LFEnergyFunctionalArchitectureModel

25 Jan 2024 12:41:59

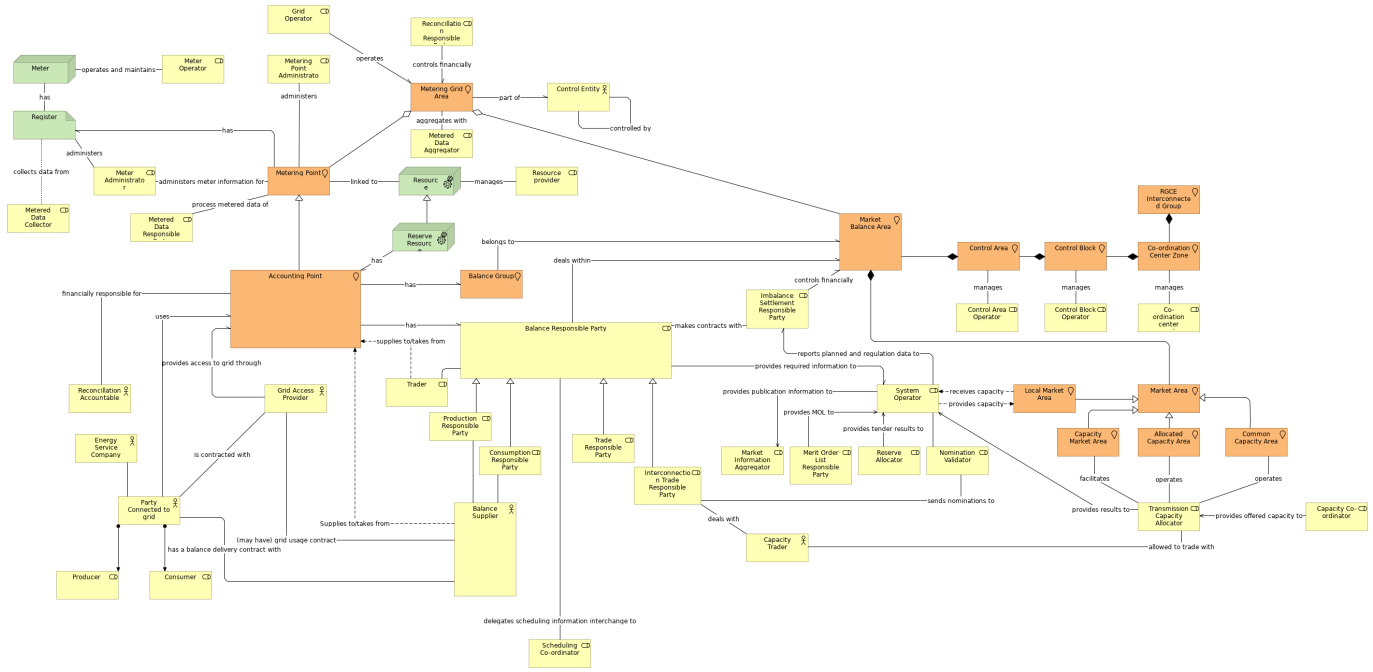
Purpose

The LF Energy members EPRI, RTE, Alliander, and Aachen University have joined together in LF Energy Archimate Working Group to create an architecture model for LF Energy. LF Energy is an open-source foundation focused on the power systems sector, hosted within The Linux Foundation. LF Energy provides a neutral, collaborative community to build the shared digital investments that will transform the world’s relationship to energy. The goal of the LF Energy Architecture Model is to become the place to go for sharing references architectures and project architectures within the LF Energy community. It aims to clarify the ecosystem of LF Energy: wherefore can the LF Energy projects be used, how they interact together, and examples of how they can be adopted in reference architectures. This will provide a clear and deep understanding of how the LF Energy projects contribute to business functions and help the project adoption, foster synergies between projects, and limit the overlap between projects. For more information, please watch the special episode of TFiR: State of Energy where Swapnil Bhartiya sits down with Prince Singh, Solution Architect at Alliander and Benoît Jeanson, Enterprise Architect at RTE, and talk about LF Energy Architecture Model and how it makes it easier for anybody in the world to identify LF Energy Projects that are of interest to them and how they can be integrated into their organization.

Views

Actors and Roles

No viewpoint



Documentation

> Organisation Viewpoint is a standard viewpoint in ArchiMate and "...focusses on the (internal) organistion of a company, network of companies, or of another organisational entity." Here, we use the organisation viewpoint to model different business actors and role in the energy market. The original document used for this viewpoint is ENTSOE The Harmonized Electricity Market Role Model Version 2017-01

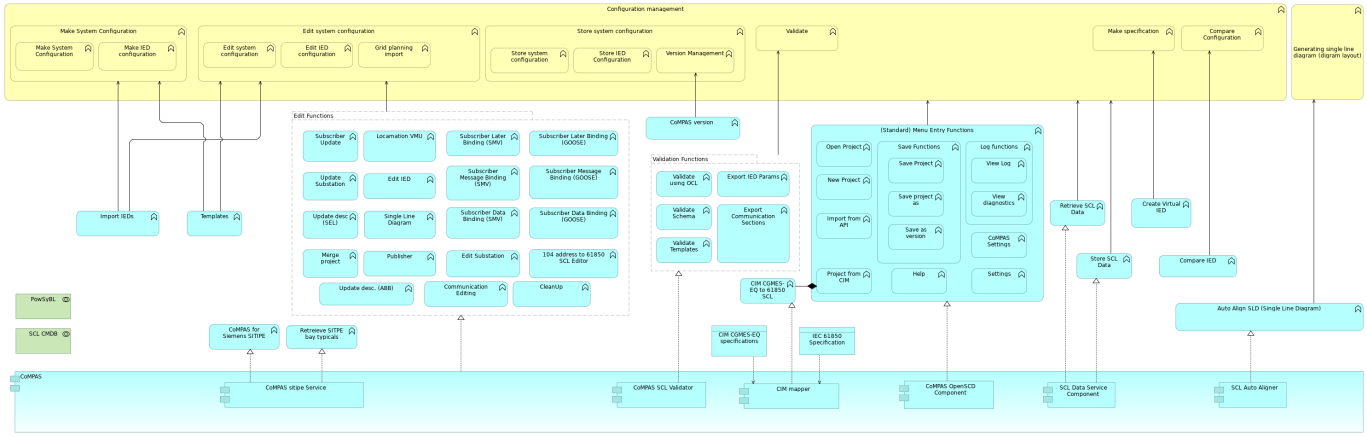
Elements

Element	Type
Accounting Point	Location
Allocated Capacity Area	Location
Balance Group	Location
Balance Responsible Party	Business Role
Balance Supplier	Business Actor
Capacity Co-ordinator	Business Role
Capacity Market Area	Location
Capacity Trader	Business Actor
Co-ordination center operator	Business Role
Co-ordination Center Zone	Location
Common Capacity Area	Location
Consumer	Business Role
Consumption Responsible Party	Business Role
Control Area	Location
Control Area Operator	Business Role

Element	Type
Control Block	Location
Control Block Operator	Business Role
Control Entity	Business Actor
Energy Service Company	Business Actor
Grid Access Provider	Business Actor
Grid Operator	Business Role
Imbalance Settlement Responsible Party	Business Role
Interconnection Trade Responsible Party	Business Role
Local Market Area	Location
Market Area	Location
Market Balance Area	Location
Market Information Aggregator	Business Role
Merit Order List Responsible Party	Business Role
Meter	Node
Meter Administrator	Business Role
Meter Operator	Business Role
Metered Data Aggregator	Business Role
Metered Data Collector	Business Role
Metered Data Responsible Party	Business Role
Metering Grid Area	Location
Metering Point	Location
Metering Point Administrator	Business Role
Nomination Validator	Business Role
Party Connected to grid	Business Actor
Producer	Business Role
Production Responsible Party	Business Role
Reconcillation Accountable	Business Actor
Reconcillation Responsible Party	Business Role
Register	Artifact
Reserve Allocator	Business Role
Reserve Resource	Equipment
Resource	Equipment
Resource provider	Business Role
RGCE Interconnected Group	Location
Scheduling Co-ordinator	Business Role
System Operator	Business Role
Trade Responsible Party	Business Role
Trader	Business Role
Transmission Capacity Allocator	Business Role

CoMPAS Realization

No viewpoint



Documentation

> This is the project achitecture view of the CoMPAS project. CoMPAS is going to provide common open source software blocks for the automizing the process for configuring Substation Automation Systems and has the ability to integrate third-party tools. For more information on CoMPAS, check out the project's page: https://lfenergy.org/projects/compas/

Elements

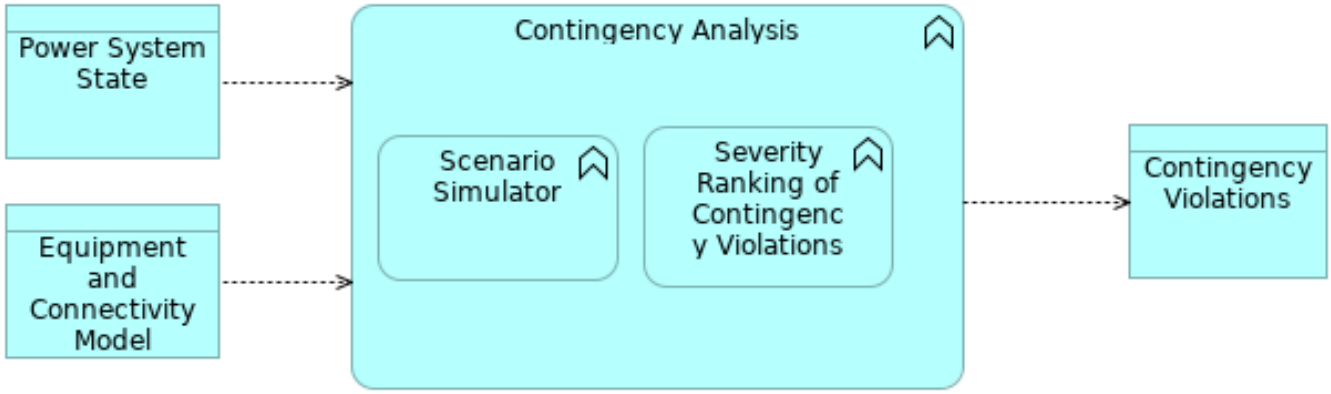
Element	Type
(Standard) Menu Entry Functions	Application Function
104 address to 61850 SCL Editor	Application Function
Auto Align SLD (Single Line Diagram)	Application Function
CIM CGMES-EQ specifications	Data Object
CIM CGMES-EQ to 61850 SCL	Application Function
CIM mapper	Application Component
CleanUp	Application Function
Communication Editing	Application Function
Compare Configuration	Business Function
Compare IED	Application Function
CoMPAS	Application Component
CoMPAS for Siemens SITIPE	Application Function
CoMPAS OpenSCD Component	Application Component
CoMPAS SCL Validator	Application Component
CoMPAS Settings	Application Function
CoMPAS sitipe Service	Application Component
CoMPAS version	Application Function
Configuration management	Business Function
Create Virtual IED	Application Function
Edit Functions	Grouping
Edit IED	Application Function
Edit IED configuration	Business Function
Edit Substation	Application Function

Element	Type
Edit system configuration	Business Function
Edit system configuration	Business Function
Export Communication Sections	Application Function
Export IED Params	Application Function
Generating single line diagram (digram layout)	Business Function
Grid planning import	Business Function
Help	Application Function
IEC 61850 Specification	Data Object
Import from API	Application Function
Import IEDs	Application Function
Locamation VMU	Application Function
Log functions	Application Function
Make IED configuration	Business Function
Make specification	Business Function
Make System Configuration	Business Function
Make System Configuration	Business Function
Merge project	Application Function
New Project	Application Function
Open Project	Application Function
PowSyBL	Technology Collaboration
Project from CIM	Application Function
Publisher	Application Function
Retreieve SITPE bay typicals	Application Function
Retrieve SCL Data	Application Function
Save as version	Application Function
Save Functions	Application Function
Save Project	Application Function
Save project as	Application Function
SCL Auto Aligner	Application Component
SCL CMDB	Technology Collaboration
SCL Data Service Component	Application Component
Settings	Application Function
Single Line Diagram	Application Function
Store IED Configuration	Business Function
Store SCL Data	Application Function
Store system configuration	Business Function
Store system configuration	Business Function
Subscriber Data Binding (GOOSE)	Application Function
Subscriber Data Binding (SMV)	Application Function
Subscriber Later Binding (GOOSE)	Application Function
Subscriber Later Binding (SMV)	Application Function
Subscriber Message Binding (GOOSE)	Application Function
Subscriber Message Binding (SMV)	Application Function
Subscriber Update	Application Function

Element	Type
Templates	Application Function
Update desc (SEL)	Application Function
Update desc. (ABB)	Application Function
Update Substation	Application Function
Validate	Business Function
Validate Schema	Application Function
Validate Templates	Application Function
Validate using OCL	Application Function
Validation Functions	Grouping
Version Management	Business Function
View diagnostics	Application Function
View Log	Application Function

Contingency Analysis

No viewpoint

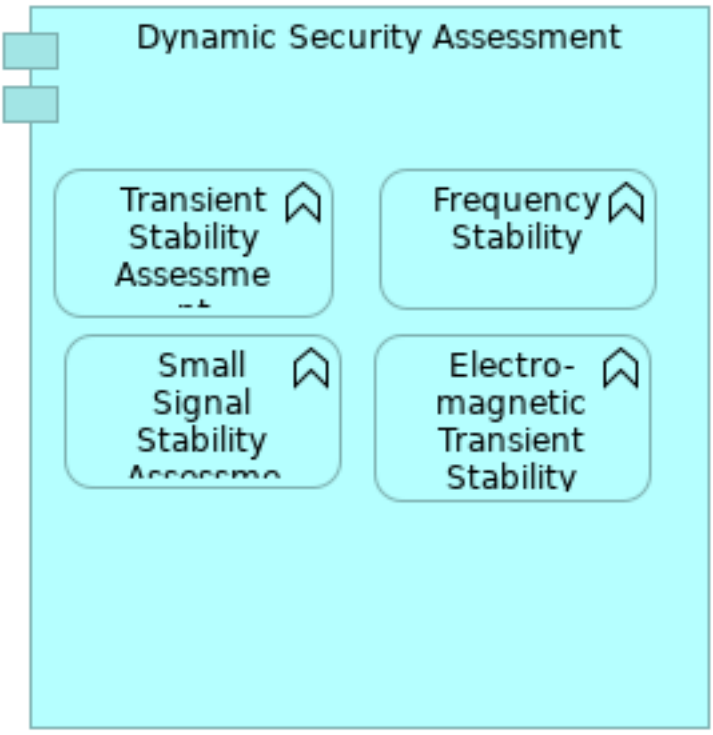


Elements

Element	Type
Contingency Analysis	Application Function
Contingency Violations	Data Object
Equipment and Connectivity Model	Data Object
Power System State	Data Object
Scenario Simulator	Application Function
Severity Ranking of Contingency Violations	Application Function

DSA aggregation

No viewpoint

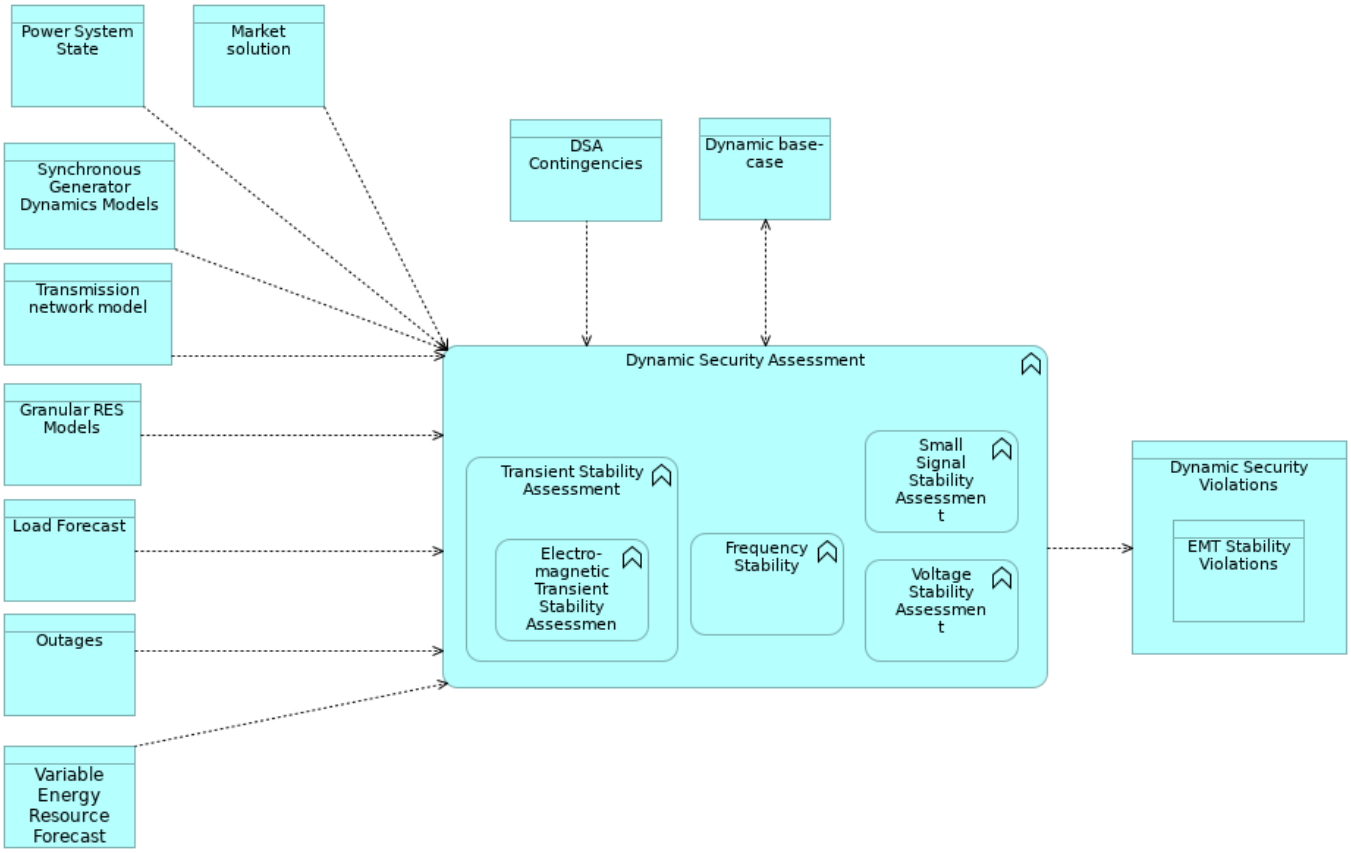


Elements

Element	Type
Dynamic Security Assessment	Application Component
Electro-magnetic Transient Stability Assessment	Application Function
Frequency Stability	Application Function
Small Signal Stability Assessment	Application Function
Transient Stability Assessment	Application Function

Dynamic Security Assessment

No viewpoint

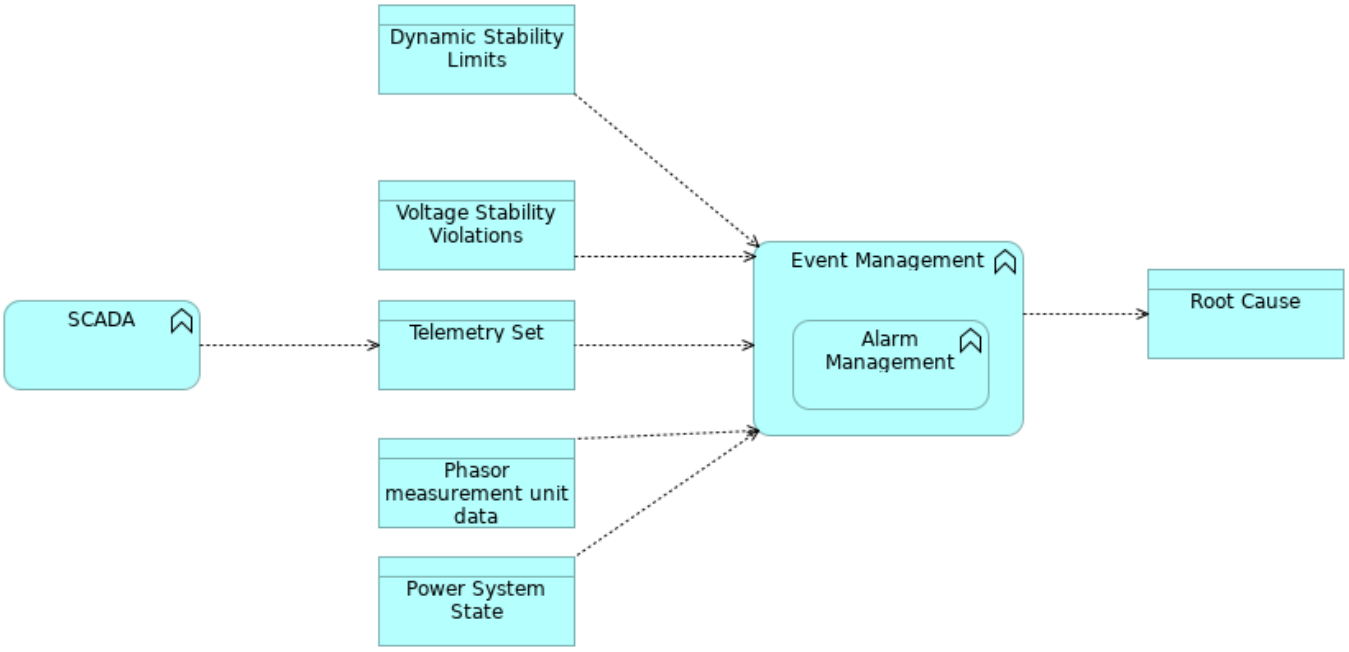


Elements

Element	Type
DSA Contingencies	Data Object
Dynamic base-case	Data Object
Dynamic Security Assessment	Application Function
Dynamic Security Violations	Data Object
Electro-magnetic Transient Stability Assessment	Application Function
EMT Stability Violations	Data Object
Frequency Stability	Application Function
Granular RES Models	Data Object
Load Forecast	Data Object
Market solution	Data Object
Outages	Data Object
Power System State	Data Object
Small Signal Stability Assessment	Application Function
Synchronous Generator Dynamics Models	Data Object
Transient Stability Assessment	Application Function
Transmission network model	Data Object
Variable Energy Resource Forecast	Data Object
Voltage Stability Assessment	Application Function

Event Management Detailed

No viewpoint

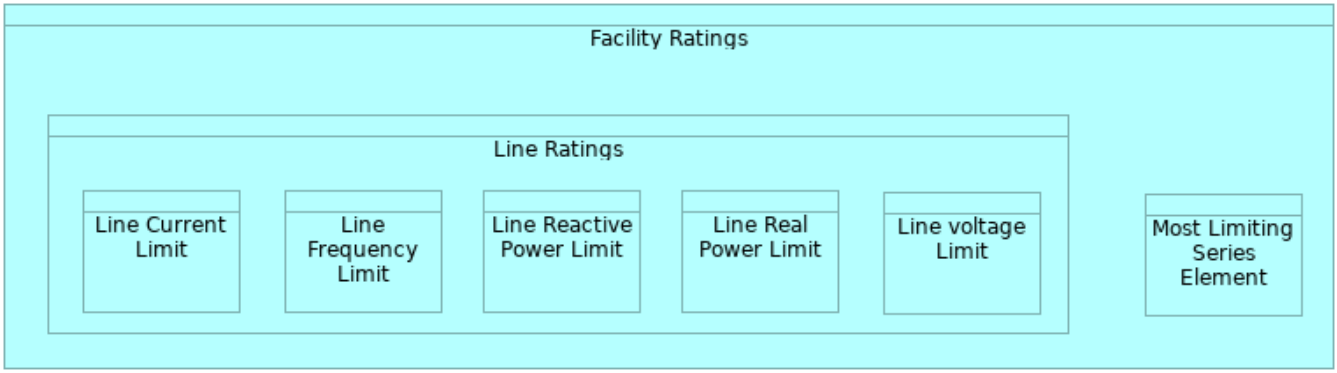


Elements

Element	Type
Alarm Management	Application Function
Dynamic Stability Limits	Data Object
Event Management	Application Function
Phasor measurement unit data	Data Object
Power System State	Data Object
Root Cause	Data Object
SCADA	Application Function
Telemetry Set	Data Object
Voltage Stability Violations	Data Object

Facility Ratings

No viewpoint

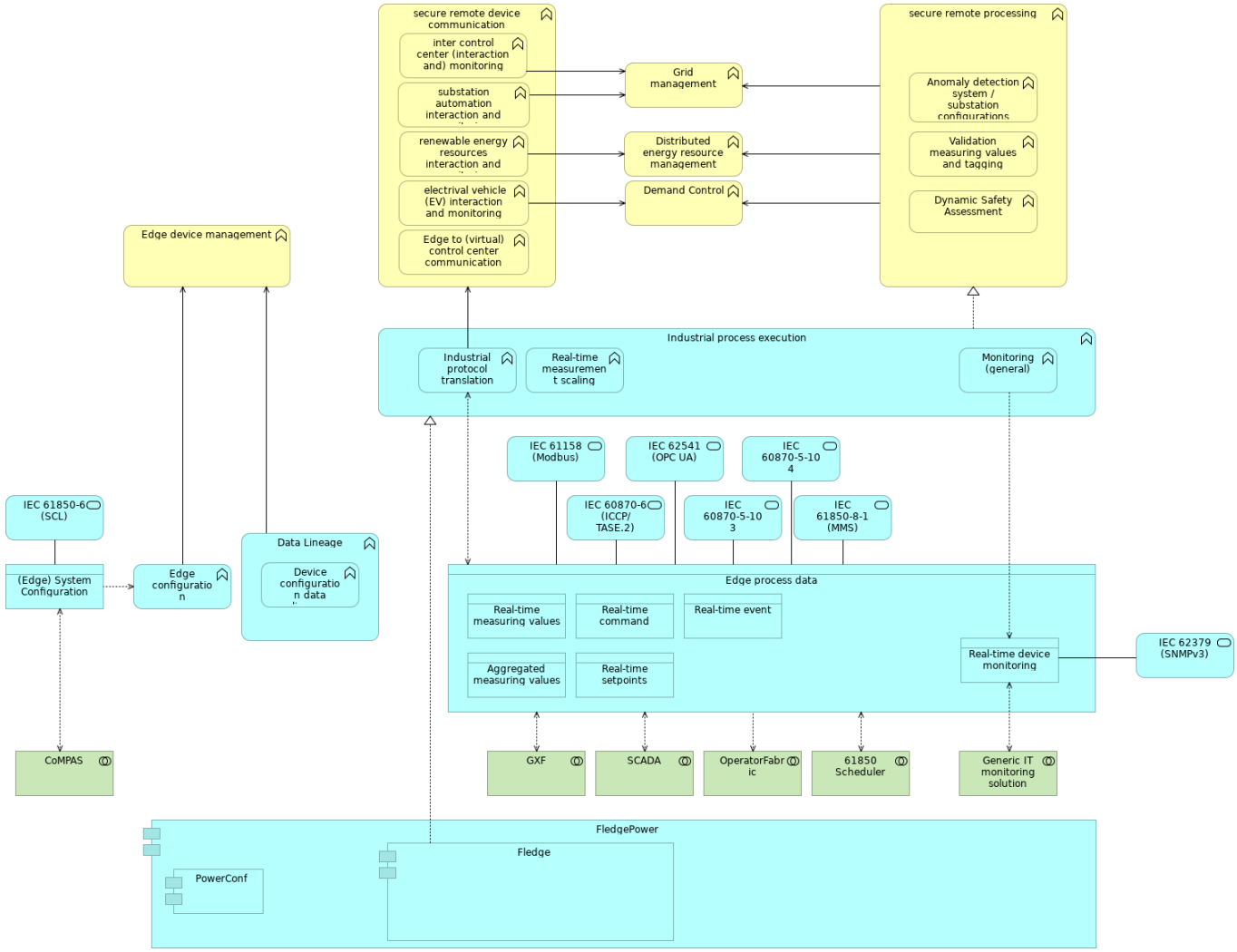


Elements

Element	Type
Facility Ratings	Data Object
Line Current Limit	Data Object
Line Frequency Limit	Data Object
Line Ratings	Data Object
Line Reactive Power Limit	Data Object
Line Real Power Limit	Data Object
Line voltage Limit	Data Object
Most Limiting Series Element	Data Object

FledgePower Realization

No viewpoint



Documentation

> This is the project achitecture view of the FledgePower project. FledgePOWER is a multi-protocol translation gateway for power systems based on the industrial IoT LF Edge project Fledge. For more information on FledgePower, check out the project's page: https://lfenergy.org/projects/fledgepower/

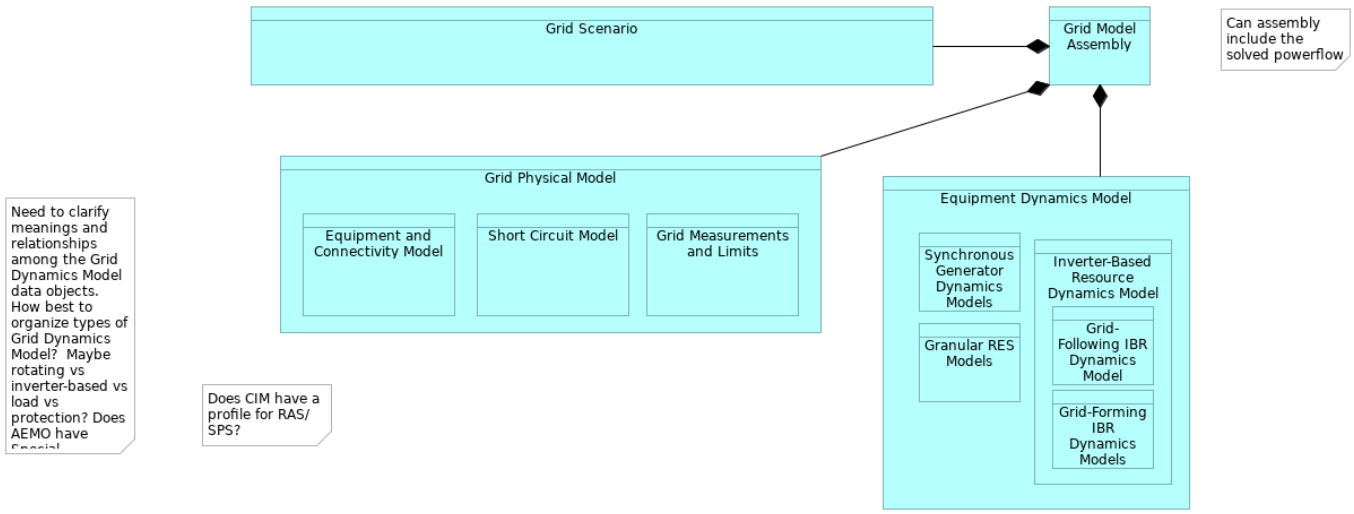
Elements

Element	Type
(Edge) System Configuration	Data Object
61850 Scheduler	Technology Collaboration
Aggregated measuring values	Data Object
Anomaly detection system / substation configurations	Business Function
CoMPAS	Technology Collaboration
Data Lineage	Application Function
Demand Control	Business Function
Device configuration data lineage	Application Function

Element	Type
Distributed energy resource management	Business Function
Dynamic Safety Assessment	Business Function
Edge configuration management	Application Function
Edge device management	Business Function
Edge process data	Data Object
Edge to (virtual) control center communication	Business Function
electrival vehicle (EV) interaction and monitoring	Business Function
Fledge	Application Component
FledgePower	Application Component
Generic IT monitoring solution	Technology Collaboration
Grid management	Business Function
GXF	Technology Collaboration
IEC 60870-5-103	Application Service
IEC 60870-5-104	Application Service
IEC 60870-6 (ICCP/TASE.2)	Application Service
IEC 61158 (Modbus)	Application Service
IEC 61850-6 (SCL)	Application Service
IEC 61850-8-1 (MMS)	Application Service
IEC 62379 (SNMPv3)	Application Service
IEC 62541 (OPC UA)	Application Service
Industrial process execution	Application Function
Industrial protocol translation	Application Function
inter control center (interaction and) monitoring	Business Function
Monitoring (general)	Application Function
OperatorFabric	Technology Collaboration
PowerConf	Application Component
Real-time command	Data Object
Real-time device monitoring	Data Object
Real-time event	Data Object
Real-time measurement scaling	Application Function
Real-time measuring values	Data Object
Real-time setpoints	Data Object
renewable energy resources interaction and monitoring	Business Function
SCADA	Technology Collaboration
secure remote device communication	Business Function
secure remote processing	Business Function
substation automation interaction and monitoring	Business Function
Validation measuring values and tagging	Business Function

Grid Model Aggregation

No viewpoint

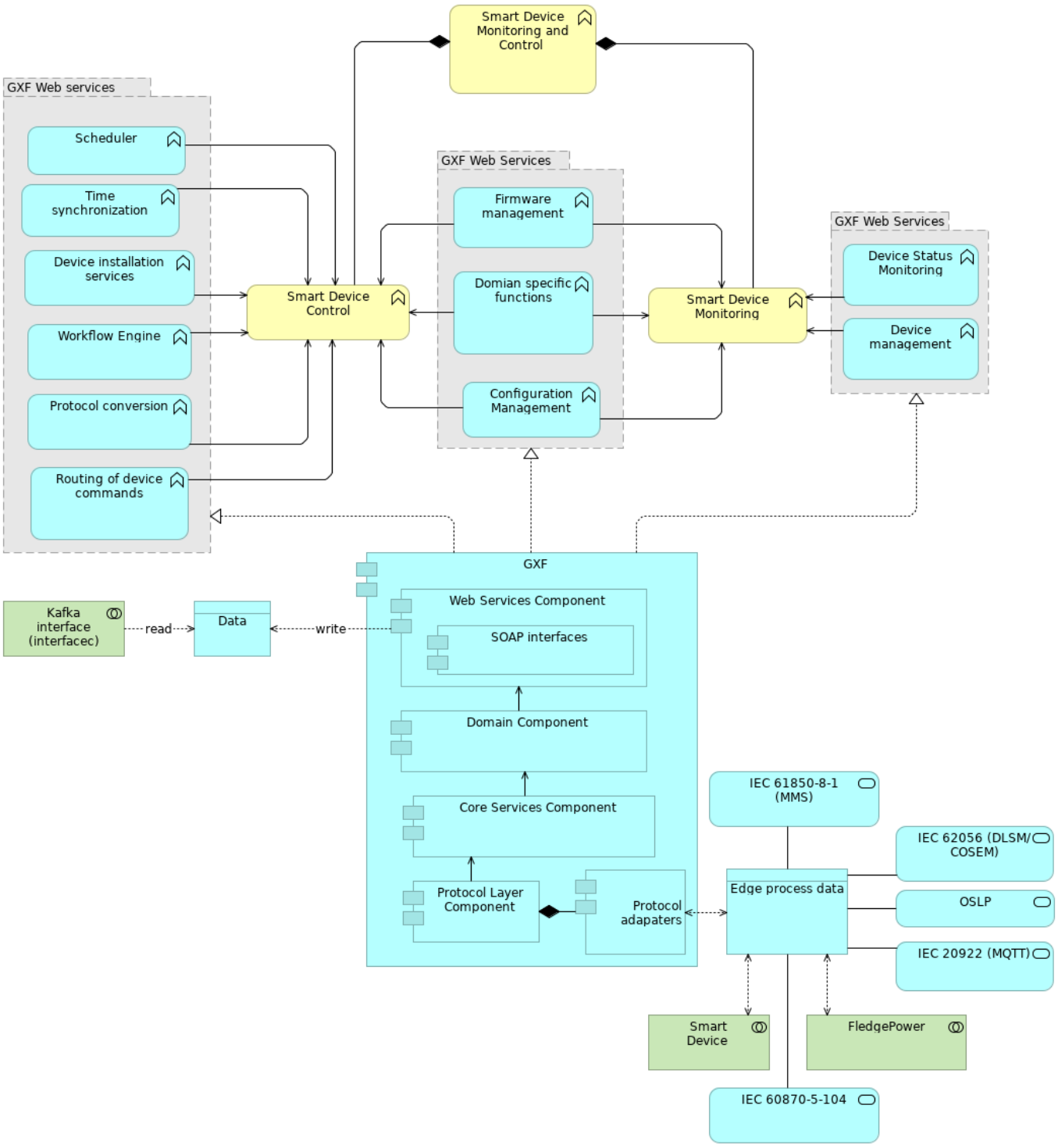


Elements

Element	Type
Equipment and Connectivity Model	Data Object
Equipment Dynamics Model	Data Object
Granular RES Models	Data Object
Grid Measurements and Limits	Data Object
Grid Model Assembly	Data Object
Grid Physical Model	Data Object
Grid Scenario	Data Object
Grid-Following IBR Dynamics Model	Data Object
Grid-Forming IBR Dynamics Models	Data Object
Inverter-Based Resource Dynamics Model	Data Object
Short Circuit Model	Data Object
Synchronous Generator Dynamics Models	Data Object

GXF Realization

No viewpoint



Documentation

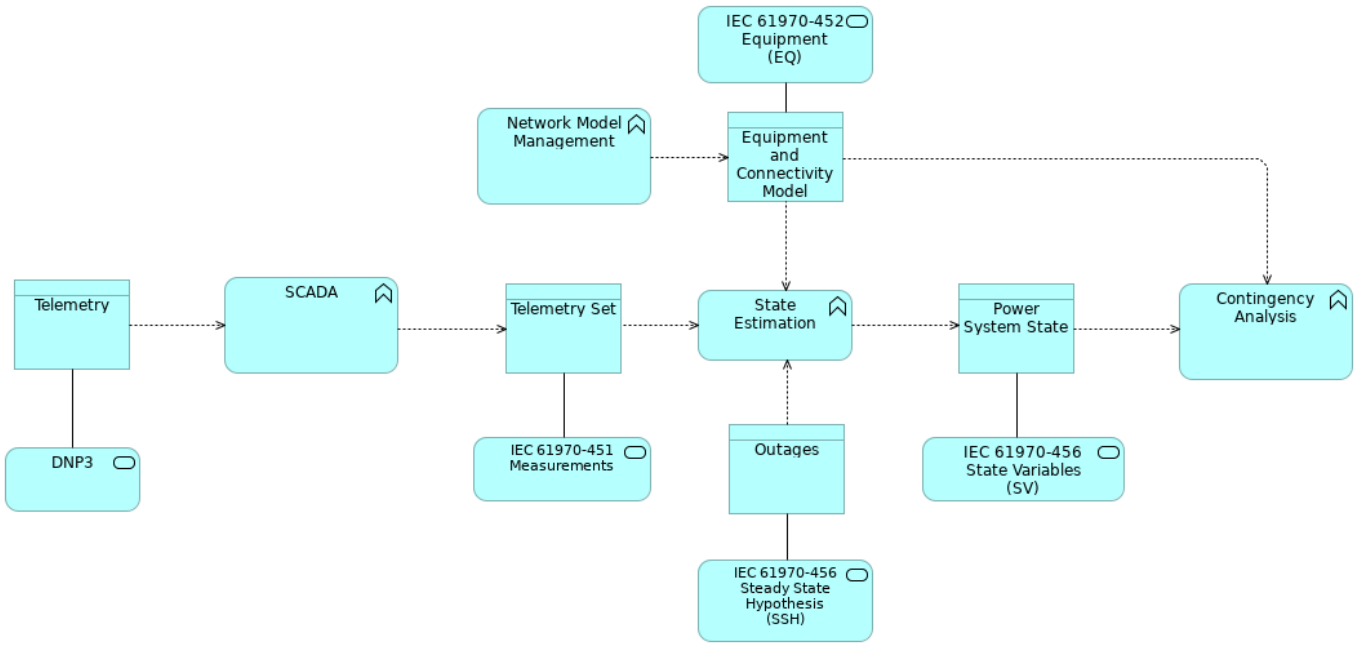
This is the project achitecture view of Grid eXchange Fabric (GXF) project. GXF is a software platform that enables hardware monitoring and control in the public space. GXF provides several functions out of the box and provides scalability & high availability, high security, a generic design, and no vendor lock-in. GXF is currently deployed in several public use cases, including microgrids, smart metering, public lighting, and distribution automation. For more information on GXF, check out the project's page: https://lfenergy.org/projects/gxf/

Elements

Element	Type
Configuration Management	Application Function
Core Services Component	Application Component
Data	Data Object
Device installation services	Application Function
Device management	Application Function
Device Status Monitoring	Application Function
Domain Component	Application Component
Domian specific functions	Application Function
Edge process data	Data Object
Firmware management	Application Function
FledgePower	Technology Collaboration
GXF	Application Component
GXF Web Services	Grouping
GXF Web Services	Grouping
GXF Web services	Grouping
IEC 20922 (MQTT)	Application Service
IEC 60870-5-104	Application Service
IEC 61850-8-1 (MMS)	Application Service
IEC 62056 (DLSM/COSEM)	Application Service
Kafka interface (interfacec)	Technology Collaboration
OSLP	Application Service
Protocol adapaters	Application Component
Protocol conversion	Application Function
Protocol Layer Component	Application Component
Routing of device commands	Application Function
Scheduler	Application Function
Smart Device	Technology Collaboration
Smart Device Control	Business Function
Smart Device Monitoring	Business Function
Smart Device Monitoring and Control	Business Function
SOAP interfaces	Application Component
Time synchronization	Application Function
Web Services Component	Application Component
Workflow Engine	Application Function

High level DFD w Data Exchange Standards

No viewpoint

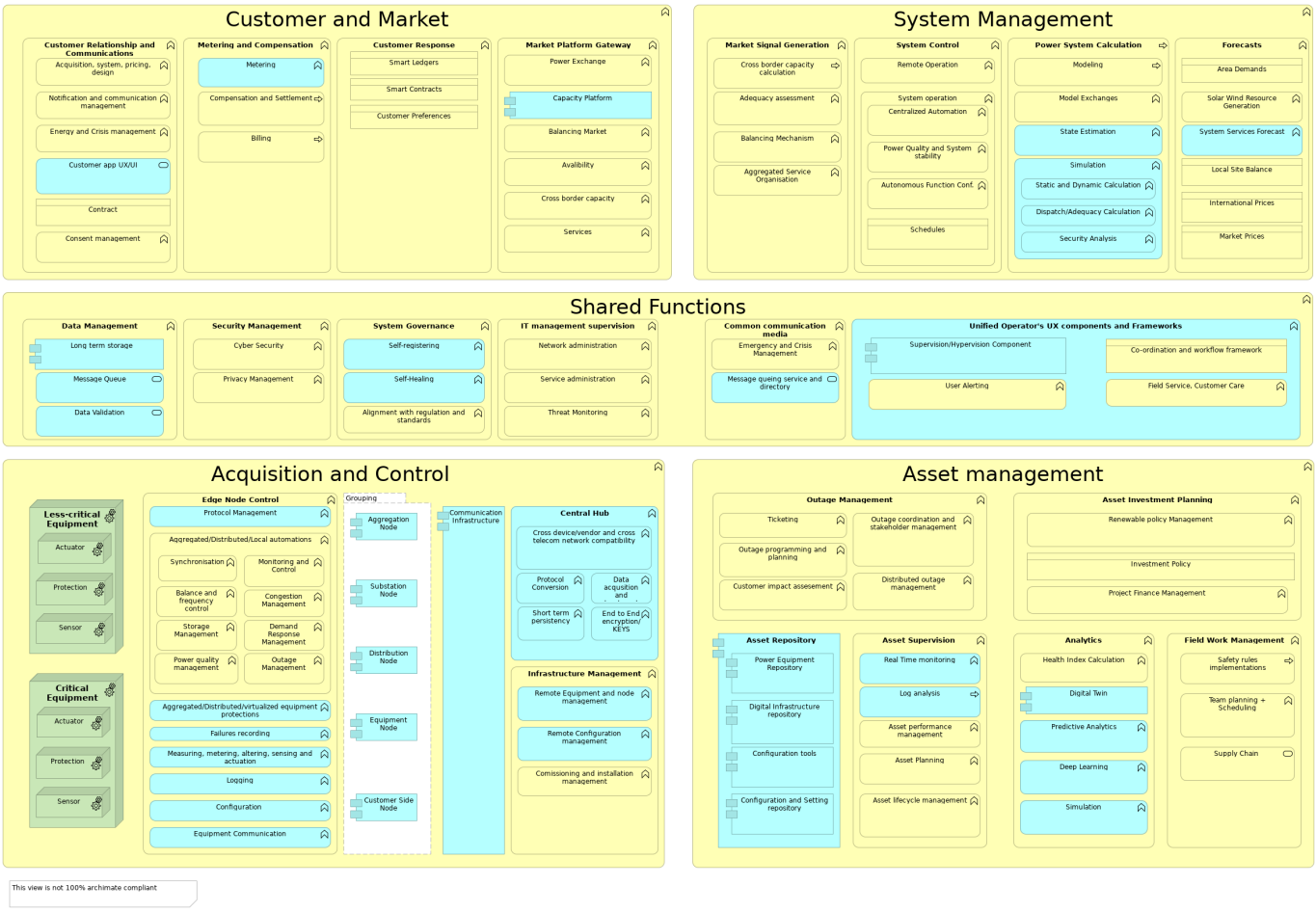


Elements

Element	Type
Contingency Analysis	Application Function
DNP3	Application Service
Equipment and Connectivity Model	Data Object
IEC 61970-451 Measurements	Application Service
IEC 61970-452 Equipment (EQ)	Application Service
IEC 61970-456 State Variables (SV)	Application Service
IEC 61970-456 Steady State Hypothesis (SSH)	Application Service
Network Model Management	Application Function
Outages	Data Object
Power System State	Data Object
SCADA	Application Function
State Estimation	Application Function
Telemetry	Data Object
Telemetry Set	Data Object

LFE High-Level Functional Architecture V1.0 (orginal)

No viewpoint



Documentation

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Elements

Element	Type
Acquisition and Control	Business Function
Acquisition, system, pricing, design	Business Function
Actuator	Equipment
Actuator	Equipment
Adequacy assessment	Business Function
Aggregated Service Organisation	Business Function
Aggregated/Distributed/Local automations	Business Function
Aggregated/Distributed/virtualized equipment protections	Application Function
Aggregation Node	Application Component
Alignment with regulation and standards	Business Function
Analytics	Business Function
Area Demands	Business Object
Asset Investment Planning	Business Function

Element	Type
Asset lifecycle management	Business Function
Asset management	Business Function
Asset performance management	Business Function
Asset Planning	Business Function
Asset Repository	Application Component
Asset Supervision	Business Function
Autonomous Function Conf.	Business Function
Avalibility	Business Function
Balance and frequency control	Business Function
Balancing Market	Business Function
Balancing Mechanism	Business Function
Billing	Business Process
Capacity Platform	Application Component
Central Hub	Application Function
Centralized Automation	Business Function
Co-ordination and workflow framework	Business Object
Comissioning and installation management	Business Function
Common communication media	Business Function
Communication Infrastructure	Application Component
Compensation and Settlement	Business Process
Configuration	Application Function
Configuration and Setting repository	Application Component
Configuration tools	Application Component
Congestion Management	Business Function
Consent management	Business Function
Contract	Business Object
Critical Equipment	Equipment
Cross border capacity	Business Function
Cross border capacity calculation	Business Process
Cross device/vendor and cross telecom network compatibility	Application Function
Customer and Market	Business Function
Customer app UX/UI	Application Service
Customer impact assesement	Business Function
Customer Preferences	Business Object
Customer Relationship and Communications	Business Function
Customer Response	Business Function
Customer Side Node	Application Component
Cyber Security	Business Function
Data acqusition and treatment	Application Function
Data Management	Business Function
Data Validation	Application Service
Deep Learning	Application Function
Demand Response Management	Business Function
Digital Infrastructure repository	Application Component

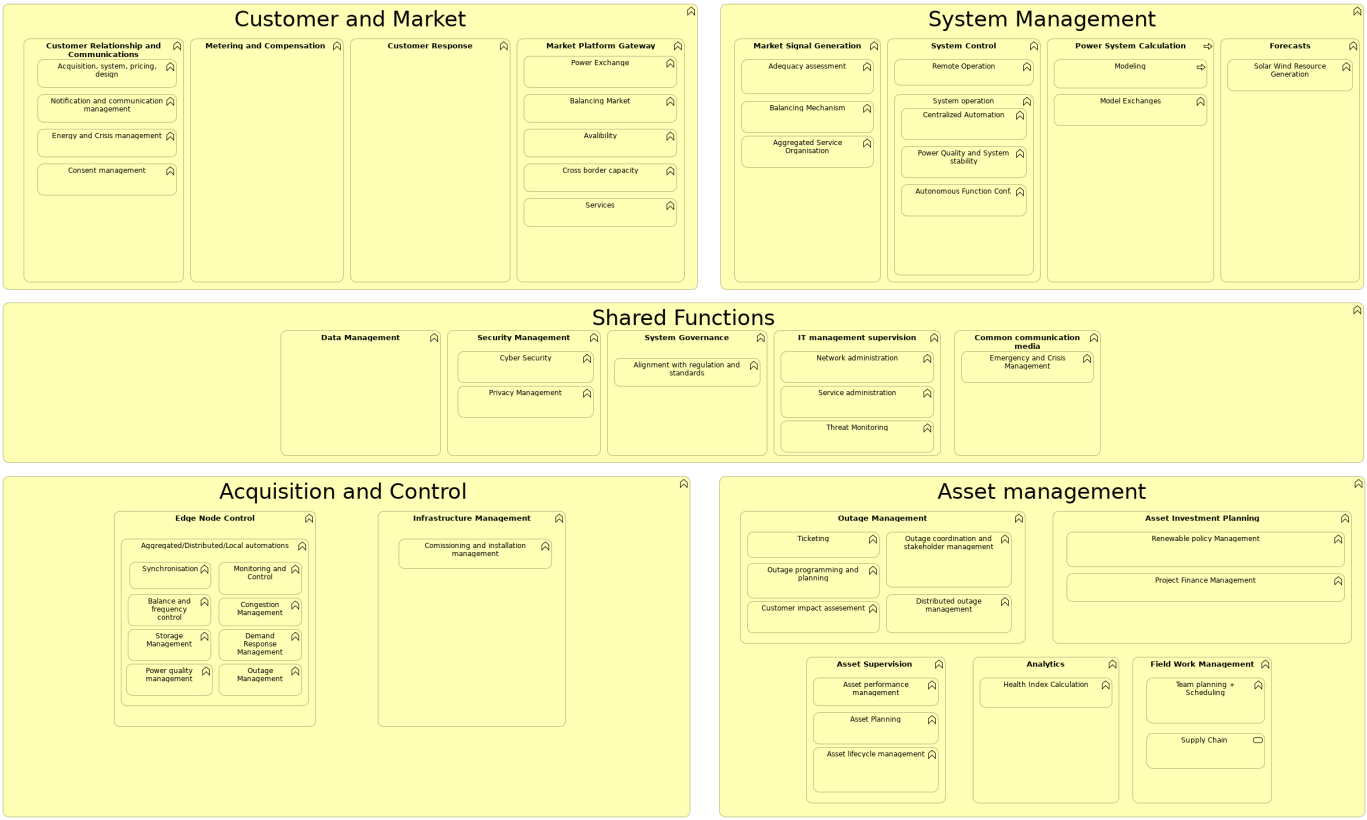
Element	Type
Digital Twin	Application Component
Dispatch/Adequacy Calculation	Application Function
Distributed outage management	Business Function
Distribution Node	Application Component
Edge Node Control	Business Function
Emergency and Crisis Management	Business Function
End to End encryption/KEYS	Application Function
Energy and Crisis management	Business Function
Equipment Communication	Application Function
Equipment Node	Application Component
Failures recording	Application Function
Field Service, Customer Care	Business Function
Field Work Management	Business Function
Forecasts	Business Function
Grouping	Grouping
Health Index Calculation	Business Function
Infrastructure Management	Business Function
International Prices	Business Object
Investment Policy	Business Object
IT management supervision	Business Function
Less-critical Equipment	Equipment
Local Site Balance	Business Object
Log analysis	Application Process
Logging	Application Function
Long term storage	Application Component
Market Platform Gateway	Business Function
Market Prices	Business Object
Market Signal Generation	Business Function
Measuring, metering, altering, sensing and actuation	Application Function
Message queing service and directory	Application Service
Message Queue	Application Service
Metering	Application Function
Metering and Compensation	Business Function
Model Exchanges	Business Function
Modeling	Business Process
Monitoring and Control	Business Function
Network administration	Business Function
Notification and communication management	Business Function
Outage coordination and stakeholder management	Business Function
Outage Management	Business Function
Outage Management	Business Function
Outage programming and planning	Business Function
Power Equipment Repository	Application Component

Element	Type
Power Exchange	Business Function
Power Quality and System stability	Business Function
Power quality management	Business Function
Power System Calculation	Business Process
Predictive Analytics	Application Function
Privacy Management	Business Function
Project Finance Management	Business Function
Protection	Equipment
Protection	Equipment
Protocol Conversion	Application Function
Protocol Management	Application Function
Real Time monitoring	Application Function
Remote Configuration management	Application Function
Remote Equipment and node management	Application Function
Remote Operation	Business Function
Renewable policy Management	Business Function
Safety rules implementations	Business Process
Schedules	Business Object
Security Analysis	Application Function
Security Management	Business Function
Self-Healing	Application Function
Self-registering	Application Function
Sensor	Equipment
Sensor	Equipment
Service administration	Business Function
Services	Business Function
Shared Functions	Business Function
Short term persistency	Application Function
Simulation	Application Function
Simulation	Application Function
Smart Contracts	Business Object
Smart Ledgers	Business Object
Solar Wind Resource Generation	Business Function
State Estimation	Application Function
Static and Dynamic Calculation	Application Function
Storage Management	Business Function
Substation Node	Application Component
Supervision/Hypervision Component	Application Component
Supply Chain	Business Service
Synchronisation	Business Function
System Control	Business Function
System Governance	Business Function
System Management	Business Function
System operation	Business Function

Element	Type
System Services Forecast	Application Function
Team planning + Scheduling	Business Function
Threat Monitoring	Business Function
Ticketing	Business Function
Unified Operator's UX components and Frameworks	Application Function
User Alerting	Business Function

LFE High-Level Functional Architecture V1.0 - Business functions only

No viewpoint



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Elements

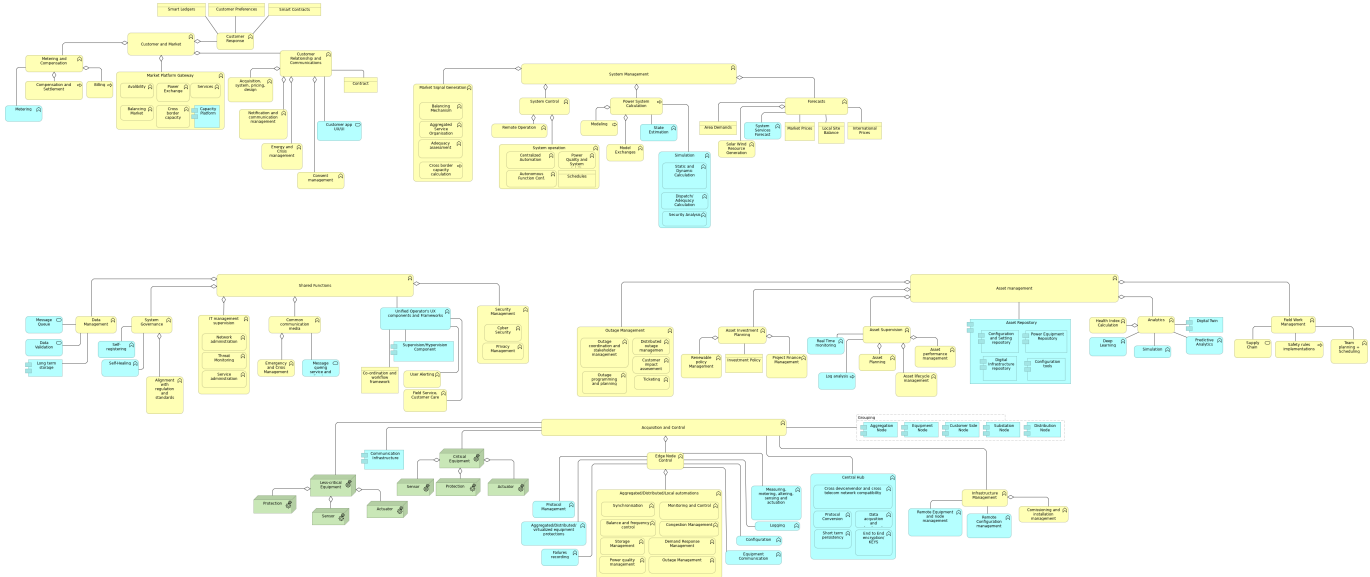
Element	Type
Acquisition and Control	Business Function
Acquisition, system, pricing, design	Business Function
Adequacy assessment	Business Function
Aggregated Service Organisation	Business Function
Aggregated/Distributed/Local automations	Business Function
Alignment with regulation and standards	Business Function
Analytics	Business Function
Asset Investment Planning	Business Function
Asset lifecycle management	Business Function
Asset management	Business Function
Asset performance management	Business Function
Asset Planning	Business Function
Asset Supervision	Business Function
Autonomous Function Conf.	Business Function
Avalibility	Business Function

Element	Type
Balance and frequency control	Business Function
Balancing Market	Business Function
Balancing Mechanism	Business Function
Centralized Automation	Business Function
Comissioning and installation management	Business Function
Common communication media	Business Function
Congestion Management	Business Function
Consent management	Business Function
Cross border capacity	Business Function
Customer and Market	Business Function
Customer impact assesement	Business Function
Customer Relationship and Communications	Business Function
Customer Response	Business Function
Cyber Security	Business Function
Data Management	Business Function
Demand Response Management	Business Function
Distributed outage management	Business Function
Edge Node Control	Business Function
Emergency and Crisis Management	Business Function
Energy and Crisis management	Business Function
Field Work Management	Business Function
Forecasts	Business Function
Health Index Calculation	Business Function
Infrastructure Management	Business Function
IT management supervision	Business Function
Market Platform Gateway	Business Function
Market Signal Generation	Business Function
Metering and Compensation	Business Function
Model Exchanges	Business Function
Modeling	Business Process
Monitoring and Control	Business Function
Network administration	Business Function
Notification and communication management	Business Function
Outage coordination and stakeholder management	Business Function
Outage Management	Business Function
Outage Management	Business Function
Outage programming and planning	Business Function
Power Exchange	Business Function
Power Quality and System stability	Business Function
Power quality management	Business Function
Power System Calculation	Business Process
Privacy Management	Business Function
Project Finance Management	Business Function
Remote Operation	Business Function

Element	Type
Renewable policy Management	Business Function
Security Management	Business Function
Service administration	Business Function
Services	Business Function
Shared Functions	Business Function
Solar Wind Resource Generation	Business Function
Storage Management	Business Function
Supply Chain	Business Service
Synchronisation	Business Function
System Control	Business Function
System Governance	Business Function
System Management	Business Function
System operation	Business Function
Team planning + Scheduling	Business Function
Threat Monitoring	Business Function
Ticketing	Business Function

LFE High-Level Functional Architecture V1.0 - Layered architecture

No viewpoint



Documentation

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Elements

Element	Type
Acquisition and Control	Business Function
Acquisition, system, pricing, design	Business Function
Actuator	Equipment
Actuator	Equipment
Adequacy assessment	Business Function
Aggregated Service Organisation	Business Function
Aggregated/Distributed/Local automations	Business Function
Aggregated/Distributed/virtualized equipment protections	Application Function
Aggregation Node	Application Component
Alignment with regulation and standards	Business Function
Analytics	Business Function
Area Demands	Business Object
Asset Investment Planning	Business Function
Asset lifecycle management	Business Function
Asset management	Business Function
Asset performance management	Business Function
Asset Planning	Business Function
Asset Repository	Application Component
Asset Supervision	Business Function
Autonomous Function Conf.	Business Function

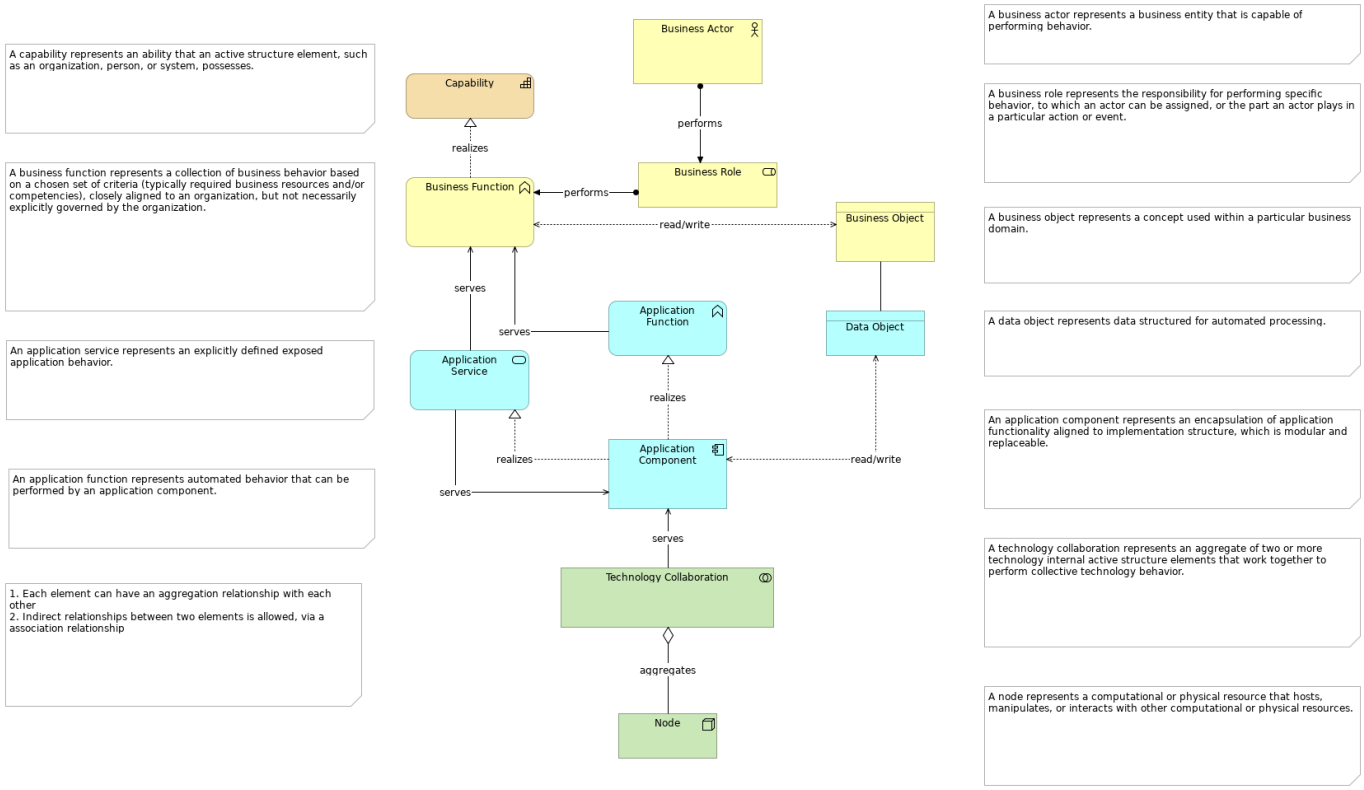
Element	Type
Avalibility	Business Function
Balance and frequency control	Business Function
Balancing Market	Business Function
Balancing Mechanism	Business Function
Billing	Business Process
Capacity Platform	Application Component
Central Hub	Application Function
Centralized Automation	Business Function
Co-ordination and workflow framework	Business Object
Comissioning and installation management	Business Function
Common communication media	Business Function
Communication Infrastructure	Application Component
Compensation and Settlement	Business Process
Configuration	Application Function
Configuration and Setting repository	Application Component
Configuration tools	Application Component
Congestion Management	Business Function
Consent management	Business Function
Contract	Business Object
Critical Equipment	Equipment
Cross border capacity	Business Function
Cross border capacity calculation	Business Process
Cross device/vendor and cross telecom network compatibility	Application Function
Customer and Market	Business Function
Customer app UX/UI	Application Service
Customer impact assesement	Business Function
Customer Preferences	Business Object
Customer Relationship and Communications	Business Function
Customer Response	Business Function
Customer Side Node	Application Component
Cyber Security	Business Function
Data acqusition and treatment	Application Function
Data Management	Business Function
Data Validation	Application Service
Deep Learning	Application Function
Demand Response Management	Business Function
Digital Infrastructure repository	Application Component
Digital Twin	Application Component
Dispatch/Adequacy Calculation	Application Function
Distributed outage management	Business Function
Distribution Node	Application Component
Edge Node Control	Business Function
Emergency and Crisis Management	Business Function
End to End encryption/KEYS	Application Function

Element	Type
Energy and Crisis management	Business Function
Equipment Communication	Application Function
Equipment Node	Application Component
Failures recording	Application Function
Field Service, Customer Care	Business Function
Field Work Management	Business Function
Forecasts	Business Function
Grouping	Grouping
Health Index Calculation	Business Function
Infrastructure Management	Business Function
International Prices	Business Object
Investment Policy	Business Object
IT management supervision	Business Function
Less-critical Equipment	Equipment
Local Site Balance	Business Object
Log analysis	Application Process
Logging	Application Function
Long term storage	Application Component
Market Platform Gateway	Business Function
Market Prices	Business Object
Market Signal Generation	Business Function
Measuring, metering, altering, sensing and actuation	Application Function
Message queing service and directory	Application Service
Message Queue	Application Service
Metering	Application Function
Metering and Compensation	Business Function
Model Exchanges	Business Function
Modeling	Business Process
Monitoring and Control	Business Function
Network administration	Business Function
Notification and communication management	Business Function
Outage coordination and stakeholder management	Business Function
Outage Management	Business Function
Outage Management	Business Function
Outage programming and planning	Business Function
Power Equipment Repository	Application Component
Power Exchange	Business Function
Power Quality and System stability	Business Function
Power quality management	Business Function
Power System Calculation	Business Process
Predictive Analytics	Application Function
Privacy Management	Business Function
Project Finance Management	Business Function

Element	Type
Protection	Equipment
Protection	Equipment
Protocol Conversion	Application Function
Protocol Management	Application Function
Real Time monitoring	Application Function
Remote Configuration management	Application Function
Remote Equipment and node management	Application Function
Remote Operation	Business Function
Renewable policy Management	Business Function
Safety rules implementations	Business Process
Schedules	Business Object
Security Analysis	Application Function
Security Management	Business Function
Self-Healing	Application Function
Self-registering	Application Function
Sensor	Equipment
Sensor	Equipment
Service administration	Business Function
Services	Business Function
Shared Functions	Business Function
Short term persistency	Application Function
Simulation	Application Function
Simulation	Application Function
Smart Contracts	Business Object
Smart Ledgers	Business Object
Solar Wind Resource Generation	Business Function
State Estimation	Application Function
Static and Dynamic Calculation	Application Function
Storage Management	Business Function
Substation Node	Application Component
Supervision/Hypervision Component	Application Component
Supply Chain	Business Service
Synchronisation	Business Function
System Control	Business Function
System Governance	Business Function
System Management	Business Function
System operation	Business Function
System Services Forecast	Application Function
Team planning + Scheduling	Business Function
Threat Monitoring	Business Function
Ticketing	Business Function
Unified Operator's UX components and Frameworks	Application Function
User Alerting	Business Function

Metamodel

No viewpoint



Documentation

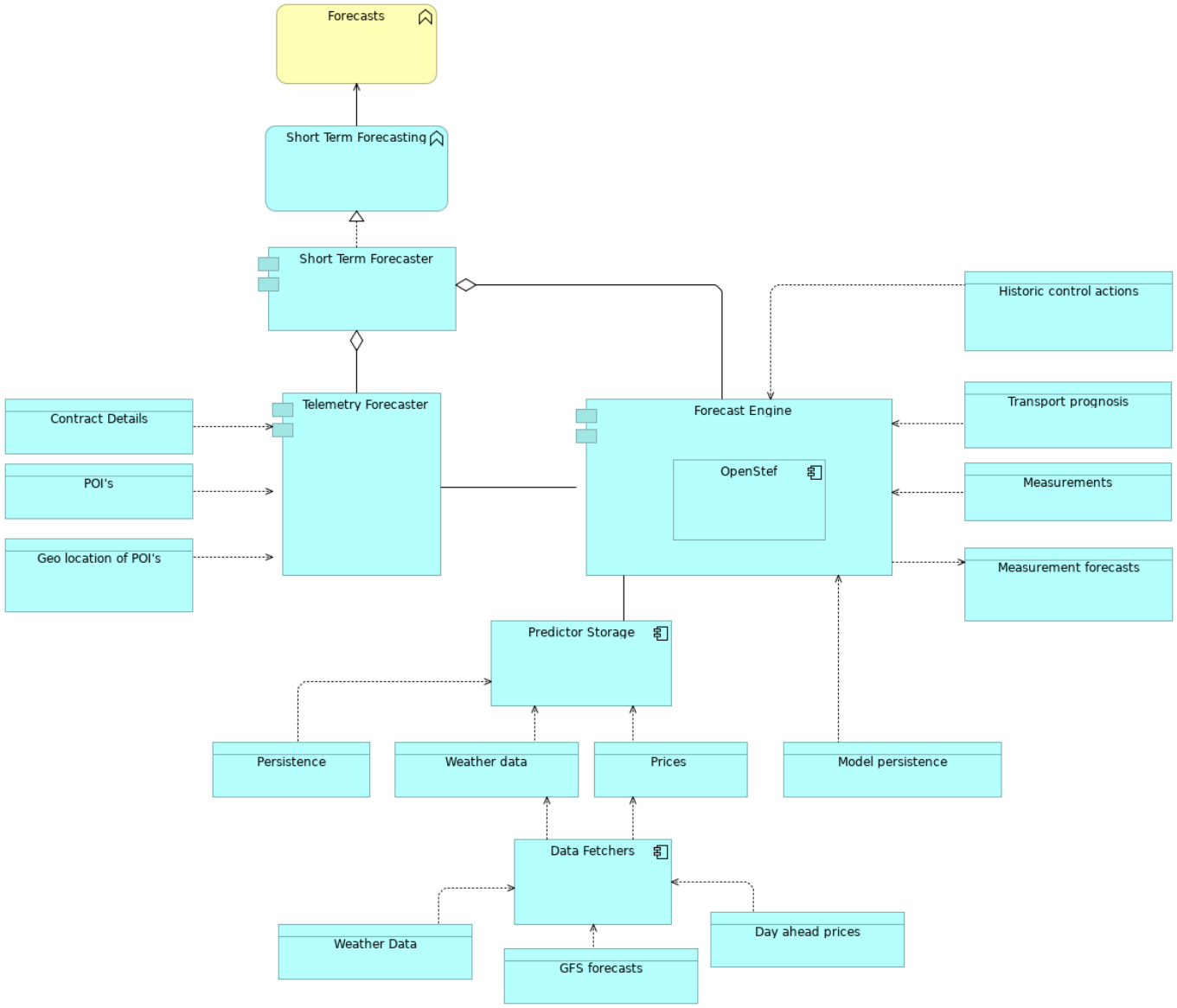
> In order to maintain consitency in the model whilst facilitating collaboration and contributions from all parties, a set of modelling guidelines have been created. If you wish to contribute to the model, please follow the LF Energy Meta model.

Elements

Element	Type
Application Component	Application Component
Application Function	Application Function
Application Service	Application Service
Business Actor	Business Actor
Business Function	Business Function
Business Object	Business Object
Business Role	Business Role
Capability	Capability
Data Object	Data Object
Node	Node
Technology Collaboration	Technology Collaboration

OpenSTEF Realization

No viewpoint



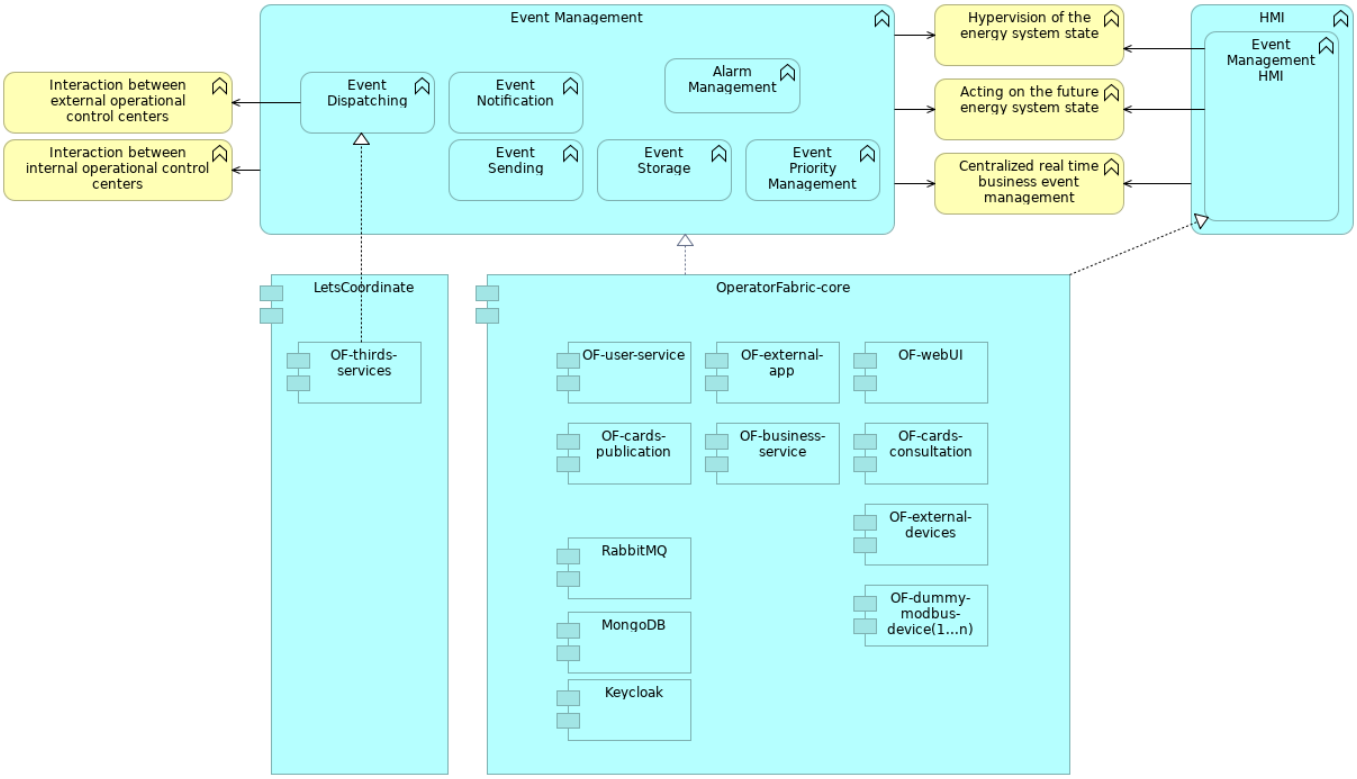
Elements

Element	Type
Contract Details	Data Object
Data Fetchers	Application Component
Day ahead prices	Data Object
Forecast Engine	Application Component
Forecasts	Business Function
Geo location of POI's	Data Object
GFS forecasts	Data Object
Historic control actions	Data Object
Measurement forecasts	Data Object
Measurements	Data Object
Model persistence	Data Object
OpenStef	Application Component

Element	Type
Persistence	Data Object
POI's	Data Object
Predictor Storage	Application Component
Prices	Data Object
Short Term Forecaster	Application Component
Short Term Forecasting	Application Function
Telemetry Forecaster	Application Component
Transport prognosis	Data Object
Weather data	Data Object
Weather Data	Data Object

OperatorFabric Realization

No viewpoint



Documentation

This is the project achitecture view of the OperatorFabric project. OperatorFabric provides a dashboard for the system operator that is designed to aggregate notifications on expectations and alerts from all applications into a single screen and allow the system operator to act on them. The notifications are materialized by cards sorted in a feed according to their period of relevance and their severity. For more information on OperatorFabric, check out the project's page: https://lfenergy.org/projects/operatorfabric/

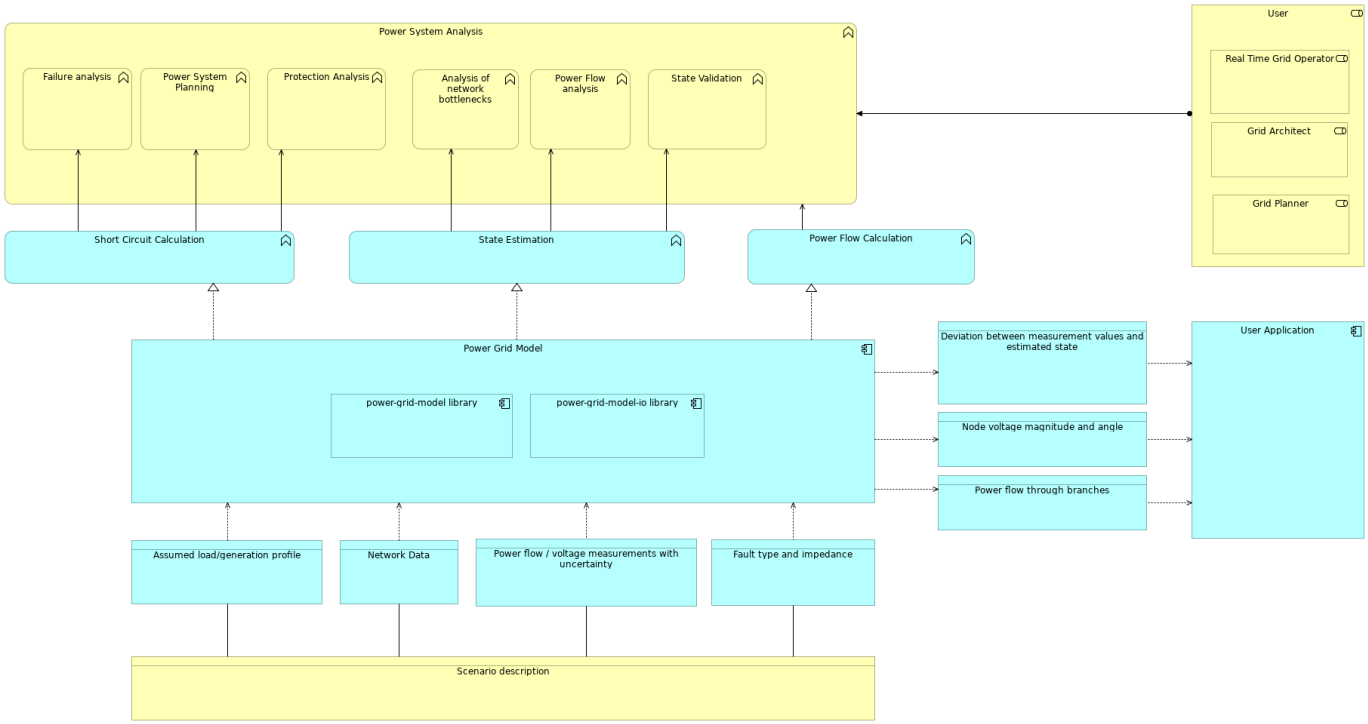
Elements

Element	Type
Acting on the future energy system state	Business Function
Alarm Management	Application Function
Centralized real time business event management	Business Function
Event Dispatching	Application Function
Event Management	Application Function
Event Management HMI	Application Function
Event Notification	Application Function
Event Priority Management	Application Function
Event Sending	Application Function
Event Storage	Application Function
HMI	Application Function
Hypervision of the energy system state	Business Function

Element	Type
Interaction between external operational control centers	Business Function
Interaction between internal operational control centers	Business Function
Keycloak	Application Component
LetsCoordinate	Application Component
MongoDB	Application Component
OF-business-service	Application Component
OF-cards-consultation	Application Component
OF-cards-publication	Application Component
OF-dummy-modbus-device(1...n)	Application Component
OF-external-app	Application Component
OF-external-devices	Application Component
OF-thirds-services	Application Component
OF-user-service	Application Component
OF-webUI	Application Component
OperatorFabric-core	Application Component
RabbitMQ	Application Component

Power Grid Model Realisation

No viewpoint



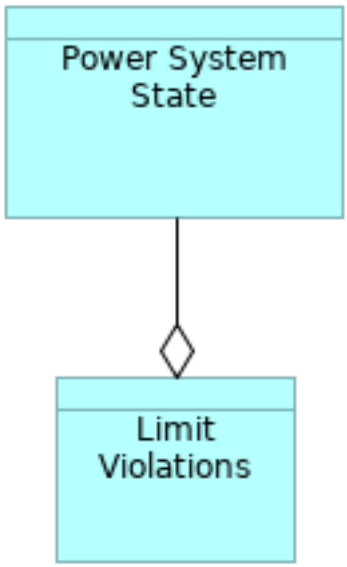
Elements

Element	Type
Analysis of network bottlenecks	Business Function
Assumed load/generation profile	Data Object
Deviation between measurement values and estimated state	Data Object
Failure analysis	Business Function
Fault type and impedance	Data Object
Grid Architect	Business Role
Grid Planner	Business Role
Network Data	Data Object
Node voltage magnitude and angle	Data Object
Power flow / voltage measurements with uncertainty	Data Object
Power Flow analysis	Business Function
Power Flow Calculation	Application Function
Power flow through branches	Data Object
Power Grid Model	Application Component
Power System Analysis	Business Function
Power System Planning	Business Function
power-grid-model library	Application Component
power-grid-model-io library	Application Component
Protection Analysis	Business Function
Real Time Grid Operator	Business Role
Scenario description	Business Object

Element	Type
Short Circuit Calculation	Application Function
State Estimation	Application Function
State Validation	Business Function
User	Business Role
User Application	Application Component

Power System State Aggregation

No viewpoint

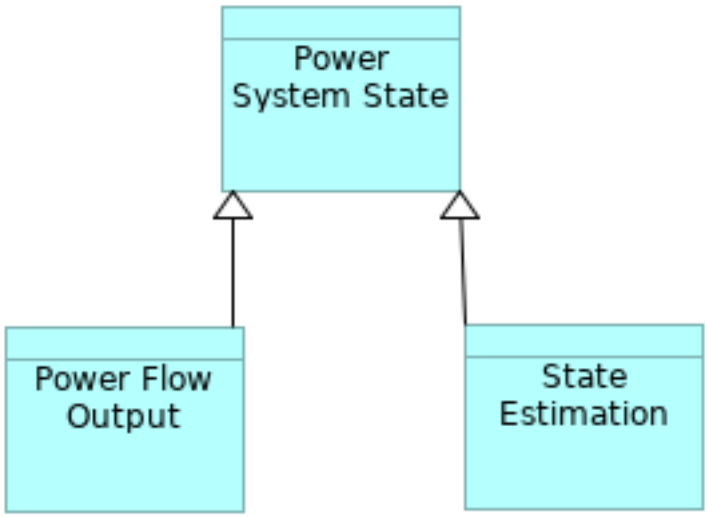


Elements

Element	Type
Limit Violations	Data Object
Power System State	Data Object

Power System State Hierarchy

No viewpoint

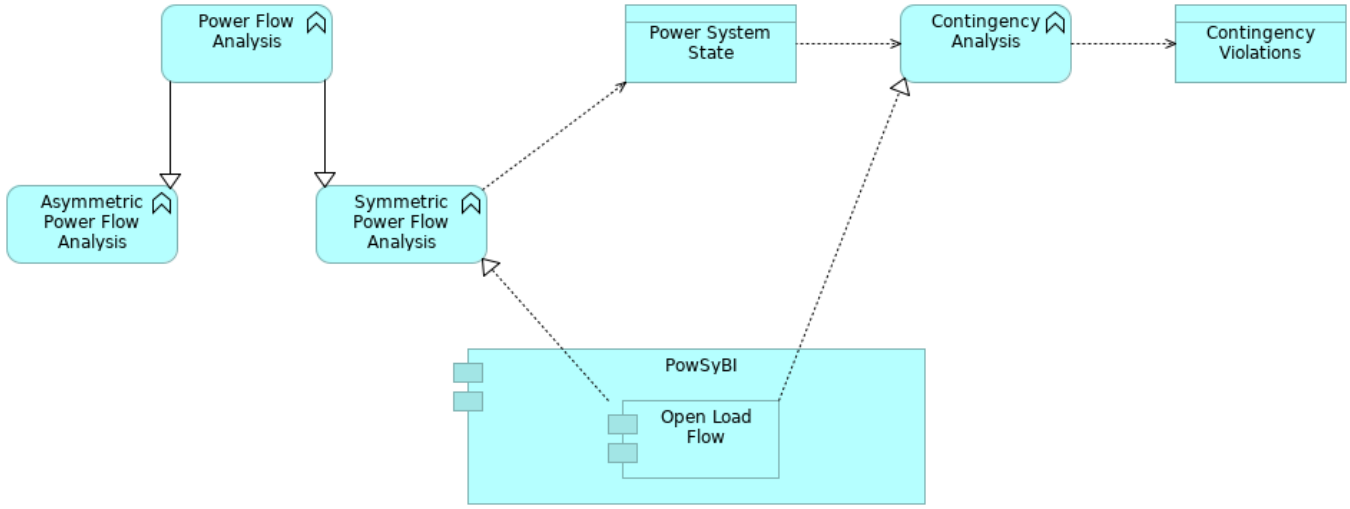


Elements

Element	Type
Power Flow Output	Data Object
Power System State	Data Object
State Estimation	Data Object

PowSyBI - OpenLoadFlow Detailed

No viewpoint

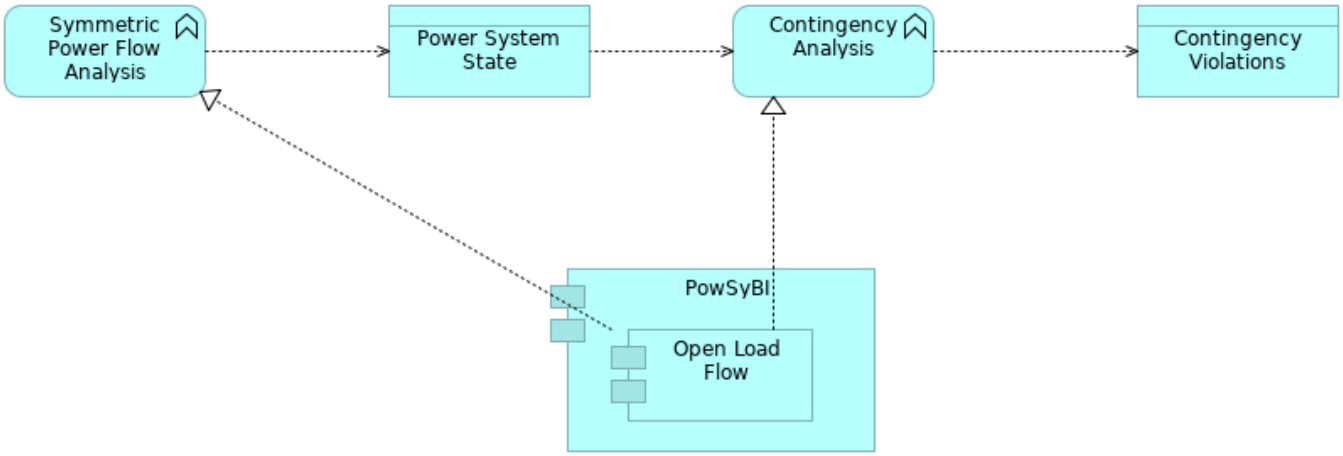


Elements

Element	Type
Asymmetric Power Flow Analysis	Application Function
Contingency Analysis	Application Function
Contingency Violations	Data Object
Open Load Flow	Application Component
Power Flow Analysis	Application Function
Power System State	Data Object
PowSyBI	Application Component
Symmetric Power Flow Analysis	Application Function

PowSyBI - OpenLoadFlow Realization

No viewpoint

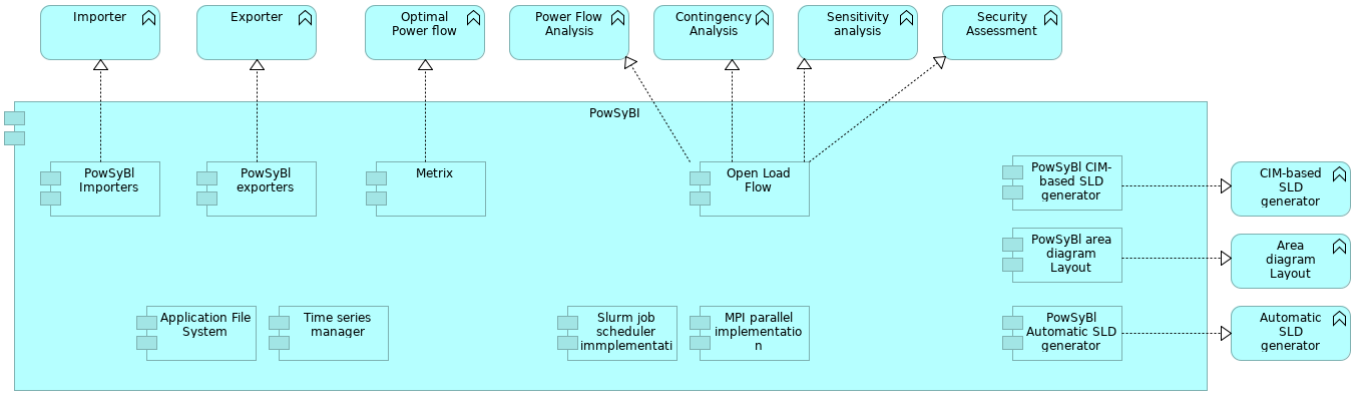


Elements

Element	Type
Contingency Analysis	Application Function
Contingency Violations	Data Object
Open Load Flow	Application Component
Power System State	Data Object
PowSyBI	Application Component
Symmetric Power Flow Analysis	Application Function

PowSyBl Detailed

No viewpoint



Documentation

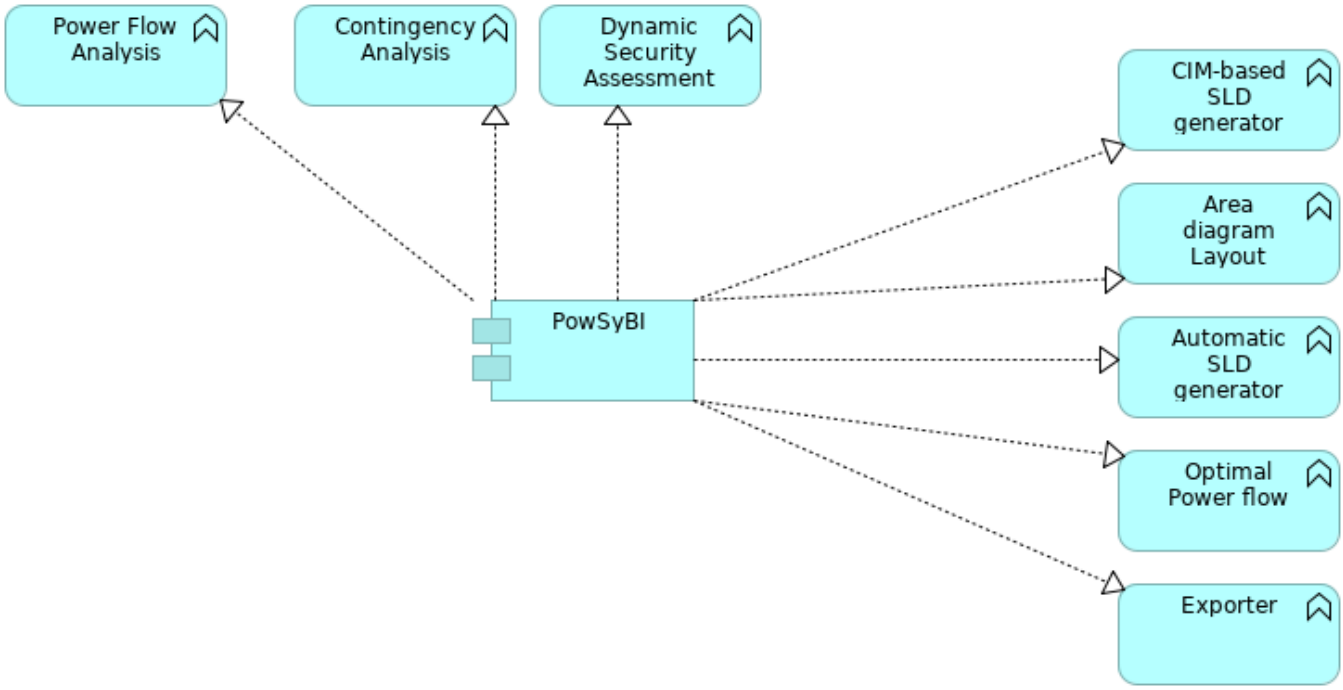
> This is the detailed project achitecture view of the PowSyBl project. PowSyBl is an open source library dedicated to electrical grid modeling and simulation. For more information on PowSyBl, check out the project's page: https://lfenergy.org/projects/powsybl/

Elements

Element	Type
Application File System	Application Component
Area diagram Layout	Application Function
Automatic SLD generator	Application Function
CIM-based SLD generator	Application Function
Contingency Analysis	Application Function
Exporter	Application Function
Importer	Application Function
Metrix	Application Component
MPI parallel implementation	Application Component
Open Load Flow	Application Component
Optimal Power flow	Application Function
Power Flow Analysis	Application Function
PowSyBl	Application Component
PowSyBl area diagram Layout	Application Component
PowSyBl Automatic SLD generator	Application Component
PowSyBl CIM-based SLD generator	Application Component
PowSyBl exporters	Application Component
PowSyBl Importers	Application Component
Security Assessment	Application Function
Sensitivity analysis	Application Function
Slurm job scheduler immplementation	Application Component
Time series manager	Application Component

PowSyBl Realization

No viewpoint



Documentation

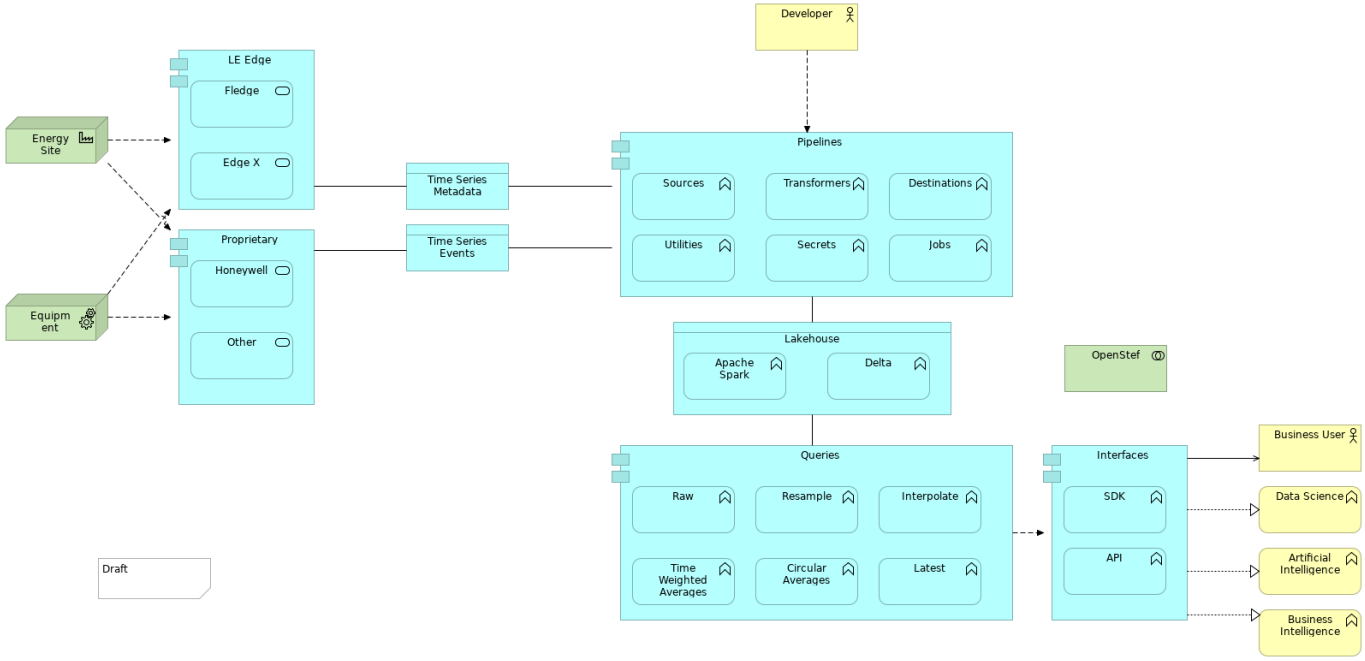
> This is the project achitecture view of the PowSyBl project. PowSyBl is an open source library dedicated to electrical grid modeling and simulation. For more information on PowSyBl, check out the project's page: https://lfenergy.org/projects/powsybl/

Elements

Element	Type
Area diagram Layout	Application Function
Automatic SLD generator	Application Function
CIM-based SLD generator	Application Function
Contingency Analysis	Application Function
Dynamic Security Assessment	Application Function
Exporter	Application Function
Optimal Power flow	Application Function
Power Flow Analysis	Application Function
PowSyBl	Application Component

RTDIP Realization

No viewpoint



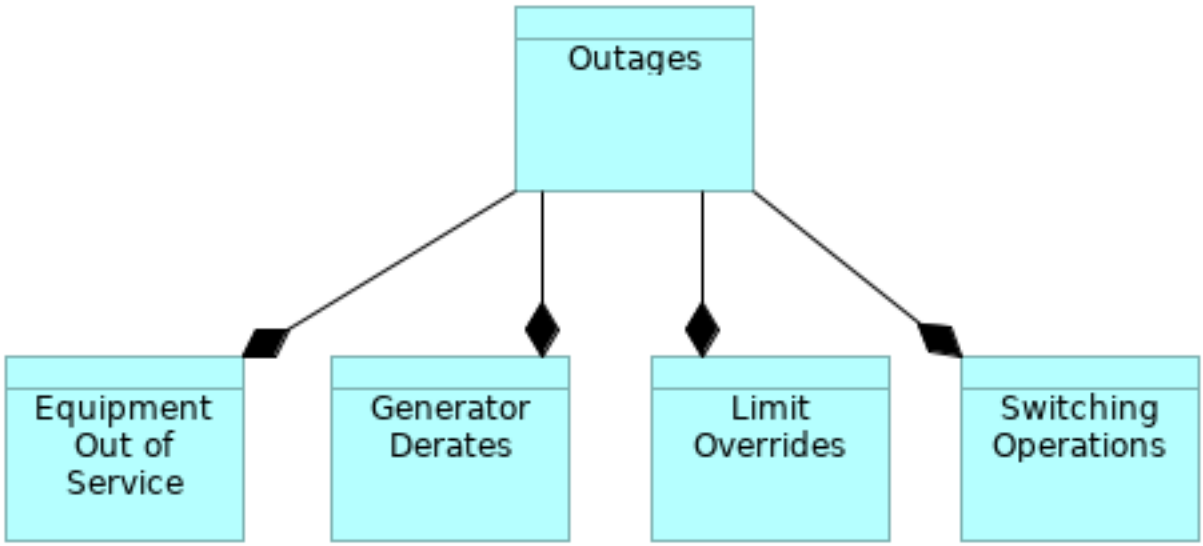
Elements

Element	Type
Apache Spark	Application Function
API	Application Function
Artificial Intelligence	Business Function
Business Intelligence	Business Function
Business User	Business Actor
Circular Averages	Application Function
Data Science	Business Function
Delta	Application Function
Destinations	Application Function
Developer	Business Actor
Edge X	Application Service
Energy Site	Facility
Equipment	Equipment
Fledge	Application Service
Honeywell	Application Service
Interfaces	Application Component
Interpolate	Application Function
Jobs	Application Function
Lakehouse	Data Object
Latest	Application Function
LE Edge	Application Component
OpenStef	Technology Collaboration
Other	Application Service
Pipelines	Application Component

Element	Type
Proprietary	Application Component
Queries	Application Component
Raw	Application Function
Resample	Application Function
SDK	Application Function
Secrets	Application Function
Sources	Application Function
Time Series Events	Data Object
Time Series Metadata	Data Object
Time Weighted Averages	Application Function
Transformers	Application Function
Utilities	Application Function

Scheduled Outages

No viewpoint

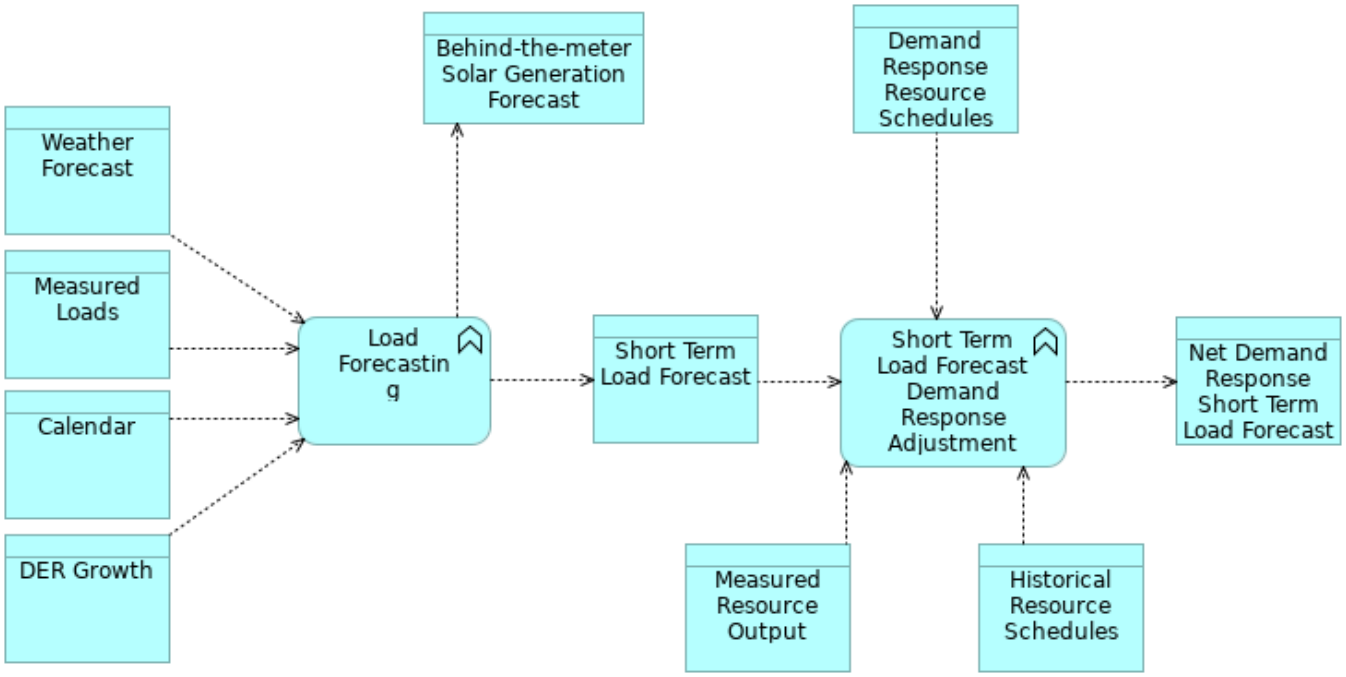


Elements

Element	Type
Equipment Out of Service	Data Object
Generator Derates	Data Object
Limit Overrides	Data Object
Outages	Data Object
Switching Operations	Data Object

Short Term Load Forecasting

No viewpoint

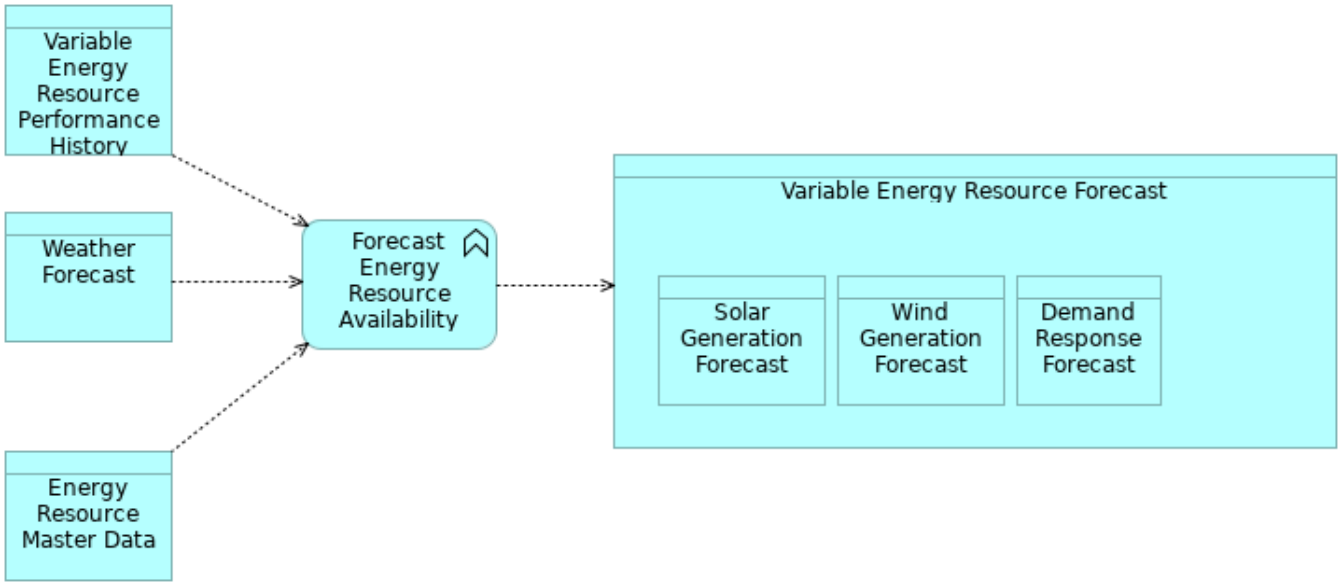


Elements

Element	Type
Behind-the-meter Solar Generation Forecast	Data Object
Calendar	Data Object
Demand Response Resource Schedules	Data Object
DER Growth	Data Object
Historical Resource Schedules	Data Object
Load Forecasting	Application Function
Measured Loads	Data Object
Measured Resource Output	Data Object
Net Demand Response Short Term Load Forecast	Data Object
Short Term Load Forecast	Data Object
Short Term Load Forecast Demand Response Adjustment	Application Function
Weather Forecast	Data Object

Short Term Variable Generation Forecasting

No viewpoint

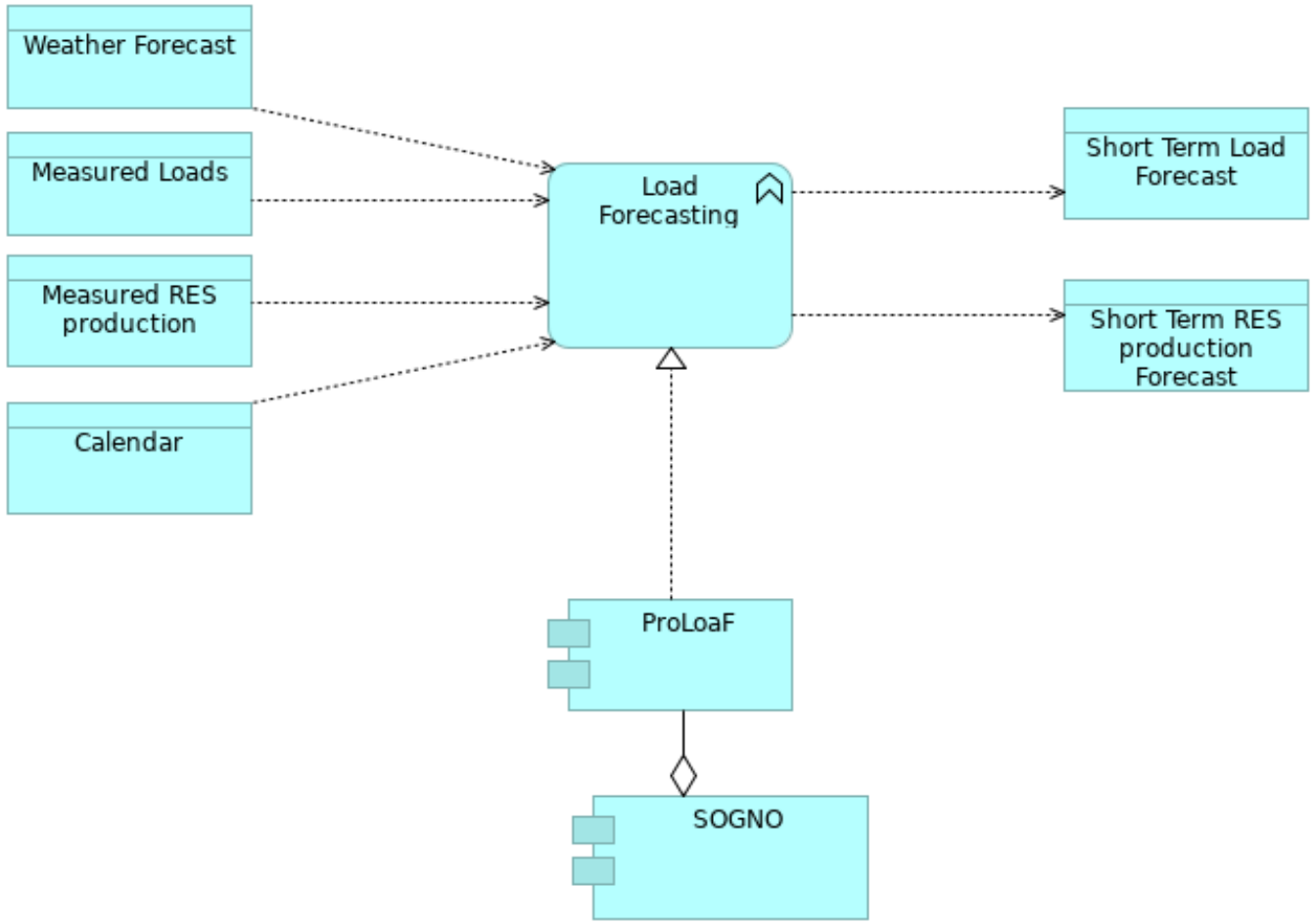


Elements

Element	Type
Demand Response Forecast	Data Object
Energy Resource Master Data	Data Object
Forecast Energy Resource Availability	Application Function
Solar Generation Forecast	Data Object
Variable Energy Resource Forecast	Data Object
Variable Energy Resource Performance History	Data Object
Weather Forecast	Data Object
Wind Generation Forecast	Data Object

SOGNO Forecasting Detailed

No viewpoint

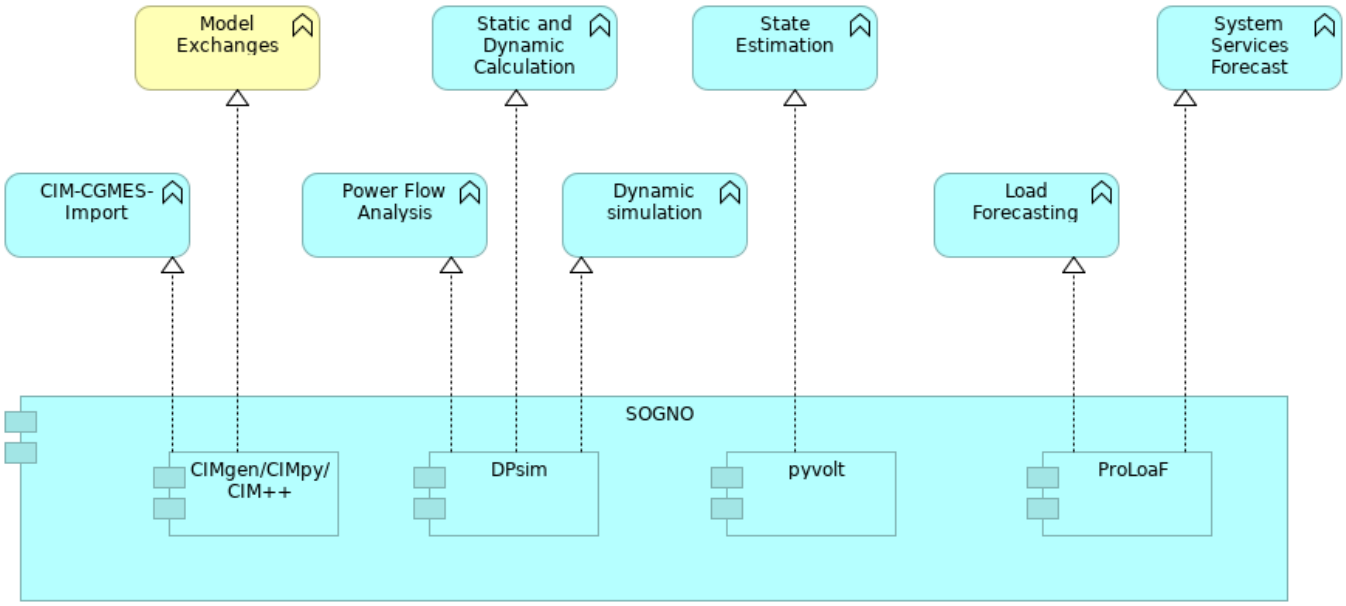


Elements

Element	Type
Calendar	Data Object
Load Forecasting	Application Function
Measured Loads	Data Object
Measured RES production	Data Object
ProLoaF	Application Component
Short Term Load Forecast	Data Object
Short Term RES production Forecast	Data Object
SOGNO	Application Component
Weather Forecast	Data Object

SOGNO Realization

No viewpoint

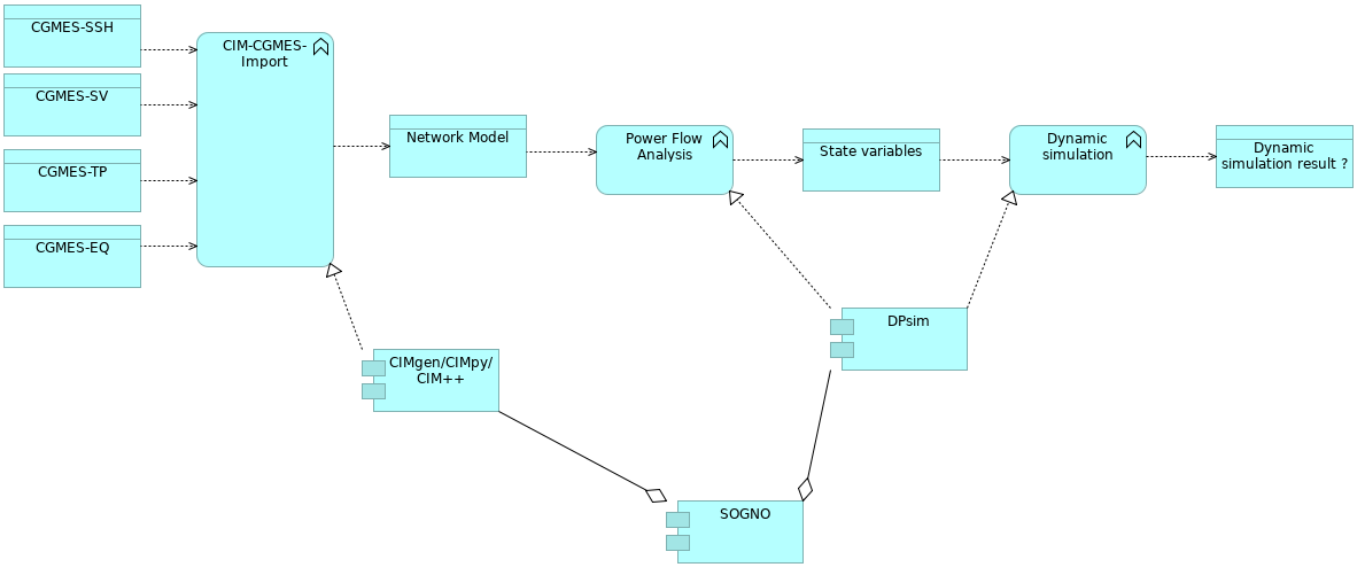


Elements

Element	Type
CIM-CGMES-Import	Application Function
CIMgen/CIMpy/CIM++	Application Component
DPsim	Application Component
Dynamic simulation	Application Function
Load Forecasting	Application Function
Model Exchanges	Business Function
Power Flow Analysis	Application Function
ProLoaF	Application Component
pyvolt	Application Component
SOGNO	Application Component
State Estimation	Application Function
Static and Dynamic Calculation	Application Function
System Services Forecast	Application Function

SOGNO Simulation Detailed

No viewpoint

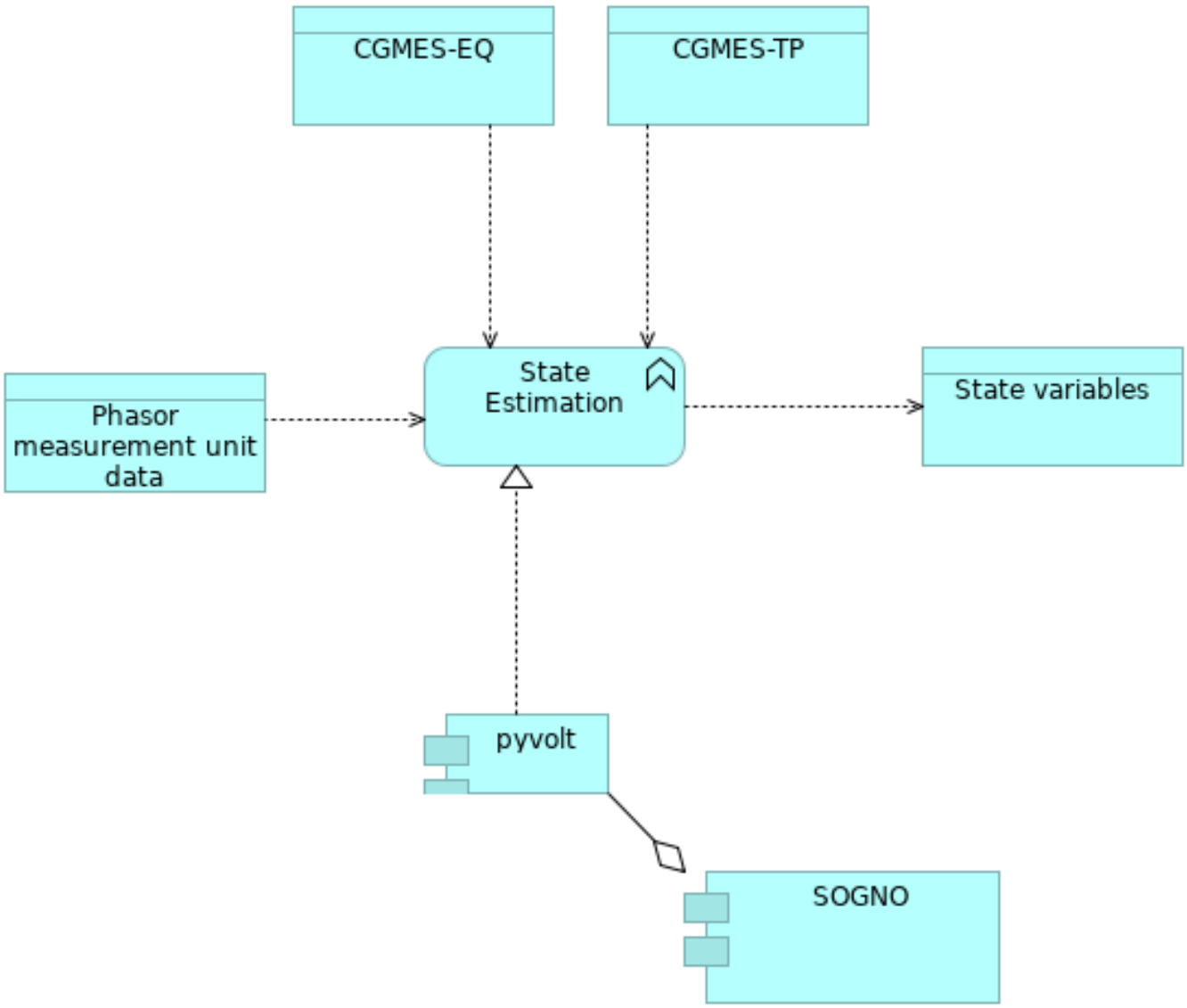


Elements

Element	Type
CGMES-EQ	Data Object
CGMES-SSH	Data Object
CGMES-SV	Data Object
CGMES-TP	Data Object
CIM-CGMES-Import	Application Function
CIMgen/CIMpy/CIM++	Application Component
DPsim	Application Component
Dynamic simulation	Application Function
Dynamic simulation result ?	Data Object
Network Model	Data Object
Power Flow Analysis	Application Function
SOGNO	Application Component
State variables	Data Object

SOGNO State Estimation Detailed

No viewpoint

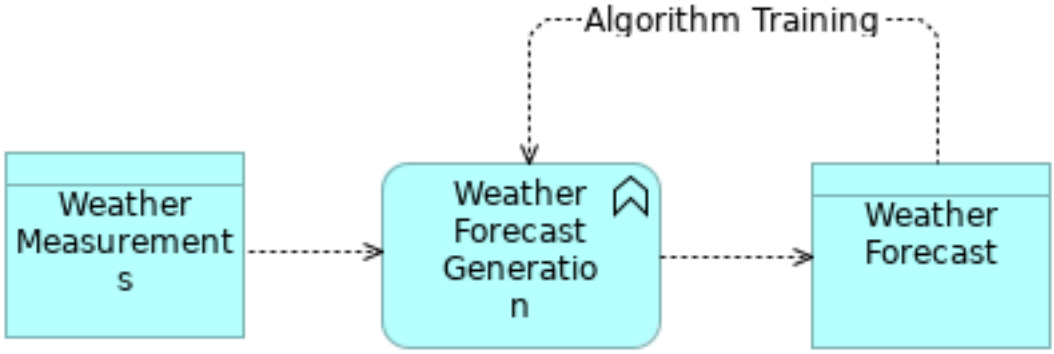


Elements

Element	Type
CGMES-EQ	Data Object
CGMES-TP	Data Object
Phasor measurement unit data	Data Object
pyvolt	Application Component
SOGNO	Application Component
State Estimation	Application Function
State variables	Data Object

Weather Forecasting

No viewpoint



Elements

Element	Type
Weather Forecast	Data Object
Weather Forecast Generation	Application Function
Weather Measurements	Data Object

Strategy Layer

Capability

Type	Capability

A capability represents an ability that an active structure element, such as an organization, person, or system, possesses. In the field of business, strategic thinking and planning delivers strategies and high-level goals that are often not directly implementable in the architecture of an organization. These long-term or generic plans need to be specified and made actionable in a way that both business leaders and Enterprise Architects can relate to, and at a relatively high abstraction level. Capabilities help to reduce this gap by focusing on business outcomes. On the one hand, they provide a high-level view of the current and desired abilities of an organization, in relation to its strategy and its environment. On the other hand, they are realized by various elements (people, processes, systems, and so on) that can be described, designed, and implemented using Enterprise Architecture approaches. Capabilities may also have serving relationships; for example, to denote that one capability contributes to another. Capabilities are expressed in general and high-level terms and are typically realized by a combination of organization, people, processes, information, and technology. For example, marketing, customer contact, or outbound telemarketing

Business Layer

Acquisition and Control

Type	Business Function

Covering the digitial capabilities to monitor and control our assets.

Acquisition, system, pricing, design

Type	Business Function

Functions required to acquire the right assets with the right capabilities both in long term and dynamically in short term for services

Acting on the future energy system state

Type	Business Function

Adequacy assessment

Type	Business Function

Estimating the adequacy of the generation to meet the demand (possibly taking into account the limits of the grid).

Aggregated Service Organisation

Type	Business Function

Hierarchically organizing an optimal distribution of individual customer contributions to provide an aggregated service (power, frequency, voltage, power quality services ...) to the system. (consider maybe rename the item)

Aggregated/Distributed/Local automations

Type	Business Function

Covering the automations functionalities that are shared amongst all nodes .

Alignment with regulation and standards

Type	Business Function

To allow a system to configure workflow and processes in compliance with national regulatory frameworks. Should be also configurable to merging of regulatory frameworks. eg. european regulatory framework

Analysis of network bottlenecks

Type	Business Function

Analytics

Type	Business Function

Covering the digital functionalities used to determine causes, draw conclusions and give advice (e.g. predicting fault locations).

Anomaly detection system / substation configurations

Type	Business Function

Area Demands

Type	Business Object

> Forecast of the power demand at an area level

Artificial Intelligence

Type	Business Function

Asset Investment Planning

Type	Business Function

> Covering the planning of the asset investments on strategic, tactical and operation level.

Asset lifecycle management

Type	Business Function

> To monitor the status and programme scheduled maintenance and replacement on deployed assets.

Asset management

Type	Business Function

> Covering the digital functionalities required to manage your assets.

Asset performance management

Type	Business Function

> Capabilities of data capture, integration, visualization and analytics tied together for the explicit purpose of improving the reliability and availability of physical assets, including the concepts of condition monitoring, predictive forecasting and reliability-centered maintenance (RCM).

Asset Planning

Type	Business Function

> To support the process of developing, operating, maintaining, upgrading, and disposing of assets in the most cost-effective manner (including all costs, risks and performance attributes).

Asset Supervision

Type	Business Function

> Covering the digital functionalities used to determine asset status and replacement plans (e.g. using condition monitoring for predictive maintenance plans).

Autonomous Function Conf.

Type	Business Function

Remote operational functional configuration of decentralized automations (potentially via aggregation of customer side assets)

Avalibility

Type	Business Function

Availablility Platform calculates the proportion, expressed as a percentage, of the total Available Time during which assets or services are available.

Balance and frequency control

Type	Business Function

To maintain frequency stability, balances the power generation and load consumption in the grid

Balance Responsible Party

Type	Business Role

A party that has a contract proving financial security and identifying balance responsibility with the Imbalance Settlement Responsible of the Market Balance Area entitling the party to operate in the market. This is the only role allowing a party to nominate energy on a wholesale level. The meaning of the word “balance” in this context signifies that the quantity contracted to provide or to consume must be equal to the quantity really provided or consumed.

Balance Supplier

Type	Business Actor

A party that markets the difference between actual metered energy consumption and the energy bought with firm energy contracts by the Party Connected to the Grid. In addition, the Balance Supplier markets any difference with the firm energy contract (of the Party Connected to the Grid) and the metered production. There is only one Balance Supplier for each Accounting Point.

Balancing Market

Type	Business Function

Trading Platform to insure system balance and frequency, as production and consumption levels must match during the operation of electric power systems.

Balancing Mechanism

Type	Business Function

Managing the real time strategy to balance the system and cope with contingency: identification the appropriate services (demand side response / generation / aggregator / storage ...) to trigger to sustain the system for the next few hours.

Billing

Type	Business Process

Billing is supported by a combination of software and hardware components that receive consumption details and service usage information, groups this information for specific accounts or customers, produces invoices, creates reports for management / investors, and records (posts) payments made to customer accounts. Includes Auditing / Verfication Activities

Business Actor

Type	Business Actor

A business actor represents a business entity that is capable of performing behavior. A business actor is a business entity as opposed to a technical entity; i.e., it belongs to the Business Layer. Actors may, however, include entities outside the actual organization; e.g., customers and partners. A business actor may be assigned to one or more business roles. It can then perform the behavior to which these business roles are assigned. A business actor can be aggregated in a location. The name of a business actor should preferably be a noun.

Business Function

Type	Business Function

Business Function

Type	Business Function

Business Function A business function represents a collection of business behavior based on a chosen set of criteria (typically required business resources and/or competencies), closely aligned to an organization, but not necessarily explicitly governed by the organization. Just like a business process, a business function also describes internal behavior performed by a business role. However, while a business process groups behavior based on a sequence or flow of activities that is needed to realize a product or service, a business function typically groups behavior based on required business resources, skills, competencies, knowledge, etc. There is a potential many-to-many relation between business processes and business functions. Complex processes in general involve activities that offer various functions. In this sense, a business process forms a string of business functions. In general, a business function delivers added value from a business point of view. Organizational units or applications may coincide with business functions due to their specific grouping of business activities. A business function may be triggered by, or trigger, any other business behavior element (business event, business process, business function, or business interaction). A business function may access business objects. A business function may realize one or more business services and may be served by business, application, or technology services. A business role may be assigned to a business function. The name of a business function should clearly indicate a well-defined behavior. Examples are customer management, claims administration, member services, recycling, or payment processing

Business Intelligence

Type	Business Function

Business Interaction

Type	Business Interaction

Business Object

Type	Business Object

Business Object

Type	Business Object

Business Object

Type	Business Object

Business Object

Type	Business Object

Business Object A business object represents a concept used within a particular business domain. The ArchiMate language in general focuses on the modeling of types, not instances, since this is the most relevant at the Enterprise Architecture level of description. Hence a business object typically models an object type (cf. a UML class) of which multiple instances may exist in operations. Only occasionally, business objects represent actual instances of information produced and consumed by behavior elements such as business processes. This is in particular the case for singleton types; i.e., types that have only one instance. A wide variety of types of business objects can be defined. Business objects are passive in the sense that they do not trigger or perform processes. A business object could be used to represent information assets that are relevant from a business point of view and can be realized by data objects. Business objects may be accessed (e.g., in the case of information objects, they may be created, read, or written) by a business process, function, business interaction, business event, or business service. A business object may have association, specialization, aggregation, or composition relationships with other business objects. A business object may be realized by a representation or by a data object (or both). The name of a business object should preferably be a noun.

Business Role

Type	Business Role

A business role represents the responsibility for performing specific behavior, to which an actor can be assigned, or the part an actor plays in a particular action or event. Business roles with certain responsibilities or skills are assigned to business processes or business functions. A business actor that is assigned to a business role is responsible for ensuring that the corresponding behavior is carried out, either by performing it or by delegating and managing its performance. In addition to the relation of a business role with behavior, a business role is also useful in a (structural) organizational sense; for instance, in the division of labor within an organization. A business role may be assigned to one or more business processes or business functions, while a business actor may be assigned to one or more business roles. A business interface or an application interface may serve a business role,

while a business interface may be part of a business role. The name of a business role should preferably be a noun.

Business User

Type	Business Actor

Capacity Co-ordinator

Type	Business Role

A party, acting on behalf of the System Operators involved, responsible for establishing a coordinated Offered Capacity and/or NTC and/or ATC between several Market Balance Areas.

Capacity Trader

Type	Business Actor

A party that has a contract to participate in the Capacity Market to acquire capacity through a Transmission Capacity Allocator. The capacity may be acquired on behalf of an Interconnection Trade Responsible or for sale on secondary capacity markets.

Centralized Automation

Type	Business Function

Based on a real time assessment of the power system state, providing real time technical signals (toward internal or external recipient) to sustain the system within its normal operational conditions (e.g. frequency or voltage secondary or tertiary control automation).

Centralized real time business event management

Type	Business Function

Co-ordination and workflow framework

Type	Business Object

To allowe the creation, monitoring and steering of workflows providing the ability to manage people and equipment with flexible scheduling options.

Co-ordination center operator

Type	Business Role

Responsible for: 1. The coordination of exchange programs between its related Control Blocks and for the exchanges between its associated Coordination Center Zones. 2. Ensuring that its Control Blocks respect their obligations in respect to load frequency control. 3. Calculating the time deviation in cooperation with the associated coordination centers. 4. Carrying out the settlement and/or compensation between its Control Blocks and against the other Coordination Center Zones.

Comissioning and installation management

Type	Business Function

To support the process through with a piece of equipment, facility, or plant (which is installed, or is complete or near completion) is tested to verify if it functions according to its design objectives or specifications.

Common communication media

Type	Business Function

Covering the digital functionalities supporting emergency and crisis management.

Compare Configuration

Type	Business Function

Compare configurations in order to find differences.

Compensation and Settlement

Type	Business Process

Compensation and Settlement represents payment or trade of value for transactions between market actors as distinct from customer billing. Includes auditing / verfication activities. Settlements are often bi-directional in nature

Configuration management

Type	Business Function

Container function for configuration management consist of (agrregate) 1. Make system configuration 1.1. Make substation configuration 1.2 Make IED configuration (bij. DER) 2. Edit system configuration 2.1 Idem 2.2 Idem 2.3 Grid planning import 3. Store system configuration 3.1 Idem 3.3 Version Management 4. Validate 5. Compare

Congestion Management

Type	Business Function

To avoid a situation where the electricity supply exceeds the grid capacity (congestion).

Consent management

Type	Business Function

Consent management is a system, process or set of policies for allowing consumers to determine what information they are willing to permit their various energy componanies to access.

Consumer

Type	Business Role

A party that consumes electricity. This is a Type of Party Connected to the Grid.

Consumption Responsible Party

Type	Business Role

Contract

Type	Business Object

> Contractual commitment enabling development / funding of the resource, will typically include perfornance requirements and reporting

Control Area Operator

Type	Business Role

> Responsible for: 1. The coordination of exchange programs between its related Market Balance Areas and for the exchanges between its associated Control Areas. 2. The load frequency control for its own area. 3. The coordination of the correction of time deviations.

Control Block Operator

Type	Business Role

> Responsible for: 1. The coordination of exchanges between its associated Control Blocks and the organisation of the coordination of exchange programs between its related Control Areas. 2. The load frequency control within its own block and ensuring that its Control Areas respect their obligations in respect to load frequency control and time deviation. 3. The organisation of the settlement and/or compensation between its Control Areas.

Control Entity

Type	Business Actor

Cross border capacity

Type	Business Function

> Trading Platform to allocate energy throughout borders between market areas

Cross border capacity calculation

Type	Business Process

> For a given timeframe, calculation of the limits of feasible power exchanges between market areas for a given timeframe under physical and security limitations

Customer and Market

Type	Business Function

> Covering all the functionalitites related to the customer and interaction with markets and other thrid parties

Customer impact assesement

Type	Business Function

To identify customers / stakeholders with reference to a service outage.

Customer Preferences

Type	Business Object

A register of customer needs, goals and economics that allows energy system to optimize delivery. Allows users to configure various ied interacting with digital energy services provided by the utility/local energy community, -> device settings: thermostat settings, storage back-up reserve, water heater settings, over-ride, EV charge schedule

Customer Relationship and Communications

Type	Business Function

Functions required to support customer / investor relationship management and communication.

Customer Response

Type	Business Function

Covering the digital functionalities supporting customers providing information.

Cyber Security

Type	Business Function

Data Management

Type	Business Function

Covering the digital functionalities supporting data retrieval and management.

Data Science

Type	Business Function

Demand Control

Type	Business Function

Demand Response Management

Type	Business Function

To encourage customers to make short-term reductions in energy demand in response to a price signal from the electricity hourly market, or a trigger initiated by the electricity grid operator.

Developer

Type	Business Actor

Distributed energy resource management

Type	Business Function

Distributed outage management

Type	Business Function

To restore the network model after an outage.

Dynamic Safety Assessment

Type	Business Function

Edge device management

Type	Business Function

Edge Node Control

Type	Business Function

Covering the digital functionalities that are shared amongst all nodes .

Edge to (virtual) control center communication

Type	Business Function

Edit IED configuration

Type	Business Function

Edit device specifc configuration

Edit system configuration

Type	Business Function

Edit system configuration

Type	Business Function

Edit system wide configurations.

electrival vehicle (EV) interaction and monitoring

Type	Business Function

Emergency and Crisis Management

Type	Business Function

To support communications with stakeholders during a emergency or crisis

Energy and Crisis management

Type	Business Function

Communication to customers in event of outage or other reduction in services

Energy Service Company

Type	Business Actor

A party offering energy-related services to the Party Connected to Grid, but not directly active in the energy value chain or the physical infrastructure itself. The ESCO may provide insight services as well as energy management services.

Failure analysis

Type	Business Function

Field Service, Customer Care

Type	Business Function

Field Work Management

Type	Business Function

Covering the digital functionalities used to prepare and execute work with the right resources.

Forecasts

Type	Business Function

Forecasts

Type	Business Function

Forecasts

Type	Business Function

Forecast are used in a variety of processes that span from multi years ahead to a few minutes ahead timeframes

Generating single line diagram (digram layout)

Type	Business Function

CGMES diagram layout (corelate on data object).

Grid Access Provider

Type	Business Actor

A party responsible for providing access to the grid through a Metering Point for energy consumption or production to the Party Connected to the Grid. The party is also responsible for creating and terminating Metering Points.

Grid Architect

Type	Business Role

Grid management

Type	Business Function

Grid Operator

Type	Business Role

A party that operates one or more grids.

Grid Planner

Type	Business Role

Grid planning import

Type	Business Function

Import exsisting grid plan as a basis for the configuration.

Health Index Calculation

Type	Business Function

Computing of health of asset from available data and predictions

Hypervision of the energy system state

Type	Business Function

Imbalance Settlement Responsible Party

Type	Business Role

A party that is responsible for settlement of the difference between the contracted quantities and the realised quantities of energy products for the Balance Responsible Parties in a Market Balance Area. The Imbalance Settlement Responsible has not the responsibility to invoice. The Imbalance Settlement Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.

Infrastructure Management

Type	Business Function

A central platform management equipment and nodes in the smart grid remotely.

inter control center (interaction and) monitoring

Type	Business Function

Interaction between external operational control centers

Type	Business Function

Interaction between internal operational control centers

Type	Business Function

Interconnection Trade Responsible Party

Type	Business Role

Is a Balance Responsible Party or depends on one. He is recognised by the Nomination Validator for the nomination of already allocated capacity. This is a type of Balance Responsible Party.

International Prices

Type	Business Object

Forecast the exchange between market areas

Investment Policy

Type	Business Object

Covering the financial investment strategy

IT management supervision

Type	Business Function

Covering the digital functionalities supporting IT systems, infrastructure and security management.

Local Site Balance

Type	Business Object

Forecast the power balance aggregated at the level of a substation or a site

Make IED configuration

Type	Business Function

Create single device configurations.

Make specification

Type	Business Function

Make configuration specifications

Make System Configuration

Type	Business Function

Create system configurations

Make System Configuration

Type	Business Function

Create system wide configurations.

Market Information Aggregator

Type	Business Role

A party that provides market related information that has been compiled from the figures supplied by different actors in the market. This information may also be published or distributed for general use. The Market Information Aggregator may receive information from any market participant that is relevant for publication or distribution.

Market Platform Gateway

Type	Business Function

Platforms allowing energy market participants to retrieve and provide market information and engagements (e.g. providing energy consumption details to energy suppliers).

Market Prices

Type	Business Object

Forecast the prices of energy products and multiple services

Market Signal Generation

Type	Business Function

Assessing the physical state of the system to provide information toward market actors to inflence their positions in response to physical needs.

Merit Order List Responsible Party

Type	Business Role

Responsible for the management of the available tenders for all Acquiring System Operators to establish the order of the reserve capacity that can be activated.

Meter Administrator

Type	Business Role

A party responsible for keeping a database of meters.

Meter Operator

Type	Business Role

A party responsible for installing, maintaining, testing, certifying and decommissioning physical meters.

Metered Data Aggregator

Type	Business Role

A party responsible for the establishment and qualification of metered data from the Metered Data Responsible. This data is aggregated according to a defined set of market rules.

Metered Data Collector

Type	Business Role

A party responsible for meter reading and quality control of the reading.

Metered Data Responsible Party

Type	Business Role

A party responsible for the establishment and validation of metered data based on the collected data received from the Metered Data Collector. The party is responsible for the history of metered data for a Metering Point.

Metering and Compensation

Type	Business Function

Determination and financially handling realization of market contracts and consequences of system operation.

Metering Point Administrator

Type	Business Role

A party responsible for registering the parties linked to the metering points in a Metering Grid Area. The party is also responsible for registering and making available the Metering Point characteristics.

Model Exchanges

Type	Business Function

format change

Modeling

Type	Business Process

Build a model of the system for simulation, and modify it: merge of submodels, change parameters, include forecasted hypothesis

Monitoring and Control

Type	Business Function

To monitor and control power assets both on grid and customer controlled in the edge

Network administration

Type	Business Function

To help a network to run smoothly and efficiently.

Nomination Validator

Type	Business Role

Has the responsibility of ensuring that all capacity nominated is within the allowed limits and confirming all valid nominations to all involved parties. He informs the Interconnection Trade Responsible of the maximum nominated capacity allowed. Depending on market rules for a given interconnection the corresponding System Operators may appoint one Nomination Validator.

Notification and communication management

Type	Business Function

Enables the delivery of information (regularly or in case of specific occurrencies) to consumers / partners

Outage coordination and stakeholder management

Type	Business Function

To provide accurate information about the extent of the outage and its impact on customers / stakeholders

Outage Management

Type	Business Function

Covering the digital functionalities used to prepare and execute service calls related to planned and unplanned outages.

Outage Management

Type	Business Function

To identify outages and provide instant alerts.

Outage programming and planning

Type	Business Function

To prepare processes and workflows for scheduled outages (eg., necessary for system maintenance)

Party Connected to grid

Type	Business Actor

A party that contracts for the right to consume or produce electricity at an Accounting Point.

Power Exchange

Type	Business Function

Trading Platform to ensure short-grid stabiity by injecting or absorbing power depending on observed local conditions or based on remote dispatch request

Power Flow analysis

Type	Business Function

Power Quality and System stability

Type	Business Function

Automation of the power system to return to its normal or stable conditions after disturbances like sudden changes of load, the sudden short circuit between line and ground, line-to-line fault, all three line faults, switching, including distributed assets.

Power quality management

Type	Business Function

To ensure the good power quality. Good power quality can be defined as a steady supply voltage that stays within the prescribed range, steady a.c. frequency close to the rated value, and smooth voltage curve waveform (resembles a sine wave).

Power System Analysis

Type	Business Function

Power System Calculation

Type	Business Process

Simulations that are done to support decision making

Power System Planning

Type	Business Function

Privacy Management

Type	Business Function

Producer

Type	Business Role

A party that produces electricity. This is a type of Party Connected to the Grid.

Production Responsible Party

Type	Business Role

A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and produced for all associated Accounting Points. This is a type of Balance Responsible Party.

Project Finance Management

Type	Business Function

To support the long-term financing of infrastructure and industrial projects based upon the projected cash flows of the project rather than the balance sheets of its sponsors.

Protection Analysis

Type	Business Function

Real Time Grid Operator

Type	Business Role

Reconcillation Accountable

Type	Business Actor

A party that is financially accountable for the reconciled volume of energy products for a profiled Accounting Point.

Reconcillation Responsible Party

Type	Business Role

A party that is responsible for reconciling, within a Metering Grid Area, the volumes used in the imbalance settlement process for profiled Accounting Points and the actual metered quantities. The Reconciliation Responsible may delegate the invoicing responsibility to a more generic role such as a Billing Agent.

Remote Operation

Type	Business Function

Supervise a control area, and trigger remote actions (SCADA console)

renewable energy resources interaction and monitoring

Type	Business Function

Renewable policy Management

Type	Business Function

Covering the renewal strategy to assure that, after replacement, assets are able to operate with th same fetures of the ones they have replaced.

Reserve Allocator

Type	Business Role

Informs the market of reserve requirements, receives tenders against the requirements and in compliance with the prequalification criteria, determines what tenders meet requirements and assigns tenders.

Resource provider

Type	Business Role

A role that manages a resource and provides the schedules for it, if required.

Safety rules implementations

Type	Business Process

Training and tracking tools to insure compliance

Scenario description

Type	Business Object

Schedules

Type	Business Object

> Define frequency and parameters of pre-programmed events

Scheduling Co-ordinator

Type	Business Role

> A party that is responsible for the schedule information and its exchange on behalf of a Balance Responsible Party. For example, in the Polish market a Scheduling Coordinator is responsible for information interchange for scheduling and settlement.

secure remote device communication

Type	Business Function

secure remote processing

Type	Business Function

Security Management

Type	Business Function

Service administration

Type	Business Function

> To allow service configuration, monitoring and steering

Services

Type	Business Function

> 3rd Party or Customer owned assets providing supporting functions to grid

Shared Functions

Type	Business Function

> Covering the digitial functionalities that are required by each of category.

Smart Contracts

Type	Business Object

> A smart contract is a protocol intended to digitally facilitate, verify, or enforce the negotiation or performance of credible transactions without third party intervention, in a trackable and irreversible way.

Smart Device Control

Type	Business Function

Smart Device Monitoring

Type	Business Function

Smart Device Monitoring and Control

Type	Business Function

Smart Ledgers

Type	Business Object

> A distributed ledger (also called a shared ledger or distributed ledger technology or DLT) is a consensus of replicated, shared, and synchronized digital data geographically spread across multiple sites, countries, or institutions, without a central administrator or centralized data storage

Solar Wind Resource Generation

Type	Business Function

> Forecast solar and wind generation (non-controlable generation)

State Validation

Type	Business Function

Storage Management

Type	Business Function

> To trigger energy storage devices to act as spinning reserves for providing short-term power supply or demand to manage instant variability in DG-generated power

Store IED Configuration

Type	Business Function

> Store IED specific configurations.

Store system configuration

Type	Business Function

> Manage (store/load) configuratons files.

Store system configuration

Type	Business Function

> Store system configurations for later use.

substation automation interaction and monitoring

Type	Business Function

Supply Chain

Type	Business Service

> To assure that the consumables, assets replacement and additional goods and services are always available to support assets management and maintenance schedules

Synchronisation

Type	Business Function

> To match the speed and frequency of a generator or other source to a running network. If two segments of a grid are disconnected, they cannot exchange AC power again until they are brought back into exact synchronization.

System Control

Type	Business Function

> Real time management of power systems

System Governance

Type	Business Function

> Covering the digital functionalities supporting systems monitoring, registering and healing to make sure that all systems together establish a grid that is stable, reliable and flexible.

System Management

Type	Business Function

> Managing the physical flow and balance of a power system.

System operation

Type	Business Function

> Deals with automation operations that are implemented at a central level

System Operator

Type	Business Role

> A party that is responsible for a stable power system operation (including the organisation of physical balance) through a transmission grid in a geographical area. The System Operator will also determine and be responsible for cross border capacity and exchanges. If necessary he may reduce allocated capacity to ensure operational stability. Transmission as mentioned above means “the transport of electricity on the extra high or high voltage network with a view to its delivery to final customers or to distributors. Operation of transmission includes as well the tasks of system operation concerning its management of energy flows, reliability of

the system and availability of all necessary system services”. (definition taken from the ENTSO-E RGCE Operation handbook Glossary). Additional obligations may be imposed through local market rules.

Team planning + Scheduling

Type	Business Function

To assure the corect allocation of human resoures to scheduled assets related maintenance plans

Threat Monitoring

Type	Business Function

Ticketing

Type	Business Function

To create work tickets to track and facilitate outage remediation work required

Trade Responsible Party

Type	Business Role

A party who can be brought to rights, legally and financially, for any imbalance between energy nominated and consumed for all associated Accounting Points. A power exchange without any privileged responsibilities acts as a Trade Responsible Party. This is a type of Balance Responsible Party.

Trader

Type	Business Role

A party that is selling or buying energy.

Transmission Capacity Allocator

Type	Business Role

Manages the allocation of transmission capacity for an Allocated Capacity Area. For explicit auctions: The Transmission Capacity Allocator manages, on behalf of the System Operators, the allocation of available transmission capacity for an Allocated Capacity Area. He offers the available transmission capacity to the market, allocates the available transmission capacity to individual Capacity Traders and calculates the billing amount of already allocated capacities to the Capacity Traders.

User

Type	Business Role

User Alerting

Type	Business Function

To notificate a user that certain parameters are either above or below a specific threshold.

Validate

Type	Business Function

> Validate configurations based on known rules.

Validation measuring values and tagging

Type	Business Function

Version Management

Type	Business Function

> Manage configuration versions.

Application Layer

(Edge) System Configuration

Type	Data Object

(Standard) Menu Entry Functions

Type	Application Function

> Menu items in LF energy CoMPAS to interface with the software.

104 address to 61850 SCL Editor

Type	Application Function

> Editor to show/change 104 adresses mapped on IEC61850 SCL adresses based on the IEC/TS 61850-80-1.

Aggregated measuring values

Type	Data Object

Aggregated/Distributed/virtualized equipment protections

Type	Application Function

> To monitor systems failures and disconnect assets to prevent them from being damaged.

Aggregation Node

Type	Application Component

> Covering the digital functionalities of a regional hub (e.g. set of connected substations)

Alarm Management

Type	Application Function

> A specific form of event management

AMPL

Type	Data Object

Apache Spark

Type	Application Function

API

Type	Application Function

Application Component

Type	Application Component

Application Component An application component represents an encapsulation of application functionality aligned to implementation structure, which is modular and replaceable. An application component is a self-contained unit. As such, it is independently deployable, re-usable, and replaceable. An application component performs one or more application functions. It encapsulates its behavior and data, exposes services, and makes them available through interfaces. Cooperating application components are connected via application collaborations. An application component may be assigned to one or more application functions. An application component has one or more application interfaces, which expose its functionality. Application interfaces of other application components may serve an application component. The name of an application component should preferably be a noun.

Application File System

Type	Application Component

This is mobule of PowSyBI

Application Function

Type	Application Function

An application function represents automated behavior that can be performed by an application component. An application function describes the internal behavior of an application component. If this behavior is exposed externally, this is done through one or more services. An application function abstracts from the way it is implemented. Only the necessary behavior is specified. An application function may realize one or more application services. Application services of other application functions and technology services may serve an application function. An application function may access data objects. An application component may be assigned to an application function (which means that the application component performs the application function). The name of an application function should preferably be a verb ending with “-ing”; e.g., “accounting”.

Application Service

Type	Application Service

Application Services An application service represents an explicitly defined exposed application behavior. An application service exposes the functionality of components to their environment. This functionality is accessed through one or more application interfaces. An application service is realized by one or more application functions that are performed by the component. It may require, use, and produce data objects. An application service should be meaningful from the point of view of the environment; it should provide a unit of behavior that is, in itself, useful to its users. It has a purpose, which states this utility to the environment. This means, for example, that if this environment includes business processes, application services should have business relevance.

Area diagram Layout

Type	Application Function

Asset Repository

Type	Application Component

Covering the digital functionalities used to keep track of asset and asset related information and configuration.

Assumed load/generation profile

Type	Data Object

Asymmetric Power Flow Analysis

Type	Application Function

Auto Align SLD (Single Line Diagram)

Type	Application Function

Generate Single line diagram layout coordinates based on SCL input.

Automatic SLD generator

Type	Application Function

Available Frequency-Responsive Demand Response

Type	Data Object

Available Frequency-responsive demand response refers to on-line generation that can measure frequency locally and change their power consumption after a non-zero frequency deviation is observed, in order to achieve power balance between supply and demand. For example fans and pumps that are directly driven by synchronous or induction motors, will, therefore, inherently reduce demand during frequency declines (and increase when frequency increases). Source: PNNL https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-23764.pdf

Available Non-spinning Reserves

Type	Data Object

A form of secondary frequency response, non-spinning reserves must be available within ten minutes, but can be offline.

Available Spinning Reserves

Type	Data Object

A form of secondary frequency response, spinning reserve refers to reserves that must be online and available within ten minutes.

Base profiles

Type	Data Object

Behind-the-meter Solar Generation Forecast

Type	Data Object

A forecast of the behind-the-meter (non-dispatchable) solar generation, usually from residential and commercial rooftop panels, that is serving local load. This can be used to calculate a potential peak demand that could occur very quickly e.g. when a storm moves in.

Black Start Service Awards

Type	Data Object

An award to provide black start service in the event of a black out. Requires: "A generating unit(s) and its associated set of equipment which has the ability to be started without support from the System or is designed to remain energized without connection to the remainder of the System, with the ability to energize a bus, meeting the Transmission Operator’s restoration plan needs for Real and Reactive Power capability, frequency and voltage control, and that has been included in the Transmission Operator’s restoration plan" https://www.nerc.com/files/glossary_of_terms.pdf

Calendar

Type	Data Object

A record of demand-influencing events for a given day of the year, based on the season, holidays, day of the week etc.

Capacity Platform

Type	Application Component

Trading Platform long-term grid reliability by procuring the appropriate amount of power supply resources needed to meet predicted energy demand X years in the future

Central Hub

Type	Application Function

A central platform for data collection, monitoring and control equipment and nodes in the smart grid (e.g. SCADA or IoT platform).

CGMES Contingency Profile

Type	Application Service

Specification proposed to IEC TC57 WG 13 for standardization by ENTSO-E. https://eepublicdownloads.entsoe.eu/clean-documents/CIM_documents/Grid_Model_CIM/Contingency_Profile_Specification_v1.0.pdf

CGMES-EQ

Type	Data Object

CGMES-SSH

Type	Data Object

CGMES-SV

Type	Data Object

CGMES-TP

Type	Data Object

CIM - CGMES

Type	Data Object

CIM CGMES-EQ specifications

Type	Data Object

> The CGMES-EQ file format can used to convert into 61850 SCL to act as a start of an SCL based configuration.

CIM CGMES-EQ to 61850 SCL

Type	Application Function

> Function convert CGMES-EQ into 61850 SCL.

CIM mapper

Type	Application Component

> A component to map CGMES-EQ on IEC 61850 SCL based on the IEC/TS 62361-102. https://github.com/com-pas/compas-cim-mapping

CIM to 61850

Type	Application Service

CIM-based SLD generator

Type	Application Function

CIM-CGMES-Import

Type	Application Function

> Imports CIM-CGMES data from XML files to make it available to other functions.

CIM-DL

Type	Data Object

CIMgen/CIMpy/CIM++

Type	Application Component

> CIMgen is a template engine based tool for code generation from the CIM / CGMES data model for several programming languages. CIMpy and CIM++ are the generated python and C++ libraries. https://github.com/sogno-platform/cimgen https://github.com/sogno-platform/cimpy https://github.com/sogno-

platform/libcimpp

Circular Averages

Type	Application Function

CleanUp

Type	Application Function

Function to check and cleanup unused SCL elements.

Communication Editing

Type	Application Function

Editor for the 61850 SCL communication subsection.

Communication Infrastructure

Type	Application Component

Communication infrastructure refers to the backbone of the communications system upon which various broadcasting and telecommunication services are operated. This can be built from copper cable, fiber, or wireless technologies utilizing the radio frequency spectrum, such as microwave and satellite.

Compare IED

Type	Application Function

Function to compare IED's. E.g. for comparing a IED with a template IED.

CoMPAS

Type	Application Component

Focus on IEC61850 SCL configurations. For more information, see: https://com-pas.github.io/compas-architecture/technical/TECHNICAL_ARCHITECTURE.html Organisation: https://github.com/com-pas

CoMPAS for Siemens SITIPE

Type	Application Function

Functions to interact with the Siemens SITIPE database.

CoMPAS OpenSCD Component

Type	Application Component

OpenSCD CoMPAS Edition Extensions on OpenSCD e.g. in order to work with the CoMPAS backend services https://github.com/com-pas/compas-open-scd

CoMPAS SCL Validator

Type	Application Component

Validate SCL files based on OCL rules and the 6850 XSD. https://github.com/com-pas/compas-scl-validator

CoMPAS SCT tool

Type	Application Component

CoMPAS Settings

Type	Application Function

See/change CoMPAS specific settings

CoMPAS sitipe Service

Type	Application Component

Siemens SITIPE for CoMPAS This repository contains an CoMPAS extension in order to integrate with Siemens SITIPE. It is open source software to interact with Siemens SITIPE. https://github.com/com-pas/compas-sitipe-service

CoMPAS version

Type	Application Function

Show and manage the CoMPAS SCL files stored in the database.

conducting element

Type	Data Object

Configuration

Type	Application Function

To configure and interact with a device on side

Configuration and Setting repository

Type	Application Component

To store and track configurations and settings for all recorded and deployed assets: Configuration Management

Configuration Management

Type	Application Function

Container function for configuration management consist of (agrregate) 1. Make system configuration 1.1. Make substation configuration 1.2 Make IED configuration (bij. DER) 2. Edit system configuration 2.1 Idem 2.2 Idem 2.3 Grid planning import 3. Store system configuration 3.1 Idem 3.3 Version Management 4. Validate 5. Compare

Configuration Management

Type	Application Function

Configuration tools

Type	Application Component

To track configuration tools to remotely configure assets

contingency

Type	Data Object

Contingency Analysis

Type	Application Function

In layman's terms, Contingency Analysis (CA) is a "what if" scenario simulator that evaluates, provides and prioritizes the impacts on an electric power system when problems occur. A contingency is the loss or failure of a small part of the power system (e.g. a transmission line), or the loss/failure of individual equipment such as a generator or transformer. Contingency analysis is an application function that uses a simulated model of the power system, to: • evaluate the effects, and • calculate any overloads, resulting from each contingency. Contingency Analysis is essentially a "preview" analysis tool. It simulates and quantifies the results of problems that could occur in the power system in the immediate future. CA is used as a study tool for the off-line analysis of contingency events, and as an on-line tool to show operators what would be the effects of future outages. This allows operators to be better prepared to react to outages by using pre-planned recovery scenarios. Definition from EPRI Smart Grid repository.https://smartgrid.epri.com/UseCases/ContingencyAnalysis-Baseline.pdf

contingency list

Type	Data Object

contingency violation

Type	Data Object

Contingency Violations

Type	Data Object

Contingency violations

Type	Data Object

Contract Details

Type	Data Object

Core Services Component

Type	Application Component

Create Virtual IED

Type	Application Function

Function to create a virtual IED based on 61850 SCL data templates.

Cross device/vendor and cross telecom network compatibility

Type	Application Function

To ensure that your system works with the widest possible device, vendor and telecom network base.

Customer app UX/UI

Type	Application Service

Customer centric access to energy services, or information of current state of system vs. preferrences and economics.

Customer Side Node

Type	Application Component

Covering the digital function of customer-specific equipment (i.e. solar panels)

DarkSkyNet

Type	Data Object

Data

Type	Data Object

Data acqusition and treatment

Type	Application Function

To acquire data from the nodes in the smart grid

Data Fetchers

Type	Application Component

Data Lineage

Type	Application Function

Data lineage is the process of tracking the flow of data over time, providing a clear understanding of where the data originated, how it has changed, and its ultimate destination within the data pipeline.

Data Object

Type	Data Object

Data Object A data object represents data structured for automated processing. A data object should be a self-contained piece of information with a clear meaning to the business, not just to the application level. Typical examples of data objects are a customer record, a client database, or an insurance claim. The ArchiMate language in general focuses on the modeling of types, not instances, since this is

the most relevant at the Enterprise Architecture level of description. Hence a data object typically models an object type (cf. a UML class) of which multiple instances may exist in operational applications. An important exception is when a data object is used to model a data collection such as a database, of which only one instance exists. An application function or process can operate on data objects. A data object may be communicated via interactions and used or produced by application services. A data object can be accessed by an application function, application interaction, or application service. A data object may realize a business object and may be realized by an artifact. A data object may have association, specialization, aggregation, or composition relationships with other data objects. The name of a data object should preferably be a noun.

Data Validation

Type	Application Service

To provide specific well-defined guarantees for fitness, accuracy, and consistency for “user inputs” into an application or automated system.

Day ahead prices

Type	Data Object

Deep Learning

Type	Application Function

Artificial intelligence functionality that imitates the workings of the human brain in processing data and creating patterns for use in decision making, capable of learning unsupervised from data that is unstructured or unlabeled.

Delta

Type	Application Function

Demand Response Forecast

Type	Data Object

A forecast of the available demand response from registered (dispatchable) resources.

Demand Response Resource Schedules

Type	Data Object

The list of energy schedules for Demand Response Resources

DER Growth

Type	Data Object

An estimate of the growth of Distributed Energy Resource (e.g. Rooftop solar and storage, that would reduce net demand or electric vehicles that would increase it) in the last year. Used to adjust load forecasts when using a "similar day" from the prior year.

Destinations

Type	Application Function

Deviation between measurement values and estimated state

Type	Data Object

Device configuration data lineage

Type	Application Function

> The check that every device in the energy system has the correct configuration

Device control

Type	Application Function

Device installation services

Type	Application Function

Device management

Type	Application Function

Device monitoring

Type	Application Function

Device Status Monitoring

Type	Application Function

Digital Infrastructure repository

Type	Application Component

> To store and track data about the available digitial infrastructure assets

Digital Twin

Type	Application Component

> To virtually replicate and simulate the performance of a specific assets over time

Dispatch/Adequacy Calculation

Type	Application Function

> Simulation for balancing responsability management across power system domains to ensure power flow and resource participation for market integrated and non-market integrated services.

Distribution Node

Type	Application Component

Covering the digital functionalities of a group of assets (e.g. bay, rail, circuit or group of bays).

DNP3

Type	Application Service

Domain Component

Type	Application Component

Domian specific functions

Type	Application Function

DPsim

Type	Application Component

DPsim is a solver library for dynamic power system simulation. It supports the electromagnetic transient (EMT), quasi-static and dynamic phasor (DP) domain for simulation. A powerflow solver is included for standalone usage or to initialize dynamic simulations. It provides a Python module which can be embedded in any Python 3 application / scripts. The simulation core is implemented in highly-efficient C++ code. It supports real-time execution with time-steps down to 50 uS. It can load models in the IEC61970 Common Information Model (CIM) / Common Grid Model Exchange Standard (CGMES) XML format. It can be interfaced to a variety of protocols and interfaces via VILLASnode. https://github.com/sogno-platform/dpsim

DSA Contingencies

Type	Data Object

DSA contingencies is a list of the largest generators and loads in the system. The DSA application function simulates the effects of these contingencies on the grid and outputs the impacts over time, including dropping frequency and stability.

Dynamic base-case

Type	Data Object
First Increment	1

Snapshot from the dynamic model Power flow solution with dynamic data

Dynamic parameters

Type	Data Object

Dynamic Security Assessment

Type	Application Function
First Increment	2

DSA focuses on the security of system dynamics in various timescales, from transients of several seconds to slow dynamics of several minutes or even hours. It refers to the analysis and quantification of the degree and risk in a power system’s ability to survive imminent disturbances (DSA contingencies) without interruption to

customer service. 1. DSA contingencies is a list of the largest generators and loads in the system. The DSA application function simulates the effects of these contingencies on the grid and outputs the impacts over time, including dropping frequency and stability. 2. The DSA tool can also be used to simulate the behaviour of the grid over time, based on the current state of the grid and/or forecasted conditions, in the absence of DSA contingency events. There are four subareas in Dynamic Security/Stability Assessment: - Transient stability analysis - Small signal analysis - Frequency stability analysis - Voltage Stability Assessment

Dynamic Security Assessment

Type	Application Component

Dynamic Security Violations

Type	Data Object

A dynamic security violation is one that requires the operator to take a dispatch action.

Dynamic simulation

Type	Application Function

Dynamic simulation result ?

Type	Data Object

Dynamic Stability Limits

Type	Data Object

Edge configuration management

Type	Application Function

maintain configuration of all edge components. Enable software updates across all edge components Includes - Building & generating configurations - Change configurations - Store configurations - Version management

Edge process data

Type	Data Object

Edge X

Type	Application Service

Edit IED

Type	Application Function

Editor to show IED's (intelligent electronic device) and their content. This incluses functions (Logical nodes/LN) and parameters.

Edit Substation

Type	Application Function

Editor to read/make changes to the IEC 61850 SCL substation section. This includes line and proces elements.

Electro-magnetic Transient Stability Assessment

Type	Application Function

Assessing the security and stability issues of HVDCs by modeling the dynamics between AC and DC susbystems during fault propagation.

EMS metingen

Type	Data Object

EMT Stability Violations

Type	Data Object

Violations of security and stability on HVDCs in sub-transient dynamics.

End to End encryption/KEYS

Type	Application Function

To prevent data being read or secretly modified, other than by the true sender and recipient(s).

Energy Resource Master Data

Type	Data Object

Behavioural attributes for an energy resource (gen, load, storage) including maximum power, ramp rate (curve), start up time, minimum run time etc.

Equipment

Type	Data Object

Equipment and Connectivity Model

Type	Data Object

A model of the grid; it's equipment and connectivity. (The EQ profile in CIM)

Equipment Communication

Type	Application Function

To allow interaction and control among distributed equiment. Facilities automous functions in the edge.

Equipment Dynamics Model

Type	Data Object

A mathematical model for an equipment's (synchronous machine, inverter based resources, transmission lines, load and energy storage) electro-mechanical and electro-magnetic response to control or grid changes. A mathematical model

representing the sub-cycle behaviour needed for analysis of the steady state stability (small-signal stability) and/or transient stability of a power system or parts of it. (The DY profile of CIM.) More info here: https://www.nerc.com/comm/PC/Model%20Validation%20Working%20Group%20MVWG%202013/NERC%20Standardized%20Component%20Model%20Manual.pdf https://arxiv.org/pdf/1804.04933.pdf#:~:text=POWER%20SYSTEM%20MODELS,wind%20generators%20and%20PV%20generators.

Equipment Node

Type	Application Component

Covering the digital functionalities of a single asset or a small group of the same assets (e.g transformer, set of three circuit breakers in 3-phase system or in case smart meter: a single electricity connection) or

Equipment Out of Service

Type	Data Object

A planned outage for which equipment needs to be taken out of service.

Estimates

Type	Data Object

Event Dispatching

Type	Application Function

Event Management

Type	Application Function

Event Management HMI

Type	Application Function

Event Notification

Type	Application Function

Event Priority Management

Type	Application Function

Event Sending

Type	Application Function

Event Storage

Type	Application Function

Exchange model

Type	Data Object

Export Communication Sections

Type	Application Function

Export IED Params

Type	Application Function

> Function to export a (pre-defined) IED settings e.g. protection settings.

Exporter

Type	Application Function

Facility Ratings

Type	Data Object

> The maximum or minimum voltage, current, frequency, or real or reactive power flow through a facility that does not violate the applicable equipment rating of any equipment comprising the facility. https://www.nerc.com/files/glossary_of_terms.pdf For context: NERC also defines Facility as a set of electrical equipment that operates as a single Bulk Electric System Element (e.g., a line, a generator, a shunt compensator, transformer, etc.)

Failures recording

Type	Application Function

> To record data related to systems and device failures.

Fault type and impedance

Type	Data Object

Firmware management

Type	Application Function

Fledge

Type	Application Service

Fledge

Type	Application Component

FledgePower

Type	Application Component

Forecast Energy Resource Availability

Type	Application Function

> Forecasting the available capacity of variable energy resources based on the historical performance for that resource, the characteristics of that resource, and

the weather forecast.

Forecast Engine

Type	Application Component

Forecasts Requests

Type	Application Event

Based on the information on KTP team confluence page - icarus-GLDPM-service > message flow

Forecasts SO

Type	Data Object

Forecasts TenneT

Type	Data Object

Frequency Stability

Type	Application Function

Frequency stability analysis refers to the ability of a power system to maintain steady frequency following a severe disturbance between generation and load. This depends on the ability to restore equilibrium between system generation and load, with minimum loss of load. Frequency instability may lead to sustained frequency swings leading to tripping of generating units or loads. During frequency excursions, the characteristic times of the processes and devices that are activated will range from fraction of seconds like under frequency control to several minutes, corresponding to the response of devices such as prime mover and hence frequency stability may be a short-term phenomenon or a long-term phenomenon.

generation and Load Time series

Type	Data Object

Generator Derates

Type	Data Object

A derate is a partial generator outage with an associated reduction in capacity. A generator derate may be scheduled to do maintenance in the future minutes, days or months.

Geo location of POI's

Type	Data Object

Geo location of contingencies ?

GFS

Type	Data Object

GFS forecasts

Type	Data Object

Granular RES Models

Type	Data Object
First Increment	3

The equipment and dynamics model for renewable energy sources.

Grid Measurements and Limits

Type	Data Object

The definition of measurements and limits that apply to a particular grid. It must be transferred with the corresponding EQ profile. Supported by the operation (OP) profile IEC 61970-452. https://webstore.iec.ch/publication/64844

Grid Model Assembly

Type	Data Object

A cohesive collection of Models (Physical, Situation or both) that has a specified purpose, which is often to serve as the starting point for the execution of some form of network analysis.

Grid Physical Model

Type	Data Object

A representation of the physical characteristics of the electrical grid including equipment, connectivity, short circuit properties, measurements and limits. Supported by the CIM EQ, OP and SC profiles IEC 61970-452.

Grid Scenario

Type	Data Object

A representation of a possible state (energy injections, switch states, control settings) of the grid for planning and coordination. Is additional to the equipment model, therefore a steady state analysis would require both an Equipment and a scenario (Steady State Hypothesis, SSH profile, in CIM)

Grid-Following IBR Dynamics Model

Type	Data Object

Grid-Forming IBR Dynamics Models

Type	Data Object

Grid-following inverters mimic current sources at their output terminals, whereas grid-forming inverters act like voltage sources and have control of voltage magnitude of frequency/phase. In contrast to inverter-based grid-following sources, inverter-based grid-forming sources would be designed to establish frequency and control voltage autonomously, and therefore they might be designed to both provide black-start capability and facilitate system restoration following a blackout.

> Source: https://www.nrel.gov/docs/fy21osti/73476.pdf

GXF

Type	Application Component

Help

Type	Application Function

> Help users to use the software.

Historic control actions

Type	Data Object

Historical load

Type	Data Object

Historical Resource Schedules

Type	Data Object

> Historical resource schedules

HMI

Type	Application Function

Honeywell

Type	Application Service

IEC 20922 (MQTT)

Type	Application Service

IEC 60870-5-103

Type	Application Service

IEC 60870-5-104

Type	Application Service

IEC 60870-6 (ICCP/TASE.2)

Type	Application Service

IEC 61158 (Modbus)

Type	Application Service

IEC 61850 Specification

Type	Data Object

CoMPAS can handle all kinds of SCL files, including specification files.

IEC 61850-6 (SCL)

Type	Application Service

IEC 61850-8-1 (MMS)

Type	Application Service

IEC 61850-9-2 (Sampled Values)

Type	Application Service

IEC 61970-451 Discrete Measurements

Type	Application Service

IEC 61970-451 Measurements

Type	Application Service

IEC 61970-452 Equipment (EQ)

Type	Application Service

IEC 61970-452 Short Circuit (SC)

Type	Application Service

IEC 61970-456 State Variables (SV)

Type	Application Service

IEC 61970-456 Steady State Hypothesis (SSH)

Type	Application Service

IEC 61970-456 Topology (TP)

Type	Application Service

IEC 61970-457 Dynamics

Type	Application Service

IEC 62056 (DLSM/COSEM)

Type	Application Service

IEC 62379 (SNMPv3)

Type	Application Service

IEC 62541 (OPC UA)

Type	Application Service

IEC61970-451 Analog Measurements

Type	Application Service

IEEE-CDF

Type	Data Object

Import from API

Type	Application Function

> Import a CIM CGMES EQ file based on a (mock-up) API.

Import IEDs

Type	Application Function

> Import exsisting IED's (CID or ICD 61850 SCL files).

Importer

Type	Application Function

Industrial process execution

Type	Application Function

Industrial protocol translation

Type	Application Function

InfluxDB

Type	Application Component

> Based on KTP confluence page icarus-influx-api (voor influxDB/MySQL)

Interfaces

Type	Application Component

Interpolate

Type	Application Function

Inverter-Based Resource Dynamics Model

Type	Data Object

> Dynamics model for inverter-based resources, including grid-following and grid-forming resources.

Jobs

Type	Application Function

Keycloak

Type	Application Component

Klant metingen

Type	Data Object

KNMI

Type	Data Object

Lakehouse

Type	Data Object

Latest

Type	Application Function

LE Edge

Type	Application Component

LetsCoordinate

Type	Application Component

Limit Overrides

Type	Data Object

> An adjustment of system operating limits.

Limit Violations

Type	Data Object

> Instances where the power system scenario (current or future) violates limits set for grid stability and security.

Line Current Limit

Type	Data Object

Line Frequency Limit

Type	Data Object

Line Ratings

Type	Data Object

Line Reactive Power Limit

Type	Data Object

Line Real Power Limit

Type	Data Object

Line voltage Limit

Type	Data Object

Load Corrections

Type	Data Object

Load Forecast

Type	Data Object
First Increment	4

A forecast of load (demand) that must be met by a grid or market operator over any timeframe (minutes, hours, days, seasons, years). Mostly impacted by season, day of week, holidays, weather and other events.

Load Forecasting

Type	Application Function

Calculates a load forecast (demand) that must be met by a grid or market operator over minutes, hours and days. Mostly impacted by season, day of week, holidays, weather and other events.

Locamation VMU

Type	Application Function

Function to edit Locamation private 61850 extensions in order configure the Locamation Virtual merging unit software.

Log analysis

Type	Application Process

To support the clustering, aggregation and analysis on assets and processes related log files

Log functions

Type	Application Function

Show relevant logs in OpenSCD/CoMPAS.

Logging

Type	Application Function

To create a log file. A log file is a file that records either events that occur in an system, or messages between different systems.

Long term storage

Type	Application Component

To storage data for a long period of time (e.g years)

Market Data

Type	Data Object

Market data

Type	Data Object

Market solution

Type	Data Object
First Increment	5

Replaces power system state, topology etc.

Matpower

Type	Data Object

Measured Loads

Type	Data Object

Loads measured in the past which may be stored historically and recorded at regular intervals.

Measured RES production

Type	Data Object

Measured Resource Output

Type	Data Object

The measured output for demand response resources for past scheduled time frames.

Measurement forecasts

Type	Data Object

Measurements

Type	Data Object

Measuring, metering, altering, sensing and actuation

Type	Application Function

To create and maintain both a costant data flows and controlling capabilities on assets distributed in different locations.

Merge project

Type	Application Function

Merge SCL files into the existing project.

Message queing service and directory

Type	Application Service

Message Queue

Type	Application Service

To queue messages that are sent between applications. It includes a sequence of work objects that are waiting to be processed. A message is the data transported between the sender and the receiver application; it's essentially a byte array with some headers at the top.

Metering

Type	Application Function

Handles the various physical measurements (energy, power (including active- and reactive power), voltage, frequency, power quality) gathering, storage, and quality management to provide for compensation, control and / or services settlement

Metrix

Type	Application Component

This is mobule of PowSyBI

Model extensions

Type	Data Object

Model persistence

Type	Data Object

MongoDB

Type	Application Component

Monitoring (general)

Type	Application Function

Most Limiting Series Element

Type	Data Object

MPI parallel implementation

Type	Application Component

This is mobule of PowSyBI

Net Demand Response Short Term Load Forecast

Type	Data Object

A short term load forecast that is adjusted for demand that is expected to be met by demand response effectively reducing the load expected and observed by the operator/market.

Network Data

Type	Data Object

Topology + Component attributes

Network Model

Type	Data Object

Network Model Management

Type	Application Function

The ‘Network Model Management’ function provides a single source of truth for network analysis data and enables grid models for different purposes to be derived from that single source of truth. Network analysis is concerned solely with the electrical grid. Grid models are abstracted from facility engineering detail and describe, in mathematical form, the characteristics of the electrical components that are significant to the overall electrical system that delivers power from sources to consumers.

New Project

Type	Application Function

Open a new SCL file.

Node voltage magnitude and angle

Type	Data Object

OF-business-service

Type	Application Component

OF-cards-consultation

Type	Application Component

OF-cards-publication

Type	Application Component

OF-dummy-modbus-device(1...n)

Type	Application Component

OF-external-app

Type	Application Component

OF-external-devices

Type	Application Component

OF-thirds-services

Type	Application Component

OF-user-service

Type	Application Component

OF-webUI

Type	Application Component

Open Load Flow

Type	Application Component

> This is mobule of PowSyBI

Open Project

Type	Application Function

> Open and SCL file to show and/or edit.

OpenStef

Type	Application Component

OpenSTEF

Type	Application Component

> OpenSTEF is a Python package which is used to make short term forecasts for the energy sector. This repository contains all components for the machine learning pipeline required to make a forecast. In order to use the package you need to provide your own data storage and retrieval interface. openstef is available at: https://pypi.org/project/openstef/

OpenSTEF application

Type	Application Component

OpenWeatherMap

Type	Data Object

OperatorFabric-core

Type	Application Component

> OperatorFabric is designed to aggregate notifications from all these applications into a single screen and allow the operator to act on them.

OPF result?

Type	Data Object

Optimal Power flow

Type	Application Function

OSLP

Type	Application Service

> Open Street Light Protocol (OSLP) is a lightweight message based protocol

Other

Type	Application Service

Outages

Type	Data Object
First Increment	4

> Outages, scheduled or unplanned (forced), are changes to the normal operation of resources and equipment on the grid. They include generators out of service or operating in a degraded mode, non-default switch positions or temporarily stricter operating limits.

Persistence

Type	Data Object

Phasor measurement unit data

Type	Data Object

> Voltage and current magnitude and phase, active and reactive power, measurement uncertainties

Pipelines

Type	Application Component

Pivot Model

Type	Data Object

PMU Data Set

Type	Data Object

POI's

Type	Data Object

POI's points of interests Further clarification needed over what is the criteria to choose these points of interests Contingency is perhaps a better term to use

Power Equipment Repository

Type	Application Component

To store and track data about all power assets

Power flow / voltage measurements with uncertainty

Type	Data Object

Power Flow Analysis

Type	Application Function

Power Flow Analysis is the computational procedure (numerical algorithms) required to determine the steady state operating characteristics of a power system network from the given line data and bus data.

Power Flow Calculation

Type	Application Function

Power flow is a 'what-if' based grid calculation that will calculate the node voltage and the power flow through the branches, based on assumed load/generation profiles.

Power Flow Output

Type	Data Object

Power flow through branches

Type	Data Object

Power Grid Model

Type	Application Component

Power Grid Model is a high-performance Python/C++ library for steady-state distribution power system analysis.

Power System State

Type	Data Object
First Increment	2

State estimator solution or power flow output - Energized State - Island Topology - Bus Voltage - Bus Injections - Terminal flows - Controls - Violations

Power Transfer Distribution Factors

Type	Data Object

power-grid-model library

Type	Application Component

The library power-grid-model is the main calculation library. It is written in C++ with native shared-memory multi-threading for parallelization in batch calculations.

power-grid-model-io library

Type	Application Component

The library power-grid-model-io is a data conversion Python library which handles the conversion between Power Grid Model format and other common grid data formats.

PowerCheck

Type	Application Component

PowerConf

Type	Application Component

PowerSim

Type	Application Component

PowerViz

Type	Application Component

PowSyBl

Type	Application Component

PowSyBl (Power System Blocks) is an open source library dedicated to electrical grid modeling and simulation. PowSyBl is written in Java and licensed under the Mozilla Public License 2.0. Using PowSyBl, developers can create applications able to perform dynamic power flow simulations and security analyses on the network, handle a variety of formats including CGMES for European data exchanges, and many other tasks.

PowSyBl area diagram Layout

Type	Application Component

This is mobule of PowSyBl

PowSyBl Automatic SLD generator

Type	Application Component

This is mobule of PowSyBl

PowSyBl CIM-based SLD generator

Type	Application Component

This is mobule of PowSyBl

PowSyBl exporters

Type	Application Component

This is mobule of PowSyBl

PowSyBl Importers

Type	Application Component

This is mobule of PowSyBl

Predictive Analytics

Type	Application Function

To define schedules on maintenancae operations related to specific assets on the basis of hystorical data.

Predictor Storage

Type	Application Component

Prices

Type	Data Object

Prioritized Alarm List

Type	Data Object

Project from CIM

Type	Application Function

Load an IEC CCGMES EQ file and convert it into 61850 SCL.

ProLoaF

Type	Application Component

ProLoaF makes use of the big data paradigm that allows machine learning algorithms, trained with data from the power system field. The core comprises a recurrent neural network (encoder-decoder architecture) to predict the target variable. The targets can vary from timerseries of PV, Wind or other generators to most commonly the total energy consumption. Both, the relevant input data history and prediction horizon are arbitrarily long and customizable for any specific need. https://github.com/sogno-platform/proloaf

Proprietary

Type	Application Component

Protocol adapaters

Type	Application Component

Protocol conversion

Type	Application Function

Protocol Conversion

Type	Application Function

To translate the protocol of the sending device to a different protocol of another device so that compatibility and communication can be established

Protocol Layer Component

Type	Application Component

Protocol Management

Type	Application Function

To translate the protocol of the sending device to a different protocol of another device so that compatibility and communication can be established

PSSE

Type	Data Object

Publisher

Type	Application Function

Editor to mange reports and datasets.

PVoutput

Type	Data Object

PVoutput gereliseerde opwek

pyvolt

Type	Application Component

State estimation python library

Queries

Type	Application Component

RabbitMQ

Type	Application Component

Raw

Type	Application Function

Real Time monitoring

Type	Application Function

To monitor asset performance and readiness in real time

Real-time command

Type	Data Object

Real-time device monitoring

Type	Data Object

Real-time event

Type	Data Object

Real-time measurement scaling

Type	Application Function

Real-time measuring values

Type	Data Object

Real-time setpoints

Type	Data Object

Remedial action

Type	Data Object

Remedial actions

Type	Data Object

Remote Configuration management

Type	Application Function

To remotely configure and interact with a device already deployed in the field

Remote Equipment and node management

Type	Application Function

To access equipment or a node remotely

Resample

Type	Application Function

Retreieve SITPE bay typicals

Type	Application Function

Function to retreive bas typicals in Siemens SITIPE.

Retrieve SCL Data

Type	Application Function

Function to load SCL XML files.

Root Cause

Type	Data Object

A description of the root cause of an incident.

Routing of device commands

Type	Application Function

RTDIP

Type	Application Component

RTDIP provides easy access to high volume, historical and real time process data for analytics applications, engineers, and data scientists wherever they are. It includes a python package which is available at https://pypi.org/project/rtdip-sdk/ and detailed project information can be found at https://www.rtdip.io/

Save as version

Type	Application Function

Save a SCL XML file as a new version.

Save Functions

Type	Application Function

Grouping of save funcitons.

Save Project

Type	Application Function

Save the SCL project.

Save project as

Type	Application Function

Save a SCD file under a different name in the CoMPAS database.

SCADA

Type	Application Function

SCADA: Supervisory Control and Data Acquisition. SCADA is a solution for data acquisition, monitor and control power systems covering large geographical areas.

It refers to the combination of data acquisition and telemetry.

Scenario

Type	Data Object

Scenario Simulator

Type	Application Function

Scheduler

Type	Application Function

SCL Auto Aligner

Type	Application Component

Componenten to auto-align single line diagram's. https://github.com/com-pas/compas-scl-auto-alignment

SCL Data Service Component

Type	Application Component

Service to store and retrieve the SCL XML to a database. https://github.com/com-pas/compas-scl-data-service

SDK

Type	Application Function

Secrets

Type	Application Function

Security Analysis

Type	Application Function

Simulate a bunch of failures starting from an initial stable state (online security analysis being the last real time state).

Security Assessment

Type	Application Function

Security report

Type	Data Object

Self-Healing

Type	Application Function

To allow a system to autonomously identify issues, self-diagnose their causes and activate mitigating measures to allow the system to continue performing its core fucntionalities

Self-registering

Type	Application Function

To allow a system to autonomously identify new users or systems and automatic registers them.

Sensitivity analysis

Type	Application Function

Settings

Type	Application Function

Make changes/see general OpenSCD settings.

Severity Ranking of Contingency Violations

Type	Application Function

Shift keys

Type	Data Object

Short Circuit Calculation

Type	Application Function

Short circuit calculation is carried out to analyze a worse case scenario where a fault has occured. The currents flowing through branches and node voltages are calculated.

Short Circuit Model

Type	Data Object

Contains the additional information (e.g. equipment Negative and Zero Sequence Impedances) necessary to perform short circuit analysis. Supported by the SC profile in CIM, IEC 61970-452. Must be exchanged with the corresponding EQ profile.

Short Term Forecaster

Type	Application Component

Short Term Forecasting

Type	Application Function

Short Term Forecasting for SO

Type	Application Function

Short Term forecasting for TenneT

Type	Application Function

Short Term Load Forecast

Type	Data Object

A forecast of load (demand) that must be met by a grid or market operator over minutes, hours and days. Mostly impacted by season, day of week, holidays, weather and other events.

Short Term Load Forecast Demand Response Adjustment

Type	Application Function

Calculates a short term load forecast that is adjusted for demand that is expected to be met by demand response effectively reducing the load expected and observed by the operator/market.

Short Term Needed Transport Forecast

Type	Data Object

Short term persistency

Type	Application Function

To store data for a short period of time

Short Term RES production Forecast

Type	Data Object

Simulation

Type	Application Function

Simulation

Type	Application Function

Simulation of performance of assets with different configurations or network locations

Simulation

Type	Application Function

Simulate the system

Single Line Diagram

Type	Application Function

Show SCL based single line diagram's.

Slurm job scheduler immplementation

Type	Application Component

This is mobule of PowSyBI

Small Signal Stability Assessment

Type	Application Function
First Increment	2

Small signal analysis is about power system stability when subject to small disturbances (sub-cycle). If power system oscillations caused by small disturbances can be suppressed, such that the deviations of system state variables remain small for a long time, the power system is stable. On the contrary, if the magnitude of oscillations continues to increase or sustain indefinitely, the power system is unstable.

SOAP interfaces

Type	Application Component

SOGNO

Type	Application Component

The LF Energy project Service-based Open-source Grid automation platform for Network Operation of the future (SOGNO) is creating plug-and-play, cloud-native, micro-services to implement our next generation of data-driven monitoring and control systems. It will simplify the life of distribution utilities by enabling them to optimize their network operations through open source to deliver cost-effectively, and seamless, secure power supply for their customers. SOGNO introduces the idea of grid automation as a modular system in which components can be added through time. https://github.com/sogno-platform

Solar Generation Forecast

Type	Data Object

The forecasted power available over time from solar generation resources for a given forecasting window (e.g., minutes, hours, days). A forecast may include metadata related to the uncertainty of its inputs and likelihood of occurrence.

Sources

Type	Application Function

Specification Management

Type	Application Function

State Estimation

Type	Application Function

State estimation is a statistical calculation method that determines the most probable state of the grid, based on network data and measurements (here measurements mean power flow or voltages values with some kind of uncertinity, which were either measure, estimated or forecasted.)

State Estimation

Type	Data Object

An estimate of the current state of the grid in terms of power flow, voltages, demand and generation based on validated and adjusted direct measurements and interpolated values where no measurement is available.

State Estimation

Type	Application Function

State Estimation

Type	Application Function

Establish a statistical state of a given real system (measured with unperfect noisy sensors) that is coherent with a physically representative model.

State variables

Type	Data Object

State variables calculated by a state estimation or power flow algorithm: voltage, current and power injections

state variables time series

Type	Data Object

Static and Dynamic Calculation

Type	Application Function

Static - Based on a model simulate the resulting physical state Dynamic - Based on a model and a scenario of event, simulate the behavior of the system

Steady State Hyposis

Type	Data Object

Store SCL Data

Type	Application Function

Function to store SCL XML files.

Subscriber Data Binding (GOOSE)

Type	Application Function

GOOSE (Generic Object Oriented Substation Event) editor to manage data binding based GOOSE.

Subscriber Data Binding (SMV)

Type	Application Function

Sample values (SMV) editor to manage data binding based SMV.

Subscriber Later Binding (GOOSE)

Type	Application Function

GOOSE (Generic Object Oriented Substation Event) editor to manage later binding based GOOSE.

Subscriber Later Binding (SMV)

Type	Application Function

Sample values (SMV) editor to manage later binding based SMV.

Subscriber Message Binding (GOOSE)

Type	Application Function

GOOSE (Generic Object Oriented Substation Event) editor to manage message binding based GOOSE.

Subscriber Message Binding (SMV)

Type	Application Function

Sample values (SMV) editor to manage message binding based SMV.

Subscriber Update

Type	Application Function

Substation Node

Type	Application Component

Covering the digital functionalities of a substation (e.g. high-voltage substation, mid-voltage substation or low-voltage substation).

Supervision/Hypervision Component

Type	Application Component

To grants access to a computer software, firmware or hardware that creates and runs virtual machines.

Switching Operations

Type	Data Object

Switching operations that change the default switch position for a period of time e.g. summer setup are communicated as part of an outage.

Symmetric Power Flow Analysis

Type	Application Function

Synchronous Generator Dynamics Models

Type	Data Object

The dynamics model for synchronous generating units.

System Services Forecast

Type	Application Function

Forecast the system services that will be required to sustain the power system within it security limits

Telemetry

Type	Data Object

Telemetry is the in situ collection of measurements or other data at remote points and their automatic transmission to receiving equipment for monitoring.

Telemetry Forecaster

Type	Application Component

Telemetry Registery

Type	Application Component

Energy Management System Link between KTP and EMS is based on the confluence pagina of KTP Applicatie architectuur > icarus EMS data consumer

Telemetry Set

Type	Data Object

A set of grid measurements (analog and digital) that represent the same (as much as possible) time.

Templates

Type	Application Function

Edit/create/show the data template sections of IEC 61850.

Time Series Events

Type	Data Object

Time series manager

Type	Application Component

This is mobule of PowSyBI

Time Series Metadata

Type	Data Object

Time synchronization

Type	Application Function

Time Weighted Averages

Type	Application Function

Transformers

Type	Application Function

Transient Stability Assessment

Type	Application Function

> Transient stability analysis simulates the effect on the grid as a result of events that can cause oscillations in the speed and angles of machines and in power flows along the lines (e.g. faults, load changes, connection/disconnection of generators). Transient stability analysis is the study of the system in response to these changes and is used to determine if the system will be stable after a given disturbance. For proper operation of the system, it is essential to ensure that after a given disturbance, the system settles down to a new, stable condition.

Transmission network model

Type	Data Object

> The equipment and dynamics model for transmission network.

Transport prognosis

Type	Data Object

Transport prognosis

Type	Data Object

Unified Operator's UX components and Frameworks

Type	Application Function

> Covering the digital functionalities supporting operators in their interaction with systems and stakeholders .

Update desc (SEL)

Type	Application Function

> Function to update the describtions in the SEL IED configurations.

Update desc. (ABB)

Type	Application Function

> Function to update the describtions in the ABB IED configurations.

Update Substation

Type	Application Function

Use profile

Type	Data Object

Verbruik Profiel These are not measurements rather in areas where we don't have measurements - we use

User Application

Type	Application Component

Utilities

Type	Application Function

Validate Schema

Type	Application Function

Validate the SCL file based on the 61850 XSD.

Validate Templates

Type	Application Function

Check the 61850 data template section against the IEC 61850 standard.

Validate using OCL

Type	Application Function

Validate the 61850 SCL file based on OCL rules.

Variable Energy Resource Forecast

Type	Data Object

The forecasted power available over time from variable energy resources for a given forecasting window (e.g., minutes, hours, days). A forecast may include metadata related to the uncertainty of its inputs and likelihood of occurrence.

Variable Energy Resource Performance History

Type	Data Object

The history of energy resources performance (supply and demand) under various operating conditions e.g., weather.

View diagnostics

Type	Application Function

Find/see/read validation and other 61850/SCL errors.

View Log

Type	Application Function

See relevant log details of OpenSCD.

Voltage Stability Assessment

Type	Application Function

Voltage Stability Analysis assesses the ability of a power system to maintain voltage stability under different contingencies and loading conditions.

Voltage Stability Violations

Type	Data Object

A list of the violations of the voltage stability limits whereby the voltage at a point in the network does not have sufficient voltage to surpass the voltage stability limit.

Weather data

Type	Data Object

Weather Data

Type	Data Object

Weather Data

Type	Data Object

Weather Forecast

Type	Data Object

Estimate of weather conditions for a given location at a given moment in time (hour/day) including all aspects relevant to demand and load forecasting e.g., air temperature, precipitation levels, cloud coverage, sunshine levels, wind speeds, and lightning.

Weather Forecast Generation

Type	Application Function

Generating a forecast for all aspects of weather related to demand and load forecasting. The algorithm in the "Weather Forecast Generation" function be trained by retrospectively comparing the weather forecast to the weather measured for a given time and location.

Weather Measurements

Type	Data Object

Weather measurements are values recorded in the field at a given time from sensors including air temperature, precipitation levels, cloud coverage, sunshine levels, wind speeds, and lightning. Weather measurements may be recorded at various time intervals and are typically stored historically.

Web Services Component

Type	Application Component

Wind Generation Forecast

Type	Data Object

> The forecasted power available over time from wind generation resources for a given forecasting window (e.g., minutes, hours, days). A forecast may include metadata related to the uncertainty of its inputs and likelihood of occurrence.

Workflow Engine

Type	Application Function

Wunderground

Type	Data Object

XIIDM

Type	Data Object

Technology & Physical Layer

61850 Scheduler

Type	Technology Collaboration

https://github.com/alliander-opensource/der-scheduling

CoMPAS

Type	Technology Collaboration

https://github.com/com-pas/

FledgePower

Type	Technology Collaboration

Generic IT monitoring solution

Type	Technology Collaboration

GXF

Type	Technology Collaboration

https://github.com/osgp

Kafka interface (interfacec)

Type	Technology Collaboration

Meter

Type	Node

A physical device containing one or more registers.

Node

Type	Node

A node represents a computational or physical resource that hosts, manipulates, or interacts with other computational or physical resources. Nodes are active structure elements that perform technology behavior and execute, store, and process technology objects such as artifacts. Nodes can be interconnected by paths. A node may be assigned to an artifact to model that the artifact is deployed on the node. The name of a node should preferably be a noun. A node may consist of sub-nodes.

OpenStef

Type	Technology Collaboration

OperatorFabric

Type	Technology Collaboration

https://github.com/opfab/operatorfabric-core

PowSyBL

Type	Technology Collaboration

PowSyBl is (partly) used to generate the single line diagram coordinates based on an SCL file.

Register

Type	Artifact

A physical or logical counter measuring energy products.

SCADA

Type	Technology Collaboration

SCL CMDB

Type	Technology Collaboration

CoMPAS can be seen as a CMDB for 61850 SCL files.

Smart Device

Type	Technology Collaboration

Technology Collaboration

Type	Technology Collaboration

Technology Collaboration A technology collaboration represents an aggregate of two or more technology internal active structure elements that work together to perform collective technology behavior. A technology collaboration specifies which nodes and/or other technology collaborations cooperate to perform some task. The collaborative behavior, including, for example, the communication pattern of these nodes, is modeled by a technology interaction. A technology collaboration typically models a logical or temporary collaboration of nodes and does not exist as a separate entity in the enterprise. EPRI EA Note: Useful for modeling complex infrastructure/systems at an abstract level e.g. Advanced Metering Infrastructure (AMI), SCADA, Telecommunications or the power grid.

Other

Accounting Point

Type	Location

A domain under balance responsibility where balance supplier change can take place and for which commercial business processes are defined. These domains are usually defined in a contract. Typical business processes where this would be used may be “compensation management”, “settlement”, “calculation of energy volumes”, etc This is a type of Metering Point.

Allocated Capacity Area

Type	Location

A market area where the transmission capacity between the Balance Areas is given to the Balance Responsible Parties according to rules carried out by a Transmission Capacity Allocator. Trade between balance areas is carried out on a bilateral or unilateral basis. Additional information: This is a type of Market Area. Example are also France-Spain (Pyrenees) and Portugal-Spain.

Balance Group

Type	Location

An energy account under responsibility of a Balance Responsible Party used to determine balance considering predefined inputs and outputs within a specific Market Balance Area.

Capacity Market Area

Type	Location

A market area where the transmission capacity between the Market Balance Areas is given to the Balance Responsible Parties in a price based process separated from trading carried out by a Transmission Capacity Allocator. Trade between Market Balance Areas is carried out on a bilateral or unilateral basis. The auctioning system between TenneT and RWE Net. This is a type of Market Area.

Co-ordination Center Zone

Type	Location

The composition of a number of Control Blocks under the responsibility of the same Coordination Center Operator.

Common Capacity Area

Type	Location

A Market Area where the available transmission capacity between the Market Balance Areas is given to the Balance Responsible Parties based on their bidding to the Market Operator. Trade between Market Balance Areas is carried out through the Market Operator. This is a type of Market Area.

Control Area

Type	Location

The composition of one or more Market Balance Areas under the same technical load frequency control responsibility. In some cases there may be some Metering Points that belong to a Market Balance Area that is not a part of the Control Area. However, these do not impact the general definition, for example, a village in one country connected to the grid of another.

Control Block

Type	Location

The composition of one or more Control Areas, working together to ensure the load frequency control on behalf of RGCE.

Edit Functions

Type	Grouping

Grouping

Type	Grouping

Grouping

Type	Grouping

GXF Web services

Type	Grouping

GXF Web Services

Type	Grouping

GXF Web Services

Type	Grouping

Local Market Area

Type	Location

A Market Area where there is no transmission capacity restrictions between the Market Balance Areas. This is a type of Market Area.

Market Area

Type	Location

An area made up of several Market Balance Areas interconnected through AC or DC links. Trade is allowed between different Market Balance Areas with common market rules for trading across the interconnection.

Market Balance Area

Type	Location

A geographic area consisting of one or more Metering Grid Areas with common market rules for which the settlement responsible party carries out a balance settlement and which has the same price for imbalance. A Market Balance Area may also be defined due to bottlenecks.

Metering Grid Area

Type	Location

A Metering Grid Area is a physical area where consumption, production and exchange can be metered. It is delimited by the placement of meters for period measurement for input to, and withdrawal from the area. It can be used to establish the sum of consumption and production with no period measurement and network losses.

Metering Point

Type	Location

A domain where energy products are measured or computed.

RGCE Interconnected Group

Type	Location

Validation Functions

Type	Grouping

Relations

Access relation

Type	Access relation
Source	Telemetry Forecaster
Target	POI's

Aggregation relation

Type	Aggregation relation
Source	Market Platform Gateway
Target	Cross border capacity

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	Save Functions

Aggregation relation

Type	Aggregation relation
Source	Security Management
Target	Privacy Management

Serving relation

Type	Serving relation
Source	substation automation interaction and monitoring
Target	Grid management

Serving relation

Type	Serving relation
Source	Protocol Layer Component
Target	Core Services Component

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-dummy-modbus-device(1...n)

Association relation

Type	Association relation
Source	Field Work Management
Target	Supply Chain

Access relation

Type	Access relation

Source	Dynamic simulation
Target	CGMES-SV

Access relation

Type	Access relation
Source	Short Term Load Forecast Demand Response Adjustment
Target	Short Term Load Forecast

Specialization relation

Type	Specialization relation
Source	Consumption Responsible Party
Target	Balance Responsible Party

Aggregation relation

Type	Aggregation relation
Source	Customer and Market
Target	Market Platform Gateway

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Outages
First Increment	4

Composition relation

Type	Composition relation
Source	Generator Derates
Target	Outages

Flow relation

Type	Flow relation
Source	Queries
Target	Interfaces

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-business-service

Aggregation relation

Type	Aggregation relation
Source	Market Platform Gateway
Target	Services

Association relation

Type	Association relation
Source	System Governance
Target	Self-registering

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Update desc (SEL)

Aggregation relation

Type	Aggregation relation
Source	Asset management
Target	Asset Supervision

Composition relation

Type	Composition relation
Source	SOGNO
Target	OpenSTEF

Realization relation

Type	Realization relation
Source	Open Load Flow
Target	Power Flow Analysis

Access relation

Type	Access relation
Source	Event Management
Target	Phasor measurement unit data

Aggregation relation

Type	Aggregation relation
Source	Outage Management
Target	Outage coordination and stakeholder management

Aggregation relation

Type	Aggregation relation
Source	Market Signal Generation
Target	Balancing Mechanism

Aggregation relation

Type	Aggregation relation
Source	Weather Data
Target	OpenWeatherMap

Aggregation relation

Type	Aggregation relation
Source	User
Target	Real Time Grid Operator

Association relation

Type	Association relation
Source	Acquisition and Control
Target	Central Hub

Association relation

Type	Association relation
Source	Analytics
Target	Digital Twin

Association relation

Type	Association relation
Source	Short Term forecasting for TenneT
Target	Forecasts TenneT

Composition relation

Type	Composition relation
Source	FledgePower
Target	PowerCheck

Flow relation

Type	Flow relation
Source	Business User
Target	Queries

Realization relation

Type	Realization relation
Source	CIM mapper
Target	CIM CGMES-EQ to 61850 SCL

Association relation

Type	Association relation
Source	IEC 61158 (Modbus)
Target	Edge process data

Realization relation

Type	Realization relation
Source	OF-thirds-services

Target	Event Dispatching

Composition relation

Type	Composition relation
Source	PowSyBI
Target	Open Load Flow

Realization relation

Type	Realization relation
Source	Short Term Forecasting for SO
Target	Forecasts

Association relation

Type	Association relation
Source	Power flow / voltage measurements with uncertainty
Target	Scenario description

Association relation

Type	Association relation
Source	Short Term Forecasting for SO
Target	Forecasts SO

Composition relation

Type	Composition relation
Source	PowSyBI
Target	PowSyBl exporters

Access relation

Type	Access relation
Source	State Estimation
Target	Phasor measurement unit data

Aggregation relation

Type	Aggregation relation
Source	Asset Investment Planning
Target	Project Finance Management

Access relation

Type	Access relation
Source	Power Flow Analysis
Target	CGMES-EQ

Aggregation relation

Type	Aggregation relation

Source	Shared Functions
Target	Data Management

Association relation

Type	Association relation
Source	Edge process data
Target	IEC 62056 (DLSM/COSEM)

Access relation

Type	Access relation
Source	CIM mapper
Target	IEC 61850 Specification

Aggregation relation

Type	Aggregation relation
Source	Central Hub
Target	Cross device/vendor and cross telecom network compatibility

Association relation

Type	Association relation
Source	Analytics
Target	Simulation

Specialization relation

Type	Specialization relation
Source	Accounting Point
Target	Metering Point

Realization relation

Type	Realization relation
Source	SCL Data Service Component
Target	Store SCL Data

Specialization relation

Type	Specialization relation
Source	Production Responsible Party
Target	Balance Responsible Party

Serving relation

Type	Serving relation
Source	secure remote processing
Target	Demand Control

Composition relation

Type	Composition relation
Source	Power Grid Model
Target	power-grid-model-io library

Realization relation

Type	Realization relation
Source	PowSyBI
Target	Power Flow Analysis

Realization relation

Type	Realization relation
Source	Short Term forecasting for TenneT
Target	Forecasts

Serving relation

Type	Serving relation
Source	Device management
Target	Smart Device Monitoring

Aggregation relation

Type	Aggregation relation
Source	Validation Functions
Target	Export IED Params

Association relation

Type	Association relation
Source	Pipelines
Target	Lakehouse

Realization relation

Type	Realization relation
Source	Power Grid Model
Target	Power Flow Calculation

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Power System State

Aggregation relation

Type	Aggregation relation
Source	Customer Relationship and Communications
Target	Energy and Crisis management

Assignment relation

Type	Assignment relation
Source	Queries
Target	Latest

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	104 address to 61850 SCL Editor

Aggregation relation

Type	Aggregation relation
Source	System Control
Target	System operation

Realization relation

Type	Realization relation
Source	PowSyBl
Target	Contingency Analysis

Realization relation

Type	Realization relation
Source	DPsim
Target	Dynamic simulation

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Load Forecast
First Increment	4

Association relation

Type	Association relation
Source	Edge process data
Target	IEC 20922 (MQTT)

Serving relation

Type	Serving relation
Source	Event Management HMI
Target	Acting on the future energy system state

Composition relation

Type	Composition relation

Source	OperatorFabric-core
Target	OF-webUI

Association relation

Type	Association relation
Source	Acquisition and Control
Target	Infrastructure Management

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-external-app

Access relation

Type	Access relation
Source	Symmetric Power Flow Analysis
Target	Power System State

Specialization relation

Type	Specialization relation
Source	Power Flow Analysis
Target	Asymmetric Power Flow Analysis

Composition relation

Type	Composition relation
Source	Remedial actions
Target	Remedial action

Access relation

Type	Access relation
Source	SCADA
Target	Edge process data

Composition relation

Type	Composition relation
Source	Co-ordination Center Zone
Target	Control Block

Association relation

Type	Association relation
Source	Acquisition and Control
Target	Less-critical Equipment

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Granular RES Models
First Increment	3

Association relation

Type	Association relation
Source	Critical Equipment
Target	Communication Infrastructure

Access relation

Type	Access relation
Source	Load Forecasting
Target	Behind-the-meter Solar Generation Forecast

Aggregation relation

Type	Aggregation relation
Source	Weather Data
Target	KNMI

Realization relation

Type	Realization relation
Source	OpenSTEF
Target	Forecast Energy Resource Availability

Access relation

Type	Access relation
Source	Network Model Management
Target	Equipment and Connectivity Model

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	Help

Association relation

Type	Association relation
Source	Edge Node Control
Target	Equipment Communication

Aggregation relation

Type	Aggregation relation
Source	Short Term Forecaster

Target	Forecast Engine

Aggregation relation

Type	Aggregation relation
Source	Variable Energy Resource Forecast
Target	Solar Generation Forecast

Access relation

Type	Access relation
Source	Predictor Storage
Target	Persistence

Association relation

Type	Association relation
Source	Forecast Engine
Target	Predictor Storage

Realization relation

Type	Realization relation
Source	Open Load Flow
Target	Contingency Analysis

Aggregation relation

Type	Aggregation relation
Source	Log functions
Target	View diagnostics

Aggregation relation

Type	Aggregation relation
Source	Shared Functions
Target	System Governance

Composition relation

Type	Composition relation
Source	(Standard) Menu Entry Functions
Target	CoMPAS Settings

Association relation

Type	Association relation
Source	System Operator
Target	Nomination Validator

Access relation

Type	Access relation

Source	SCADA
Target	Telemetry

Association relation

Type	Association relation
Source	Power System Calculation
Target	Simulation

Access relation

Type	Access relation
Source	OpenSTEF application
Target	Use profile

Aggregation relation

Type	Aggregation relation
Source	Edit system configuration
Target	Edit system configuration

Realization relation

Type	Realization relation
Source	Unified Operator's UX components and Frameworks
Target	Field Service, Customer Care

Serving relation

Type	Serving relation
Source	HMI
Target	Hypervision of the energy system state

Composition relation

Type	Composition relation
Source	Edge to (virtual) control center communication
Target	Distributed energy resource management

Composition relation

Type	Composition relation
Source	secure remote device communication
Target	electrival vehicle (EV) interaction and monitoring

Realization relation

Type	Realization relation
Source	GXF
Target	GXF Web Services

Realization relation

Type	Realization relation
Source	DPsim
Target	Power Flow Analysis

Assignment relation

Type	Assignment relation
Source	Interfaces
Target	SDK

Realization relation

Type	Realization relation
Source	CoMPAS OpenSCD Component
Target	(Standard) Menu Entry Functions

Composition relation

Type	Composition relation
Source	FledgePower
Target	PowerSim

Realization relation

Type	Realization relation
Source	Queries
Target	Data Science

Aggregation relation

Type	Aggregation relation
Source	Save Functions
Target	Save Project

Serving relation

Type	Serving relation
Source	Protocol conversion
Target	Smart Device Control

Aggregation relation

Type	Aggregation relation
Source	Short Term Forecaster
Target	Telemetry Forecaster

Realization relation

Type	Realization relation
Source	SCL Data Service Component
Target	Retrieve SCL Data

Access relation

Type	Access relation
Source	Power Grid Model
Target	Network Data

Association relation

Type	Association relation
Source	Asset management
Target	Asset Repository

Association relation

Type	Association relation
Source	Lakehouse
Target	Queries

Aggregation relation

Type	Aggregation relation
Source	IT management supervision
Target	Service administration

Access relation

Type	Access relation
Source	User Application
Target	Node voltage magnitude and angle

Composition relation

Type	Composition relation
Source	secure remote processing
Target	Validation measuring values and tagging

Access relation

Type	Access relation
Source	Short Term Load Forecast Demand Response Adjustment
Target	Measured Resource Output

Flow relation

Type	Flow relation
Source	Equipment
Target	Proprietary

Composition relation

Type	Composition relation
Source	Edge process data

Target	Real-time measuring values

Aggregation relation

Type	Aggregation relation
Source	Less-critical Equipment
Target	Sensor

Access relation

Type	Access relation
Source	Monitoring (general)
Target	Real-time device monitoring

Serving relation

Type	Serving relation
Source	Time synchronization
Target	Smart Device Control

Access relation

Type	Access relation
Source	CIM mapper
Target	CIM CGMES-EQ specifications

Association relation

Type	Association relation
Source	System Governance
Target	Self-Healing

Composition relation

Type	Composition relation
Source	PowSyBl
Target	PowSyBl area diagram Layout

Serving relation

Type	Serving relation
Source	renewable energy resources interaction and monitoring
Target	Distributed energy resource management

Association relation

Type	Association relation
Source	Assumed load/generation profile
Target	Scenario description

Serving relation

Type	Serving relation

Source	HMI
Target	Centralized real time business event management

Serving relation

Type	Serving relation
Source	Compare IED
Target	Compare Configuration

Realization relation

Type	Realization relation
Source	Power Grid Model
Target	Short Circuit Calculation

Access relation

Type	Access relation
Source	Contingency Analysis
Target	Power System State

Association relation

Type	Association relation
Source	IEC 61970-452 Equipment (EQ)
Target	Equipment and Connectivity Model

Access relation

Type	Access relation
Source	Short Term Load Forecast Demand Response Adjustment
Target	Demand Response Resource Schedules

Assignment relation

Type	Assignment relation
Source	Pipelines
Target	Destinations

Access relation

Type	Access relation
Source	Load Forecasting
Target	DER Growth

Assignment relation

Type	Assignment relation
Source	Queries
Target	Raw

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Merge project

Composition relation

Type	Composition relation
Source	Equipment Out of Service
Target	Outages

Aggregation relation

Type	Aggregation relation
Source	Power System Calculation
Target	Modeling

Composition relation

Type	Composition relation
Source	Event Management
Target	Event Dispatching

Composition relation

Type	Composition relation
Source	Industrial process execution
Target	Real-time measurement scaling

Aggregation relation

Type	Aggregation relation
Source	Weather Data
Target	GFS

Access relation

Type	Access relation
Source	Event Management
Target	Dynamic Stability Limits

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	CleanUp

Composition relation

Type	Composition relation
Source	Edge process data
Target	Real-time event

Specialization relation

Type	Specialization relation
Source	State Estimation
Target	Power System State

Access relation

Type	Access relation
Source	Load Forecasting
Target	Short Term Needed Transport Forecast

Access relation

Type	Access relation
Source	Customer Response
Target	Smart Ledgers

Realization relation

Type	Realization relation
Source	Queries
Target	Business Interaction

Serving relation

Type	Serving relation
Source	OpenSTEF application
Target	Short Term Forecasting for SO

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis
Target	Power Flow analysis

Access relation

Type	Access relation
Source	Power Grid Model
Target	Assumed load/generation profile

Serving relation

Type	Serving relation
Source	Routing of device commands
Target	Smart Device Control

Realization relation

Type	Realization relation
Source	PowSyBI

Target	Exporter

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Message Binding (SMV)

Access relation

Type	Access relation
Source	CIM-CGMES-Import
Target	CGMES-EQ

Composition relation

Type	Composition relation
Source	secure remote processing
Target	Dynamic Safety Assessment

Access relation

Type	Access relation
Source	Weather Forecast Generation
Target	Weather Forecast

Aggregation relation

Type	Aggregation relation
Source	Simulation
Target	Dispatch/Adequacy Calculation

Access relation

Type	Access relation
Source	61850 Scheduler
Target	Edge process data

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	MongoDB

Access relation

Type	Access relation
Source	Weather Forecast Generation
Target	Weather Measurements

Aggregation relation

Type	Aggregation relation

Source	Edit Functions
Target	Publisher

Aggregation relation

Type	Aggregation relation
Source	Simulation
Target	Static and Dynamic Calculation

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Balance and frequency control

Flow relation

Type	Flow relation
Source	Developer
Target	Pipelines

Composition relation

Type	Composition relation
Source	PowSyBl
Target	PowSyBl Importers

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Data Binding (SMV)

Realization relation

Type	Realization relation
Source	Industrial process execution
Target	secure remote processing

Access relation

Type	Access relation
Source	Load Forecasting
Target	Historical load

Composition relation

Type	Composition relation
Source	Grid Model Assembly
Target	Grid Physical Model

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	New Project

Realization relation

Type	Realization relation
Source	PowSyBI
Target	Area diagram Layout

Serving relation

Type	Serving relation
Source	Configuration Management
Target	Smart Device Control

Aggregation relation

Type	Aggregation relation
Source	Common communication media
Target	Emergency and Crisis Management

Composition relation

Type	Composition relation
Source	GXF
Target	Core Services Component

Access relation

Type	Access relation
Source	Dynamic simulation
Target	Dynamic simulation result ?

Access relation

Type	Access relation
Source	CIM-CGMES-Import
Target	CGMES-SV

Composition relation

Type	Composition relation
Source	(Standard) Menu Entry Functions
Target	Log functions

Access relation

Type	Access relation
Source	Event Management
Target	Root Cause

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Storage Management

Access relation

Type	Access relation
Source	Forecast Engine
Target	Historic control actions

Aggregation relation

Type	Aggregation relation
Source	Customer and Market
Target	Metering and Compensation

Access relation

Type	Access relation
Source	Forecast Energy Resource Availability
Target	Energy Resource Master Data

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	Project from CIM

Specialization relation

Type	Specialization relation
Source	Allocated Capacity Area
Target	Market Area

Serving relation

Type	Serving relation
Source	Industrial protocol translation
Target	secure remote device communication

Access relation

Type	Access relation
Source	Load Forecasting
Target	Calendar

Realization relation

Type	Realization relation
Source	CoMPAS

Target	Edit Functions

Access relation

Type	Access relation
Source	Contingency Analysis
Target	Equipment and Connectivity Model

Realization relation

Type	Realization relation
Source	PowSyBl exporters
Target	Exporter

Composition relation

Type	Composition relation
Source	Limit Overrides
Target	Outages

Realization relation

Type	Realization relation
Source	Open Load Flow
Target	Symmetric Power Flow Analysis

Serving relation

Type	Serving relation
Source	Device installation services
Target	Smart Device Control

Serving relation

Type	Serving relation
Source	Templates
Target	Make System Configuration

Access relation

Type	Access relation
Source	Load Forecasting
Target	Weather Forecast

Aggregation relation

Type	Aggregation relation
Source	Market Signal Generation
Target	Adequacy assessment

Realization relation

Type	Realization relation

Source	PowSyBI
Target	CIM-based SLD generator

Access relation

Type	Access relation
Source	Data Fetchers
Target	Weather Data

Association relation

Type	Association relation
Source	Edge Node Control
Target	Configuration

Access relation

Type	Access relation
Source	Forecasts
Target	Market Prices

Composition relation

Type	Composition relation
Source	Forecast Engine
Target	OpenStef

Composition relation

Type	Composition relation
Source	CoMPAS
Target	SCL Auto Aligner

Composition relation

Type	Composition relation
Source	GXF
Target	Protocol adapaters

Access relation

Type	Access relation
Source	Forecast Energy Resource Availability
Target	Weather Forecast

Flow relation

Type	Flow relation
Source	Data Science
Target	Queries

Aggregation relation

Type	Aggregation relation
Source	System Control
Target	Remote Operation

Composition relation

Type	Composition relation
Source	Smart Device Monitoring and Control
Target	Smart Device Monitoring

Composition relation

Type	Composition relation
Source	Event Management
Target	Event Priority Management

Access relation

Type	Access relation
Source	OperatorFabric
Target	Edge process data

Association relation

Type	Association relation
Source	Time Series Events
Target	Pipelines

Access relation

Type	Access relation
Source	Data Fetchers
Target	Day ahead prices

Composition relation

Type	Composition relation
Source	OpenSTEF
Target	ProLoaF

Aggregation relation

Type	Aggregation relation
Source	Outage Management
Target	Outage programming and planning

Access relation

Type	Access relation
Source	State Estimation
Target	Outages

Specialization relation

Type	Specialization relation
Source	Trade Responsible Party
Target	Balance Responsible Party

Access relation

Type	Access relation
Source	Power Flow Analysis
Target	State variables

Aggregation relation

Type	Aggregation relation
Source	Save Functions
Target	Save project as

Access relation

Type	Access relation
Source	State Estimation
Target	Equipment and Connectivity Model

Serving relation

Type	Serving relation
Source	OpenSTEF application
Target	Short Term forecasting for TenneT

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Synchronisation

Serving relation

Type	Serving relation
Source	Firmware management
Target	Smart Device Monitoring

Access relation

Type	Access relation
Source	Customer Response
Target	Customer Preferences

Aggregation relation

Type	Aggregation relation
Source	Market Platform Gateway

Target	Power Exchange

Access relation

Type	Access relation
Source	Forecast Engine
Target	Measurement forecasts

Composition relation

Type	Composition relation
Source	PowSyBI
Target	Metrix

Aggregation relation

Type	Aggregation relation
Source	Validation Functions
Target	Validate using OCL

Realization relation

Type	Realization relation
Source	DPsim
Target	Static and Dynamic Calculation

Serving relation

Type	Serving relation
Source	Event Management
Target	Hypervision of the energy system state

Access relation

Type	Access relation
Source	OpenSTEF application
Target	PVoutput

Association relation

Type	Association relation
Source	Edge Node Control
Target	Failures recording

Serving relation

Type	Serving relation
Source	Event Management
Target	Acting on the future energy system state

Association relation

Type	Association relation

Source	Edge Node Control
Target	Logging

Aggregation relation

Type	Aggregation relation
Source	Save Functions
Target	Save as version

Realization relation

Type	Realization relation
Source	CoMPAS SCL Validator
Target	Validation Functions

Access relation

Type	Access relation
Source	Forecasts
Target	Area Demands

Access relation

Type	Access relation
Source	Event Management
Target	Voltage Stability Violations

Aggregation relation

Type	Aggregation relation
Source	Store system configuration
Target	Store IED Configuration

Realization relation

Type	Realization relation
Source	Queries
Target	Artificial Intelligence

Aggregation relation

Type	Aggregation relation
Source	Customer Relationship and Communications
Target	Acquisition, system, pricing, design

Serving relation

Type	Serving relation
Source	secure remote processing
Target	Grid management

Composition relation

Type	Composition relation
Source	PowSyBl
Target	PowSyBl CIM-based SLD generator

Association relation

Type	Association relation
Source	IEC 61970-451 Measurements
Target	Telemetry Set

Aggregation relation

Type	Aggregation relation
Source	Metering Grid Area
Target	Metering Point

Aggregation relation

Type	Aggregation relation
Source	Analytics
Target	Health Index Calculation

Association relation

Type	Association relation
Source	Unified Operator's UX components and Frameworks
Target	User Alerting

Flow relation

Type	Flow relation
Source	Telemetry Registery
Target	OpenSTEF application

Composition relation

Type	Composition relation
Source	RGCE Interconnected Group
Target	Co-ordination Center Zone

Aggregation relation

Type	Aggregation relation
Source	IT management supervision
Target	Network administration

Access relation

Type	Access relation
Source	CIM-CGMES-Import
Target	Network Model

Aggregation relation

Type	Aggregation relation
Source	Outage Management
Target	Ticketing

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Power quality management

Composition relation

Type	Composition relation
Source	PowSyBI
Target	Slurm job scheduler immplementation

Assignment relation

Type	Assignment relation
Source	User
Target	Power System Analysis

Access relation

Type	Access relation
Source	Event Management
Target	Power System State

Aggregation relation

Type	Aggregation relation
Source	Metering and Compensation
Target	Compensation and Settlement

Access relation

Type	Access relation
Source	User Application
Target	Power flow through branches

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis
Target	Failure analysis

Aggregation relation

Type	Aggregation relation
Source	Outage Management

Target	Distributed outage management

Realization relation

Type	Realization relation
Source	PowSyBl CIM-based SLD generator
Target	CIM-based SLD generator

Access relation

Type	Access relation
Source	Data Fetchers
Target	Prices

Specialization relation

Type	Specialization relation
Source	Local Market Area
Target	Market Area

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Demand Response Management

Association relation

Type	Association relation
Source	Infrastructure Management
Target	Remote Configuration management

Composition relation

Type	Composition relation
Source	Edge process data
Target	Aggregated measuring values

Aggregation relation

Type	Aggregation relation
Source	Market Signal Generation
Target	Cross border capacity calculation

Association relation

Type	Association relation
Source	Data Management
Target	Message Queue

Composition relation

Type	Composition relation

Source	Event Management
Target	Event Sending

Assignment relation

Type	Assignment relation
Source	Pipelines
Target	Sources

Association relation

Type	Association relation
Source	Unified Operator's UX components and Frameworks
Target	Co-ordination and workflow framework

Association relation

Type	Association relation
Source	Balance Supplier
Target	Production Responsible Party

Access relation

Type	Access relation
Source	Predictor Storage
Target	Prices

Realization relation

Type	Realization relation
Source	GXF
Target	GXF Web Services

Aggregation relation

Type	Aggregation relation
Source	Asset management
Target	Analytics

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Edit IED

Association relation

Type	Association relation
Source	IEC 61850-6 (SCL)
Target	(Edge) System Configuration

Serving relation

Type	Serving relation
Source	Import IEDs
Target	Edit system configuration

Serving relation

Type	Serving relation
Source	secure remote processing
Target	Distributed energy resource management

Aggregation relation

Type	Aggregation relation
Source	CoMPAS
Target	CIM mapper

Composition relation

Type	Composition relation
Source	Industrial process execution
Target	Industrial protocol translation

Access relation

Type	Access relation
Source	Event Management
Target	Telemetry Set

Serving relation

Type	Serving relation
Source	Edit Functions
Target	Edit system configuration

Association relation

Type	Association relation
Source	Telemetry Forecaster
Target	Forecast Engine

Access relation

Type	Access relation
Source	OpenSTEF application
Target	Market Data

Aggregation relation

Type	Aggregation relation
Source	Make System Configuration
Target	Make System Configuration

Association relation

Type	Association relation
Source	IEC 61970-456 State Variables (SV)
Target	Power System State

Composition relation

Type	Composition relation
Source	Event Management
Target	Alarm Management

Aggregation relation

Type	Aggregation relation
Source	Asset management
Target	Outage Management

Association relation

Type	Association relation
Source	Time Series Metadata
Target	Pipelines

Realization relation

Type	Realization relation
Source	ProLoaF
Target	System Services Forecast

Access relation

Type	Access relation
Source	Power Flow Analysis
Target	CGMES-SSH

Access relation

Type	Access relation
Source	Dynamic simulation
Target	CGMES-EQ

Association relation

Type	Association relation
Source	Critical Equipment
Target	Less-critical Equipment

Realization relation

Type	Realization relation
Source	PowSyBl Automatic SLD generator

Target	Automatic SLD generator

Realization relation

Type	Realization relation
Source	OperatorFabric-core
Target	Event Management HMI

Specialization relation

Type	Specialization relation
Source	Capacity Market Area
Target	Market Area

Realization relation

Type	Realization relation
Source	Fledge
Target	Industrial process execution

Aggregation relation

Type	Aggregation relation
Source	Market Signal Generation
Target	Aggregated Service Organisation

Serving relation

Type	Serving relation
Source	Edge configuration management
Target	Edge device management

Aggregation relation

Type	Aggregation relation
Source	Validation Functions
Target	Validate Schema

Assignment relation

Type	Assignment relation
Source	Queries
Target	Circular Averages

Association relation

Type	Association relation
Source	Common communication media
Target	Message queing service and directory

Composition relation

Type	Composition relation

Source	Switching Operations
Target	Outages

Composition relation

Type	Composition relation
Source	Event Management
Target	Event Notification

Specialization relation

Type	Specialization relation
Source	Common Capacity Area
Target	Market Area

Access relation

Type	Access relation
Source	Pipelines
Target	Lakehouse

Aggregation relation

Type	Aggregation relation
Source	Asset Repository
Target	Digital Infrastructure repository

Access relation

Type	Access relation
Source	Power Grid Model
Target	Node voltage magnitude and angle

Access relation

Type	Access relation
Source	State Estimation
Target	CGMES-TP

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Edit Substation

Access relation

Type	Access relation
Source	CoMPAS
Target	(Edge) System Configuration

Aggregation relation

Type	Aggregation relation
Source	System operation
Target	Power Quality and System stability

Aggregation relation

Type	Aggregation relation
Source	System Management
Target	Power System Calculation

Composition relation

Type	Composition relation
Source	FledgePower
Target	PowerViz

Access relation

Type	Access relation
Source	OpenSTEF application
Target	Load Corrections

Access relation

Type	Access relation
Source	Power Grid Model
Target	Power flow through branches

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	Keycloak

Aggregation relation

Type	Aggregation relation
Source	Simulation
Target	Security Analysis

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-cards-consultation

Serving relation

Type	Serving relation
Source	Data Lineage
Target	Edge device management

Access relation

Type	Access relation
Source	SCADA
Target	Telemetry Set

Serving relation

Type	Serving relation
Source	Queries
Target	Business User

Serving relation

Type	Serving relation
Source	Domian specific functions
Target	Smart Device Monitoring

Access relation

Type	Access relation
Source	Forecast Energy Resource Availability
Target	Variable Energy Resource Performance History

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis
Target	Business Function

Serving relation

Type	Serving relation
Source	Create Virtual IED
Target	Make specification

Composition relation

Type	Composition relation
Source	Industrial process execution
Target	Monitoring (general)

Aggregation relation

Type	Aggregation relation
Source	Weather Data
Target	Wunderground

Aggregation relation

Type	Aggregation relation
Source	Customer Relationship and Communications

Target	Consent management

Access relation

Type	Access relation
Source	Data Fetchers
Target	GFS forecasts

Realization relation

Type	Realization relation
Source	pyvolt
Target	State Estimation

Composition relation

Type	Composition relation
Source	secure remote processing
Target	Anomaly detection system / substation configurations

Composition relation

Type	Composition relation
Source	PowSyBl
Target	PowSyBl Automatic SLD generator

Aggregation relation

Type	Aggregation relation
Source	Less-critical Equipment
Target	Actuator

Access relation

Type	Access relation
Source	User Application
Target	Deviation between measurement values and estimated state

Association relation

Type	Association relation
Source	Asset Investment Planning
Target	Investment Policy

Composition relation

Type	Composition relation
Source	Protocol Layer Component
Target	Protocol adapaters

Access relation

Type	Access relation

Source	Dynamic Security Assessment
Target	Transmission network model

Realization relation

Type	Realization relation
Source	CoMPAS sitipe Service
Target	Retreieve SITPE bay typicals

Aggregation relation

Type	Aggregation relation
Source	Central Hub
Target	Data acqusition and treatment

Aggregation relation

Type	Aggregation relation
Source	Asset Investment Planning
Target	Renewable policy Management

Aggregation relation

Type	Aggregation relation
Source	Customer and Market
Target	Customer Response

Aggregation relation

Type	Aggregation relation
Source	SOGNO
Target	ProLoaF

Association relation

Type	Association relation
Source	Acquisition and Control
Target	Communication Infrastructure

Realization relation

Type	Realization relation
Source	Interfaces
Target	Business Intelligence

Access relation

Type	Access relation
Source	Protocol adapaters
Target	Edge process data

Aggregation relation

Type	Aggregation relation
Source	Metering and Compensation
Target	Billing

Access relation

Type	Access relation
Source	Power Grid Model
Target	Fault type and impedance

Aggregation relation

Type	Aggregation relation
Source	Central Hub
Target	End to End encryption/KEYS

Aggregation relation

Type	Aggregation relation
Source	Grouping
Target	Substation Node

Assignment relation

Type	Assignment relation
Source	LE Edge
Target	Fledge

Association relation

Type	Association relation
Source	IEC 62541 (OPC UA)
Target	Edge process data

Composition relation

Type	Composition relation
Source	CoMPAS
Target	CoMPAS SCL Validator

Realization relation

Type	Realization relation
Source	Interfaces
Target	Data Science

Association relation

Type	Association relation
Source	Forecasts
Target	International Prices

Aggregation relation

Type	Aggregation relation
Source	Asset Supervision
Target	Asset Planning

Access relation

Type	Access relation
Source	Power Grid Model
Target	Power flow / voltage measurements with uncertainty

Composition relation

Type	Composition relation
Source	Project from CIM
Target	CIM CGMES-EQ to 61850 SCL

Realization relation

Type	Realization relation
Source	SCL Auto Aligner
Target	Auto Align SLD (Single Line Diagram)

Serving relation

Type	Serving relation
Source	Event Management
Target	Interaction between internal operational control centers

Realization relation

Type	Realization relation
Source	Short Circuit Calculation
Target	Power System Planning

Flow relation

Type	Flow relation
Source	Accounting Point
Target	Trader

Aggregation relation

Type	Aggregation relation
Source	Validation Functions
Target	Validate Templates

Access relation

Type	Access relation
Source	Load Forecasting

Target	Short Term Load Forecast

Association relation

Type	Association relation
Source	Fault type and impedance
Target	Scenario description

Realization relation

Type	Realization relation
Source	Open Load Flow
Target	Security Assessment

Aggregation relation

Type	Aggregation relation
Source	Make System Configuration
Target	Make IED configuration

Aggregation relation

Type	Aggregation relation
Source	Asset Repository
Target	Power Equipment Repository

Aggregation relation

Type	Aggregation relation
Source	Configuration management
Target	Compare Configuration

Association relation

Type	Association relation
Source	Customer Relationship and Communications
Target	Customer app UX/UI

Serving relation

Type	Serving relation
Source	Validation Functions
Target	Validate

Aggregation relation

Type	Aggregation relation
Source	User
Target	Grid Planner

Access relation

Type	Access relation

Source	Power Flow Analysis
Target	CGMES-TP

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Message Binding (GOOSE)

Serving relation

Type	Serving relation
Source	Scheduler
Target	Smart Device Control

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	Import from API

Access relation

Type	Access relation
Source	Load Forecasting
Target	Base profiles

Serving relation

Type	Serving relation
Source	State Estimation
Target	Analysis of network bottlenecks

Association relation

Type	Association relation
Source	Analytics
Target	Predictive Analytics

Serving relation

Type	Serving relation
Source	(Standard) Menu Entry Functions
Target	Configuration management

Association relation

Type	Association relation
Source	Metering and Compensation
Target	Metering

Association relation

Type	Association relation
Source	Data Object
Target	Business Object

Access relation

Type	Access relation
Source	Contingency Analysis
Target	Contingency Violations

Access relation

Type	Access relation
Source	Telemetry Registery
Target	EMS metingen

Realization relation

Type	Realization relation
Source	GXF
Target	GXF Web services

Access relation

Type	Access relation
Source	Edge configuration management
Target	(Edge) System Configuration

Composition relation

Type	Composition relation
Source	PowSyBI
Target	MPI parallel implementation

Aggregation relation

Type	Aggregation relation
Source	Shared Functions
Target	Common communication media

Composition relation

Type	Composition relation
Source	GXF
Target	Domain Component

Access relation

Type	Access relation
Source	Customer Response
Target	Smart Contracts

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-cards-publication

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-user-service

Aggregation relation

Type	Aggregation relation
Source	SOGNO
Target	CIMgen/CIMpy/CIM++

Specialization relation

Type	Specialization relation
Source	Power Flow Output
Target	Power System State

Composition relation

Type	Composition relation
Source	GXF
Target	Web Services Component

Association relation

Type	Association relation
Source	Field Work Management
Target	Safety rules implementations

Specialization relation

Type	Specialization relation
Source	Interconnection Trade Responsible Party
Target	Balance Responsible Party

Realization relation

Type	Realization relation
Source	OperatorFabric-core
Target	Event Management

Composition relation

Type	Composition relation
Source	Control Area

Target	Market Balance Area

Access relation

Type	Access relation
Source	Data Fetchers
Target	Weather data

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Variable Energy Resource Forecast

Composition relation

Type	Composition relation
Source	CoMPAS
Target	SCL Data Service Component

Access relation

Type	Access relation
Source	FledgePower
Target	Edge process data

Association relation

Type	Association relation
Source	Acquisition and Control
Target	Critical Equipment

Aggregation relation

Type	Aggregation relation
Source	Less-critical Equipment
Target	Protection

Serving relation

Type	Serving relation
Source	CoMPAS version
Target	Version Management

Composition relation

Type	Composition relation
Source	secure remote device communication
Target	Edge to (virtual) control center communication

Serving relation

Type	Serving relation

Source	Retrieve SCL Data
Target	Configuration management

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	Open Project

Access relation

Type	Access relation
Source	Unified Operator's UX components and Frameworks
Target	Co-ordination and workflow framework

Assignment relation

Type	Assignment relation
Source	Queries
Target	Resample

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Update

Serving relation

Type	Serving relation
Source	Short Circuit Calculation
Target	Power System Planning

Access relation

Type	Access relation
Source	Forecast Engine
Target	Measurements

Association relation

Type	Association relation
Source	Outages
Target	IEC 61970-456 Steady State Hypothesis (SSH)

Aggregation relation

Type	Aggregation relation
Source	Acquisition and Control
Target	Edge Node Control

Association relation

Type	Association relation
Source	Unified Operator's UX components and Frameworks
Target	Supervision/Hypervision Component

Association relation

Type	Association relation
Source	Asset Supervision
Target	Log analysis

Serving relation

Type	Serving relation
Source	Domian specific functions
Target	Smart Device Control

Aggregation relation

Type	Aggregation relation
Source	(Standard) Menu Entry Functions
Target	Settings

Access relation

Type	Access relation
Source	Telemetry Forecaster
Target	Contract Details

Access relation

Type	Access relation
Source	OpenSTEF application
Target	Weather Data

Aggregation relation

Type	Aggregation relation
Source	Asset management
Target	Asset Investment Planning

Association relation

Type	Association relation
Source	IEC 61850-8-1 (MMS)
Target	Edge process data

Access relation

Type	Access relation
Source	Power Flow Analysis
Target	Network Model

Serving relation

Type	Serving relation
Source	State Estimation
Target	Power Flow analysis

Association relation

Type	Association relation
Source	Customer Preferences
Target	Customer Response

Flow relation

Type	Flow relation
Source	Equipment
Target	LE Edge

Access relation

Type	Access relation
Source	Telemetry Forecaster
Target	Geo location of POI's

Composition relation

Type	Composition relation
Source	Edge process data
Target	Real-time command

Association relation

Type	Association relation
Source	IEC 60870-5-104
Target	Edge process data

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Dynamic base-case

Serving relation

Type	Serving relation
Source	Short Circuit Calculation
Target	Failure analysis

Association relation

Type	Association relation
Source	Energy Service Company

Target	Party Connected to grid

Aggregation relation

Type	Aggregation relation
Source	Grouping
Target	Customer Side Node

Aggregation relation

Type	Aggregation relation
Source	Forecasts
Target	Solar Wind Resource Generation

Realization relation

Type	Realization relation
Source	Fledge
Target	Industrial protocol translation

Association relation

Type	Association relation
Source	Edge Node Control
Target	Measuring, metering, altering, sensing and actuation

Access relation

Type	Access relation
Source	Short Term Load Forecast Demand Response Adjustment
Target	Historical Resource Schedules

Composition relation

Type	Composition relation
Source	HMI
Target	Event Management HMI

Access relation

Type	Access relation
Source	Industrial protocol translation
Target	Edge process data

Aggregation relation

Type	Aggregation relation
Source	Variable Energy Resource Forecast
Target	Demand Response Forecast

Association relation

Type	Association relation

Source	Customer Relationship and Communications
Target	Contract

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Single Line Diagram

Aggregation relation

Type	Aggregation relation
Source	Validation Functions
Target	Export Communication Sections

Composition relation

Type	Composition relation
Source	Data Lineage
Target	Device configuration data lineage

Serving relation

Type	Serving relation
Source	Device Status Monitoring
Target	Smart Device Monitoring

Aggregation relation

Type	Aggregation relation
Source	Store system configuration
Target	Version Management

Aggregation relation

Type	Aggregation relation
Source	Metering Grid Area
Target	Market Balance Area

Aggregation relation

Type	Aggregation relation
Source	Critical Equipment
Target	Protection

Aggregation relation

Type	Aggregation relation
Source	Edge Node Control
Target	Aggregated/Distributed/Local automations

Assignment relation

Type	Assignment relation
Source	Pipelines
Target	Secrets

Aggregation relation

Type	Aggregation relation
Source	Contingency violations
Target	contingency violation

Composition relation

Type	Composition relation
Source	CoMPAS
Target	CoMPAS OpenSCD Component

Flow relation

Type	Flow relation
Source	Business Intelligence
Target	Queries

Association relation

Type	Association relation
Source	Forecasts
Target	Local Site Balance

Aggregation relation

Type	Aggregation relation
Source	Configuration management
Target	Edit system configuration

Access relation

Type	Access relation
Source	Load Forecasting
Target	Short Term RES production Forecast

Association relation

Type	Association relation
Source	Smart Ledgers
Target	Customer Response

Realization relation

Type	Realization relation
Source	PowerViz
Target	Monitoring (general)

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Locamation VMU

Access relation

Type	Access relation
Source	Load Forecasting
Target	Market data

Serving relation

Type	Serving relation
Source	Forecasts Requests
Target	OpenSTEF application

Access relation

Type	Access relation
Source	State Estimation
Target	CGMES-EQ

Assignment relation

Type	Assignment relation
Source	Interfaces
Target	API

Assignment relation

Type	Assignment relation
Source	Party Connected to grid
Target	Consumer

Aggregation relation

Type	Aggregation relation
Source	System operation
Target	Centralized Automation

Access relation

Type	Access relation
Source	Dynamic simulation
Target	State variables

Serving relation

Type	Serving relation
Source	Power Flow Calculation

Target	Power System Analysis

Aggregation relation

Type	Aggregation relation
Source	Configuration management
Target	Validate

Aggregation relation

Type	Aggregation relation
Source	Customer and Market
Target	Customer Relationship and Communications

Realization relation

Type	Realization relation
Source	CIMgen/CIMpy/CIM++
Target	CIM-CGMES-Import

Aggregation relation

Type	Aggregation relation
Source	Grouping
Target	Aggregation Node

Association relation

Type	Association relation
Source	Balance Supplier
Target	Consumption Responsible Party

Aggregation relation

Type	Aggregation relation
Source	Asset Supervision
Target	Asset lifecycle management

Composition relation

Type	Composition relation
Source	Edge process data
Target	Real-time device monitoring

Aggregation relation

Type	Aggregation relation
Source	Customer Relationship and Communications
Target	Notification and communication management

Flow relation

Type	Flow relation

Source	Energy Site
Target	Proprietary

Realization relation

Type	Realization relation
Source	Unified Operator's UX components and Frameworks
Target	User Alerting

Aggregation relation

Type	Aggregation relation
Source	Shared Functions
Target	IT management supervision

Aggregation relation

Type	Aggregation relation
Source	IT management supervision
Target	Threat Monitoring

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Monitoring and Control

Association relation

Type	Association relation
Source	IEC 60870-6 (ICCP/TASE.2)
Target	Edge process data

Access relation

Type	Access relation
Source	Forecast Engine
Target	Transport prognosis

Composition relation

Type	Composition relation
Source	PowSyBI
Target	Time series manager

Realization relation

Type	Realization relation
Source	Open Load Flow
Target	Sensitivity analysis

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Congestion Management

Access relation

Type	Access relation
Source	Customer Relationship and Communications
Target	Contract

Aggregation relation

Type	Aggregation relation
Source	Edit system configuration
Target	Grid planning import

Serving relation

Type	Serving relation
Source	Short Circuit Calculation
Target	Protection Analysis

Serving relation

Type	Serving relation
Source	State Estimation
Target	State Validation

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis
Target	State Validation

Aggregation relation

Type	Aggregation relation
Source	Web Services Component
Target	SOAP interfaces

Realization relation

Type	Realization relation
Source	CoMPAS sitipe Service
Target	CoMPAS for Siemens SITIPE

Realization relation

Type	Realization relation
Source	Power Grid Model
Target	State Estimation

Specialization relation

Type	Specialization relation
Source	Reserve Resource
Target	Resource

Association relation

Type	Association relation
Source	DNP3
Target	Telemetry

Association relation

Type	Association relation
Source	Edge Node Control
Target	Protocol Management

Access relation

Type	Access relation
Source	State Estimation
Target	State variables

Serving relation

Type	Serving relation
Source	Interfaces
Target	Business User

Composition relation

Type	Composition relation
Source	FledgePower
Target	Fledge

Composition relation

Type	Composition relation
Source	Configuration management
Target	Make specification

Association relation

Type	Association relation
Source	Metering
Target	Metering and Compensation

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis

Target	Protection Analysis

Flow relation

Type	Flow relation
Source	InfluxDB
Target	OpenSTEF application

Predictions and measurements

Association relation

Type	Association relation
Source	Proprietary
Target	Time Series Events

Composition relation

Type	Composition relation
Source	Grid Model Assembly
Target	Grid Scenario

Flow relation

Type	Flow relation
Source	Artificial Intelligence
Target	Queries

Association relation

Type	Association relation
Source	Field Work Management
Target	Team planning + Scheduling

Assignment relation

Type	Assignment relation
Source	Pipelines
Target	Transformers

Aggregation relation

Type	Aggregation relation
Source	Central Hub
Target	Short term persistency

Aggregation relation

Type	Aggregation relation
Source	User
Target	Grid Architect

Association relation

Type	Association relation
Source	Network Data
Target	Scenario description

Access relation

Type	Access relation
Source	Generic IT monitoring solution
Target	Real-time device monitoring

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	OF-external-devices

Aggregation relation

Type	Aggregation relation
Source	Variable Energy Resource Forecast
Target	Wind Generation Forecast

Realization relation

Type	Realization relation
Source	ProLoaF
Target	Load Forecasting

Access relation

Type	Access relation
Source	Power Grid Model
Target	Deviation between measurement values and estimated state

Association relation

Type	Association relation
Source	Analytics
Target	Deep Learning

Access relation

Type	Access relation
Source	Forecast Energy Resource Availability
Target	Variable Energy Resource Forecast

Access relation

Type	Access relation
Source	Predictor Storage
Target	Weather data

Access relation

Type	Access relation
Source	Short Term Load Forecast Demand Response Adjustment
Target	Net Demand Response Short Term Load Forecast

Access relation

Type	Access relation
Source	Forecasts
Target	Local Site Balance

Composition relation

Type	Composition relation
Source	secure remote device communication
Target	inter control center (interaction and) monitoring

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Update Substation

Aggregation relation

Type	Aggregation relation
Source	Asset Repository
Target	Configuration and Setting repository

Serving relation

Type	Serving relation
Source	Workflow Engine
Target	Smart Device Control

Aggregation relation

Type	Aggregation relation
Source	Critical Equipment
Target	Actuator

Serving relation

Type	Serving relation
Source	electrival vehicle (EV) interaction and monitoring
Target	Demand Control

Serving relation

Type	Serving relation
Source	Core Services Component

Target	Domain Component

Association relation

Type	Association relation
Source	Asset Supervision
Target	Real Time monitoring

Realization relation

Type	Realization relation
Source	PowSyBI
Target	Dynamic Security Assessment

Aggregation relation

Type	Aggregation relation
Source	Log functions
Target	View Log

Realization relation

Type	Realization relation
Source	PowSyBI
Target	Optimal Power flow

Association relation

Type	Association relation
Source	Unified Operator's UX components and Frameworks
Target	Field Service, Customer Care

Serving relation

Type	Serving relation
Source	Import IEDs
Target	Make System Configuration

Access relation

Type	Access relation
Source	Load Forecasting
Target	Measured RES production

Association relation

Type	Association relation
Source	Balance Responsible Party
Target	Trader

Aggregation relation

Type	Aggregation relation

Source	Market Platform Gateway
Target	Avalibility

Association relation

Type	Association relation
Source	Smart Contracts
Target	Customer Response

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Later Binding (GOOSE)

Realization relation

Type	Realization relation
Source	PowSyBI
Target	Automatic SLD generator

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Market solution
First Increment	5

Serving relation

Type	Serving relation
Source	Firmware management
Target	Smart Device Control

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Communication Editing

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	DSA Contingencies

Association relation

Type	Association relation
Source	Power System Calculation
Target	State Estimation

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Update desc. (ABB)

Association relation

Type	Association relation
Source	Forecasts
Target	Area Demands

Aggregation relation

Type	Aggregation relation
Source	Central Hub
Target	Protocol Conversion

Realization relation

Type	Realization relation
Source	PowSyBl area diagram Layout
Target	Area diagram Layout

Aggregation relation

Type	Aggregation relation
Source	Configuration management
Target	Make System Configuration

Composition relation

Type	Composition relation
Source	Power Grid Model
Target	power-grid-model library

Composition relation

Type	Composition relation
Source	Control Block
Target	Control Area

Realization relation

Type	Realization relation
Source	Interfaces
Target	Artificial Intelligence

Composition relation

Type	Composition relation
Source	PowSyBl
Target	Application File System

Aggregation relation

Type	Aggregation relation
Source	System Management
Target	System Control

Association relation

Type	Association relation
Source	Infrastructure Management
Target	Remote Equipment and node management

Assignment relation

Type	Assignment relation
Source	Queries
Target	Interpolate

Aggregation relation

Type	Aggregation relation
Source	Edit system configuration
Target	Edit IED configuration

Realization relation

Type	Realization relation
Source	pyvolt
Target	State Estimation

Serving relation

Type	Serving relation
Source	Domain Component
Target	Web Services Component

Assignment relation

Type	Assignment relation
Source	Proprietary
Target	Honeywell

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis
Target	Analysis of network bottlenecks

Aggregation relation

Type	Aggregation relation
Source	Infrastructure Management

Target	Comissioning and installation management

Access relation

Type	Access relation
Source	Dynamic simulation
Target	CGMES-TP

Access relation

Type	Access relation
Source	Forecasts
Target	International Prices

Aggregation relation

Type	Aggregation relation
Source	SOGNO
Target	pyvolt

Serving relation

Type	Serving relation
Source	Short Term Forecasting
Target	Forecasts

Aggregation relation

Type	Aggregation relation
Source	System Management
Target	Forecasts

Assignment relation

Type	Assignment relation
Source	Pipelines
Target	Jobs

Aggregation relation

Type	Aggregation relation
Source	Weather Data
Target	DarkSkyNet

Assignment relation

Type	Assignment relation
Source	Party Connected to grid
Target	Producer

Access relation

Type	Access relation

Source	Forecast Engine
Target	Model persistence

Composition relation

Type	Composition relation
Source	LetsCoordinate
Target	OF-thirds-services

Aggregation relation

Type	Aggregation relation
Source	Security Management
Target	Cyber Security

Association relation

Type	Association relation
Source	Edge process data
Target	OSLP

Composition relation

Type	Composition relation
Source	Grid Model Assembly
Target	Equipment Dynamics Model

Aggregation relation

Type	Aggregation relation
Source	System Management
Target	Market Signal Generation

Serving relation

Type	Serving relation
Source	inter control center (interaction and) monitoring
Target	Grid management

Association relation

Type	Association relation
Source	Data Management
Target	Long term storage

Composition relation

Type	Composition relation
Source	GXF Web services
Target	Scheduler

Association relation

Type	Association relation
Source	IEC 60870-5-103
Target	Edge process data

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Dynamic Security Violations

Access relation

Type	Access relation
Source	CIM-CGMES-Import
Target	CGMES-TP

Aggregation relation

Type	Aggregation relation
Source	Critical Equipment
Target	Sensor

Realization relation

Type	Realization relation
Source	PowerCheck
Target	Data Lineage

Aggregation relation

Type	Aggregation relation
Source	Grouping
Target	Distribution Node

Flow relation

Type	Flow relation
Source	Energy Site
Target	LE Edge

Association relation

Type	Association relation
Source	Shared Functions
Target	Unified Operator's UX components and Frameworks

Realization relation

Type	Realization relation
Source	PowSyBI
Target	Open Load Flow

Composition relation

Type	Composition relation
Source	Distributed energy resource management
Target	Edge to (virtual) control center communication

Aggregation relation

Type	Aggregation relation
Source	Asset management
Target	Field Work Management

Access relation

Type	Access relation
Source	CIM-CGMES-Import
Target	CGMES-SSH

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Later Binding (SMV)

Access relation

Type	Access relation
Source	Dynamic Security Assessment
Target	Synchronous Generator Dynamics Models

Composition relation

Type	Composition relation
Source	secure remote device communication
Target	substation automation interaction and monitoring

Aggregation relation

Type	Aggregation relation
Source	Asset Repository
Target	Configuration tools

Access relation

Type	Access relation
Source	Telemetry Registery
Target	Estimates

Assignment relation

Type	Assignment relation
Source	Pipelines

Target	Utilities

Aggregation relation

Type	Aggregation relation
Source	Asset Supervision
Target	Asset performance management

Association relation

Type	Association relation
Source	LE Edge
Target	Time Series Metadata

Access relation

Type	Access relation
Source	Smart Device
Target	Edge process data

Serving relation

Type	Serving relation
Source	Templates
Target	Edit system configuration

Aggregation relation

Type	Aggregation relation
Source	Store system configuration
Target	Store system configuration

Serving relation

Type	Serving relation
Source	Event Management HMI
Target	Hypervision of the energy system state

Association relation

Type	Association relation
Source	Forecasts
Target	Market Prices

Realization relation

Type	Realization relation
Source	OpenSTEF
Target	Load Forecasting

Realization relation

Type	Realization relation

Source	Metrix
Target	Optimal Power flow

Access relation

Type	Access relation
Source	Telemetry Registery
Target	Klant metingen

Aggregation relation

Type	Aggregation relation
Source	Configuration management
Target	Store system configuration

Composition relation

Type	Composition relation
Source	Event Management
Target	Event Storage

Composition relation

Type	Composition relation
Source	Market Balance Area
Target	Market Area

Access relation

Type	Access relation
Source	Power Flow Analysis
Target	CGMES-SV

Access relation

Type	Access relation
Source	State Estimation
Target	Telemetry Set

Aggregation relation

Type	Aggregation relation
Source	Edit Functions
Target	Subscriber Data Binding (GOOSE)

Access relation

Type	Access relation
Source	State Estimation
Target	Power System State

Composition relation

Type	Composition relation
Source	GXF
Target	Protocol Layer Component

Realization relation

Type	Realization relation
Source	PowSyBl Importers
Target	Importer

Composition relation

Type	Composition relation
Source	Edge process data
Target	Real-time setpoints

Aggregation relation

Type	Aggregation relation
Source	Outage Management
Target	Customer impact assesement

Aggregation relation

Type	Aggregation relation
Source	Aggregated/Distributed/Local automations
Target	Outage Management

Aggregation relation

Type	Aggregation relation
Source	System Governance
Target	Alignment with regulation and standards

Association relation

Type	Association relation
Source	Grouping
Target	Acquisition and Control

Aggregation relation

Type	Aggregation relation
Source	Market Platform Gateway
Target	Balancing Market

Composition relation

Type	Composition relation
Source	OperatorFabric-core
Target	RabbitMQ

Aggregation relation

Type	Aggregation relation
Source	Power System Analysis
Target	Power System Planning

Realization relation

Type	Realization relation
Source	Short Term Forecaster
Target	Short Term Forecasting

Realization relation

Type	Realization relation
Source	CIMgen/CIMpy/CIM++
Target	Model Exchanges

Composition relation

Type	Composition relation
Source	System operation
Target	Autonomous Function Conf.

Access relation

Type	Access relation
Source	Load Forecasting
Target	Measured Loads

Serving relation

Type	Serving relation
Source	Event Dispatching
Target	Interaction between external operational control centers

Access relation

Type	Access relation
Source	Dynamic simulation
Target	CGMES-SSH

Aggregation relation

Type	Aggregation relation
Source	Power System Calculation
Target	Model Exchanges

Assignment relation

Type	Assignment relation
Source	LE Edge

Target	Edge X

Aggregation relation

Type	Aggregation relation
Source	CoMPAS
Target	CoMPAS sitipe Service

Access relation

Type	Access relation
Source	System operation
Target	Schedules

Serving relation

Type	Serving relation
Source	Store SCL Data
Target	Configuration management

Serving relation

Type	Serving relation
Source	Configuration Management
Target	Smart Device Monitoring

Aggregation relation

Type	Aggregation relation
Source	Grouping
Target	Equipment Node

Composition relation

Type	Composition relation
Source	FledgePower
Target	PowerConf

Assignment relation

Type	Assignment relation
Source	Queries
Target	Time Weighted Averages

Assignment relation

Type	Assignment relation
Source	Proprietary
Target	Other

Association relation

Type	Association relation

Source	Data Management
Target	Data Validation

Association relation

Type	Association relation
Source	IEC 62379 (SNMPv3)
Target	Real-time device monitoring

Composition relation

Type	Composition relation
Source	Smart Device Monitoring and Control
Target	Smart Device Control

Association relation

Type	Association relation
Source	Edge Node Control
Target	Aggregated/Distributed/virtualized equipment protections

Association relation

Type	Association relation
Source	Forecasts
Target	System Services Forecast

Serving relation

Type	Serving relation
Source	Auto Align SLD (Single Line Diagram)
Target	Generating single line diagram (digram layout)

Aggregation relation

Type	Aggregation relation
Source	Limit Violations
Target	Power System State

Access relation

Type	Access relation
Source	GXF
Target	Edge process data

Serving relation

Type	Serving relation
Source	Event Management
Target	Centralized real time business event management

Composition relation

Type	Composition relation
Source	secure remote device communication
Target	renewable energy resources interaction and monitoring

Aggregation relation

Type	Aggregation relation
Source	Shared Functions
Target	Security Management

Realization relation

Type	Realization relation
Source	PowerSim
Target	Simulation

Aggregation relation

Type	Aggregation relation
Source	SOGNO
Target	DPsim

Specialization relation

Type	Specialization relation
Source	Power Flow Analysis
Target	Symmetric Power Flow Analysis

(may have) grid usage contract

Type	Association relation
Source	Balance Supplier
Target	Grid Access Provider

administers

Type	Association relation
Source	Metering Point Administrator
Target	Metering Point

administers

Type	Association relation
Source	Meter Administrator
Target	Register

administers meter information for

Type	Association relation
Source	Meter Administrator
Target	Metering Point

aggregates

Type	Aggregation relation
Source	Technology Collaboration
Target	Node

aggregates with

Type	Association relation
Source	Metered Data Aggregator
Target	Metering Grid Area

Algorithm Training

Type	Access relation
Source	Weather Forecast Generation
Target	Weather Forecast

> The algorithm in the "Weather Forecast Generation" function be trained by retrospectively comparing the weather forecast to the weather measured for a given time and location.

allowed to trade with

Type	Association relation
Source	Capacity Trader
Target	Transmission Capacity Allocator

belongs to

Type	Association relation
Source	Balance Group
Target	Market Balance Area

collects data from

Type	Access relation
Source	Metered Data Collector
Target	Register

controlled by

Type	Association relation
Source	Control Entity
Target	Control Entity

controls financially

Type	Association relation
Source	Reconcillation Responsible Party
Target	Metering Grid Area

controls financially

Type	Association relation
Source	Imbalance Settlement Responsible Party
Target	Market Balance Area

deals with

Type	Association relation
Source	Interconnection Trade Responsible Party
Target	Capacity Trader

deals within

Type	Association relation
Source	Balance Responsible Party
Target	Market Balance Area

delegates scheduling information interchange to

Type	Association relation
Source	Balance Responsible Party
Target	Scheduling Co-ordinator

facilitates

Type	Association relation
Source	Transmission Capacity Allocator
Target	Capacity Market Area

financially responsible for

Type	Association relation
Source	Reconcillation Accountable
Target	Accounting Point

has

Type	Association relation
Source	Accounting Point
Target	Balance Responsible Party

has

Type	Association relation
Source	Accounting Point
Target	Balance Group

has

Type	Association relation
Source	Reserve Resource
Target	Accounting Point

has

Type	Association relation
Source	Meter
Target	Register

has

Type	Association relation
Source	Metering Point
Target	Register

has a balance delivery contract with

Type	Association relation
Source	Party Connected to grid
Target	Balance Supplier

is contracted with

Type	Association relation
Source	Party Connected to grid
Target	Grid Access Provider

linked to

Type	Association relation
Source	Resource
Target	Metering Point

makes contracts with

Type	Association relation
Source	Balance Responsible Party
Target	Imbalance Settlement Responsible Party

manages

Type	Association relation
Source	Control Block Operator
Target	Control Block

manages

Type	Association relation
Source	Resource provider
Target	Resource

manages

Type	Association relation
Source	Co-ordination center operator

Target	Co-ordination Center Zone

manages

Type	Association relation
Source	Control Area Operator
Target	Control Area

operates

Type	Association relation
Source	Grid Operator
Target	Metering Grid Area

operates

Type	Association relation
Source	Transmission Capacity Allocator
Target	Allocated Capacity Area

operates

Type	Association relation
Source	Transmission Capacity Allocator
Target	Common Capacity Area

operates and maintains

Type	Association relation
Source	Meter Operator
Target	Meter

part of

Type	Association relation
Source	Metering Grid Area
Target	Control Entity

performs

Type	Assignment relation
Source	Business Actor
Target	Business Role

performs

Type	Assignment relation
Source	Business Role
Target	Business Function

process metered data of

Type	Association relation

Source	Metered Data Responsible Party
Target	Metering Point

provides access to grid through

Type	Association relation
Source	Grid Access Provider
Target	Accounting Point

provides capacity

Type	Flow relation
Source	System Operator
Target	Local Market Area

provides MOL to

Type	Serving relation
Source	Merit Order List Responsible Party
Target	System Operator

provides offered capacity to

Type	Serving relation
Source	Capacity Co-ordinator
Target	Transmission Capacity Allocator

provides publication information to

Type	Serving relation
Source	System Operator
Target	Market Information Aggregator

provides required information to

Type	Association relation
Source	Balance Responsible Party
Target	System Operator

provides results to

Type	Serving relation
Source	Transmission Capacity Allocator
Target	System Operator

provides tender results to

Type	Serving relation
Source	Reserve Allocator
Target	System Operator

read

Type	Access relation
Source	Kafka interface (interfacec)
Target	Data

read/write

Type	Access relation
Source	Business Function
Target	Business Object

read/write

Type	Access relation
Source	Application Component
Target	Data Object

realizes

Type	Realization relation
Source	Application Component
Target	Application Function

realizes

Type	Realization relation
Source	Business Function
Target	Capability

realizes

Type	Realization relation
Source	Application Component
Target	Application Service

receives capacity

Type	Flow relation
Source	Local Market Area
Target	System Operator

reports planned and regulation data to

Type	Association relation
Source	System Operator
Target	Imbalance Settlement Responsible Party

sends nominations to

Type	Association relation
Source	Interconnection Trade Responsible Party
Target	Nomination Validator

serves

Type	Serving relation
Source	Application Service
Target	Business Function

serves

Type	Serving relation
Source	Application Service
Target	Application Component

serves

Type	Serving relation
Source	Technology Collaboration
Target	Application Component

serves

Type	Serving relation
Source	Application Function
Target	Business Function

supplies to/takes from

Type	Flow relation
Source	Trader
Target	Accounting Point

Supplies to/takes from

Type	Flow relation
Source	Balance Supplier
Target	Accounting Point

takes from

Type	Flow relation
Source	Accounting Point
Target	Balance Supplier

uses

Type	Association relation
Source	Accounting Point
Target	Party Connected to grid

uses

Type	Association relation
Source	Party Connected to grid

Target	Accounting Point

write

Type	Access relation
Source	Web Services Component
Target	Data