

TOWARDS FUTURE INTERNET AND 5G IN EUROPE



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www.finesce.eu www.fi-ppp.eu

OUTLINE OF THE PRESENTATION



- › Trends in the market – IoT and video are generating growth
- › The FI-PPP as a focus for on-going field trials and innovation in Europe
- › The FI-PPP FINESCE field trials of ICT in the smart energy sector
- › Towards the new 5G-PPP in the Horizon 2020 context

MARKET FACTS



5 years ago...

4B Mobile subscriptions

1,5B Internet users

300MoU Voice per user

30M Smartphones shipped Q1-08

>500M Apps downloaded January 2009

...and now

6,4B Mobile subscriptions

2,4B Internet users

500MB Monthly traffic per smartphone user

210M Smartphones shipped Q1-13

>98B Apps downloaded June 2013





Everything gets connected & smart, not just phones

Expansion into digital services to find new revenues

Tiered, shared, bundled and real-time pricing models

Customer experience & efficiency driving operator transformation

Differentiation through superior network performance and quality



EVERYTHING GETS
CONNECTED & SMART, NOT
JUST PHONES

MARKET DRIVERS



GROWTH
OPPORTUNITY

MARKET & CONSUMER
DEMANDS

COST REDUCTIONS

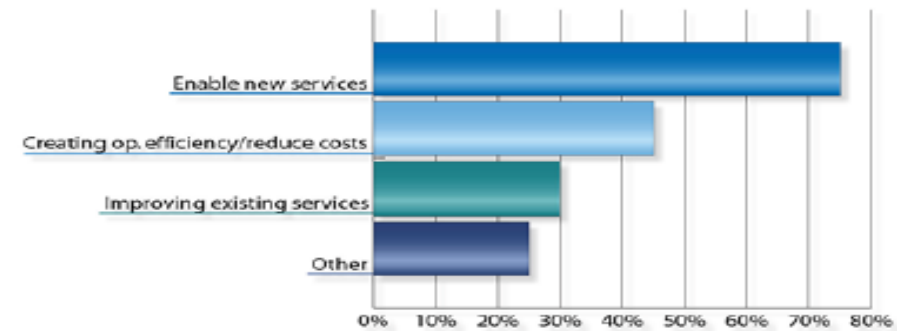
REGULATORY MANDATES

SUSTAINABILITY

Figure 2 - Vendor priorities in M2M/IoT

What are the primary drivers behind your M2M projects now?

Survey of M2M Solution Providers published November 2012:



Source: Beecham Research Sept 2012, for Oracle

- M2M has always been about creating new differentiation in the market
- M2M used to be about operational efficiency, and reducing costs
- Now increasingly seen as enabler for new services



Source: Beecham Research

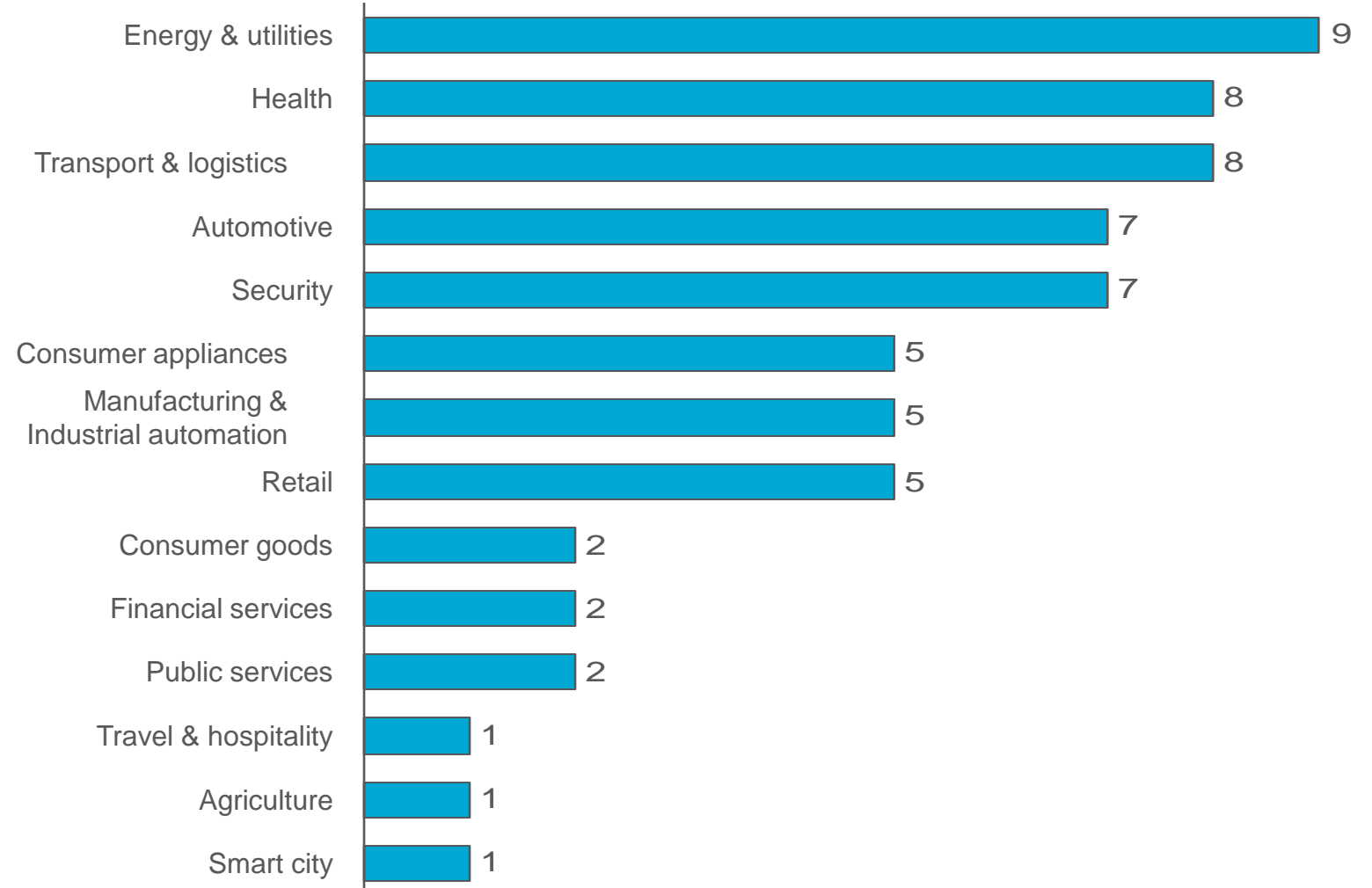
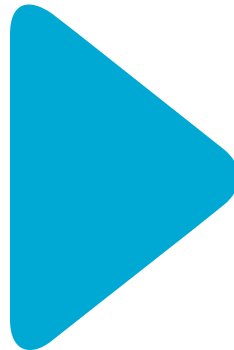
OPERATORS M2M EFFORTS FOCUSED ON UTILITIES, HEALTH & TRANSPORT



Sample: 10 operators with ambitions in M2M

Number of operators that focus their M2M efforts on different industries

- Vodafone
- Telefonica
- AT&T
- China Mobile
- Verizon
- Orange
- Telenor
- Deutsche Telekom
- SingTel
- DoCoMo

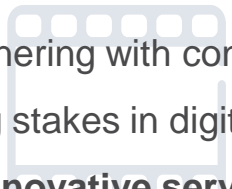


INDUSTRY INNOVATION



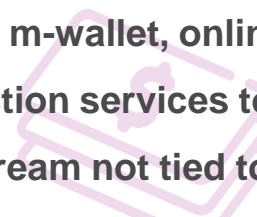
Media

Tapping opportunities in the digital media world by partnering with content providers and acquiring stakes in digital companies
Introducing innovative services in music, Mobile TV, apps and gaming areas



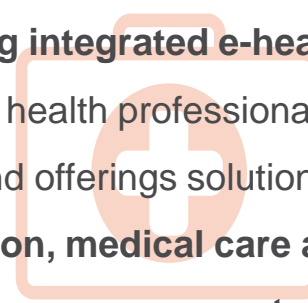
Commerce

Launching m-wallet, online shopping, internet auction services to add another revenue stream not tied to data traffic, thereby driving M-Commerce growth



Health

Developing integrated e-health platform to connect health professionals & patients together and offerings solutions for remote consultation, medical care and disease management



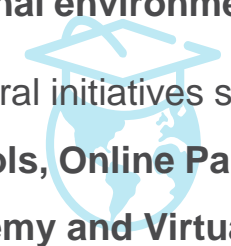
Utilities

Making efforts to move toward a low-carbon society by offering Smart Grid Technology
Transforming cities into intelligent metropolitan areas using M2M technology.
Smart City Initiatives such as Smart Santander and Wireless City



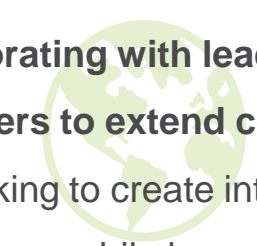
Education

Working towards provision of total educational environment using ICT
Started several initiatives such as network-based schools, Online Parent Schools, N-Academy and Virtual English Conversation Lessons



Transport

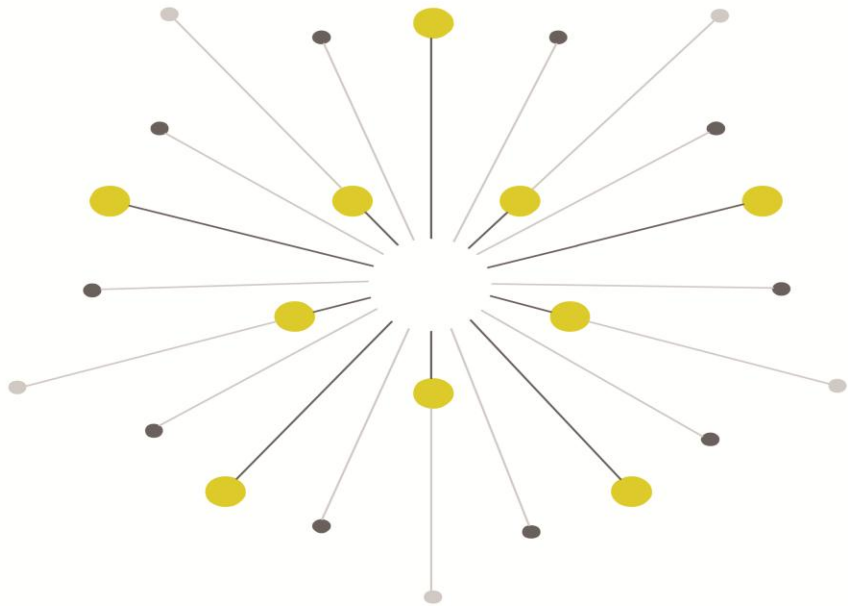
Collaborating with leading auto manufacturers to extend connectivity to the car. Working to create intelligent vehicle by integrating mobile broadband service into cars



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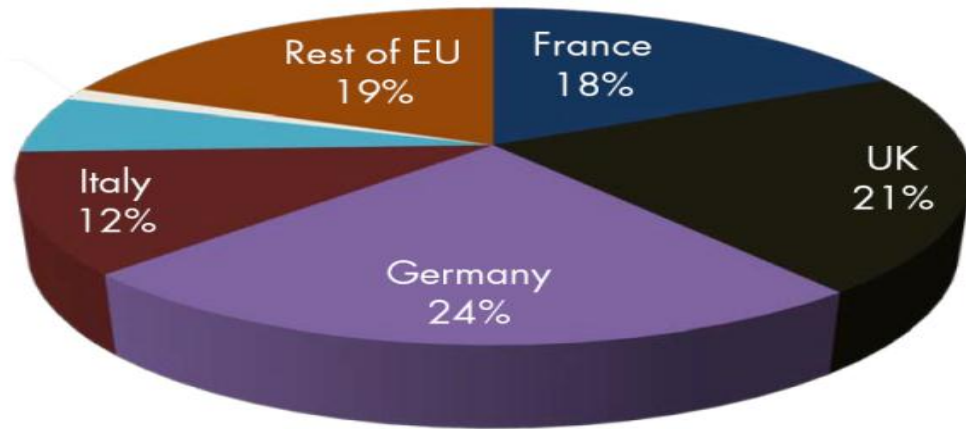


FUTURE INTERNET PPP

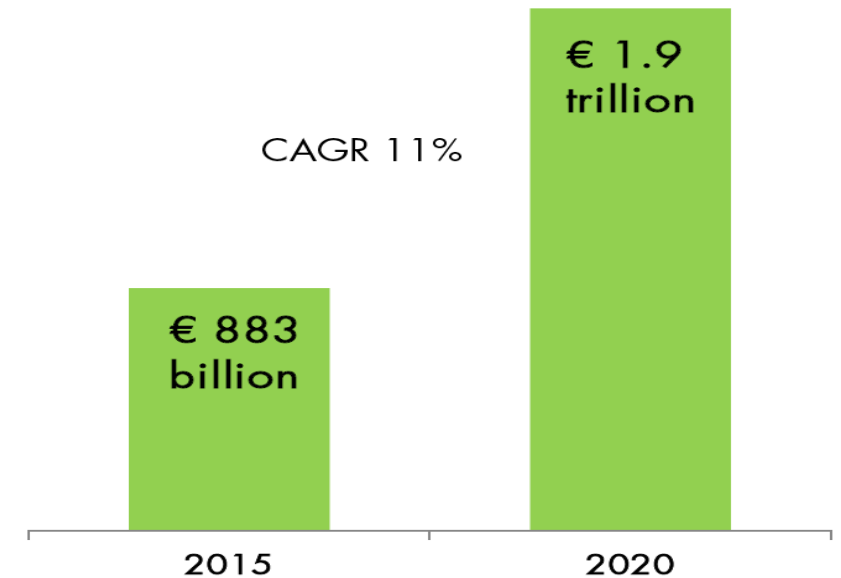
THE EUROPEAN INTERNET ECONOMY



Total size of the European Internet Economy 2010
€498 billion = 4.1% EU GDP



Estimated size and growth of EU Internet economy 2015-2020
(Realistic scenario)

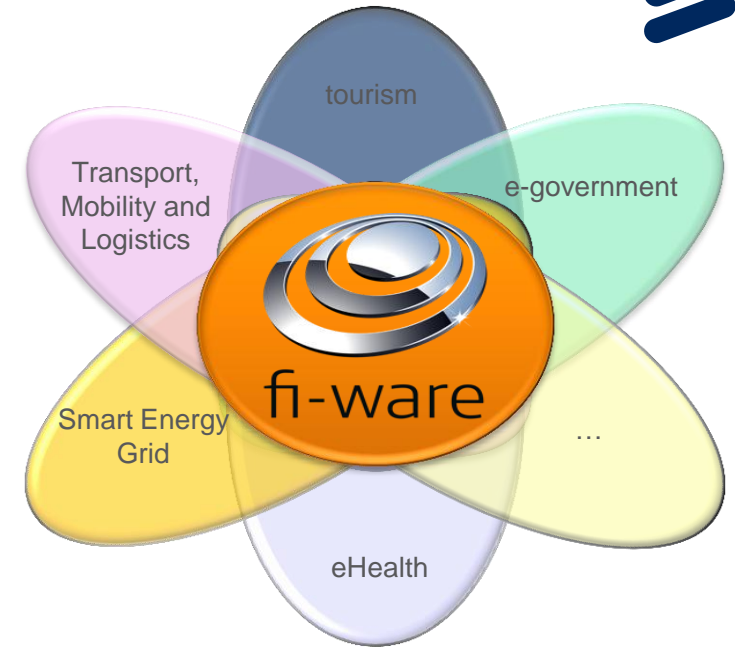


Source: Towards a competitive European Internet industry
European Commission 2012, SMART 2009/0044

THE FUTURE INTERNET PUBLIC-PRIVATE PARTNERSHIP (FI-PPP)



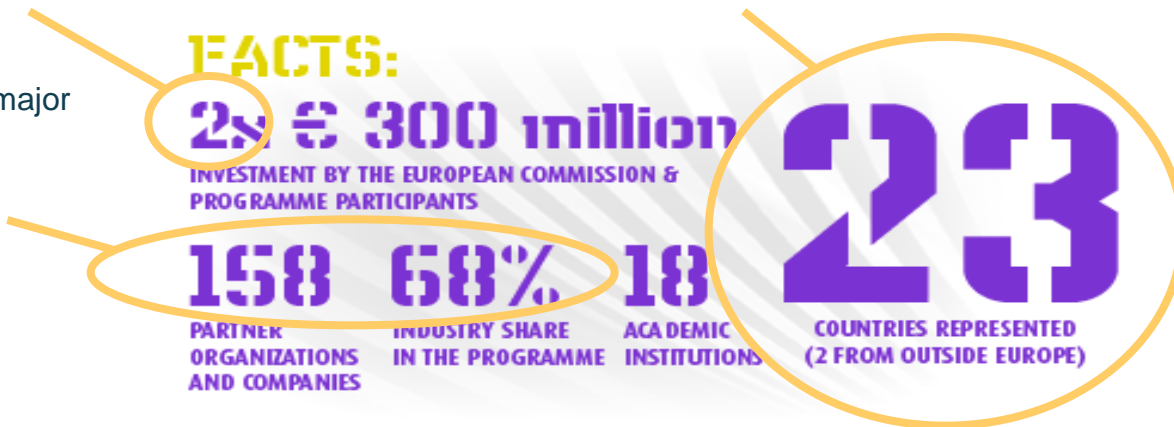
- › The aim of the FI-PPP is to capture new opportunities in the Future Internet, derived from digitalization of economy sectors
- › This requires creating an generic, open and standard platform (FI-WARE) and meeting point (FI-LAB) around which a dynamic innovation ecosystem can be created engaging developers and entrepreneurs
- › Born local (Europe) but with global ambition



EC provides half of the funding:

Pan-european dimension

Industry driven, major industry players involved



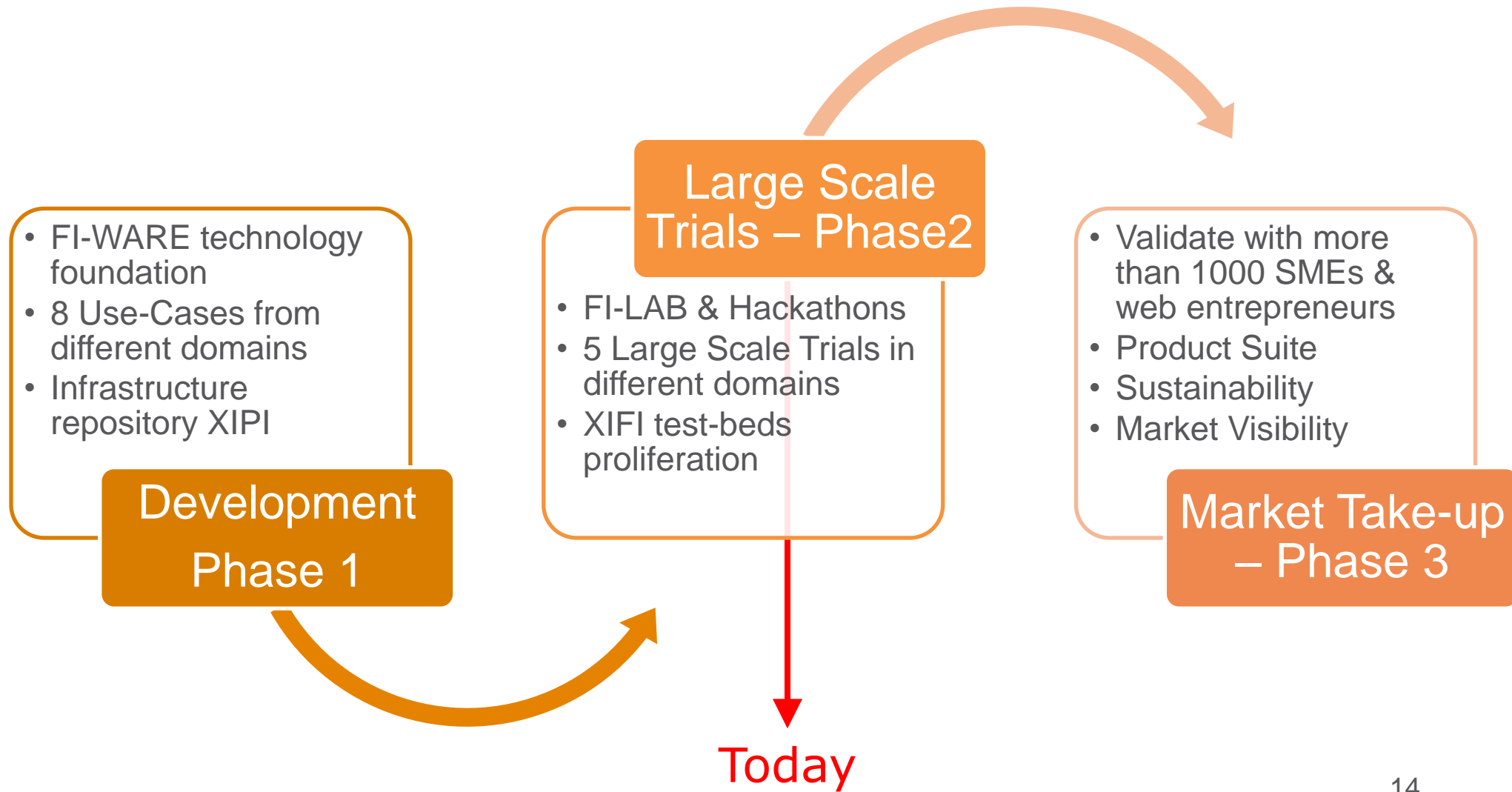


The Next Computer



Yes WE'RE
OPEN

THE FUTURE INTERNET PPP DELIVERS:



FI-LAB (FI-WARE Open Innovation Lab)



- › FI-LAB will be a **case example of a FI-WARE Instance**. It:
 - Provides [Cloud hosting](#) capabilities so third parties can run experimental Future Internet Applications and test them
 - Make [Generic Enablers](#) implementations available for experimentation:
 - › Global accessible instances provided “as a Service”
 - › Deployable as dedicated instances by application providers using Cloud blueprint management functions
 - Will be operated under central control and be accessible from a dedicated website.
- › A meeting point for innovation:
 - Entrepreneurs can setup accounts for free, adhering to certain terms and conditions
 - Liason with so-called application sponsors (e.g., cities) to enrich the environment



OPPORTUNITIES FOR ALL



Application sponsors (business, cities, etc)

- Connect to entrepreneurs
- Put their data at work
- Visibility, promotion
- Costs saving
- Better service to customers
- Corporate Reputation



Entrepreneurs, Developers

- Ability to test with real data
- Ability to run trials with real users
- Visibility, promotion
- Hosting of permanent showcase
- Connection to potential customers
- Acceleration of product development

FI-WARE Technology Providers

- Added value to the technology
- Connecting to entrepreneurs: Revenue-sharing opportunities

NEXT STEPS



- **Ambitious FI-WARE promotion campaign (4,2 M€ investment during May 2013 – April 2014 period)**
 - Successful launch of the **FI-Lab** at [London Campus Party](#) (September 3-8)
 - [Startup weekend](#) events planned across Europe
 - Hackathons, Development contests (870 K€ in awards)
- › **100 M€ of funding for SMEs and Web entrepreneurs** developing products on top of FI-WARE:
 - to be canalized through incubators, accelerators, SME associations
 - projects starting in 2014
- › Design and deployment of **pan-european FI-WARE trial facility** to be launch in April 2014
- › Proposal for **FI-WARE continuation** phase (23 M€)



OUTLINE OF THE PRESENTATION

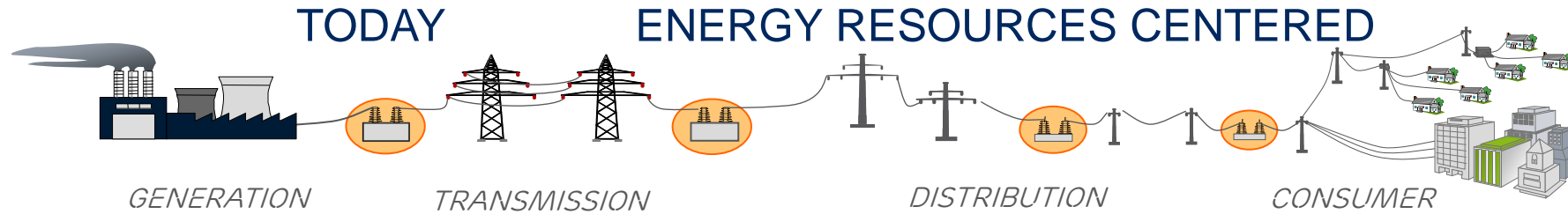


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GRID TRANSFORMATION

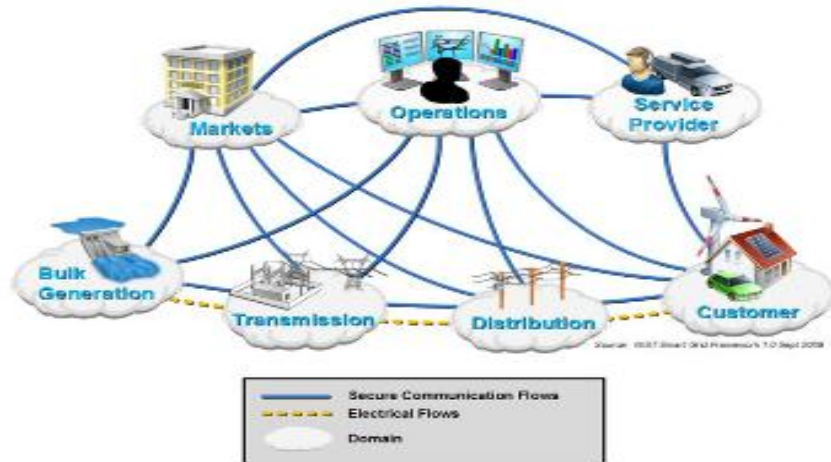


ERICSSON



ONE ENERGY FLOW, ONE INFORMATION FLOW

EXPECTED DISTRIBUTED AND PARTICIPATIVE MARKET

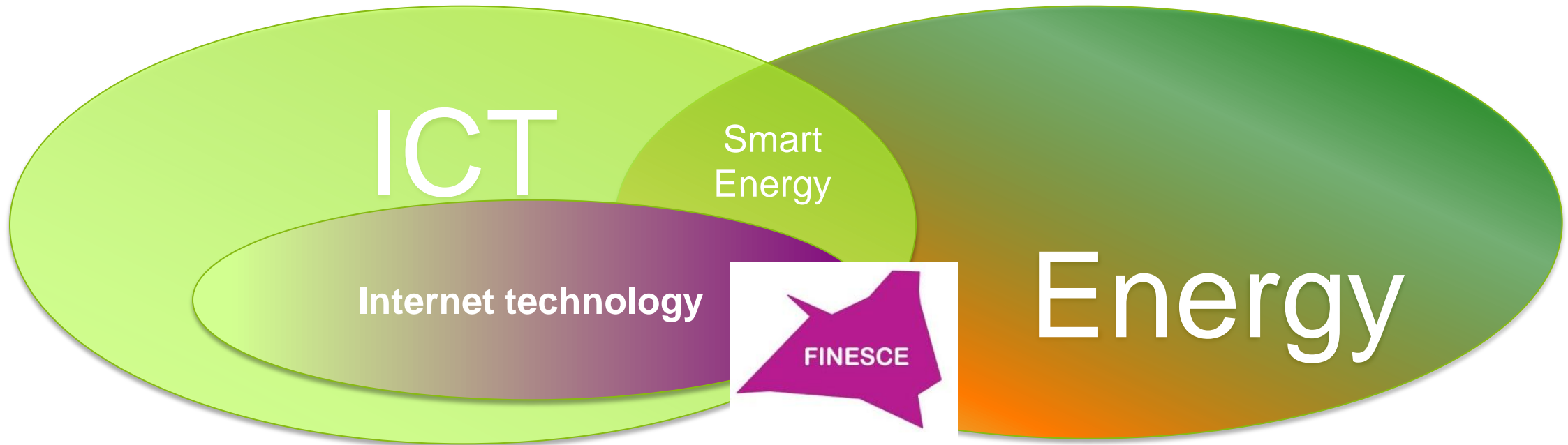


Source: NIST Smart Grid Framework 1.0 Sept 2009

- Distributed generation and consumption
- More focus on customer concerns; quality, security of supply
- New market participants, pro-sumers, aggregators, mobility service operators, etc
- New management models; transparency and non discriminatory access.
- New products and services.

BI-DIRECTIONAL ENERGY FLOW, "N" INFORMATION FLOWS

THE FUTURE INTERNET FOR SMART ENERGY



Future Internet of Energy: organizing many...

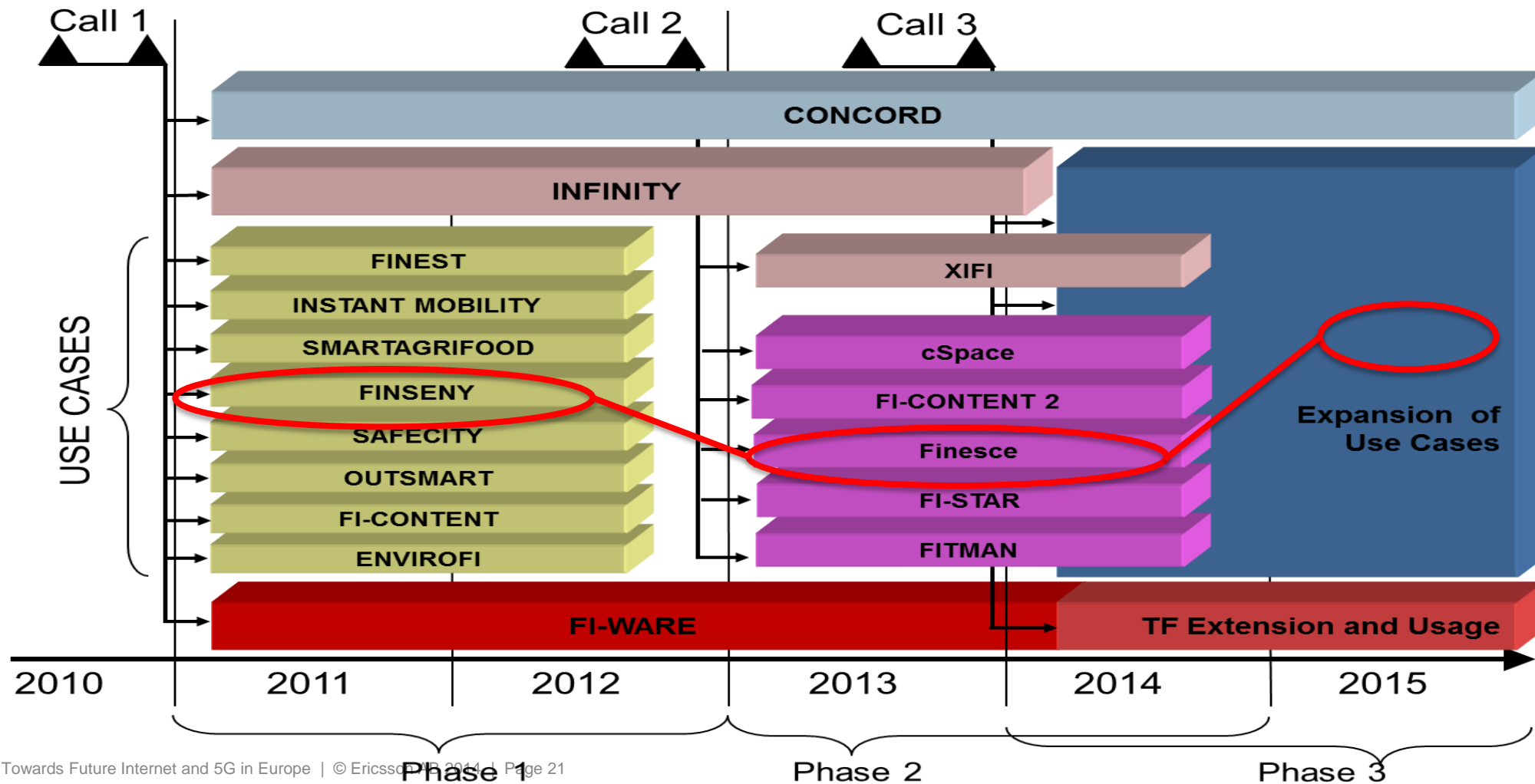
- (volatile) distributed energy production
- (flexible) consumers and prosumers
- electric vehicles (as consumers and storage)

Benefits of using the future internet:

- lower costs for application development
- easy access for new partners
- scalability of applications



FI-PPP FAMILY OF PROJECTS





FI-PPP Phase I: FINSENY's 4-Step Approach

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

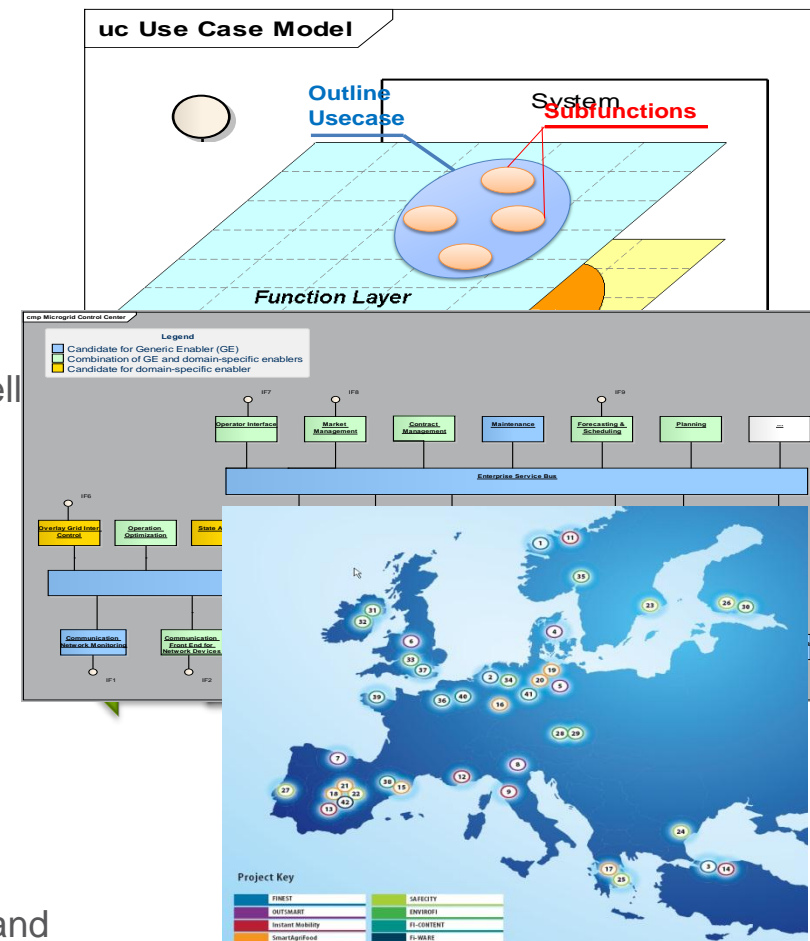
3. Functional Architecture

identify key functional building blocks and interfaces, specify data models and communication protocols

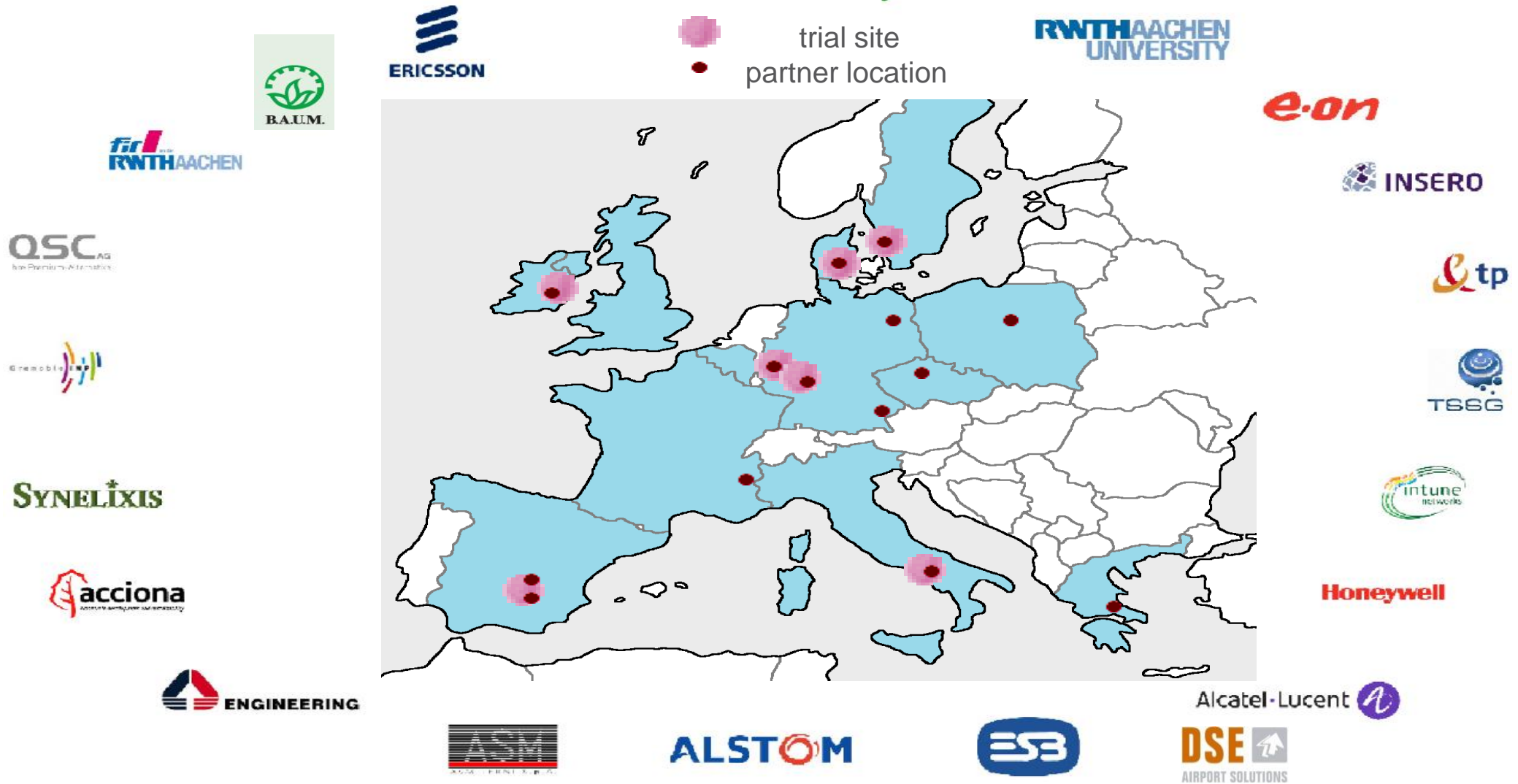
develop ICT architecture based on common and domain specific enablers

4. Trial candidates

identify trial candidates taking into account relevance, trial setup and reuse of existing trials



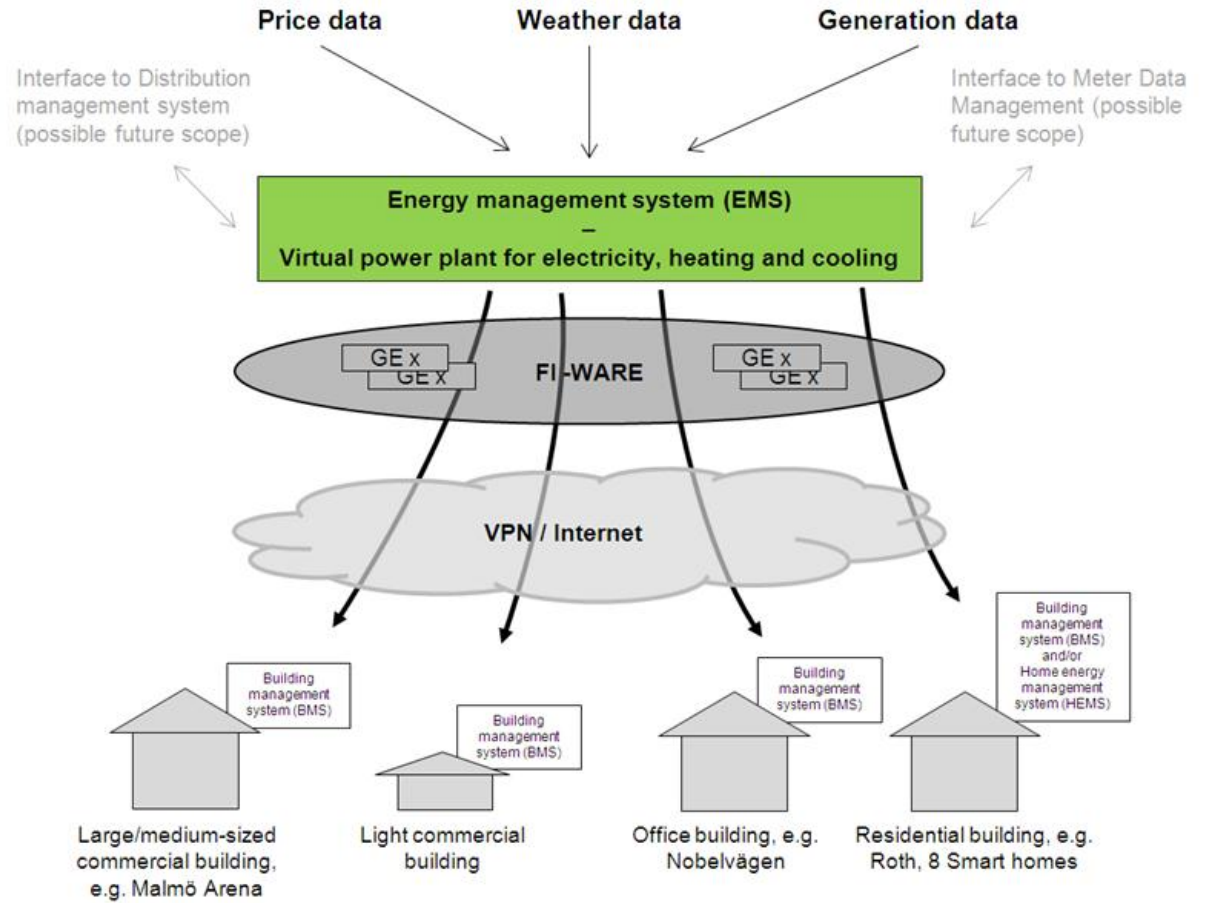
FINESCE PARTNERS AND TRIAL SITES



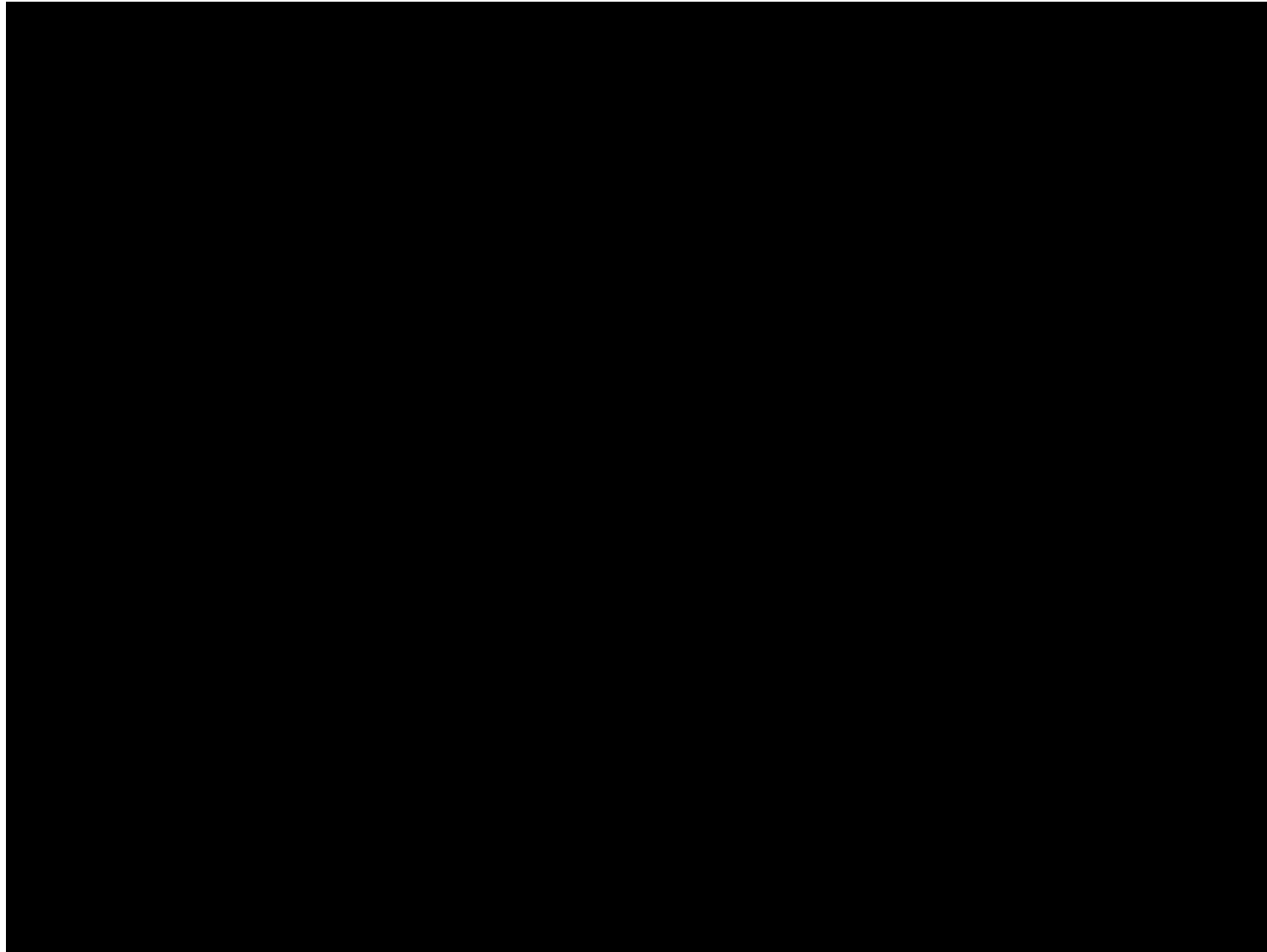
TRIAL 1: SUSTAINABLE SMART CITY ENERGY (MALMÖ, SWEDEN)



- Using Future Internet as an enabler for innovation and oper
- Demonstrate optimization of supply and demand across diff



E.ON MALMÖ SMART ENERGY SITE



TRIAL 2 SMART REGIONS HORSENS, DENMARK & MADRID, SPAIN



› Motivation:

- Support the change of end user behaviour towards a more optimal usage of renewable energy when available.
- Create an opportunity for entrepreneurs and SMEs to implement, test and improve new prosumer services, thus fostering innovation.

› Scope:

› The WP will follow two streams of activities:

- Energy management in a community of 25 single family houses in the Horsens area
- Energy management in a commercial office building in Madrid



› Objectives:

› Evaluate the value provided by enabling innovative services to prosumers using FI Generic Enablers in the two trial sites. Jointly, the two streams of activities will address the following objectives:

1. Enable value added services through an open FI based platform with FINESCE APIs, offering rich data on energy needs and consumption patterns.
2. Promote energy efficiency via incentives from the energy market place and dynamic tariffs.



INSERO

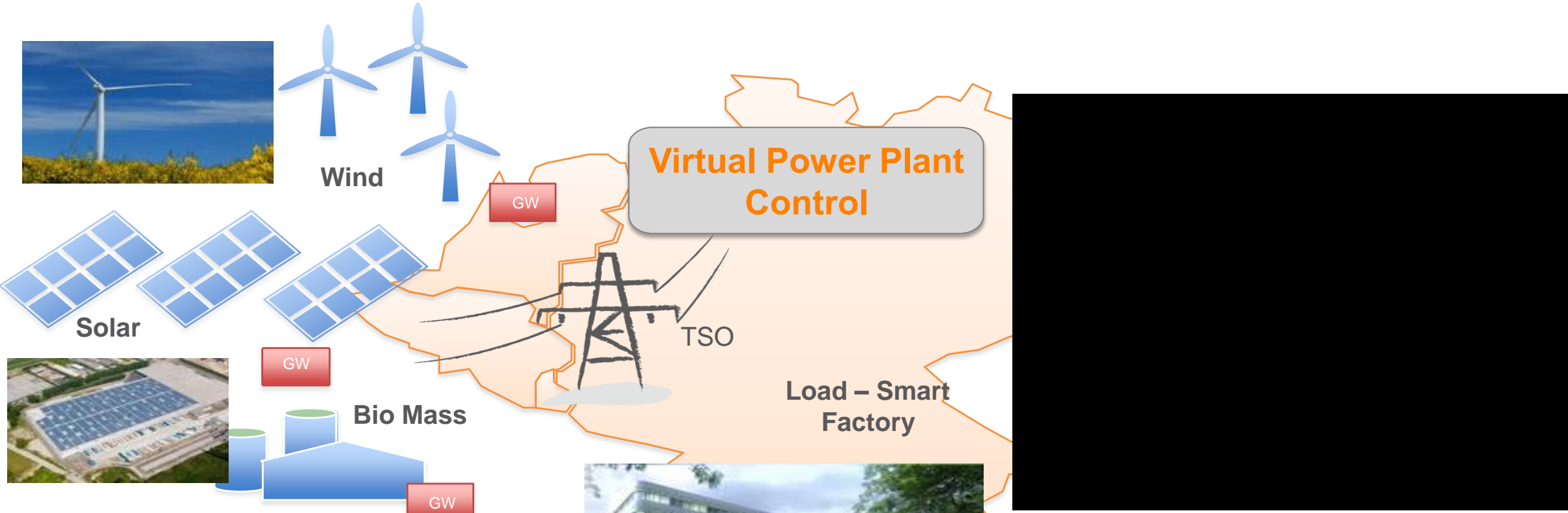
RWTH



TRIAL 2 - TRIAL SITES



TRIAL 3 - FI DEVELOPING B2B ELECTRICITY ECO-SYSTEM – BUILDING A CROSS-BORDER VIRTUAL UTILITY



FUTURE
INTERNET
SMART
UTILITY
SERVICES



WZL
RWTHAACHEN

Honeywell

QSC AG

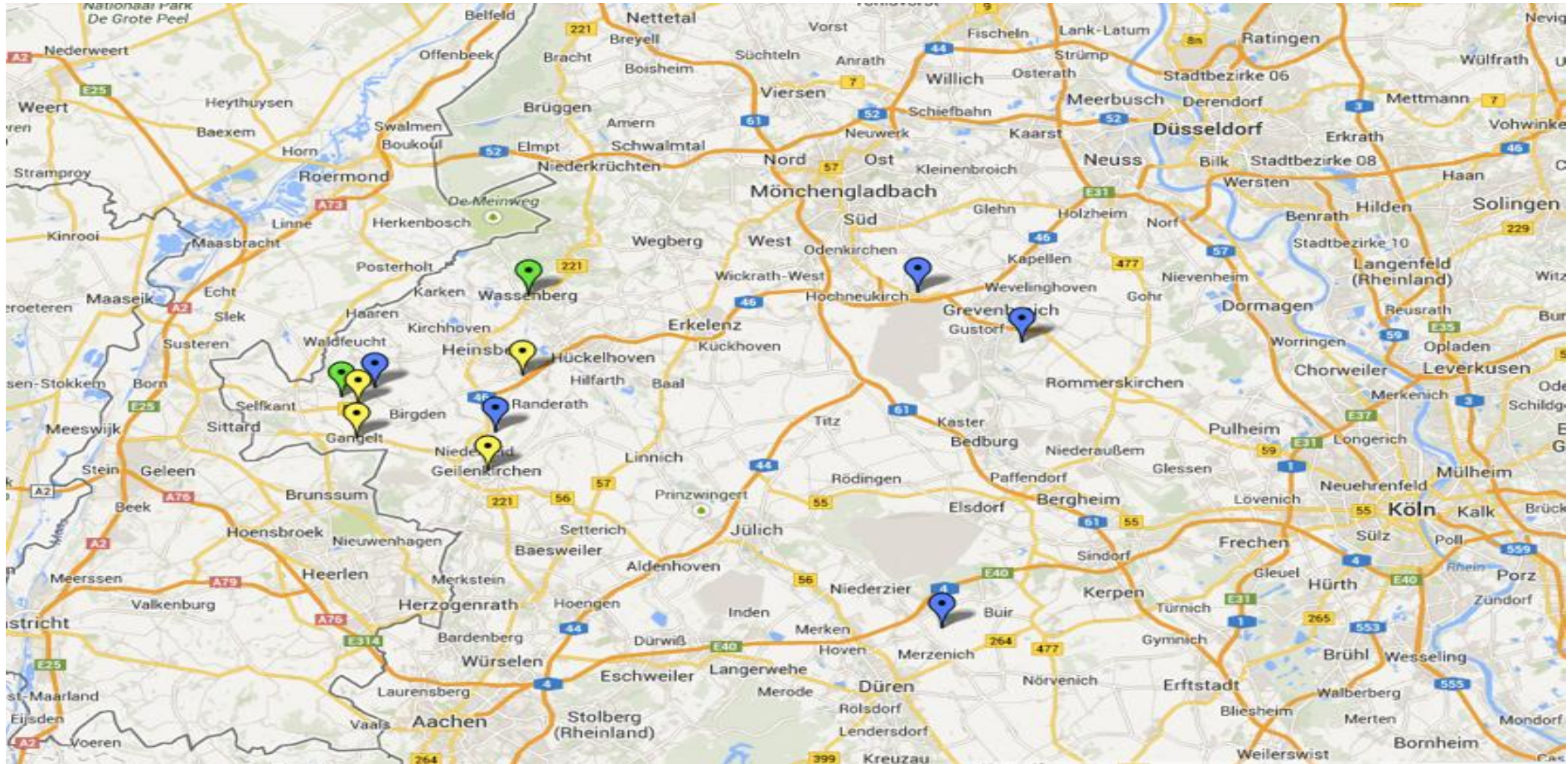
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an der
RWTHAACHEN

E.ON Energy Research Center
RWTHAACHEN
UNIVERSITY

VPP GENERATION SITES IN BELGIUM



VPP GENERATION SITES IN GERMANY



TRIAL 4 – FI BUILDING THE ENERGY MARKETPLACE



Motivations

- *High density of Renewable Energy Sources*
 - *Generation is more and more distributed*
- *Demand is more controllable than production*

Objective

...to increase the grid stability and efficiency by using energy market mechanisms...

Scope

*Experimentation in **Terni (Italy)***

- *~15 Customers*
- *~2 Renewable Energy Sources*

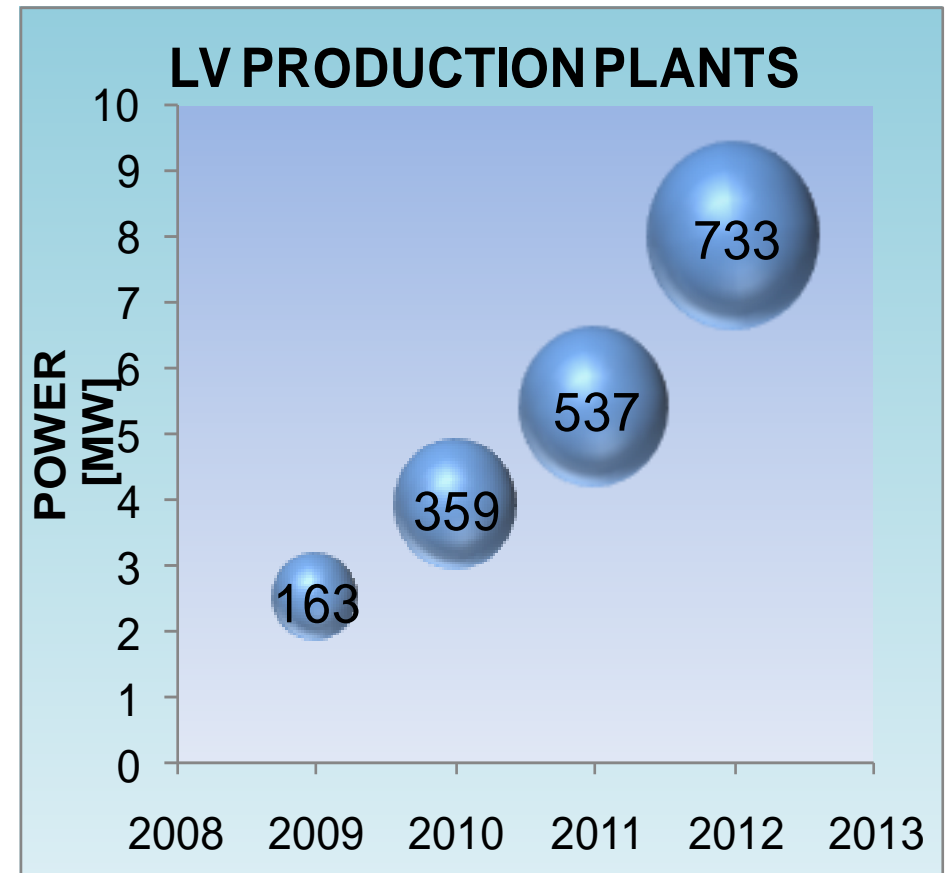
Marketplace for Demand Side Management



CONTEXT...



› Trial site: Terni (Italy)

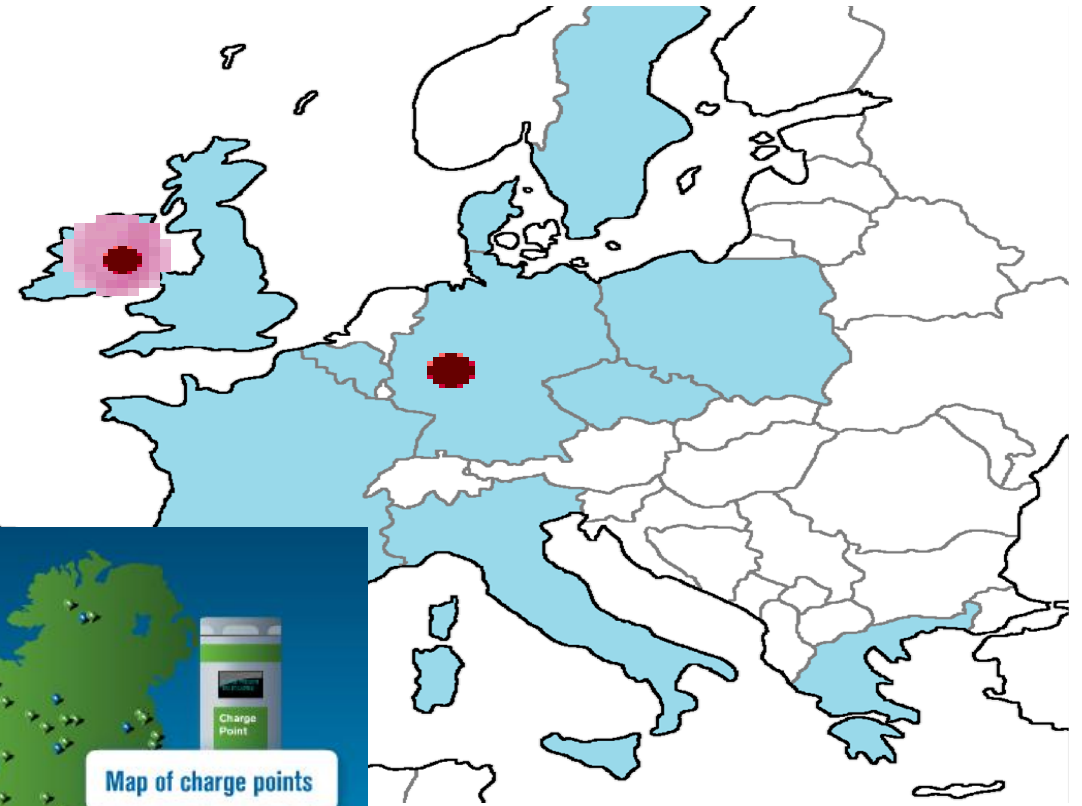


TRIAL 5 - FUTURE INTERNET : ELECTRICITY IN ACTION, IRELAND



Objectives:

- eCar batteries as interruptible loads to balance the power grid
- Substation communication for power management
- Simulation at RWTH to scale up results



trial site
partner location



E.ON Energy Research Center



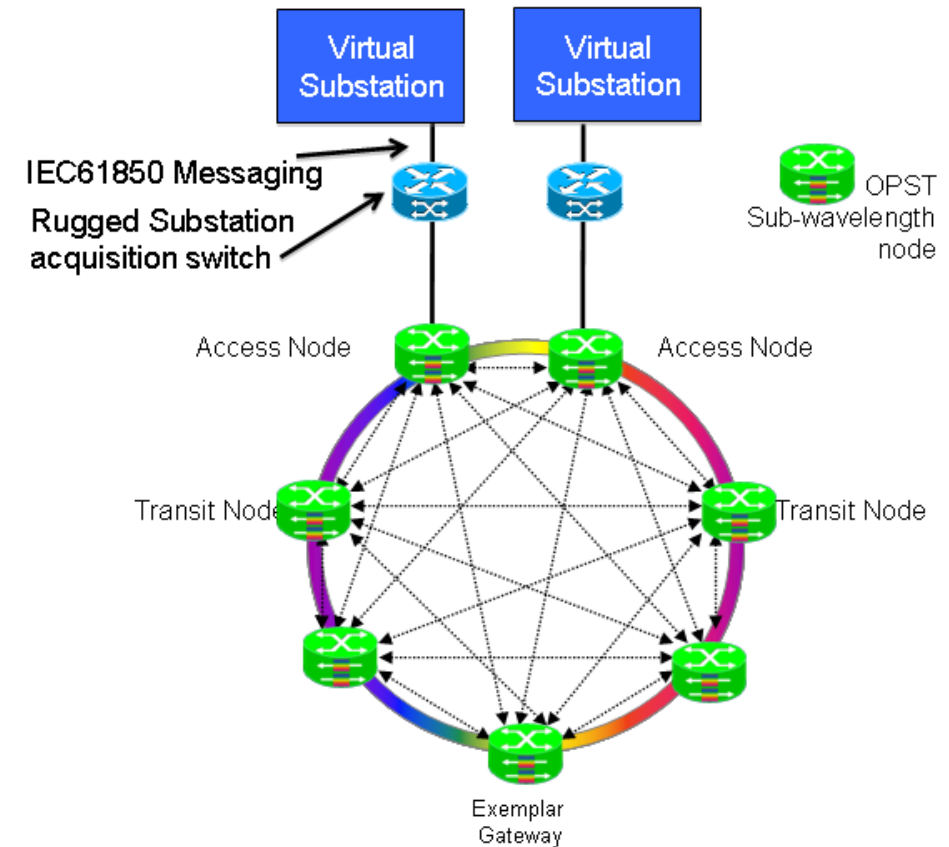


TRIAL 5: PART II OF TRIAL – SMART GRID COMMUNICATION



- Objectives

- ❖ Develop a highly advanced IP-based smart grid Packet Switch and Transport (OPST) architecture
- ❖ Implement and gain knowledge of FI-Ware Services
- ❖ Enhance knowledge of utilities' smart grid communication analysis in this area



Smart Grid Communications using OPST

SIMULATION SUPPORT AT RWTH



- The Institute for Automation of Complex Power Systems at RWTH is equipped with a unique infrastructure for simulation of power systems and interaction with communication infrastructure
- The simulation facility will be used both as proof of concept and as a test for scalability



Real-Time Digital Simulator
(Copyright Peter Winand)

APPS FOR THE SMART ENERGY WORLD



original trials plus open call

APP APP APP APP APP APP

FINESCE SME contest

APP APP APP APP APP

Phase III

APP APP APP

API Layer

Virtual Power Plant

DSE

GE

GE

Smart Factory

DSE

DSE

GE

Smart Home and Prosumers

DSE

GE

GE

Electric Vehicles

DSE

GE

GE

eMarket Place

DSE

DSE

GE

Device



Sensor



Actor



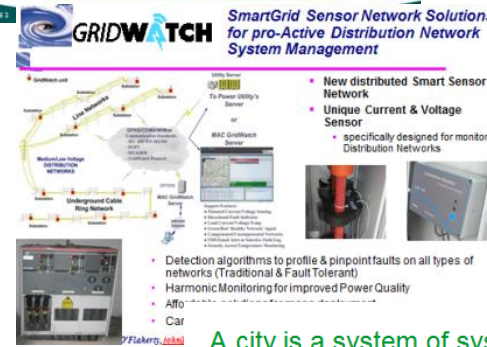
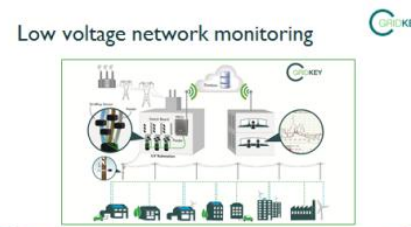
Device



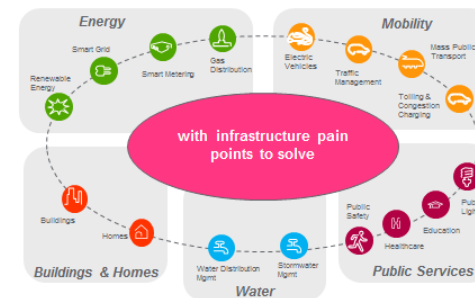
Actor



FINESCE 5 INNOVATION EVENTS: IMPRESSIONS



A city is a system of systems



More information on www.finesce.eu

FINESCE DISSEMINATION EVENTS



10TH EDITION
FUTURE INTERNET ASSEMBLY
DUBLIN | 2013

8TH-10TH MAY 2013

UtiliNet Europe 2013

Conference & Exhibition

Future Network & MobileSummit 2013

SMART GRIDS WEEK | SALZBURG 2013
13. bis 17. Mai 2013

2013
Create Connect Grow

Welcome from FuNeMS 2013
Follow us on our videoblog!

Campus Party™
Europe in London
2-7 September
The O₂

Telefónica | O₂

MOBILE™
WORLD CONGRESS

Barcelona | 25 - 28 February 2013

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EU COMMISSIONER KROES CALLED INDUSTRY TO JOIN EU COMMISSION IN A PPP ON 5G



- › Commissioner Kroes called industry at Mobile World Congress 2013 in Barcelona, Spain

“... And today I call on EU industry and other partners to join us in a Public-Private partnership in this area. An open platform that helps us reach our common goal more coherently, directly, and quickly. European 5G is an unmissable opportunity to recapture the global technological lead. And I hope you will be able to support and join us. ...”

- › Group of organisations prepared a PPP proposal

Source: Commissioner Neelie Kroes, Smashing barriers and thinking big. Address at Mobile World Congress, 26 February 2013, Barcelona, Spain, http://europa.eu/rapid/press-release_SPEECH-13-159_en.htm?locale=en .

WHY A PPP? I



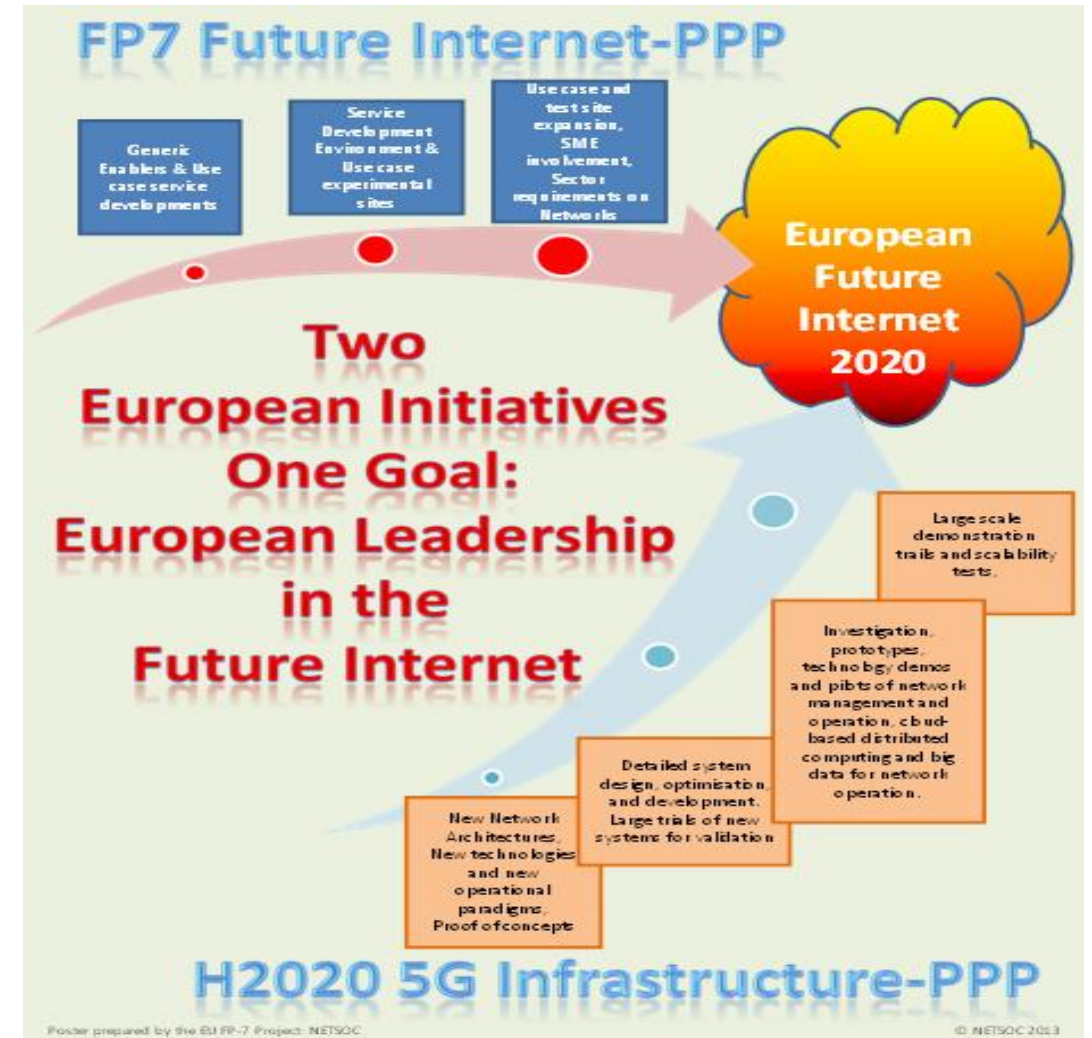
- › PPP Programme that will deliver solutions, architectures, technologies and standards for the ubiquitous 5G communication infrastructures of the next decade
- › Programme Ambitions: Key Challenges / High level KPIs
 - Providing **1000 times higher wireless area capacity** and more varied service capabilities compared to 2010
 - **Saving up to 90% of energy** per service provided. The main focus will be in mobile communication networks where the dominating energy consumption comes from the radio access network
 - Reducing the average **service creation time** cycle from 90 hours to **90 minutes**
 - Creating a secure, reliable and dependable Internet with a “**zero perceived**” **downtime** for services provision
 - Facilitating **very dense deployments** of wireless communication links to connect over 7 trillion wireless devices serving over 7 billion people
 - Enabling advanced **User controlled privacy**

Source: 5G PPP proposal.

WHY A PPP? II



- › Complementary PPPs
- › Progress on services (e.g. FI-PPP) is accelerating the already high pressure for improved Infrastructure(s)
- › Need to advance networks (e.g. 5G Infrastructure PPP) to ensure the optimal user experience and EU Leadership



Source: EC NetSoc CSA – FI and 5G PPP – Poster.

5G PPP VISION



› Context

- Future 5G networks quite different from today's networks
- It takes in average 10 years to develop a new generation of network

› Vision

- In ten years from now, telecom and IT will be integrated towards a common very high capacity ubiquitous infrastructure
- Converging capabilities for both fixed and mobile accesses
- Future networks massively based on general purpose, programmable and specific high performance hardware
- That will offer resources for transport, routing, storage and execution
- Network elements will become "computing equivalent" equipment that gathers programmable resources, interfaces and functions based on virtualisation technologies

Source: 5G PPP proposal.

PROPOSED RESEARCH PROGRAM



Project implementation

- › Faster, More Powerful and More Energy Efficient Solutions for integrated High Capacity Access and Core Networks for a Wider Range of Services
 - Wireless Networks
 - Optical Networks
 - Automated Network Organisation - Network Management and Automation
 - Implementing Convergence Beyond the Access Last Mile
- › Re-Designing the Network
 - Information Centric Networks
 - Network Function Virtualisation
 - Software Defined Networking
 - Networks of Clouds
- › Ensuring availability, robustness and security
- › Ensuring efficient hardware implementations

Source: 5G PPP proposal

INDICATIVE TIMELINE I



- Mid 2014: **Expected start of first projects** under the PPP umbrella.
- 2014 **Exploratory phase** to understand detailed requirements on **5G** future systems and to identify most promising functional architectures and technology options which will meet the requirements. These activities will build on previous research work in industry and research framework programs as well as global activities in other regions and standards bodies.
- 2015** **Detailed system research** and development for all access means, backbone and core networks (including SDN, virtualised network resources, cloud systems, undedicated programmable hardware, ...) by taking into account economic conditions for future deployment. This work will set the basis for a Pan European experimental infrastructure serving all network domains. The proof of concepts in particular for core network elements is expected in this phase.

Source: 5G PPP proposal.

INDICATIVE TIMELINE II



2016/2017

Detailed system optimisation by taking into account all identified requirements and constraints.

Finalise consensus on globally identified frequency bands for mobile and wireless communications (also taken into account the result of WRC15) and final system definition and optimisation by means of simulations, validation of concepts and early trials. The PPP will develop contributions to initial global standardisation activities and will build the Pan European experimental infrastructure in collaboration with GEANT and FIRE initiative.

Preparation of WRC17/18.

Support of initial international standardisation activities, which will continue in the following years.

2016/2017

Support of regulatory bodies for the allocation of newly identified frequency bands for the deployment of new systems. New frequency bands should be available around 2019/2020.

Source: 5G PPP proposal.

INDICATIVE TIMELINE III



- 2016/2017** **Implementation of large trials** of new systems for validation under close to real world conditions, complementary research work as the need will arise as technologies are assessed.
- 2016 to 2019** Investigation, prototypes, technology demos and **pilots of network management and operation**, cloud-based distributed computing and big data for network operation.
- 2017/2018** **Extension of trials to non ICT stakeholders** to evaluate the programme results and its impact in the real economy.
- 2017/2018** **Detailed standardisation process** based on validated system concepts by means of simulations and close to real world trials.
- 2018 to 2020** **Large scale demonstrations and trials**, scalability testing, etc.

Source: 5G PPP proposal.

INDICATIVE TIMELINE IV



2019/2020

New frequency bands available for trial network deployment and initial commercial deployment of new systems.

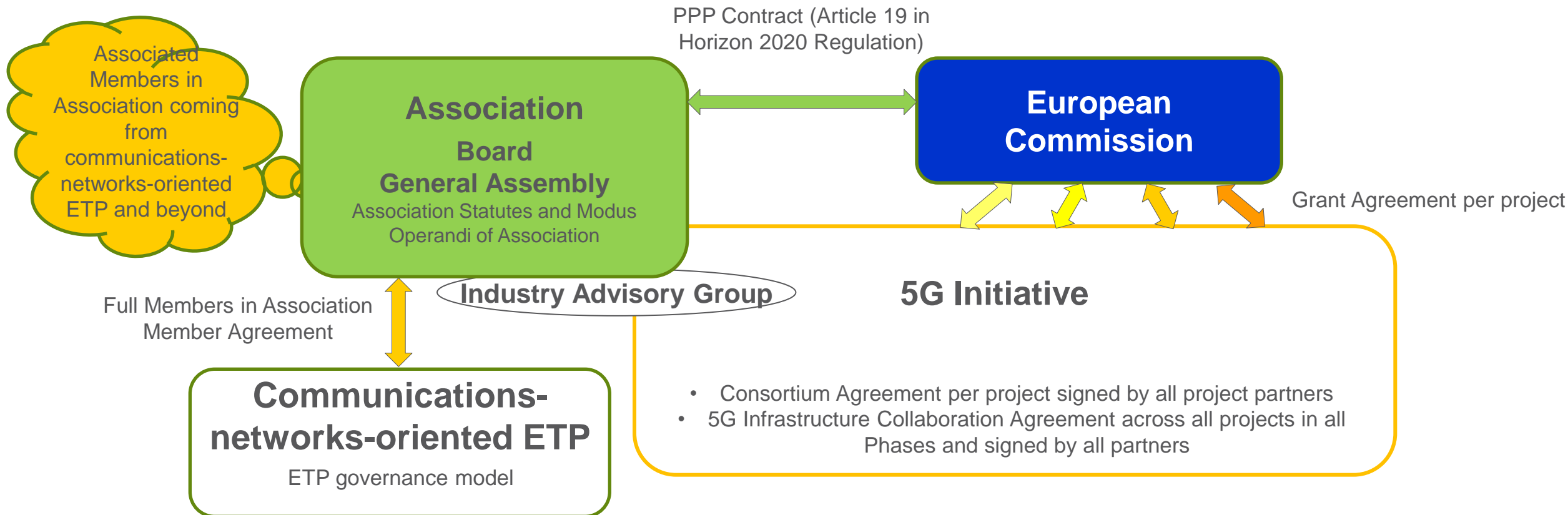
2019/2020

Close to commercial systems deployment under real world conditions with selected customers to prepare economic exploitation on global basis.

Source: 5G PPP proposal.

PROPOSED GOVERNANCE MODEL

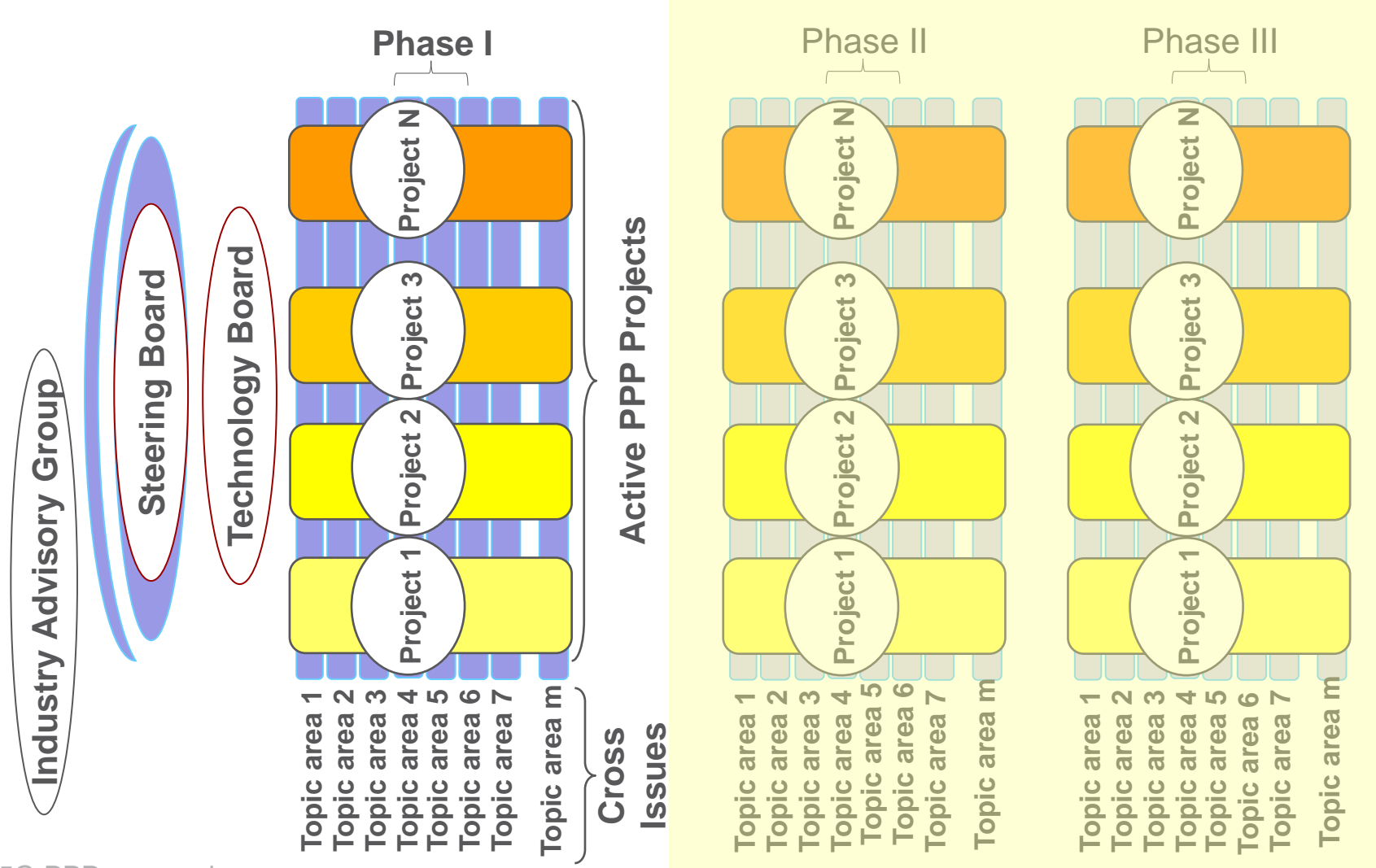
Basic approach



Source: 5G PPP proposal.

PROPOSED GOVERNANCE MODEL

Project implementation



- Consortium Agreement per project signed by all project partners
- 5G Infrastructure Collaboration Agreement across all projects in all Phases and signed by all partners

Source: 5G PPP proposal.



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