Towards a service-driven Energy Market

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The Platform Concept
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The E.ON Energy Research Center

- June 2006: the largest research co-operation in Europe between a private company and a university was signed
- Five new professorships in the field of energy technology were defined across 4 faculties
- Research areas: energy savings, efficiency and sustainable power sources
ACS Research Areas

Applications

Smart Cities
Future Energy Networks
Center for Wind Drives
Future Internet

Grid Operations

Fundamentals of Grid Dynamics
Network Stability
Hybrid DC/AC Networks
Grid Monitoring
Grid Automation
Integration of Renewables

ICT 4 Energy

Energy as data-driven systems
Distributed Computing for
Complex System Simulation
Distributed Intelligence for
Energy Systems
Cloud applications for energy
Real-Time Systems
The Lab as a Network of Experiments

- ACS Real Time Lab
- Wide Area Network Emulation
- Hybrid Microgrid
- Phasor Measurement Units (Alstom)
- Substation Automation (ABB)

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09/07/2015 | ACS Automation of Complex Power Systems | 4
The Platform Concept
Times they are a changing....

The Platform Concept
Grid (R)Evolution
Products need an ecosystem
Utility 4.0

- A new model of utility is emerging
- This new model of utility has to be closer to customers
- We need to integrate data and components for “smart processing”
- Such a vision is line with “Internet of Things”
- Utilities are looking for a concept of “platform” to focus on what they better understand: energy
Platform - The window of opportunity

- Creation can not be done by one utility alone
- Consensus and support to be built by all stakeholders
- The competitive advantage given by the services on top
- Critical to keep “a door open” to fast developing solutions such as the one SME can provide
- Critical to merge Smart Energy in the Smart City scenario
The Future Internet Public-Private Partnership, short: FI-PPP, is a European programme for Internet-enabled innovation. The FI-PPP will accelerate the development and adoption of Future Internet technologies in Europe, advance the European market for smart infrastructures, and increase the effectiveness of business processes through the Internet.
FIWARE and its catalogue
Why FIWARE?

- It is a growing available platform supported by the EC
- There is a growing community of developers
- It is getting momentum in the Smart City arena
- It is currently the only real way to have a cross-disciplinary platform (vital for Smart Cities)
Future Internet for Energy
Towards the concept of a standard platform

- The FINESCE Platform:
  - ICT Platform for Energy Services implementation
  - Based on the FIWARE concept developed and supported by the European Commission
  - Basic ideas: minimize development costs, use standard SW building blocks, standardize interfaces and API, ready for Smart City

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**FINESCE platform**

- Advanced monitoring
- Renewable generation forecast
- Demand forecast
- Energy management services
- Data Analytics

- Distributed Generation
- Industrial Loads
- Residential Loads
- Electric Vehicles
- Energy market
The building blocks

- Generic Enablers
- Domain Specific Enablers
- Proprietary Solutions
The complete picture

Third party Applications

API Layer

Service and Application Layer

Protocol and Data Modeling

- Distributed Generation
- Industrial Loads
- Residential Loads
- Electric Vehicles
- Energy market
What is already out there?

**Contract Information (ContractInformation2Orion**)**
ContractInformation2Orion is a REST service (developed in Java) which allows clients (e.g., Retailers) to register data about cost of energy produced from the DERs, costs of transmission system and power plants, energy costs in an Instance of ORION Context Broker GE.

**Social Events Interface (Social2Orion**)**
Social2Orion is a REST service (developed in Java) which allows clients (e.g., Social Events Information Providers) to register data about social events (affecting consumption/production in a specific area such as a concert or a football match) in an instance of ORION Context Broker GE.

**Weather Condition Interface (WeaFor2Orion**)**
WeaFor2Orion consists of a REST service (developed in Java) which allows clients (e.g., Weather Condition Information Providers) to register data about weather conditions and predictions in a specific area onto an instance of ORION Context Broker GE + a Java client which retrieves weather conditions and predictions from an external service (forecast) and then "passes" the data to the above mentioned REST service.

**Metering (Metering2Orion**)**
Metering2Orion consists of a REST service (developed in Java) which allow clients (e.g., DSOs) to register data about metering and load profile in a specific area in Context Broker GE + a Java client which accepts data about metering and load profile coming from the smart meters (via either an IoT gateway or an existing legacy "passes" the data to the above mentioned REST service.

**Field**

**FINESCE Specific Enablers**

**Home / Specific Enablers**

**Browse by Trial Site:**

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The concept of an open platform

- Creating a consortium of Industry interested in developing and supporting the platform
- Creating a forum where the needs for future developments are discussed
- Exploiting university resources to have the needed support
- Sharing the results in an open source version
- Allowing partners to develop supported versions (similar to the Linux concept)
Grid Monitoring as a Service

Gridhound UG (haftungsbeschränkt)

Gridhound
The low-cost grid monitoring solution as a service

Our solution provides a cloud-based data-driven monitoring service for power distribution systems. Using a new monitoring idea that we have developed and is in the process of being filed as a patent, we can perform this monitoring task with very few measurements, no need for system model, and with very low computational cost.

Using such a monitoring service, any power distribution system operators (DSOs) can obtain an understanding of the ongoing situation in their networks (compared to the actual situation in which there is almost no data in real-time). This allows the violation detection of system operating limits in real-time and therefore, enables a much safer and more efficient system operation. Considering the impacts of the ever-increasing penetration of distributed generation units such as photovoltaic units on distribution systems, our service would be highly valuable in order to integrate higher volumes of renewable generation at the distribution level and also make better decisions about the required upgrades in the systems.

More information will come soon.
Cloud-based Monitoring

The Platform Concept
SW Architecture based on FIWARE

The Platform Concept
Summary

- The energy system is going through a real revolution
- We are moving from a top-down to a bottom-up system
- All the players are facing a dramatic change of their role
- New players are supposed to appear and this opens the door for significant innovation
- Data are the new big value for the system: ownership/management
- Main changes will be enabled by the implementation of new Smart Services able to exploit the knowledge in the data
- Creating a platform for Europe can significantly push the development further
- The best we can do is to extract what we can from the available infrastructure minimizing large investments
- Ideas are on the way …..
Thanks for your attention!!!