

ADDRESS Project & Communication Issues



CIM User Group Meeting
15-18 June 2010 Milan, ITALY

PANEL – Smart Grid Developments

Romano NAPOLITANO, Enel Distribuzione
June, 16th 2010

active demand

address
interactive
energy



Official Partner



The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 207643

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Research and Pilots Actions concerning Smart Energy Networks are growing since 2000 under EU Framework Programs for R&D.

The Seventh Framework Program



<http://www.smartgrids.eu>

- European research activities are structured around consecutive four-year programs (i.e. 2008-2012), within so-called Framework Programs. The Seventh Framework Program (FP7/2007-2013) sets out the priorities.
- More than 140 M€ spent/earmarked so far (2005 - 2010) in FP7 and according to the EC, a substantial budget increase is forecasted for 2012-2013
- **ENERGY-2007-1- RTD** regards several topics: in the contest of the **Smart Energy Networks**:
 - ◆ Development of **interactive** distribution energy networks
 - ◆ ...

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ADDRESS stands for **Active Distribution** network with full integration of **Demand** and **Distributed energy RESources**

Project Highlights



The overarching goal of ADDRESS project is the active participation of domestic and small commercial consumers in the power system markets and the provision of services to the different participants

<http://www.addressfp7.org>

Project Details

- Project Reference: 207643
- Starting Date: June 2008
- Duration: 48 months
- Project Cost: 16 million €
- Contract Type: Integrated Project
- Ending Date: May 2012
- Project Status: Underway
- Project Funded: 9 million €



Project Coordination



Technical Management

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Consortium is composed of 25 Partners coming from 11 European Countries.
All required resources to target successfully the ADDRESS goals are present.

Consortium

- **40%** - Research Centres & Academies
- **30%** - Power Utilities (DSOs, Energy Supplier and Retail Companies)
- **30%** - Manufacturers

The ADDRESS partners are of various types and gather all needed competences from the development of Electric Equipments, Home Appliances & White Goods, ICT to the analysis of the energy markets mechanisms



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Interaction with significant and representative User Groups and Stakeholders will help to understand concerns, aspiration and benefits of Active Demand.

Stakeholders & User Groups



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Objectives



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Project includes a number of workpackages: WP1 to WP6 basically focus on Vision Development and Demostration aspects. In addition WP7 provide for Dissemination activities & WP8 finally for Project Management.

Overall Schedule

		WP1	WP2	WP3	WP4	WP5	WP6
JUN 2008	<p>VISION DEFINITION Concepts, functional requirements and scenarios</p> <p>DEVELOPMENT & LAB TEST Strategies, algorithms, prototypes</p> <p>DEMONSTRATION Validation & assessment of results</p>						
DEC 2009							
JUN 2011							
JUN 2012							

Consumers' engagement

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In the Active Demand Architecture a key role is played by the Aggregator which acts as a mediator between Consumers, Market and other Participants.

Conceptual Architecture

Aggregator Functions

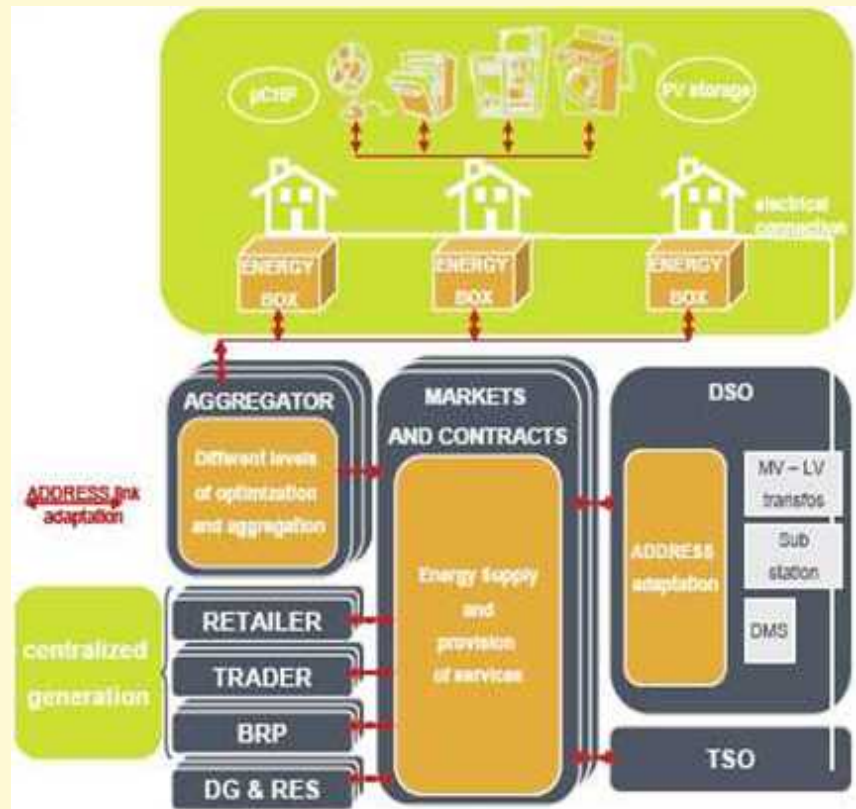
Gathers the flexibilities and contributions of consumers to “build” Active Demand (AD) “products”

Offers/sells the AD products to the power system participants via the markets and in this provide AD Services to the electricity system players

Manages the risks (for price and volume) associated with uncertainties in the markets & responsiveness of the consumer base.

Interacts with consumers through price and volume signals and assesses their response and behavior

Maximize the value of Consumers' flexibility



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Demand Approach means all AD Service requests are managed through the implementation of Price and/or Volume Signal mechanism all Participants exchange.

Key Concepts

Interaction based on *real-time* Price and Volume Signals

- Real-time = 15 - 30 min ahead or longer
- Modulated by geographical/topological information
- Direct load control by DSO will be not considered
- Emergency situations are not considered

Demand Approach

- Demand through Signal Price Volume and voluntary participation under a contractual basis
- Deployment of appropriate technologies at Consumers' premises
- Accompanying measures for societal and behavioural aspects

Distributed Intelligence and Local Optimization

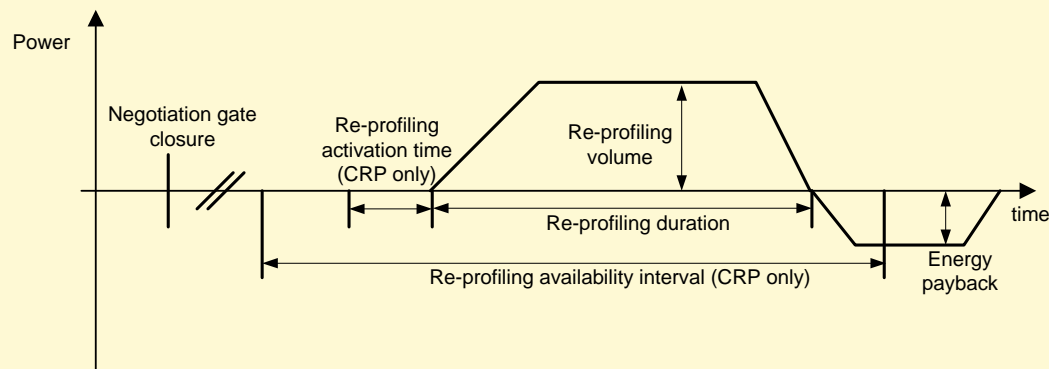
- Topologically Dependent Services (Load Area)
- Participants optimise real-time response according to the real-time signals

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Active Demand Services could be offered to Regulated (DSOs, TSOs) and DeRegulated electricity system players (Producers, Intermediaries & Consumers). ADDRESS Project deals with 31 AD Services.

Active Demand Products

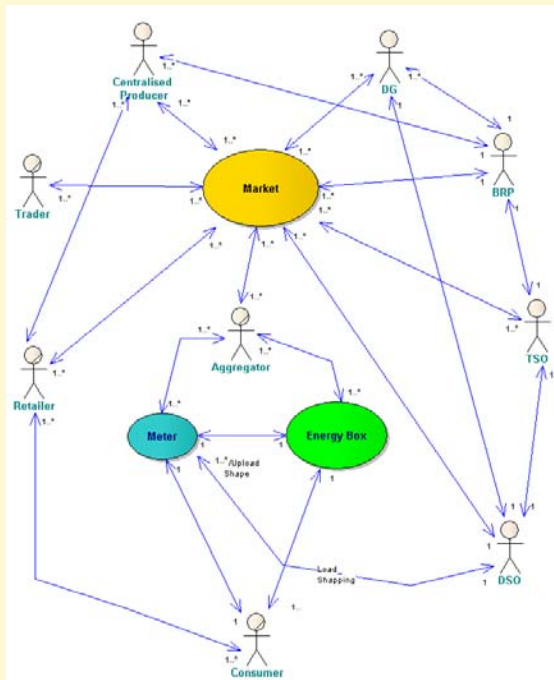
AD Products	Conditionality	Typical example
Scheduled re-profiling (SRP)	Unconditional (obligation)	The aggregator has the obligation to provide a <i>specified</i> demand modification (reduction or increase) at a given time to the product buyer.
Conditional re-profiling (CRP)	Conditional (option)	The aggregator must have the capacity to provide a <i>specified</i> demand modification during a given period. The delivery is called upon by the buyer (similar to a reserve service)
Bi-directional conditional re-profiling (CRP-2)	Conditional (option)	The aggregator must have the capacity to provide a <i>specified</i> demand modification during a given period in a bi-directional range $[-y, x]$ MW, including both demand increase and decrease. The delivery is called upon by the buyer of the AD product (similar to a reserve service).



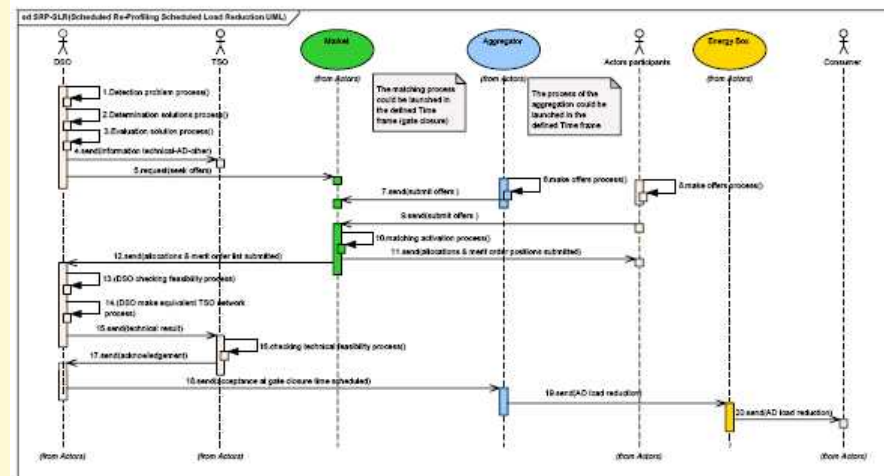
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Use Cases methodology has been followed for modeling interactions and describe in unambiguous and uniform way all Active Demand ADDRESS Service Requirements using UML.

Services Modeling



Scheduled load reduction to solve network constraints



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Communication aspects of ADDRESS Project are in the scope of WP4. Service Modeling/Deployment, Functional Requirements Identification for the Telecommunication Infrastructure and the comparison of some possible Solutions enabling the delivery of AD Services are some of the main topics to be faced.

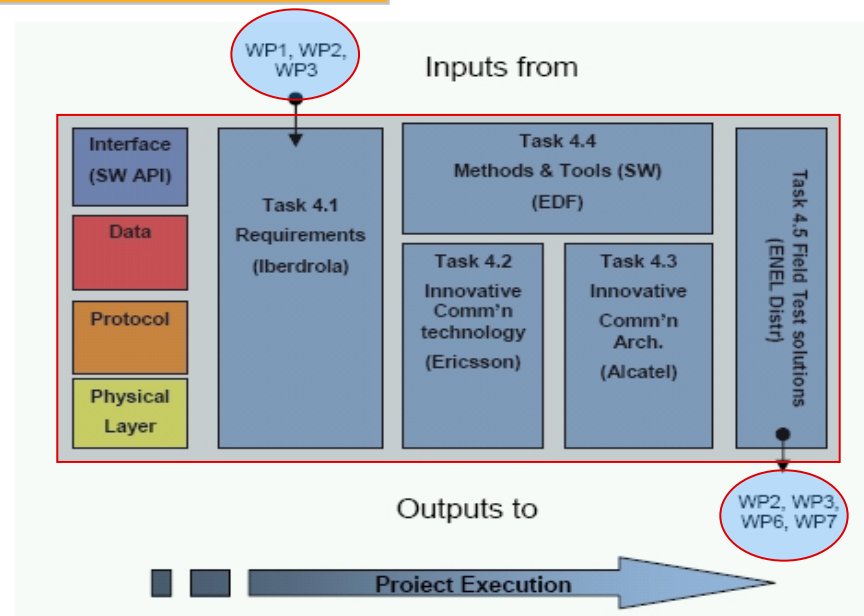
WP4 - Communication

WP4 Five Subtasks

- Services
- Functional Requirements
- Technologies
- Architecture Solutions
- Interoperability

WP4 Outcomes

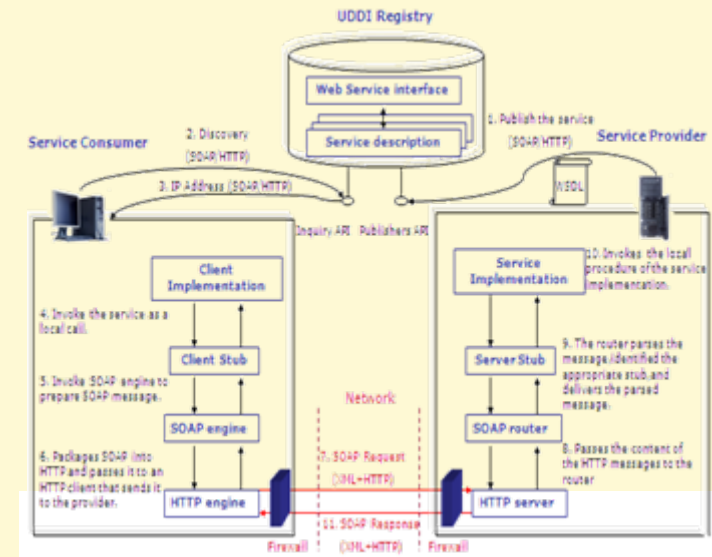
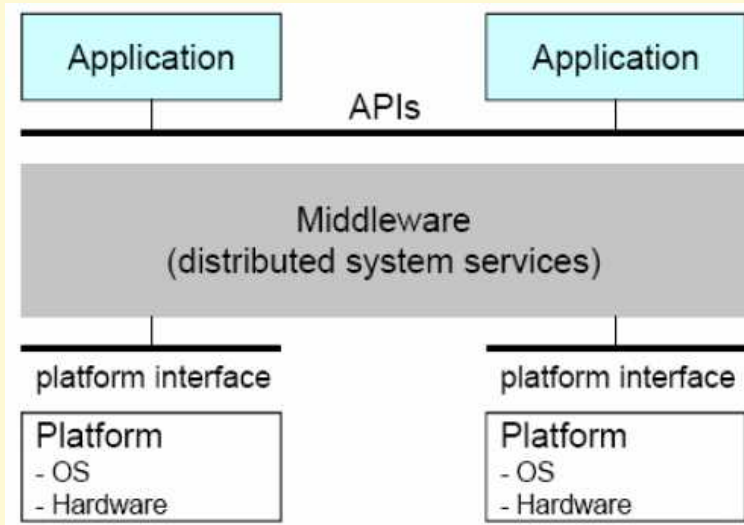
- Documentation of Software Architecture encoded in UML and API
- Technical Guide for building up a Smart Grids Telecommunication Infrastructure enabling ADDRESS Active Demand
- Communication Field Test Design including the testing ADDRESS Prototypes



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The SOA based on Web Services was seen to be the most modern and flexible way of implementing an interoperable communication system capable to fulfill ADDRESS Requirements.

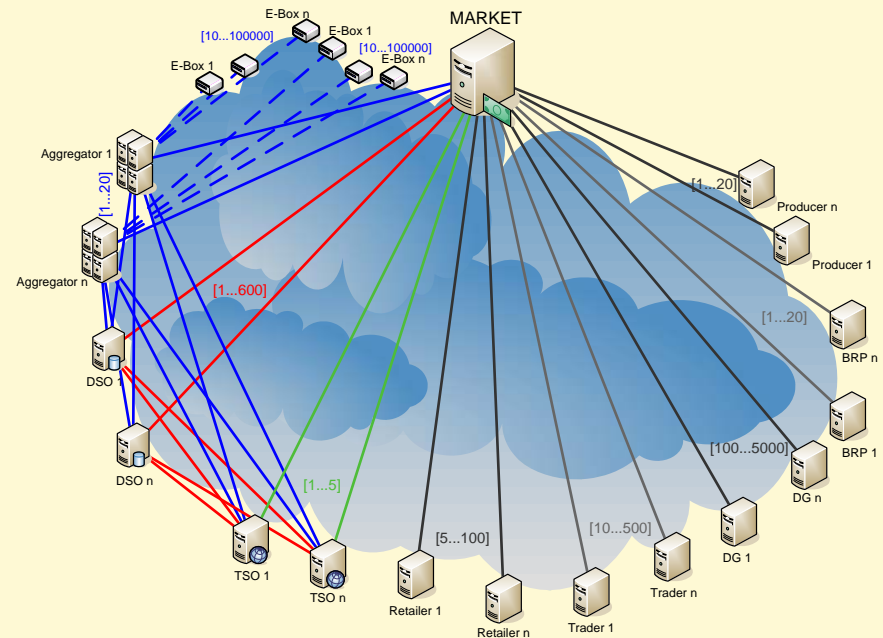
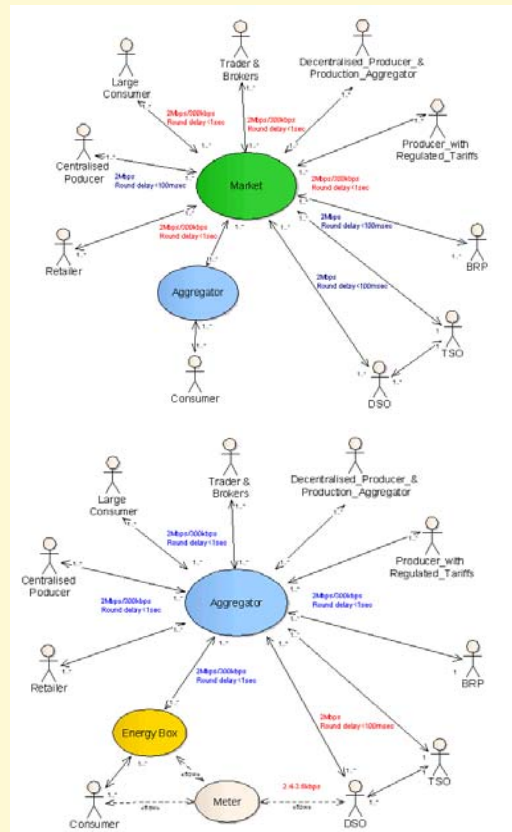
SOA and WEB Services



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The Basic Telecommunication Architecture was derived from both the Use Cases as well as taking into account the UGS Survey on Telecommunication.

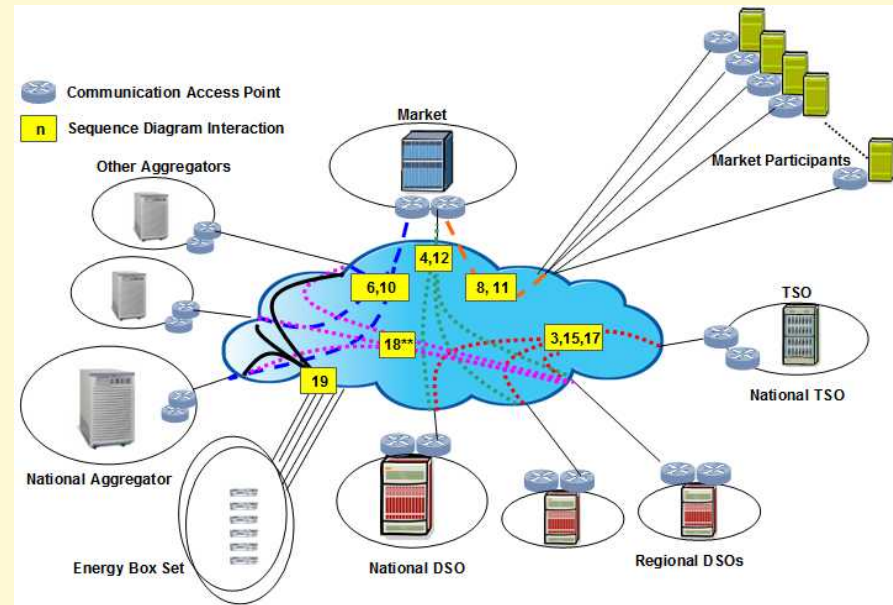
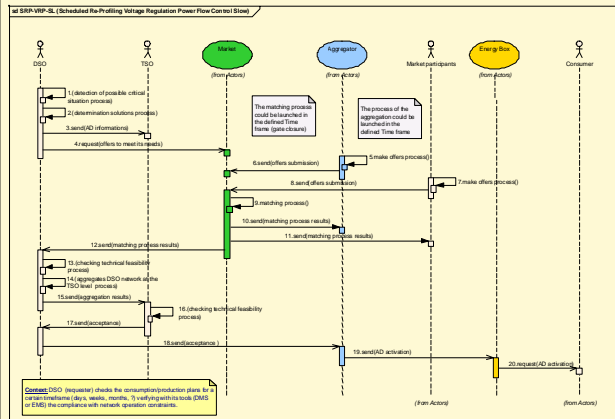
Communication Architecture



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UML Sequence Diagram provide for a Service Description. It is a graphical representations of all interactions between actors contributing in that service.

Network Service Mapping



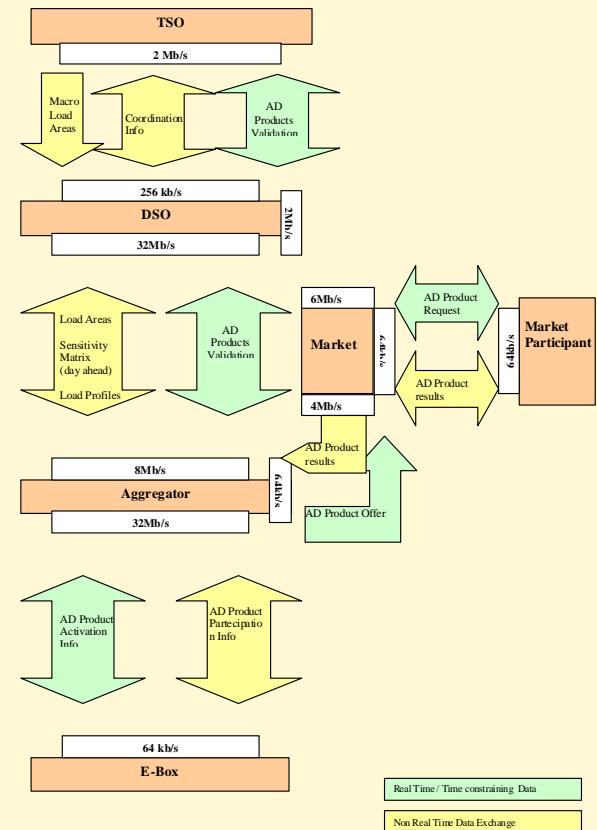
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WEB Services exploitation increase the cost of the elements of Traffic Matrix while assures the highest level of interoperability: this is a key aspect for this project.

Traffic Matrix Sample

Scenario	
TSO	1-5
DSOs	1-600
Aggregators	1-20
Market Participants	1000-10000
Market	1
E-boxes	100000-1000000

SRP Request	Message Payload Short Description		
From → To (n:m)	Market Participant → Market (1000:1) Note: Request - from different buyers - for a SRP Product		
	Data	Lenght (bit)	Note
	Parameter	256	Description
	TimeStamp	64	Standard Reference
	Sender ID	32	Description
	Service ID	32	Description
	Service requested/supplied	16	Status
	Service negotiation gate closure	64	Time Reference
Payload (Application Layer)	Minimum volume	64	Power reference
	Requested/supplied power or power curve shape	256	Description
	Price structure	256	Description
	Macro Load Areas or Load Areas involved	256	Description
	Other conditions	256	Description
	Total	...	
Traffic	(Before Market gate closure;60)	(Frequency Periodicity in second; Max Round Trip Time including channel and Telecommunication Interfaces in seconds)	
Priority	L	Low; High	



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