



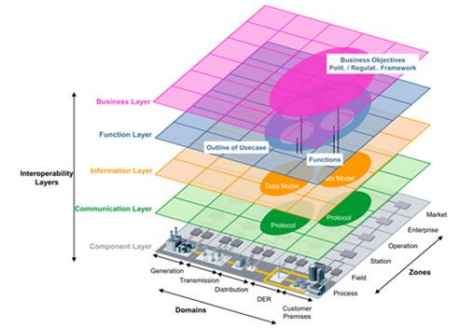
- IDE4L project overview and ANM concept
- Aggregator concept
- Developed functionalities
- Distributed automation system
- Demonstrations
- Conclusions



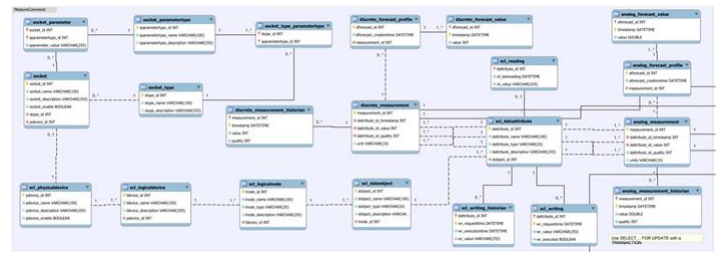
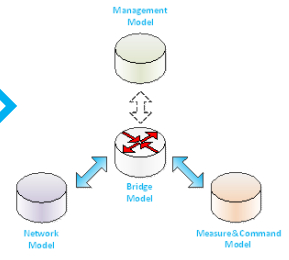
1. Use Cases



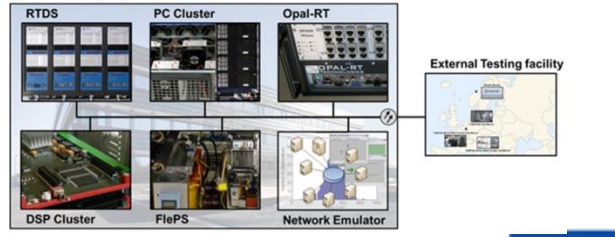
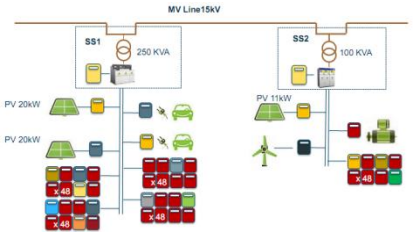
2. SGAM Architecture



3. Implementation of architecture

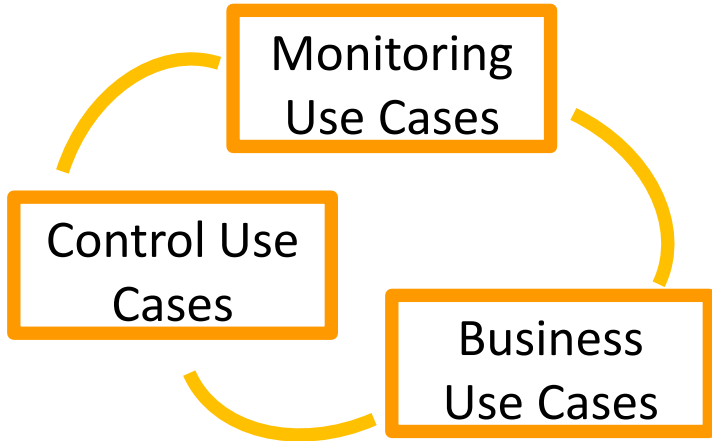


4. Field and Lab Demonstration





1. Use Cases



- State estimation, forecast, network update, measurement collection
- LV, MV, control center power control, block OLTCs, FLISR
- Purchase of energy and flexibility, activation of flexibility





1. Use Cases

Use Case description

Steps	Information producer	Information receiver	Function	Information exchanged	Requirement
1	SAU(PSAU).MMS	SAU(SSAU).MMS	Data Report	Switch Status	TT = 100 ms ...
2	

Actors

- SAU(PSAU).MMS
- SAU(PSAU).RDBM
- SSAU(PSAU).IEC104
- DMS.MMS
- Sensor
- SAU(SSAU).MMS
- DMS.Modbus
- SAU(PSAU).Functions
- SAU(PSAU).Modbus
- DMS.IEC104
- IED(PSIED).MMS
- IED(PSIED).functions

Functions

- Data acquisition
- Data report
- Data storage
- Signals sampling
- Statistical calculation

Information exchanged

- Switch status
- Voltage measurement
- Current measurement
- Power/energy measurement

Requirements

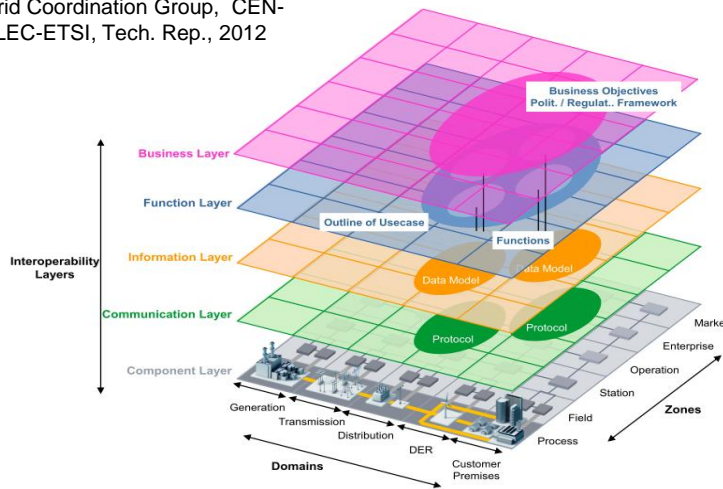
- Requirement: transfer time
- Requirement: Transfer rate
- Requirement: Synchronization
- Requirement: Availability





2. SGAM architecture General description and link to use cases

Smart Grid Coordination Group, CEN-
CENELEC-ETSI, Tech. Rep., 2012

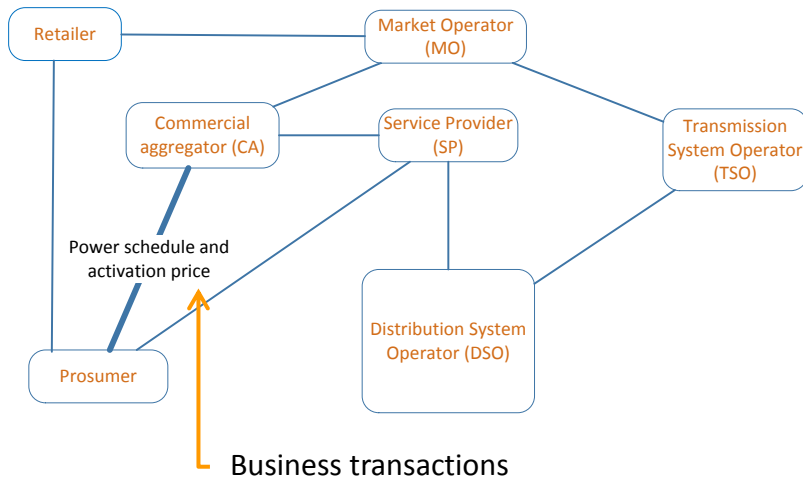


1. Business framework
2. Functions to be implemented
3. Data models in the main automation standards
4. Communication protocols
5. Components, both hardware and software to take part to the automation system



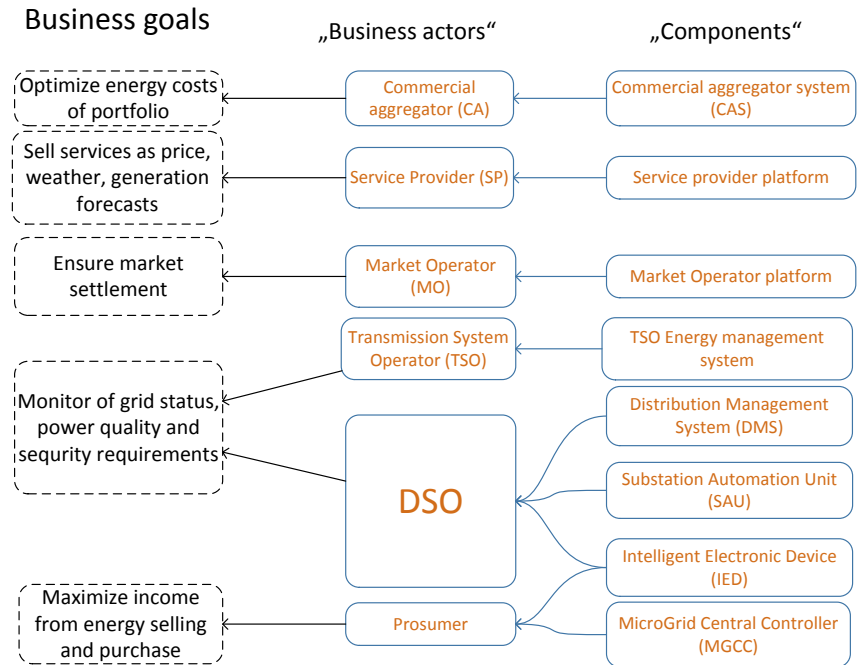


2. SGAM architecture Business layer and mapping to component layer



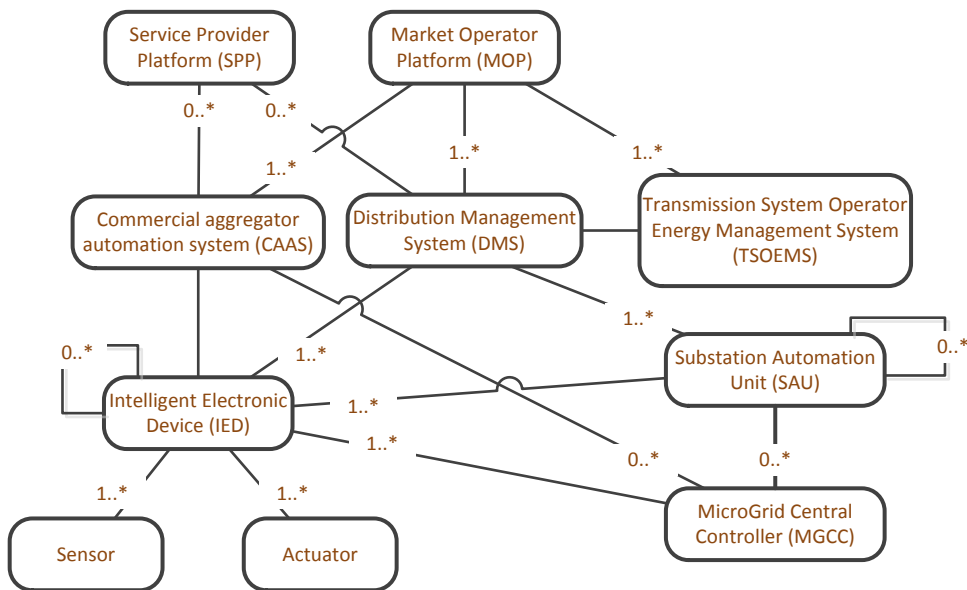
Business layer

- Business actors are connected by business transaction
- Each one has a business goal
- Business actors are mapped onto components





2. SGAM architecture Component layer



New actor developed :

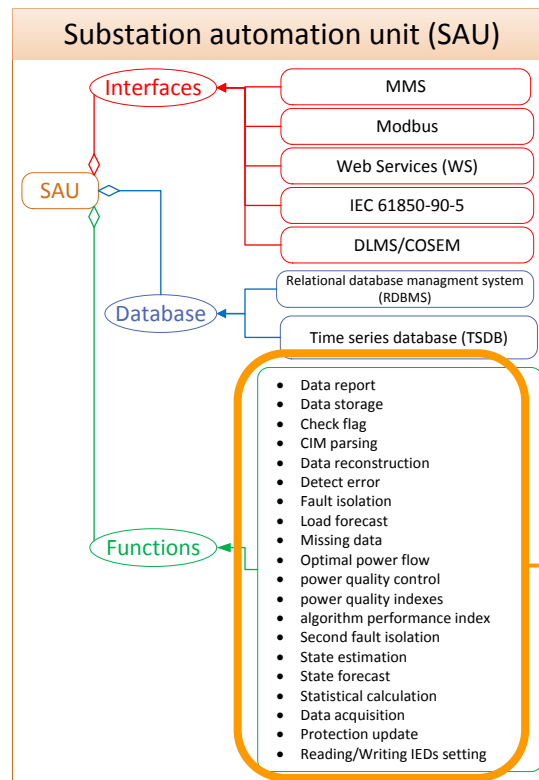
- Substation Automation Unit

Further development for

- Commercial aggregator
- Distribution management system (DMS)
- MicroGrid Central Controller

Each component has been defined in terms of

- Interfaces
- Database
- Functions

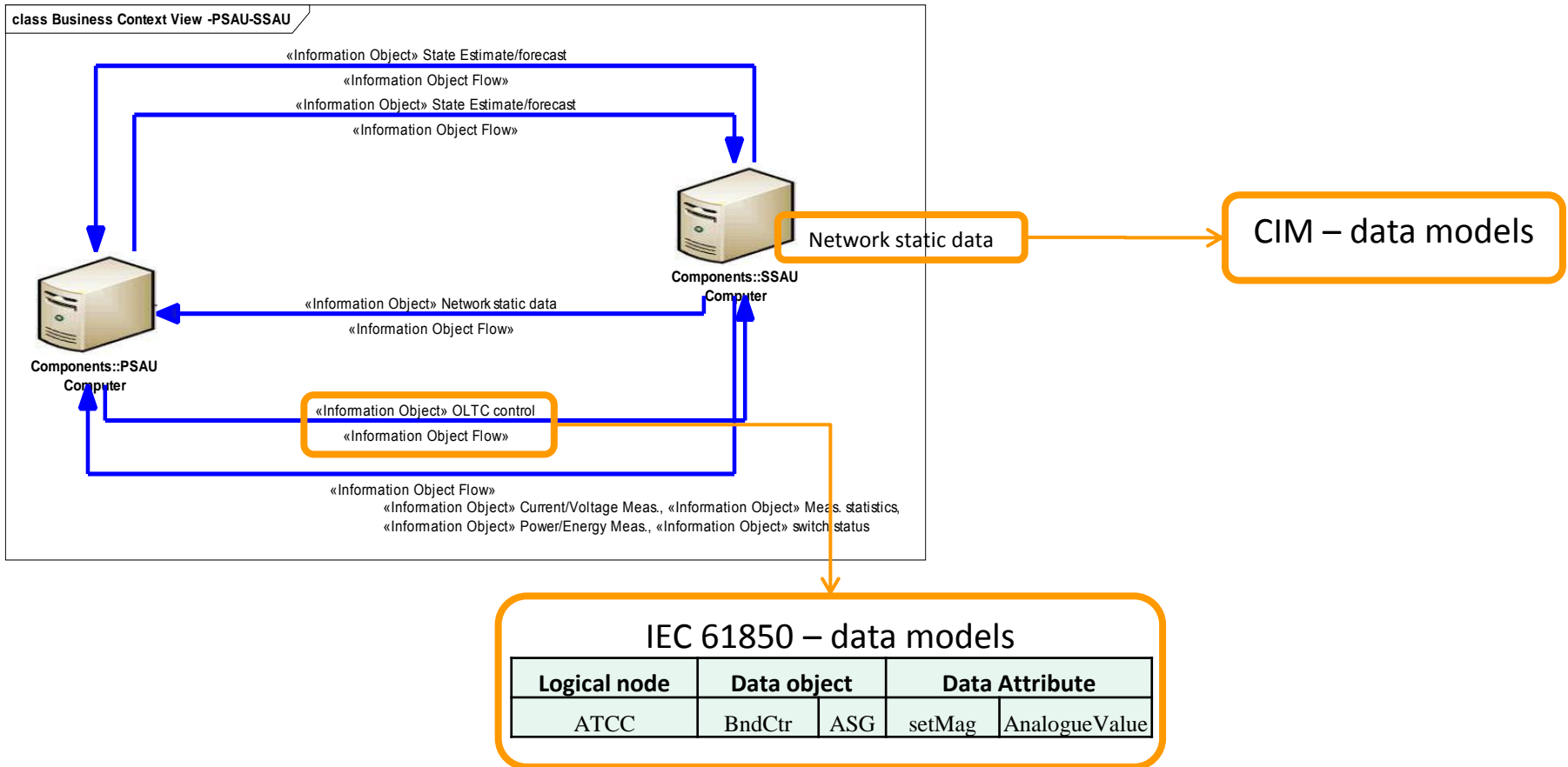


Also present in
function layer
and UCs



2. SGAM architecture

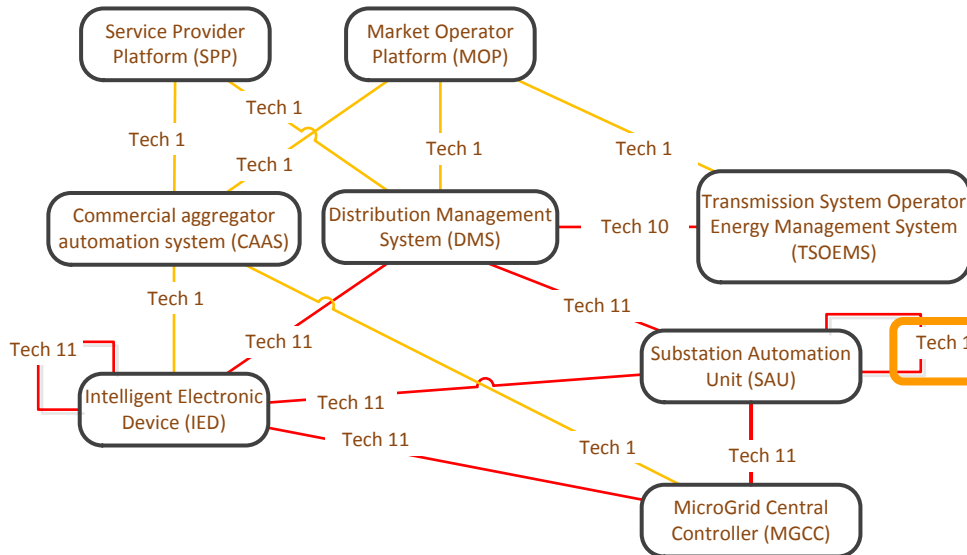
Information layer



2. SGAM architecture

Communication layer

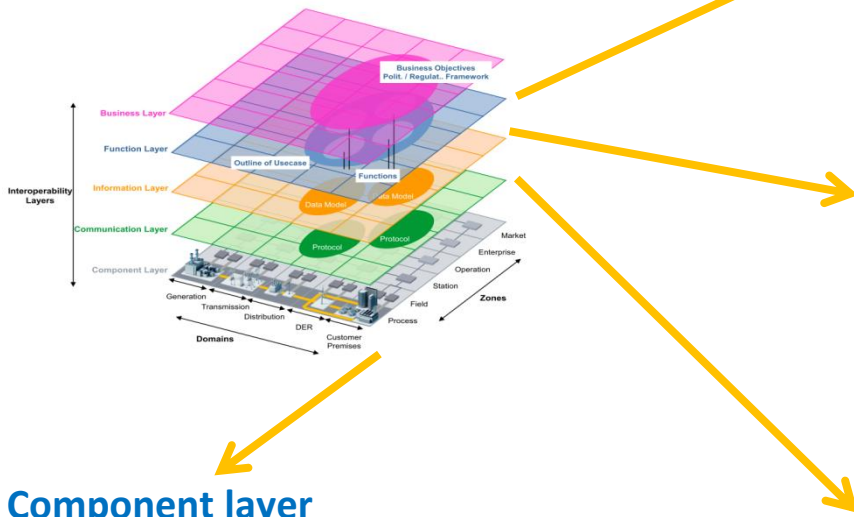
Steps	Information producer	Information receiver	Function	Information exchanged	Requirement
1	SAU(PSAU).MMS	SAU(SSAU).MMS	Data Report	Switch Status	<div style="border: 2px solid orange; padding: 5px;"> Transfer Time = 500 ms Transfer Rate = 1000 kb/s Synchronization accuracy = ... Availability = ... </div>
2	





2. SGAM architecture One step toward implementation

Smart Grid Coordination Group, CEN-CENELEC-ETSI, Tech. Rep., 2012



Function layer

- Functions have been realized in WP4 (FLISR), WP5 (Monitoring and LV, MV, control center control), WP6 (business and commercial aggregator)
- Functions are adapted in order to read and write from a standardized IDE4L database

Information layer

Exchanged data are clustered onto classes and mapped to

- CIM data models for static data and business related data
- 61850 for real time data

Communication layer

- The requirements of the information exchange grouped onto technology classes

Component layer

Each component has been defined in terms of

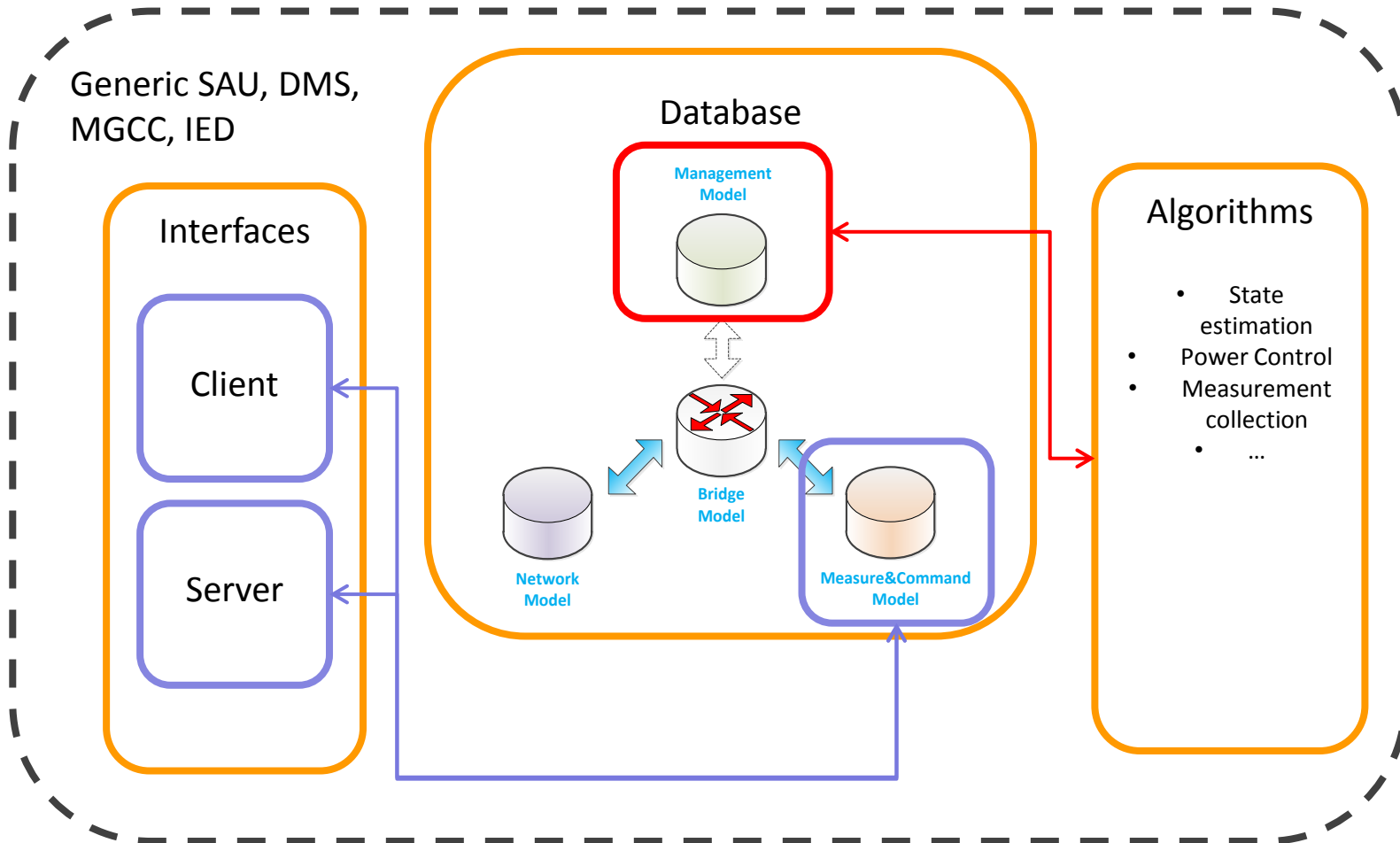
- Interfaces
- Database
- Functions





3. Implementation of architecture

Interfaces, Database, Algorithms





3. Implementation of architecture Database structure

Measure & Command Model

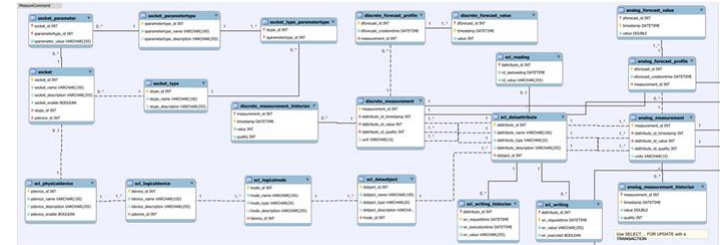
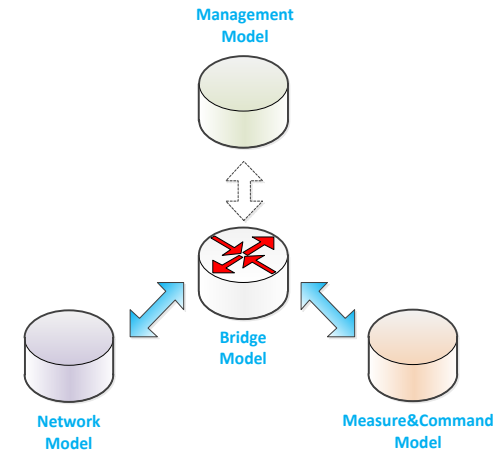
- physical device, logical device, logical node, data object and data attribute
- set of information to parameterize the communications interface to each physical device (such as IP addresses, TCP ports, users and passwords, etc.)

Network Model

Contains the network topology and parameter representation

Management Model

- Represents the models related to an algorithm.
- instantiate, parameterize and control the execution of a specific algorithm



Bridge Model

It is the connection schema for all other schemas. In this data model every relation among Measure & Control, Management and Network are described





4. Field and Lab demonstration

Use Case mapping, KPIs

Use Case mapping and KPIs

- All use cases have been assigned to demonstrators
- Each use case has a set of Key Performance Indexes (KPIs) in order to evaluate the performance of the architecture (deliverable 7.1)

Field demonstrators

- Real loading/generation conditions
 - real PQ issues
 - real congestions
- Real amount of information exchanged
- Real components

Lab demonstrators

- “Real” → “Realistic” (past data or collection of statistics)
- Tests with different time windows and simulation steps → check different issues of PQ, congestions
- It is possible to introduce errors/issues in different parts of monitoring/control chain





Conclusions and Exploitation of IDE4L architecture

1. Use cases

- Around 30 use case detailed descriptions
- List/description of actors, information exchange, functions and requirements
(D3.1 and D3.2)

2. SGAM architecture

- SGAM communication, information, component, business layer in .xls or enterprise architect files
(D3.2)

3. Architecture Implementation

- 61850, CIM information mapping .xls tables to facilitate standard implementation of architecture
- Database structure and sample communication interfaces
(D3.2)

4. Field and Lab demonstration

- Demonstration results
(D7.2)

