SEESGEN-ICT

4° GENERAL WORKSHOP

Paris - SAP Office, April 14th – 15th 2011

Rune Gustavsson & Shahid Hussain

BTH SWEDEN

WP3 - ICT for Energy Efficiency Monitoring in Smartgrids

Recommendations for concrete actions – Added values

PARIS 14/04/2011

Summary

Overview of earlier presentations

1. Interoperability definitions from NIST and GridWise
2. Aspects of Interoperability in Smartgrids
3. ICT and Interoperability in Smart Grids
4. Examples of Pilots of Smartgrids
5. Requirements on Monitoring
6. Technical barriers and solutions
7. Security issues

Systems of Systems

- The GridWise view of **Interoperability between Energy Systems (E) and ICT Systems (I)**
- **End-to-End** Interoperability

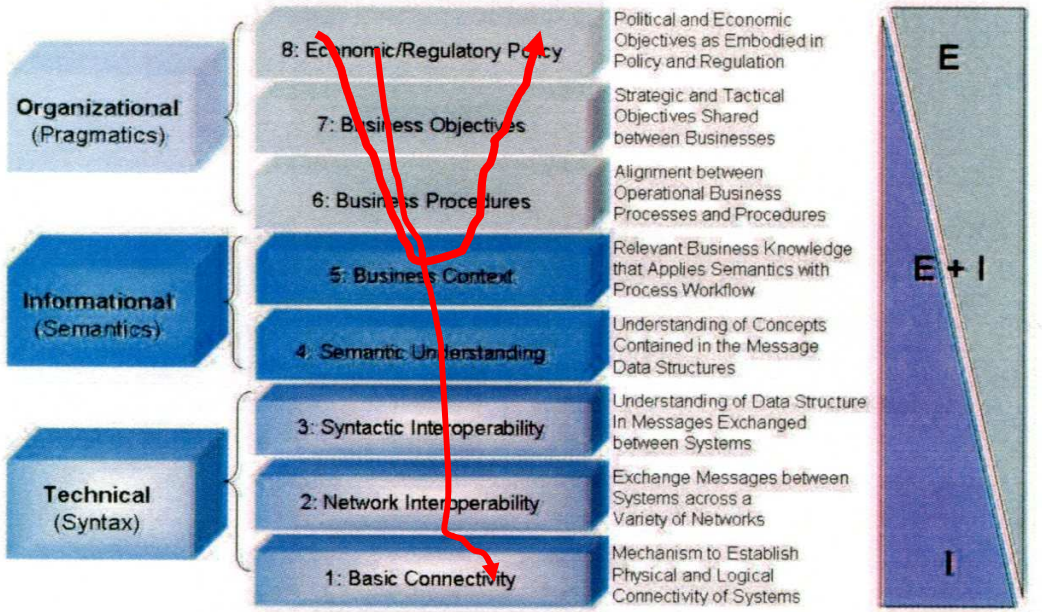

Figure S.2: Interoperability Framework Categories

Requirements

Abstractions (virtualizations)

Alignment

Affordances of components

Issues

- Interoperability is layered into ***eight Categories***. The ***non-functional system requirements*** are defined as ***vertical crosscutting Issues across Categories***.

- *Challenges are related to proper implementations of* ***horizontal coordination within Categories*** *and* ***vertical coordination across categories*** *taking into account the cross-cutting issues. The vertical integration will require* ***transformation of data content****, while* ***maintaining contextual meaning*** *interpreted by sender-receiver*

- ***Local interoperability*** *is enabled by* ***enforcing standards****. However,* ***global end-to-end interoperability*** *require* ***implementation and monitoring message exchange and content across organizational boundaries****.*

Issues and recommendations addressed in WP3

- Service Level Agreements (SLAs)
- Monitoring
- Evolution of Smartgrids
- Enforcement of standards

Concerns

- Implementing and validating Interoperability in Smartgrids
- Interoperability between SCADA systems and supporting ICT systems in contexts of Smartgrids
- Lessons learned from Smartgrids Pilots
- A Roadmap of designing and implementing ICT enabled Interoperable Smartgrids

Service Level Agreements (SLAs)

- **Issue**: The requirements on ***flexibility and interoperability*** of Smartgrids, combined with preparedness of flexible groupings of (partially new) stakeholders, delivering energy-based services meeting desired ***Quality of Service*** (QoS) in flexible energy markets require ***coordination mechanisms*** such as SLAs that can be properly ***monitored and controlled***.
- The SLAs specifies, at least:
  - The ***service*** (product) to be ***delivered with monitored*** KPIs. ***Contracts***.
  - The ***role, competencies, responsibilities*** and delivered services by each stakeholder of the SLA
  - The ***control and coordination*** of the execution of the SLA
  - ***Management at breakdowns*** of services
- It should be noted that a ***SLA specifies*** a ***unique area*** of the GridWise "Interoperability Cross-cutting Issue" rectangle.

Implementation of SLAs

- From previous discussion we note that Specifications of SLAs kan be mapped on the GridWise table on Categories and Cross-cutting Issues. Hence:
  - ***SLA specifications*** can be regarded as ***supporting Interoperability*** over a set of services and stakeholders.
  - By implementing the SLA application as a configuration of Smartgrids services and associated middleware we can ***ensure that we have achieved an end-to-end interoperability as well***.
  - ***Monitoring the SLAs will enable QoS assurance*** according to the agreements. Furthermore, conflict resolution between stakeholders should be supported by adequate agreements and monitoring.

Recommendations

- Define ***Minimum Requirements for SLA procurement, design and implementation*** in the energy sector, taking into account different ***context dependant tasks and cross-cutting issues*** such as Power quality, smart metering or Demand-Response. Identify the stakeholders involved and the ***service performance KPIs*** to monitor.

- Define ***strategies for coordination and governance*** of SLAs. The vertical interoperability is based on ***bundles of SLAs of high level and low level Categories***. The coordination between these bundles can be facilitated by message exchanges.

Actions and added value

- ***Inter sector oriented Mandates*** to define and implement the Minimum Requirements and Governance strategies for SLAs in Smartgrids.

- **Added value**: A necessary but nor sufficient action for enabling Smartgrids. Added value for all stakeholders, provided that ***supporting regulatory frameworks*** of energy markets are in place

Monitoring

- **Issue:** ***Monitoring of processes*** is at the core of distributed systems. Monitoring is based on ***states and state transitions following by a pre-defined set of actions***. Crucial to monitoring is ***proper data formats and eventual data transformations***. Other crucial issues are related to ***data management and data storage***.

- In ***classical power systems*** the monitoring and control tasks of the flow of electricity is supported by ***SCADA systems***.

- However, ***SCADA systems are***, for several reasons, ***inadequate*** as information processing systems ***for Smartgrids***. ***Complementary*** ICT systems has to be designed and implemented to meet hose requirements.

Smart monitoring

- Smart monitoring has to deal with issues related to a ***smarter electric grid*** and ***inclusion of large amounts of DER and RES***
  - Smart monitoring is enabled by architectures ***of loosely coupled components*** coordinated taking into account interoperability requirements
  - Smart monitoring might include extended services related to ***predictions*** of demand-supply as well as ***selected price signals*** based on analysis of wholesale and retail pricing
  - Smart monitoring might include services ***supporting active customers***

Recommendations

- Efforts on supporting ***inter-changeability and inter-operability*** of monitoring, measurements and control components

- ***Trustworthy management*** of collection, processing, distribution and storage of monitored data

Actions and added value

- Push standardization efforts to the target!
  - Smart Grid Mandate. *Standardization Mandate*. M/490, March 2011.
- Push for standard interfaces between subsystems of the emergent Smartgrids
- R&D to integrate data management and data processing in SCADA and complementary ICT systems
- **Added value** for all stakeholders of Smartgrids

Evolution of Smartgrids

- **Issue:** Design and implementation of Smartgrids and its subsystems can draw benefit from the increasing ***use of already partially rolled out technologies***) suitable for the application and to the criticality of the situation) such as OPC-VPN-Semantic web- Service oriented Computing-Cloud Computing, etc.

  Furthermore, In order to foster progress, means for collection and dissemination of ***lessons learned and best practices*** should be encouraged.

Recommendations

- Explore the ***effectiveness and the suitability*** of technologies for design and implementation of SLAs and associated information exchange

Actions and added value

- Support ***setting up and evaluation of pilot projects*** related to different applications and situations

- ***Added value***: Increased cost efficiency in development of Smartgrids. ***Supports evolution and realization of existing Roadmaps.***

Enforcement of standards

- **Issue**: There is a need to guarantee an ***effective interface between electric and telecommunication/ICT worlds***, c.f. the E+I notation of GridWise Framework.

  Protocols belonging to the two ***lowest categories*** of the Framework, i.e. ***Basic Connectivity and Network Interoperability*** also allow virtualization of the technical components and hence interoperability. This is a minimum requirement to to implement effective interfaces between the two worlds mentioned above. Furthermore, based on a shared set of protocols we can focus on ***methodologies and solutions supporting coordination on top of selected communication solutions.***

Recommendations

- Select ***appropriate sets of standards*** proposed by different EU and US SmartGrids efforts listed earlier
- Select also ***guidelines codes and practises*** from those and other sources and also from other sectors, e.g., telecommunication and electronic banking
- Suggest ***aggregation methodologies*** to ***select and implement non-functional Cross-cutting Issues*** such as security, information security and privacy

Actions and added value

- ***Commit*** to an Intersectoral Mandate
- ***Push regulators*** to the above recommendations
- ***Validate EG2*** recommendations regarding Data Privacy
- ***Validate NITRD CSIA*** recommendations on R&D on cyber security
- **Added value**: All stakeholders of Smartgrids

Conclusions

- Open floor!