver the features above

Basic idea of the FI-PPP (Future Internet Public-Private-Partnership)

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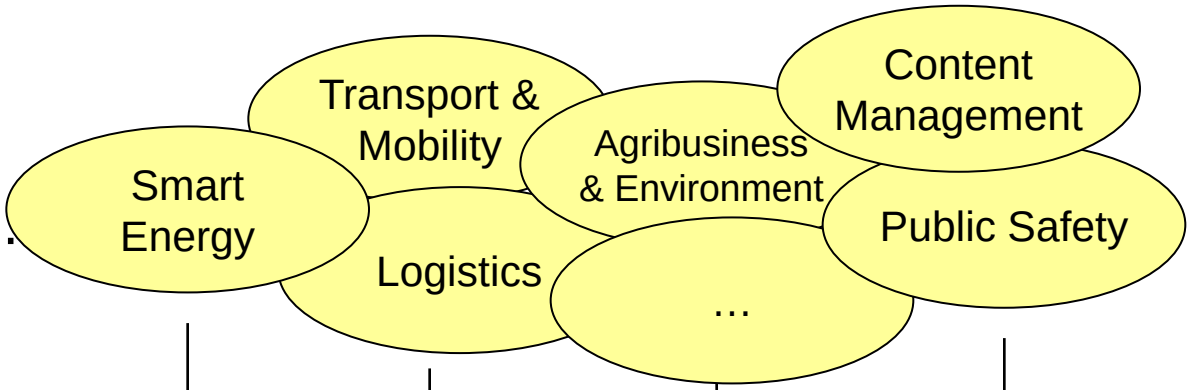
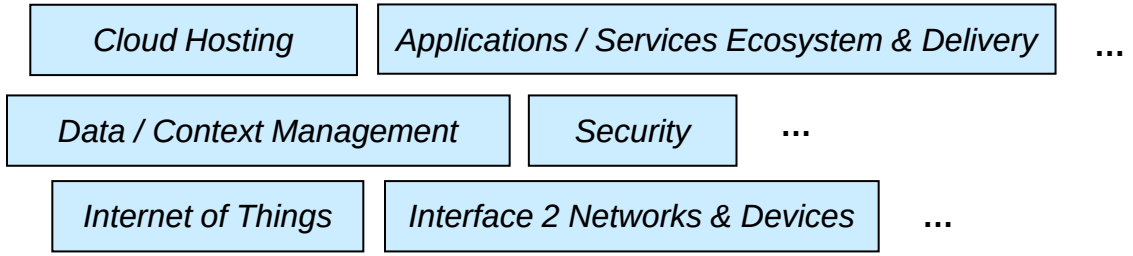
Usage Areas like …



… require today or in future …



… which should be provided in a generic way by the Future Internet

FI-PPP Programme

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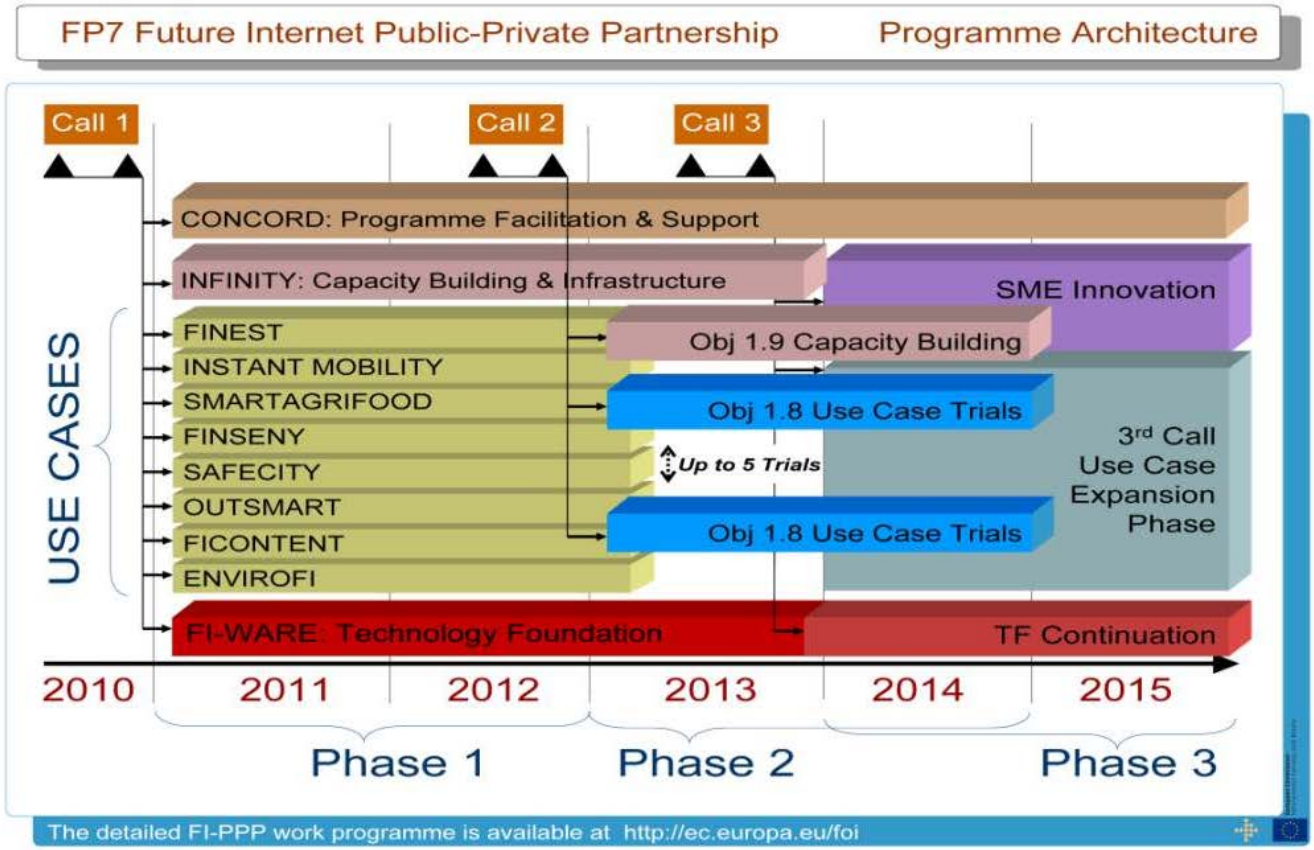
Identification of the requirements for each usage area

Generalization of requirements

Implementation of generic requirements as core platform



Deploy domain-specific applications on core platform

Large-scale testing

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FINSENY Scenarios

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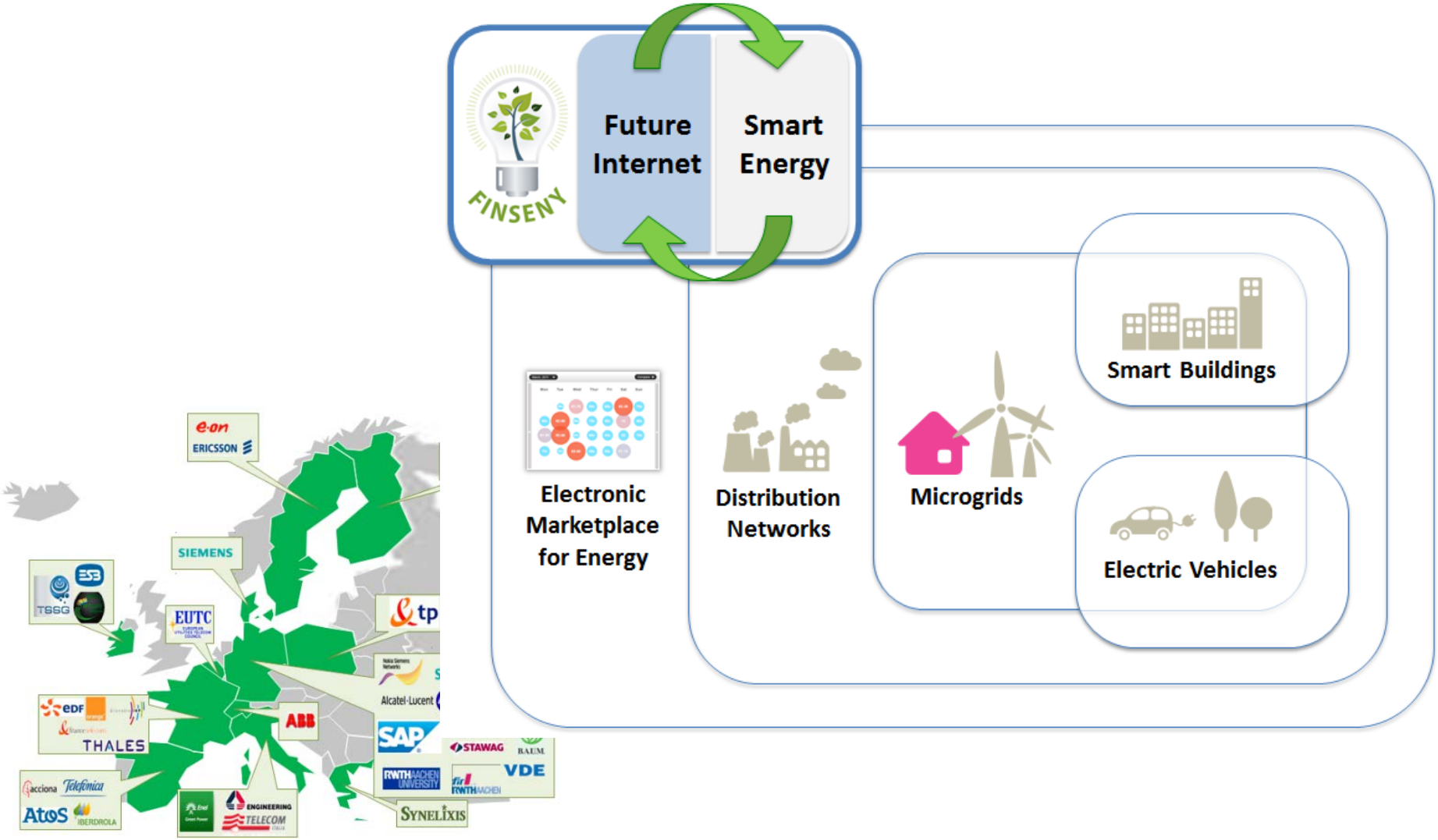

Illustration by FINSENY movie

FINSENY‘s 4-Step Approach

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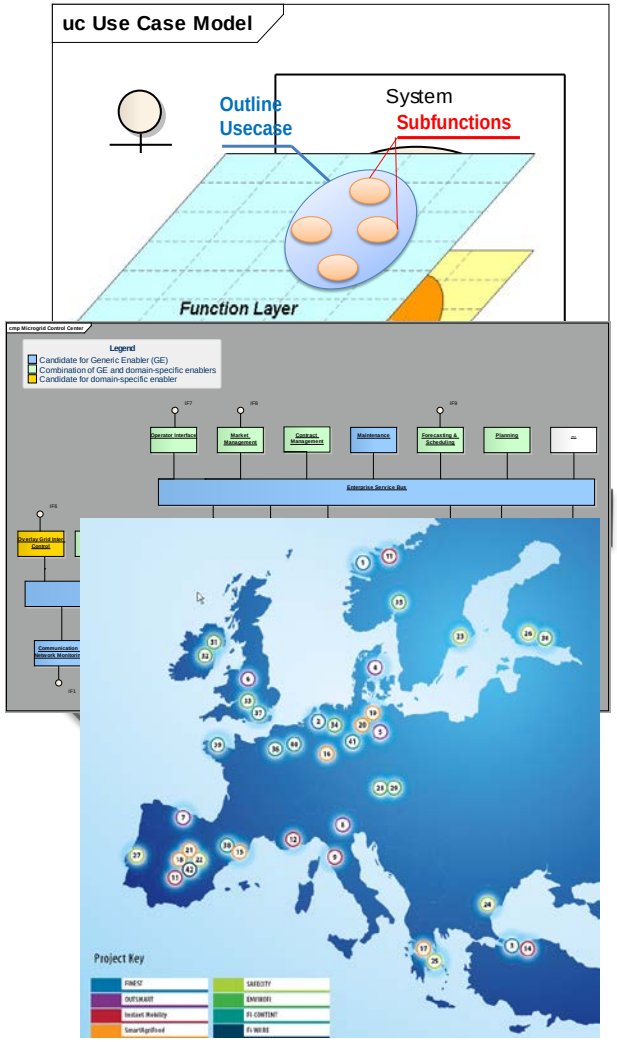
1. Scenario description
   - Identify use cases and actors (market roles as well as systems & devices) according IntelliGrid method
2. ICT requirements
   - Define requirements for communication & information flows as well as services and middleware
3. Functional Architecture
   - Identify key functional building blocks and interfaces, specify data models and communication protocols
   - Develop ICT architecture based on common and domain specific enablers
4. Trial candidates
   - Identify trial candidates taking into account relevance, trial setup and reuse of existing trials



Smart Grid Architecture Model (SGAM)

by CEN/CENELEC/ETSI Smart Grid Coordination Group RAWG

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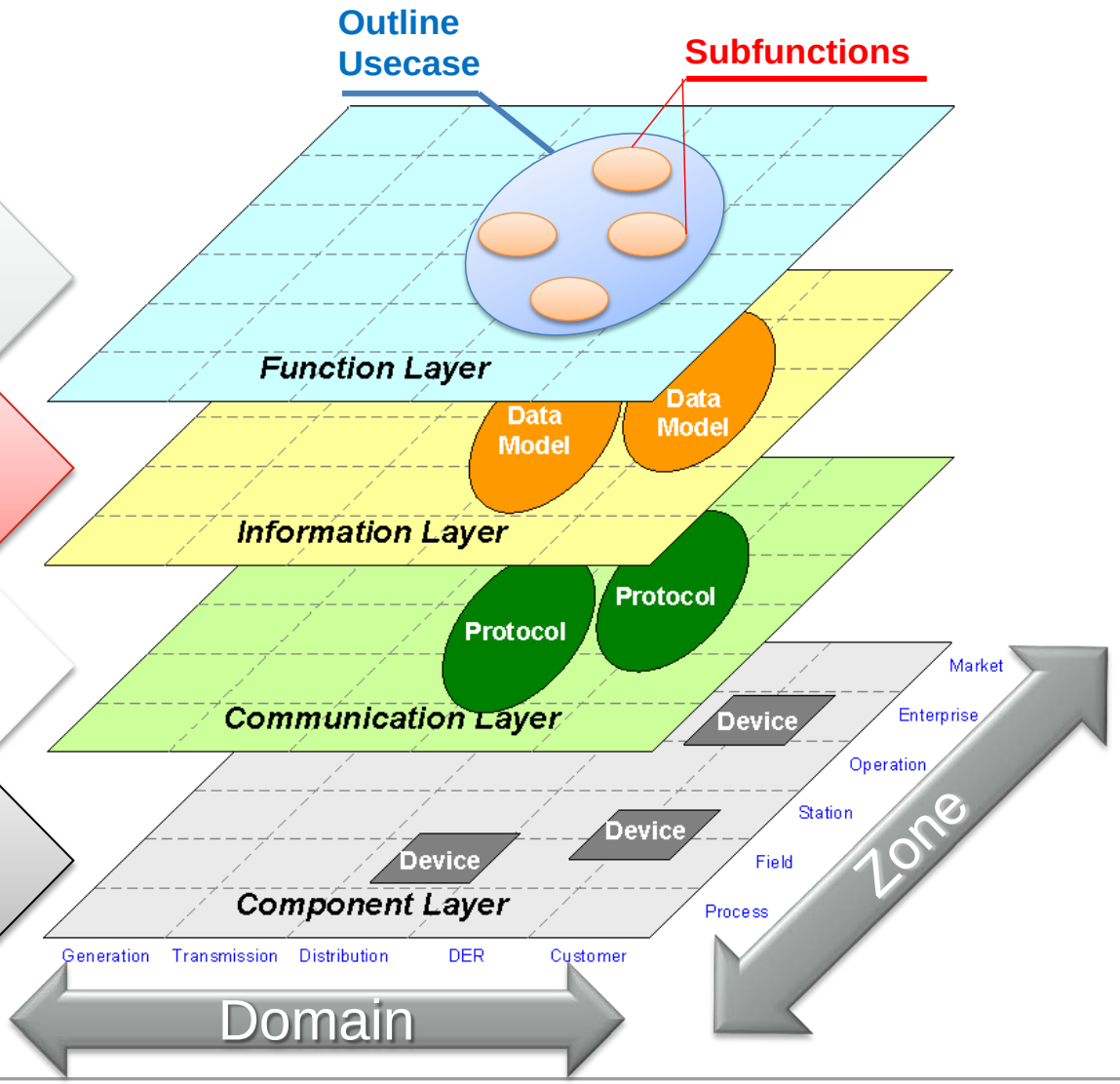
Represents use cases including logical functions or services independent from physical implementations

Represents information objects or data models required to fulfill functions and to be exchanged by communication

Represents protocols and mechanisms for the exchange of information between components

Represents physical components which host functions, information and communication means



FINSENY Experimentation

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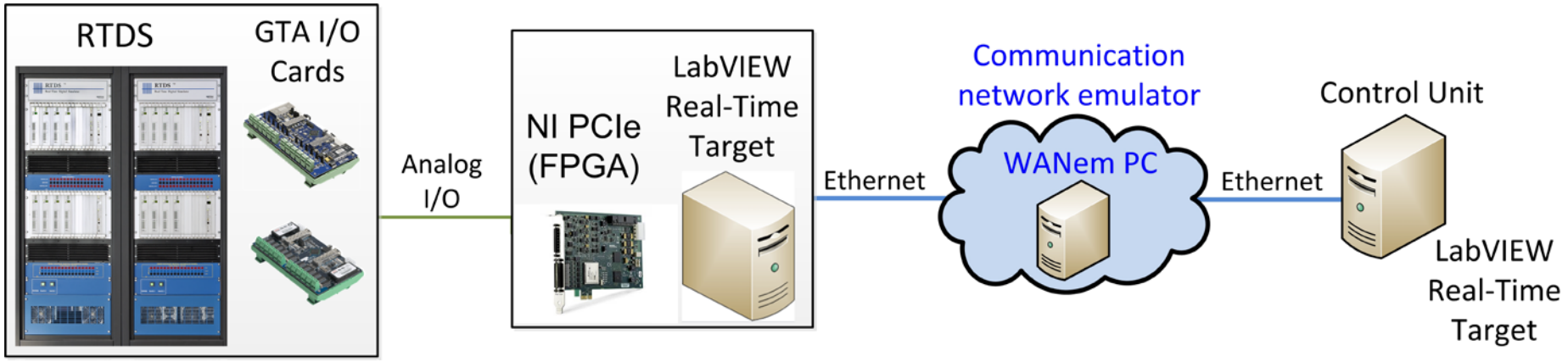
- Experimentation Scenario
  - Study the impact of sudden increase in EV charging load on system frequency
  - Investigate benefits of smart chargers by possible contribution of EVs to frequency control
- Communication characteristics
  - Investigate the impact of communication disturbances on the contribution of EVs in frequency control of future smart grids



FINSENY Conclusion

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- The FINSENY project
  - Collected and selected use cases for its five scenarios
  - Provided use case descriptions as input to SG-CG WG Sustainable Processes
  - Identified ICT requirements within scenarios
  - Consolidated ICT requirements in the project
  - Coordination with the other FI-PPP usage areas
  - requirements covered by generic enablers (FI-WARE)
  - requirements covered by specific enablers (FINSENY)
  - Develop consistent functional ICT architecture considering FI-WARE GEs for FINSENY scenarios
  - Experimentation results
  - Plan for consolidated Smart Energy trial

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FINESCE
FI-PPP Phase 2 Use Case Project

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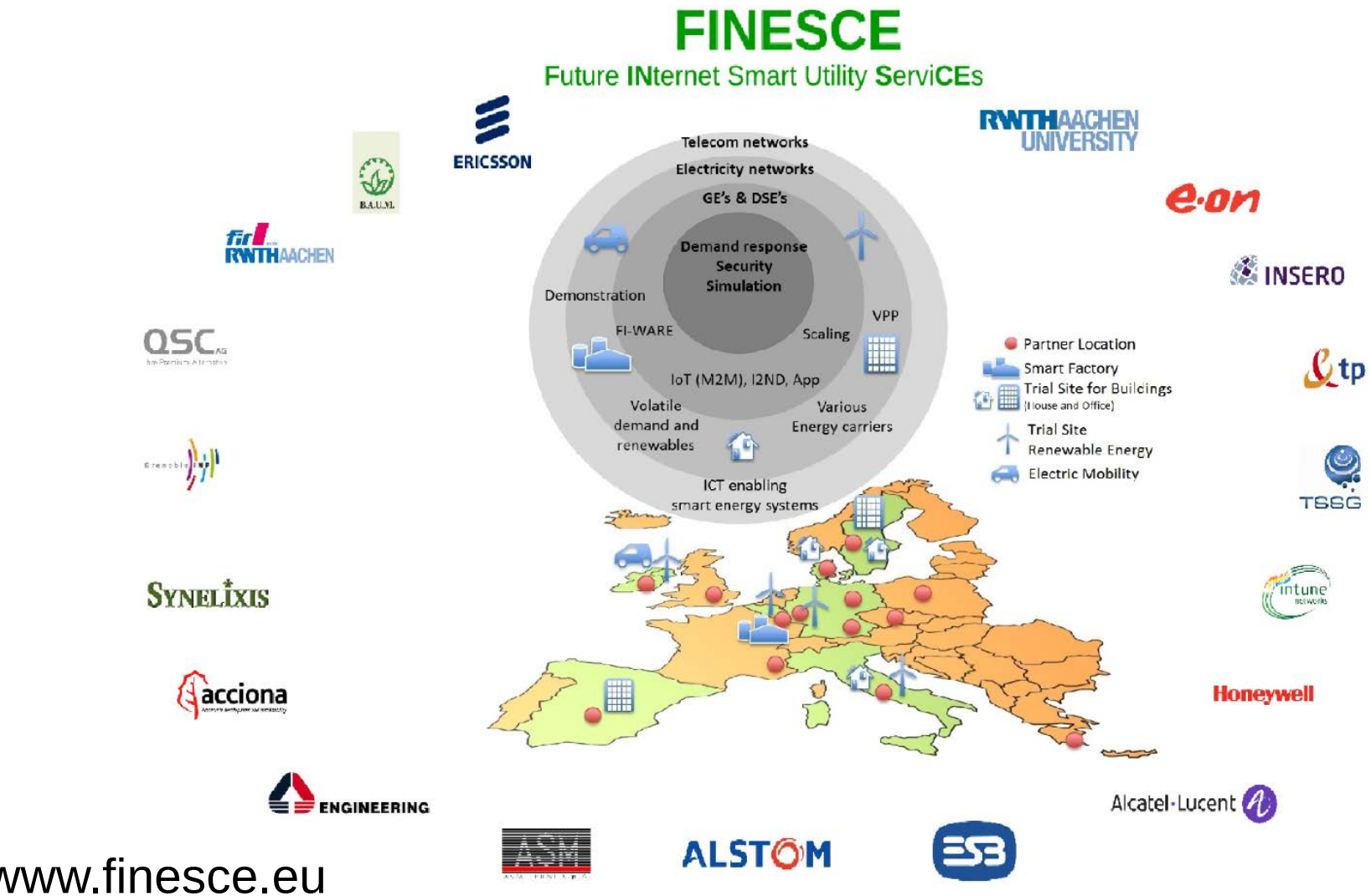
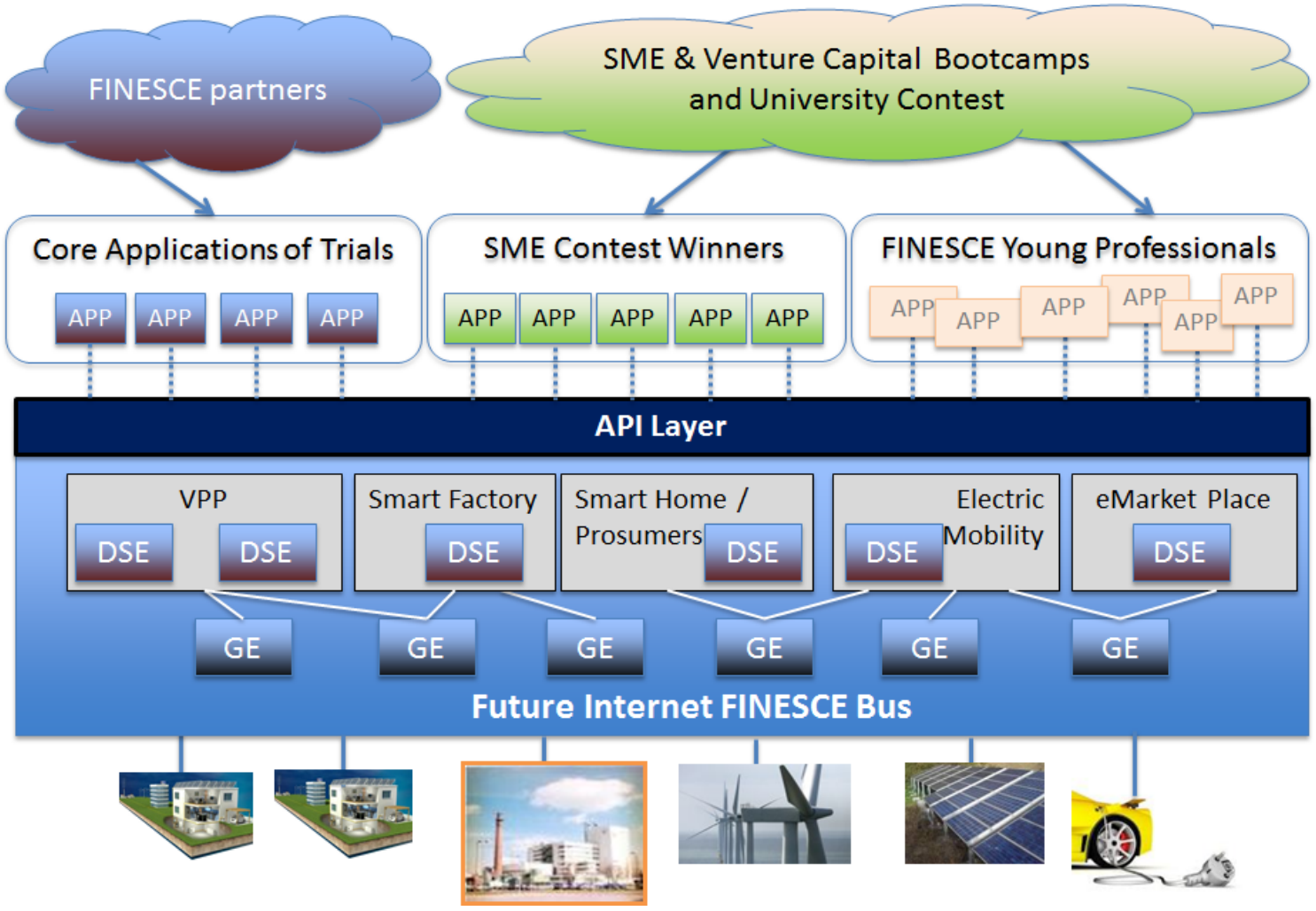


www.finesce.eu

FINESCE Logical Architecture



Expected Results after the FI-PPP ends

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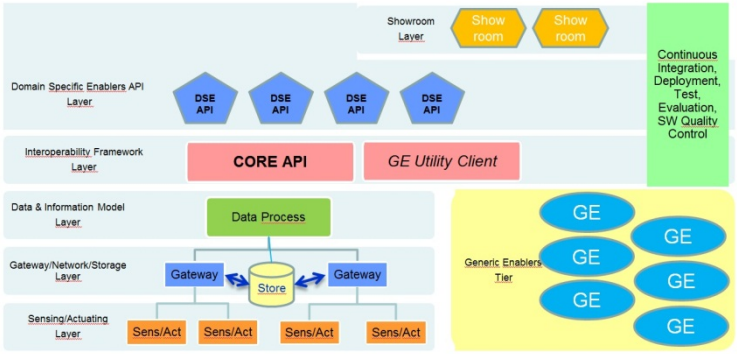
- **FINESCE API**



- The FINESCE-API, as an interface definition, validated in field trials before being offered for standardization after the project ends

- Our innovation efforts, helping new companies & communities develop
- **Our Open call opens Sep'13 1.2 Million Euro available for new partners to work on new smart energy technologies in our trials**
- Results from the trials for use in large scale smart grid developments
- Phase III proposals (**deadline Dec 2013**)

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Conclusion

- FI-PPP programme advances Future Internet technologies across diverse business domains

- Future Internet Energy projects:
  - FINSENY – successfully finished
  - FINESCE – just started
  - Open Call and Phase III to come

Thank you very much!