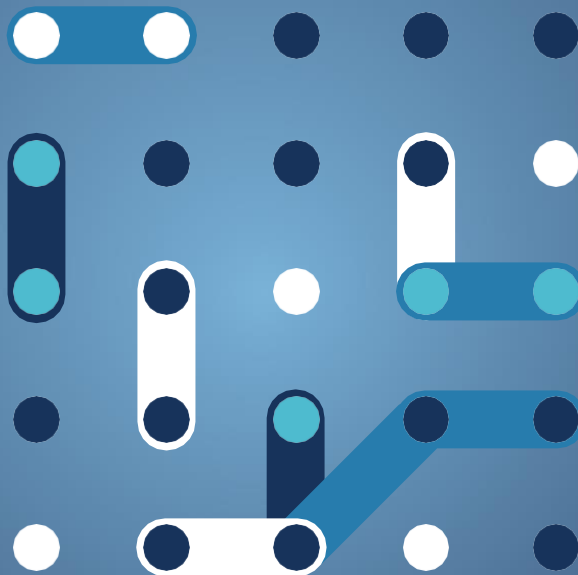# bridge

Action#1 – Set up a use case repository 2.0

Data Management Working Group

AUTHORS

Lola Alacreu, *ETRA I+D*

Alberto Zambrano, *ETRA I+D*

Lucas Pons, *ETRA I+D*

Markus Mirz, *RWTH Aachen University*

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May 2022

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PDF	ISBN 978-92-76-99537-1	doi: 10.2833/329067	MJ-03-23-055-EN-N

Luxembourg: Publications Office of the European Union, 2023

Manuscript completed in May 2022

First edition

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Executive summary

The final output of this report is to describe the Use case repository that have been developed in Action #1 of the BRIDGE Data Management Working Group.

This Use case repository, based on the Use-Case Methodology defined in the standard IEC 62559-2:2015, is an easily accessible tool that will be used for alignment of new BRIDGE projects started recently (such as X-FLEX, FEVER or SENDER) with ongoing projects (such as EU-SysFlex, GIFT or CROSSBOW) or completed projects and serve as a foundation for future research activities process. The repository is built in a modular way. So far, three formats to describe use cases are supported: MarkDown documents, XML files complying with IEC 62559-3 as well as Excel sheets following the format defined by the BRIDGE WG Data Management. Support for new use case formats can be added without changing the existing setup.

The validation of this use case repository has been an iterative process, where all projects have been invited to test the preliminary repository, in order to evaluate the tool and send feedback for improving it in the new versions. Based on the feedback received so far, some errors have been identified, fixed already and some additional functionalities to be added in the next iterations, such as:

- Versioning & Revisions;

- Authoring;

- Web-based edition of UCs;

- Advanced search, combining with roles' repository and with CIM repository.

After the testing process finishes, the tool will be made available for all the projects of BRIDGE. The type of licences for the use of the tool that have been suggested are:

• Creative Commons license for the use case files;

• Apache2 for the processing tools

This will allow the redistribution and modification of written code, so that anyone can not only use it, but also adapt/improve.

The report also describes the status of the repository, next steps and conclusions. Specially, the report includes information about the potential integration of the repository with other platforms.

1. Introduction

The Data Management Working Group aims to cover a wide range of aspects ranging from the technical means for exchanging and processing data between interested stakeholders to the definition of rules for exchange, including security issues and responsibility distribution in data handling. Accordingly, the WG has identified 3 areas of collaboration around which mutual exchange of views and discussions have been set:

1. **Communication Infrastructure**, embracing the technical and non-technical aspects of the communication infrastructure needed to exchange data and the related requirements.

2. **Cybersecurity and Data Privacy**, entailing data integrity, customer privacy and protection and general security of energy systems.

3. **Data Handling**, including the framework for data exchange and related roles / responsibilities, together with the technical issues supporting the exchange of data in a secure and interoperable manner, and the data analytics techniques for data processing.

Following work performed by WG Data Management in the TSO-DSO report, and discussions held during the BRIDGE General Assembly in February 2020 at Parallel Sessions 4 "Interoperability of flexibility assets" and 5 "TSO-DSO Cooperation #2 – Data Management", the need for a use-case (UC) repository easily accessible has been identified. EC has initiated major Smart Grid and Storage demonstrations initiatives that involve demonstration of distributed resource integration, coordination between major stakeholder groups such as TSOs, DSOs and flexibility and new marketplace modelling with all aspects of the power system operation. These demonstration projects involve formal use-case development for the demonstration initiatives and the knowledge so far has been mostly shared under individual WG activities and BRIDGE General Assembly.

The objective for this repository is to develop an industry-wide repository for BRIDGE project use cases that can be used for alignment of new BRIDGE projects started in 2019-2020 (such as X-FLEX) with ongoing projects (such as EU-SysFlex) or completed projects and serve as a foundation for future research activities process definition and requirements development. This would help develop, but also be an input to other topics including interoperability and data exchange architecture.

In summary, the objectives of the Action #1 – Set up a use case repository, of the BRIDGE Data Management Working Group are:

- Create an easily accessible use case repository, hosted under the umbrella of BRIDGE. In the meantime, this repository could be temporarily hosted by any of BRIDGE projects, such as X-FLEX.

- Develop and agree (high-level / specific) use cases, originated from previously participated BRIDGE projects as well as newly initiated ones.

- The repository would focus on Data use cases – use cases agnostic to specific business processes, i.e., applicable to several business processes and/or to several market designs, e.g., access to data, balance management, market for flexibilities, operational planning and forecasting and services related to end customers.

- It will be an input to other topics (interoperability, data exchange architecture, role definition, etc.).

2. Action #1 general approach

The Use case repository developed as part of the Action #1, is based on the Use-Case Methodology defined in the standard IEC 62559-2:2015 for the purposes of projects in software engineering, as Use Cases are the first building blocks of such projects. UCs should describe system functionalities in a technology-neutral way and identify participating actors. The UC template provided by the methodology has been adapted to better link with the scope of BRIDGE – e.g., the roles definitions will be linked to the HEMRM defined for the Electricity sector.

The final purpose of this action is not to provide a revision of the methodology defined by the standard, but an agreed model of presenting the final result of the methodology: the use case. Therefore, the action does not cover the internal discussions within each BRIDGE project to define its own use cases, neither it tries to interfere the internal decisions of any project. The action simply provides a mechanism to easily feed a repository with the final agreed specification of use cases that each project is tackling.

3. Action #1 general Methodology

Considering that the final outcome – the repository –follows the IEC 6559-2 methodology, the final installation of the template, adapted to the special needs (if any) of the BRIDGE Community has been agreed with the partners participating in the action, on.

1. On a first stage, this action has discussed and negotiated the final instantiation of the use case template (specially with regards to fields, and potential categorisation)

2. Further to that, it has been agreed on an on-line mechanism to retrieve the templates, easy to use and maintain.

3. A couple of projects that had successfully completed the use case definition phase, has been invited to pilot the repository and provide feedback.

4. With the feedback, and after fine tuning, the repository will be open to the BRIDGE community.

3.1 Who contributed to what

X-FLEX has led the work with the WG chairs to propose a first instantiation of the template and a mechanism to gather the information.

After discussion and agreement –also involving the rest of the partners of the WG and the EC – a pilot phase was launched, inviting all the projects involved in BRIDGE.

With the feedback, and after refinements on the template and repository, all projects will be able to use the repository final version.

3.2 What are the joint activities with other BRIDGE WGs/TFs

There is a clear dependency with the Sub-Group HEMRM, as ideally the «Actors Involved» field within the Use Case template should be selected from the list of roles defined at the HEMRM. If it is necessary to enhance the Role Model, it should be done in cooperation with the relevant sub-group within this WG.

Moreover, there is a second relationship with any action linked to the use of SGAM – as the SRA (Scalability and Replicability Analysis) task force. Most of the BRIDGE projects naturally match the uses cases to the SGAM model. Since -XFLEX project (ETRA I+D) is leading both, Action #1 of DM WG and the SRA (Scalability and Replicability Analysis) task force, the collaboration between both activities has been possible from the beginning.

3.3 What are the interactions with other groups / initiatives / bodies

The Action has interacted with other initiatives such as;

- IEC SyC Smart Energy WG5 "Methodology and tools" (https://syc-se.iec.ch/home/organisation/methodology-tools/)

- ETIP-SNET WG4 "Digitisation of the electricity system
  and Customer participation" (https://smart-networks-energy-transition.ec.europa.eu/working-groups/wg4

- Use Case Explorer WG of the Energy vertical of the OPEN-DEI project (coordination between IoT Large Scale Pilots). (https://www.opendei.eu/)

4. Standard IEC 62559-2

For complex systems, the use case methodology supports a common understanding of functionalities, actors and processes across different technical committees or even different organisations. Developed as software engineering tool, the methodology can be used to support the development of standards as it facilitates the analysis of requirements in relation to new or existing standards. Further arguments for the use case methodology and background information are available in IEC 62559-1.

Figure 1 provides an overview of the intended first parts of the IEC 62559, mainly describing the relation between IEC 62559-2 and IEC 62559-3.
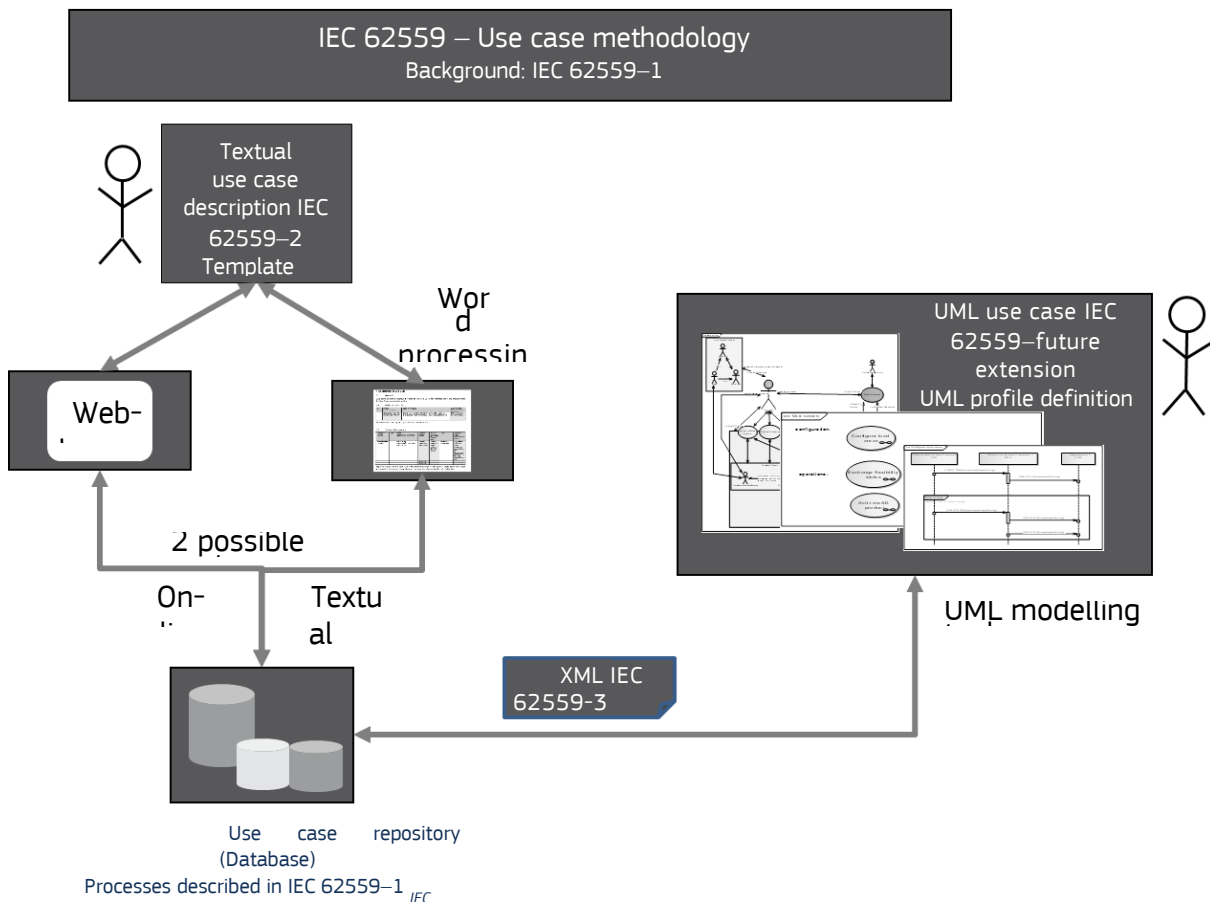

Figure 1. IEC 62559 standard series

IEC 62559-1 – Concept and processes in standardisation

IEC 62559-1 defines the concepts and processes to define use-cases and gather them within a repository or collaborative platform. It also describes processes and provides basics for the use case methodology like terms or use case types.

IEC 62559-2 – Definition of the templates for use cases, actor list and requirements list

IEC 62559-2 defines the structure of a use case template. The document is mainly based on the previous IEC PAS 62559 specification and shall be read together with IEC 62559-1.

IEC 62559-3 – Definition of use case template artefacts into an XML serialised format

The use case methodology has to be seen as a process which
starts with the definition of business ideas, goals and requirements, detailing these in use case descriptions. This information can be used as a basis to identify/link reference architectures describing the types of components used, and going further down to an analysis for the further standardisation process.

IEC 62559-4 – Best practices in use case development for IEC standardisation processes and some examples for application outside standardisation

IEC SRD 62559-4:2020 specifies best practices for an entity to engage in a use cases redaction process to determine and describe their user requirements for systems, based on the business needs.

5. Solution proposal

First, it has been prepared and validated the Use Case template based on IEC 62559-2 standard.

Secondly, it has been developed the use case repository, using the fields included in the standard and based on Platone project approach.

5.1 Use case repository template

Below, it can be found all the fields to be included in the UC repository, based on IEC 62559-2 standard:

1 Description of the use case

1.1 Name of use case

- *Use case identification*
- *ID Area/ Domain(s)/*
- *Zone(s)*
- *Name of use case*

1.2 Version management

- *Version management*
- *Version No.*
- *Date Name of author(s)*
- *Changes Approval status*

1.3 Scope and objectives of use case

- *Scope and objectives of use case*
- *Scope*
- *Objective(s)*
- *Related business case(s)*

1.4 Narrative of use case

- *Narrative of use case*
- *Short description*
- *Complete description*

1.5 Key performance indicators (KPI)

- *Key performance indicators*
- *ID Name Description Reference to mentioned use case objectives*
- *1.6 Use case conditions*
- *Use case conditions*
- *Assumptions*
- *Prerequisites*

1.7 Further information to the use case for classification/mapping

- *Classification information*
- *Relation to other use cases*
- *Level of depth*
- *Prioritisation*
- *Generic, regional or national relation*
- *Nature of the use case*
- *Further keywords for classification*

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1.8 General remarks
- *General remarks*

2 Diagrams of use case
- *Diagram(s) of use case*

3 Technical details

3.1 Actors
- *Actors*
- *Grouping Group description*
- *Actor name*
- *Actor type*
- *Actor description*
- *Further information specific to this use case*

3.2 References
- *References*
- *No. References type*
- *Reference Status Impact on use case*
- *Originator/organisation*
- *Link*

4 Step by step analysis of use case

4.1 Overview of scenarios
- Scenario conditions
- No.
- Scenario name
- Scenario description
- Primary actor
- Triggering event
- Pre-condition
- Postcondition

4.2 Steps – Scenarios
- *Scenario*
- *Scenario name:*
- *Step No.*
- *Event*
- *Name of process/activity*
- *Description of process/activity*
- *Service*
- *Information producer (actor)*
- *Information receiver (actor)*
- *Information exchanged (IDs)*
- *Requirement, R-IDs*

5 Information exchanged
- *Information exchanged*
- *Information exchanged, ID*
- *Name of information*
- *Description of information exchanged*
- *Requirement, R-IDs*

6 Requirements (optional)
- *Requirements (optional)*
- *Categories ID*
- *Category name for requirements*

- *Category description*
- *Requirement R-ID*
- *Requirement name*
- *Requirement description*

7 Common terms and definitions

- *Common terms and definitions*
- *Term*
- *Definition*

8 Custom information (optional)

- *Custom information (optional)*
- *Key Value Refers to section*

5.2 Use case repository development process.

During the process, it has been set up a website (https://smart-grid-use-cases.github.io/docs/), which is automatically generated from a variety of input formats. The website is based on a group of GitHub repositories (https://github.com/smart-grid-use-cases) to facilitate collaboration among different parties and to support version management.

The solution is built in a modular way. Support for new use case formats can be added without changing the existing setup. So far, three formats to describe use cases are supported: MarkDown documents, XML files complying with IEC 62559-3 as well as Excel sheets following the format defined by the BRIDGE WG Data Management.

The support for Excel files translation to XML has been developed following the IEC 62559 data schema (XSD file), which provides a formal description for the attributes and relationships between the different objects defined in the standard itself.

This XSD schema file is translated into Python objects using the package pyxb and its tools (pyxbgen), that generates a Python file containing the object definition from XSD, later used within the Excel translator to XML. This program is built utilising Python language and works like an ETL.

The process involved in the translator program consists of parsing the Excel file and creating a Python object tree with the data read, which is later transcribed into an XML file that respects the relationships via XML nesting.

The resultant or otherwise uploaded XML files are treated automatically through GitHub Workflows, running a translator from XML to Markdown files that are used as the input to the website generator.

MarkDown files are processed by the static website generation framework Hugo, whereas the tools to process XML files and Excel sheets have been developed by RWTH Aachen University (Platone project) and ETRA I+D (XFLEX project). The GitHub repositories and the automation of the website generation whenever use cases are added or updated is currently maintained by RWTH Aachen.

It is necessary to highlight that, in this initial version of the proposed solution, use cases diagrams are attached separately as image files together with the UC itself (in Excel or XML format) and linked to the static page generated. In other words, the UC file (Excel or XML) and also the UCs diagrams (image files) will be uploaded to the repository where the web generator is located; then it takes the images and inserts them into the HTML that is generated from the Markdown file derived from the uploaded XML Use Case.
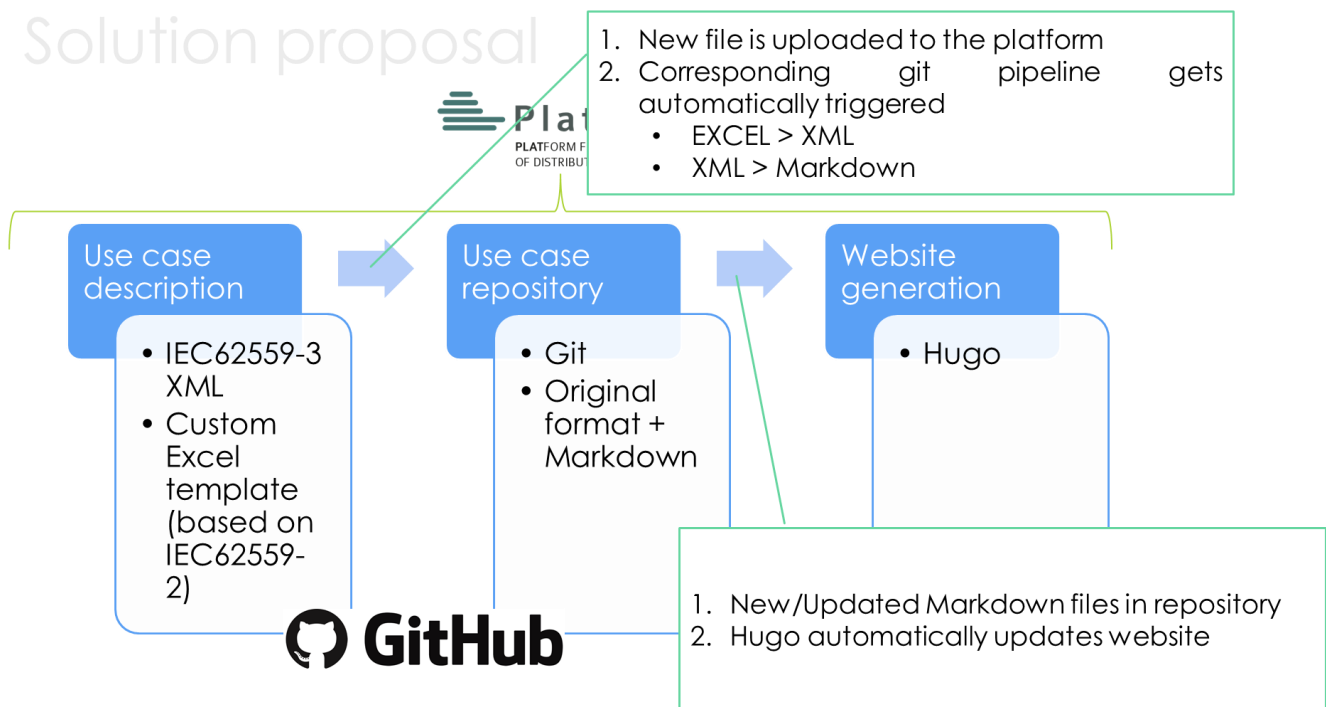
bridge

Figure 2. Use case repository development process

5.3 How Use case repository works.

This section will show how new Use cases can be added to the repository in excel format:

1. Get access

- Sign up at **github.com**
- Write mail to repository manager to get direct write access
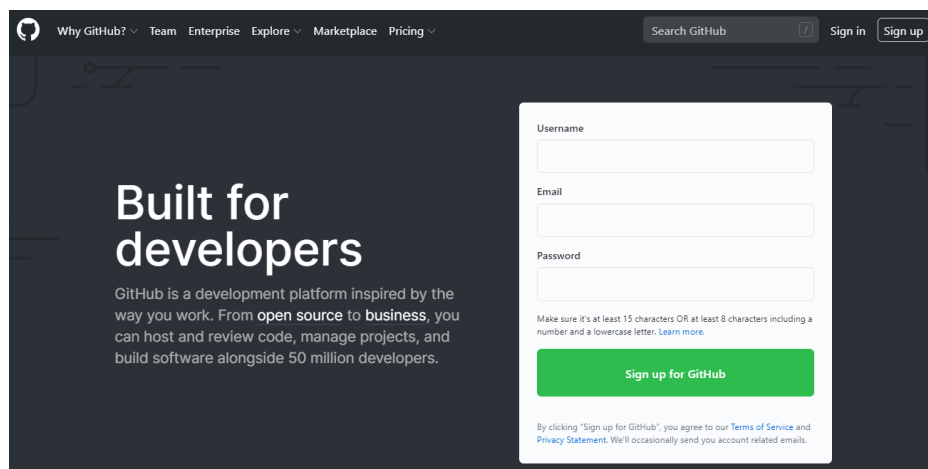- Or create a fork and send us a pull request (PR)

Figure 3. Sign up of GitHub page

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2. Complete the excel file template based on the standard IEC 62559-2

Figure 4. Excel file template based on the standard IEC 62559-2

3. Upload Excel Use Case File

- Sign in at github.com and follow the link in the web documentation (https://github.com/smart-grid-use-cases/excel2xml-input/tree/master/excel-use-cases)

- Click "Add file" and then "Upload files"

- Drag your Excel file

- If you like, you can leave a message to describe your change (optional)

- Finally, click "commit changes"

bridge

Figure 5. Upload Excel Use Case File and commit changes

4. **Check the Website**

- Go to the website in https://smart-grid-use-cases.github.io/docs/usecases/bridge/
- The uploaded use cases will be showed in the website (Processing the changes may take some minutes)

Figure 6. BRIDGE Use case Repository website

More updated information about the process can be found in https://smart-grid-use-cases.github.io/docs/getting-started/.

6. Repository integration

Technically, the BRIDGE use case repository has been created so that can be deployed in any GitHub infrastructure. For the sake of simplicity and saving resources, the official, free-to-use GitHub code repository infrastructure has been used (www.github.com) for allowing project participants to upload the use case definitions. Also, the official (also free-to-use) GitHub websites hosting infrastructure (pages.github.com/) has been used to host the UC repository web pages generated from the processing of the use cases introduced in the GitHub code repository.

The current deployment has the advantage of price, platform stability and easy access. Using such a 'public' or open infrastructure for deployment is currently the default option in most of the cases, but there are some drawbacks identified in it:

- Since there is no person responsible of the 'physical' infrastructure (GitHub) that is taking care of the BRIDGE UC repository specific problems that may happen (cyber-attacks, credentials compromise, UC repository failure/bugs, etc.), this surveillance tasks have to be carried out by the partners that created the UC repository, with resources taken from specific projects. This is not the best solution for different reasons:

  o The role and expertise of the persons and organisations that developed the BRIDGE UC repository is not the most appropriate to maintain it on a mid-long term.

  o The projects whose resources are used for the maintenance will eventually finalise and might be replaced by other persons/projects. This might be a problem and affect the quality and speed of the BRIDGE UC repository maintenance and up-time.

  o Public and well-known infrastructures are prone to more cyber-attacks compared to on-premises specific application.

- The fact that the BRIDGE UC repository web page is not included in any other broader infrastructure but isolated, make it a bit harder to be found by the people potentially interested in it, negatively affecting the impact and of promotion of the tool.

- The European Commission has a huge deployment infrastructure, both internally owned and outsourced, and normally has the policy of using it for hosting the developments and systems resulting from their investments. The UC repository fits in this description.

In this context, the recommendation from the EC is that the UC repository will be hosted on a EC server. Therefore, In the previous months, some efforts have been done towards analysing the potential integration of the BRIDGE UC repository in other, broader-scope and EU-promoted, platforms described in the following points:

6.1 EIRIE Platform

The European Interconnection for Research Innovation & Entrepreneurship (EIRIE) Platform is an interactive multi-functional platform that acts as the meeting point for all actors active in the field of energy research and innovation from all Europe. It is constricted by the PANTERA consortium with support from subcontractor and it's hosted by JRC (EC Joint Research Centre).

The EIRIE Platform is acting as a single point of reference, connecting several databases and platforms into one platform. The stakeholders active in the field of energy research and innovation have access to the following functionalities and tools:

- The project results and outcomes.

- Stakeholders' community Building.

- Training service.

- Research infrastructure.

- Standards and Regulation.

- Matchmaking and R&I funding opportunities.

- News & Events.

- …. & More.
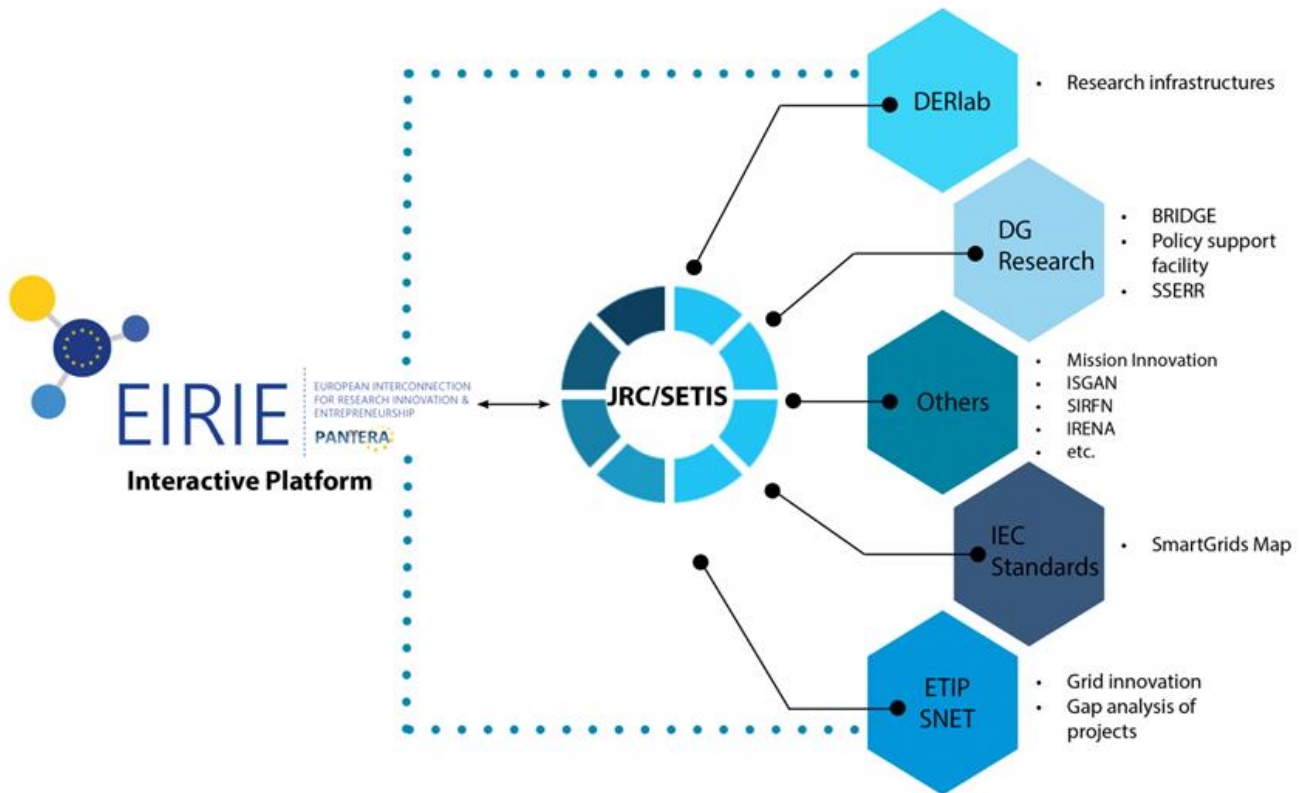
Figure 7. EIRIE Interactive platform architecture

PANTERA (PAN European Technology Energy Research Approach) is an EU H2020 project aimed at setting up a European forum composed of Research & Innovation stakeholders active in the fields of smart grids, storage and local energy systems, including policy makers, standardisation bodies and experts, representing the EU energy system. The ultimate objective is to generate support to the 16 countries in the EU that are characterised with low R&I activity in the field.

This will be achieved by:

- **Building the EIRIE platform**: A sustainable and interactive multi-dimensional platform of pan-European status and influence.

- Delivering, through the EIRIE platform, ready-made tools to support the R&I community.

- Developing knowledge-sharing mechanisms that will help identify, discuss and structure the key R&I challenges.

- Organising dedicated workshops to facilitate interaction of the relevant stakeholders and sharing valuable knowledge.

- Operating regional desks and ad hoc working groups to identify, mobilise and enrich regional strengths through well-selected R&I themes pushed to gain European status for implementation.
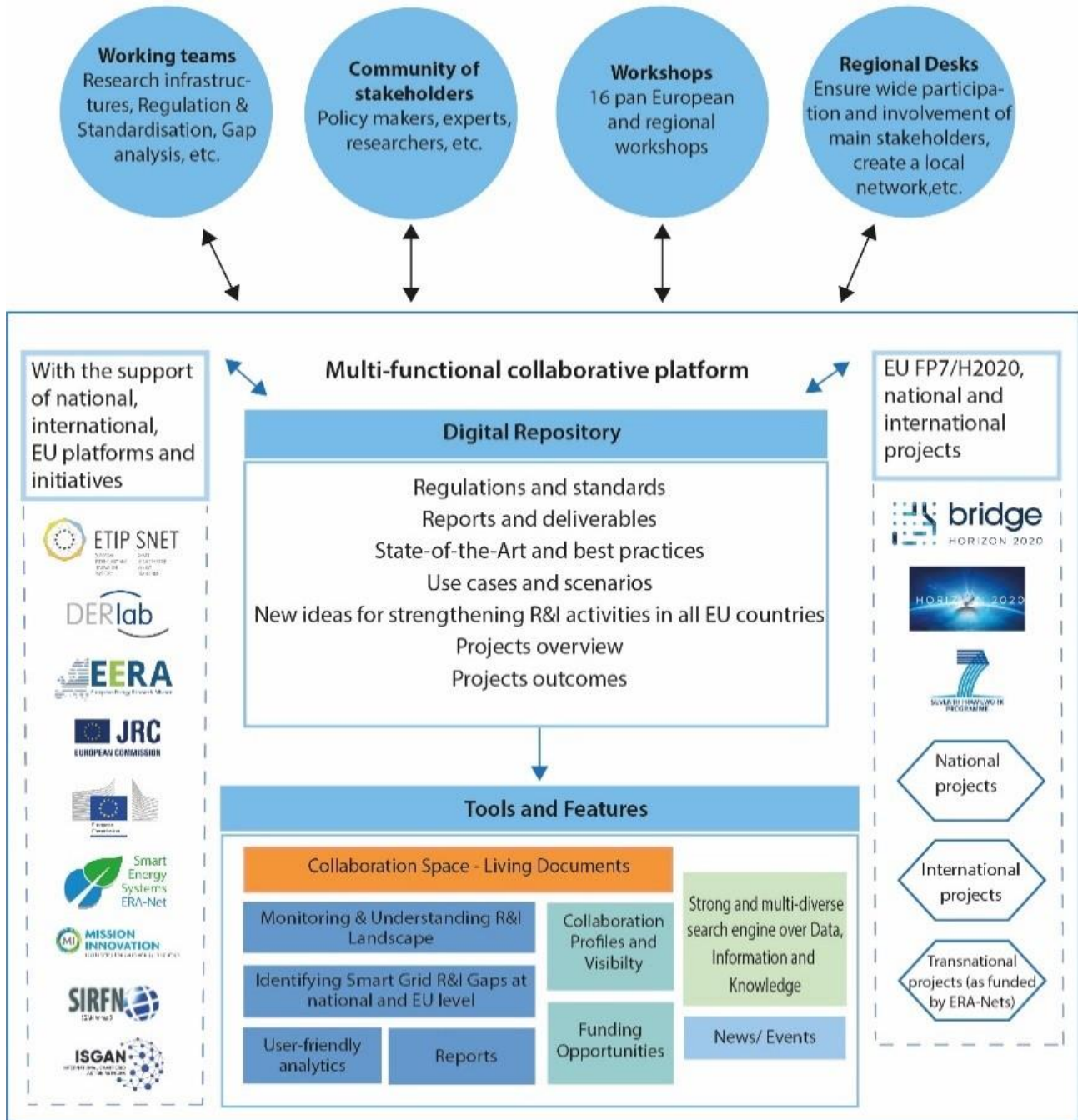
Figure 8. EIRIE Interactive platform functionalities

The EIRIE platform functionalities seems to fit perfectly with the Use Case repository. Actually, EIRIE already features a use case repository for the European projects:

Figure 9. Example of use case in EIRIE platform

Having in mind all the deployment problems identified in the previous section, the possibility of integrating the BRIDGE UC repository in the EIRIE platform was considered. During the final quarter of 2021, efforts were made for contacting the EIRIE platform responsible team to analyse:

- The potential interest of the integration for all the relevant stakeholders.

- The technical feasibility of the integration.

- The effort that would be needed.

The conclusions of the interaction are the following:

- After comparing both solutions, we have the impression that the mechanism for creating and maintaining the use cases in our repository is easier compared to the one offered by the EIRIE platform.

- EIRIE already has an IT infrastructure for hosting the repository and budged/staff for managing it. This is the main problem of the current deployment of the BRIDGE UC repository.

- EIRIE is internally a content management system. No
direct upload of results from one platform to another is possible. A translation would be required.

- EIRIE features a lot of services (~1900) to programmatically create the required artifacts (use cases, links, actors, dependencies, diagrams, etc.). They could be used for synchronising the set of use cases.

- The BRIDGE UC repository development team estimates that the effort required to implement such integration would be considerable and deserves an official confirmation.

- **The commission has decided that, even though this integration is quite interesting, due to the amount of effort required and the maturity of the platform, this task will not be tackled in the short term.**

6.2 SG-DOIT

The Joint Research Centre recently launched an online portal where laboratories, academia and industry can meet and exchange knowledge and experience in the preparation and running of interoperability testing. The SG-DoIT portal is based on the first complete and actionable European Interoperability testing Methodology, designed by JRC.

The portal, which is access-restricted (https://smart-interoperability.jrc.ec.europa.eu/index.php/home) is intended to be used for sharing knowledge and experiences in the testing activities linked to smart grid projects. The SG-DOIT has been presented in the BRIDGE Data Management Workshop invitation on 13 October 2021. Based on this presentation, efforts have been made to analyse the synergies and eventual integration between both platforms. The main findings of the analysis were:

- SG-DoIT portal handles test-cases, which are different from use cases, and therefore the data is not directly integrable among each other, but the BRIDGE UC repository is considering the integration of test cases in their roadmap for the future.

- The technologies of both platforms are not similar, and a considerable effort would be needed to integrate both platforms.

Based on this, it has been decided to leave this integration for the future and concentrate the efforts in other tasks.

6.3 BRIDGE web page. EU/CORDIS infrastructure

The BRIDGE web page is hosted in the EU commission infrastructure and is the central point for BRIDGE-related queries and data sharing. The integration of the platform in this infrastructure will boost its visibility and alleviate the problems linked to the current deployment.

The possibility of hosting the BRIDGE UC repository platform in this infrastructure will be evaluated in the first half of 2022. At the time this report is generated this analysis has not been done yet.

6.4 BRIDGE Use Case repository and IEC Use Case repository

IEC has set-up a Use Case repository, which is compliant with IEC 62559. IEC is promoting Use Case development in several Technical Committees (TCs). Several TCs are managing their Use cases using a Subversion use case repository as illustrated by the following figure:

Ultimately it should be guaranteed that BRIDGE Use case
repository is interoperable with IEC Use case repository. If the two repositories are compliant with IEC 62559-2 and 62559-3, these repositories should be interoperable. A common list of roles should also be shared.

7. Conclusions and next steps

The validation of the use case repository has been an iterative process, where all projects have been invited to test the draft repository, in order to evaluate the tool and send feedback for improving the repository in the new versions.

Based on the feedback received so far, we have added the following features in 2021:

- UC diagrams can be included with Excel UCs and not only with XML UCs

- Simple search function for the entire UC website

- Taxonomy / categorisation

- Excel UCs can be downloaded in the XML format

It is envisioned to link the UC repository to the role and CIM repository of the Data Management WG.

The tool is available for all the projects of BRIDGE. The type of licences for the use of the tool that have been suggested are:

- Creative Commons license for the use case files

- Apache2 for the processing tools

This will allow the redistribution and modification of written code, so that anyone can not only use it, but also adapt/improve.

The potential integration with the platforms defined in section "Repository integration" will be carried out in the next months, with the focus in the integration with the BRIDGE web site.

7.1 Relation to the Digitalisation of Energy Action Plan (DoEAP)

The European Commission is currently defining an Action Plan related to the digitalisation of the energy sector[1]. It will be presented in autumn 2022 to "help to develop a competitive market for digital energy services and digital energy infrastructure that are cyber-secure, efficient and sustainable". It is articulated around five working areas, provisionally identified as:

- Developing a European data exchange framework

- Benefits for consumers: literacy, skills, digital tools to empower citizens

- Mobilising investments

- Enhancing Cybersecurity

- Climate neutrality of the ICT

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[1] See EC dedicated webpage: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13141-Digitalising-the-energy-sector-EU-action-plan_en

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Among several initiatives, BRIDGE is expected to contribute to the DoEAP. Therefore, the table below maps the findings & recommendations of this report to the five working areas, replying to the following question: "how each 'finding & recommendation' contributes to the five DoEAP areas?"

	Developing a European data exchange framework	Benefits for consumers	Mobilising investments	Enhancing Cybersecurity	Climate neutrality of the ICT
To link the UC repository to the role and CIM repository of the Data Management WG	**Contribute to the interoperability framework**		**Contribute to the development, implementation, and upscaling of digital solutions for the energy system**		
To use the licenses that will allow anyone not only using the UC repository, but also adapting and improving it.					
Integration with other European initiatives and platforms (BRIDGE website) to facilitate and promote the access to the repository to all type of end users.					
Monitor what other projects and initiatives (such as PANTERA Project and SG-DoIT) are doing in order to avoid overlapping and				**Raise security and privacy concerns related to data exchanges**	

extra use of resources.					
To all BRIDGE projects to include their use cases in the UC repository.		bridge			28

8. List of Acronyms and Abbreviations

DSO   Distribution System Operator

HEMRM   Harmonised Electricity Market Role Model

SGAM   Smart Grid Architecture Model

TSO   Transmission System Operator

WG   Working Group

DSO   Distribution System Operator

9. List of Figures

Annex 1: Use case example

HLU02-UC02

1. Description of the Use Case

1.1. Name of the Use Case

ID	Area /Domain(s)/Zone(s)	Name of the Use Case
1	None,	HLU02-UC02

1.2. Version Management

Version No.	Date	Name of author(s)	Changes	Approval status
1	2018-01-01T00:00:00	Lucas Pons (ETRA),	Creation	None

1.3. Scope and Objectives of Use Case

Scope	RES generation Forecast
Objective(s)	Calculate RES forecast of generation units. Also including maintenance periods
Related business case(s)	is invoked by HLU02-UC4, HLU02-UC5, HLU02-UC6, HLU02-UC7

1.4. Narrative of Use Case

Short description

RES generation is required for different purposes. This UC calculates the RES generarion forecast

Complete description

RES generation forecasts are needed by different actors and for different purposes, among others: • For bidding in the different energy markets • For assessing the security of the transmission grid Each type of RES has its own forecasting algorithm and required inputs. For wind and solar generation, an accurate weather forecast is required. For hydro generation, besides weather forecast, it is also needed a forecasting of the water level in the reservoir, which may involve a modelling of the plant and historical data. Additionally, any RES production forecast should take into account the following: • Operational rules • Scheduled maintenance periods The operational rules for the RES do not change very often and can be modelled in the forecasting algorithm (e.g. maximum wind speed that the windmill supports or scheduled stops to avoid shadow flickering) Scheduled maintenance periods cannot be predicted and thus there should be a procedure to agree and distribute information on these periods, in a request/approval scheme. The objective is that all the relevant actors are aware of the maintenance periods and these periods are taken into account in the calculation of the forecast. The role of the actor generating the forecast is the FORECASTING GENERATION CALCULATOR.

1.5. Key Performance Indicatiors (KPI)

ID	Name	Description	Reference to mentioned use case objectives

1.6. Use case conditions

Assumptions
Prerequisites
HLU02-UC02

1.7. Further information to the use case for classification/mapping

Relation to other use cases

Level of depth

Prioritisation

Mandatory

Generic, regional or national relation

Regional

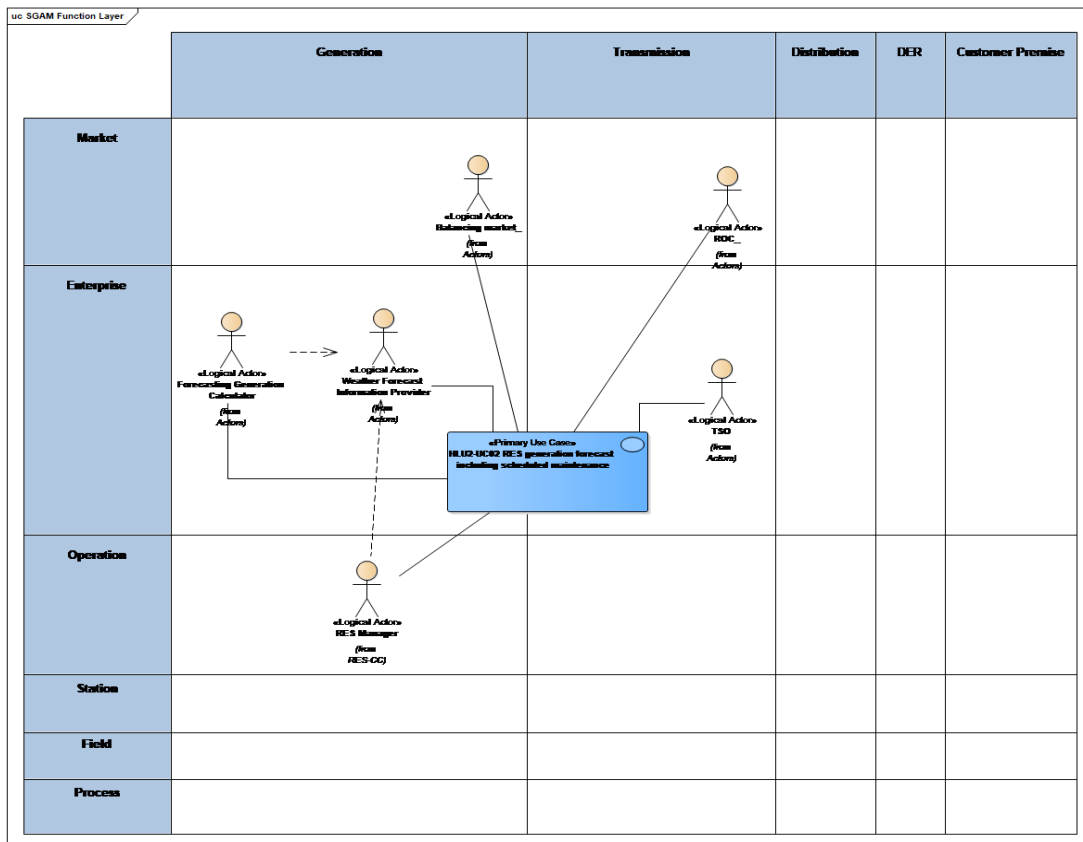**Nature of the use cases**

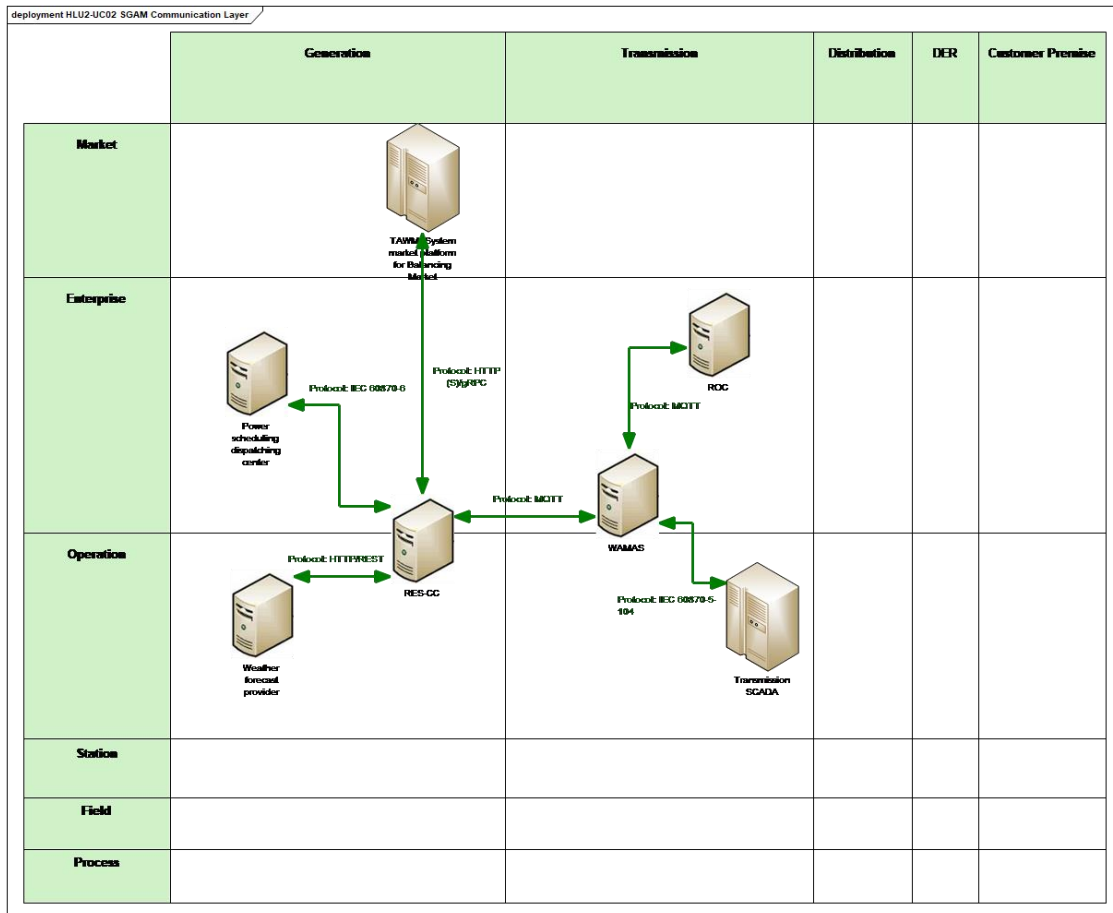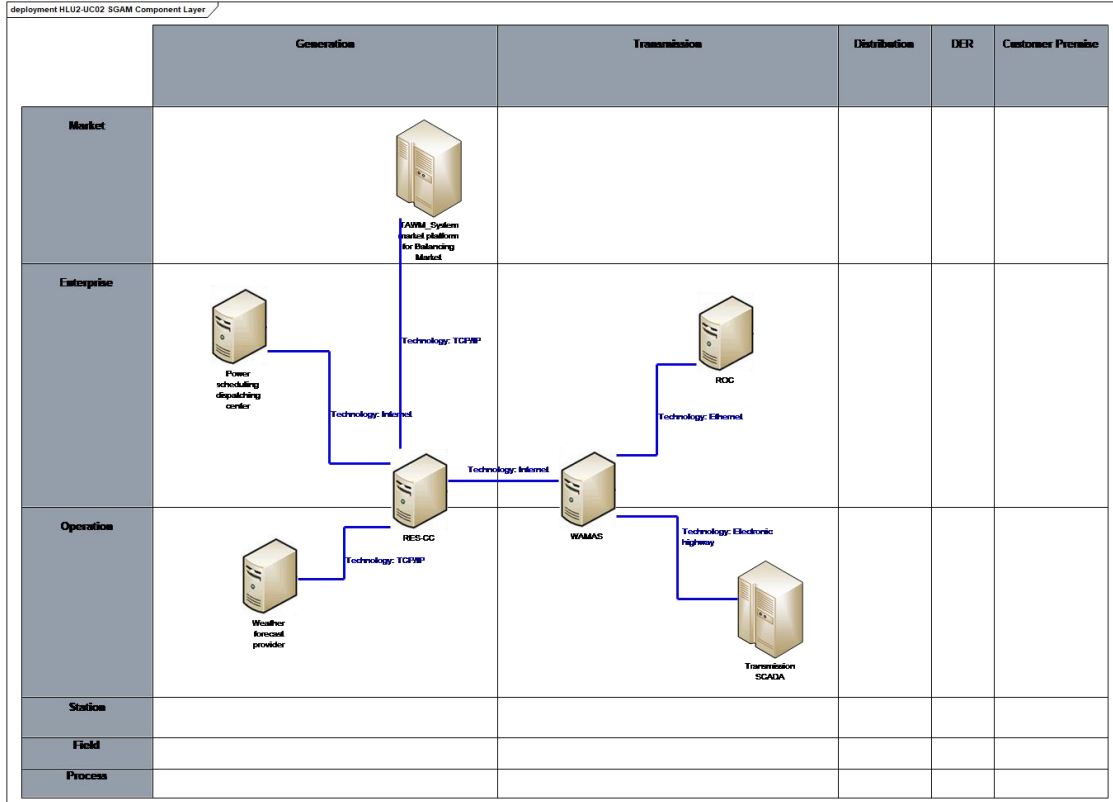Technical use case

Further keywords for classification

RES, Forecast, machine learning

1.8. General remarks

General remarks

2. Diagrams of Use Case

deployment HLU2-UC02 SGAM Component Layer

	Generation	Transmission	Distribution	DER	Customer Premise
Market	TAWM_System market platform for Balancing Market				
Enterprise	Power scheduling dispatching center	ROC			
Operation	RES-CC — Weather forecast provider	WAMAS — Transmission SCADA			
Station					
Field					
Process					

Technology: TCP/IP · Technology: Internet · Technology: Ethernet · Technology: Electronic highway · Technology: TCP/IP

deployment HLU2-UC02 SGAM Communication Layer

	Generation	Transmission	Distribution	DER	Customer Premise
Market	TAWM_System market platform for Balancing Market				
Enterprise	Power scheduling dispatching center	ROC			
Operation	RES-CC — Weather forecast provider	WAMAS — Transmission SCADA			
Station					
Field					
Process					

Protocol: IEC 60870-6 · Protocol: HTTP (S)/gRPC · Protocol: MQTT · Protocol: MQTT · Protocol: HTTP/REST · Protocol: IEC 60870-5-104

SGAM estandard and information data model layer SGAM

act HLU2-UC02 RES generation forecast including scheduled maintenance_ActivityGraph

uc SGAM Function Layer
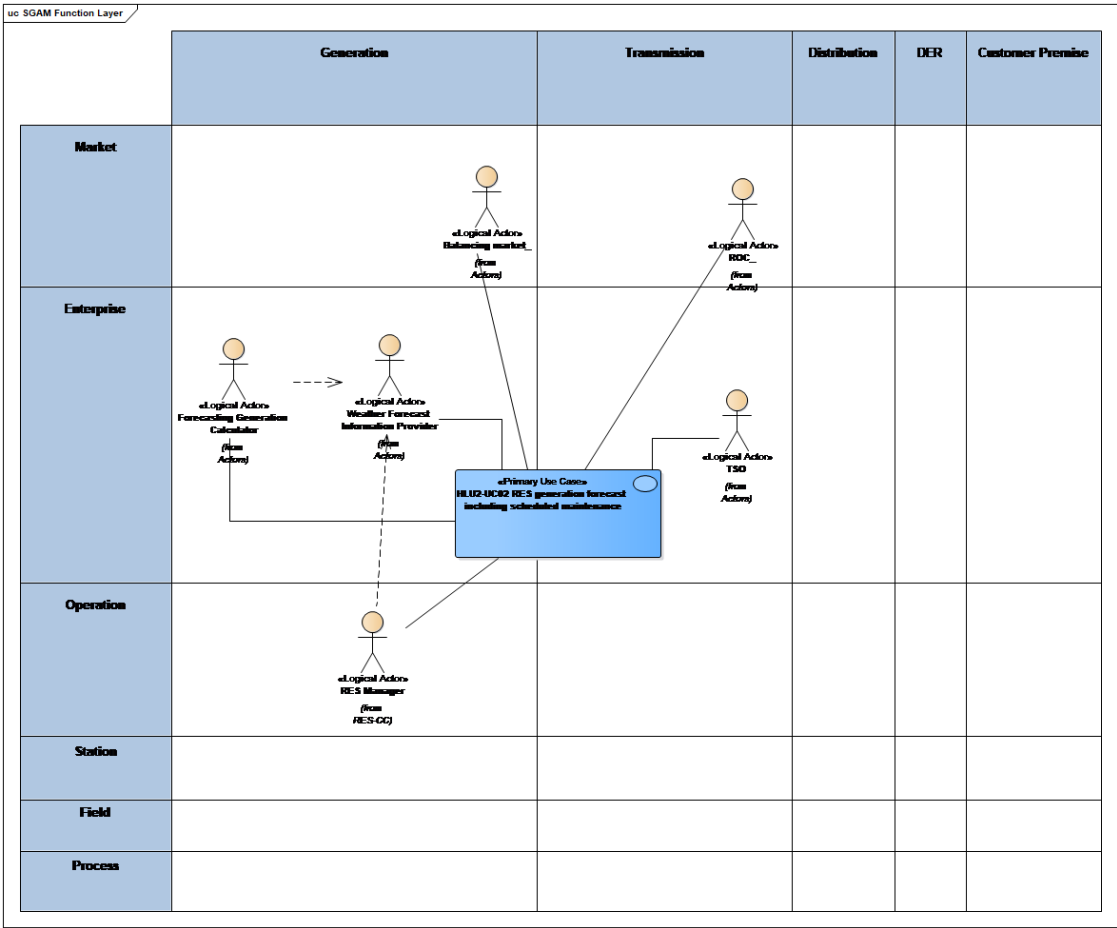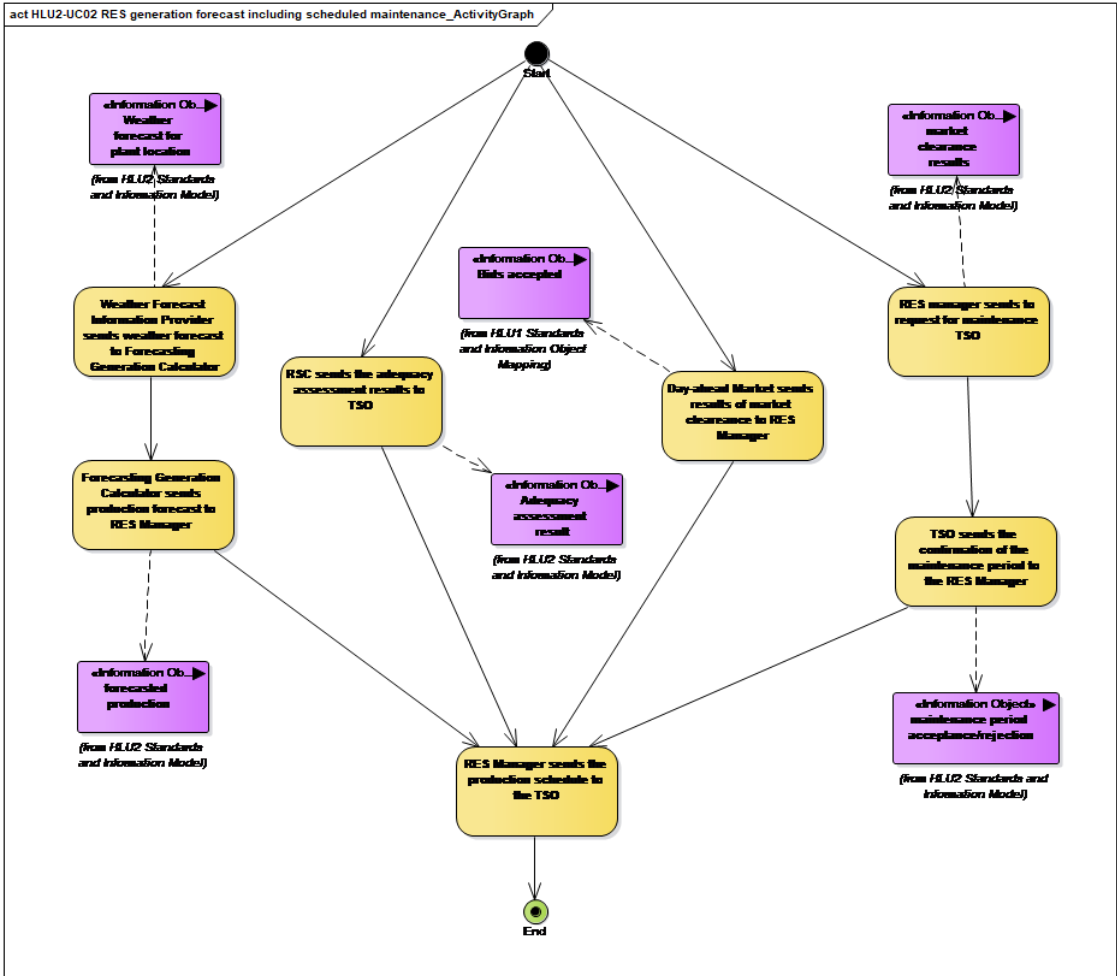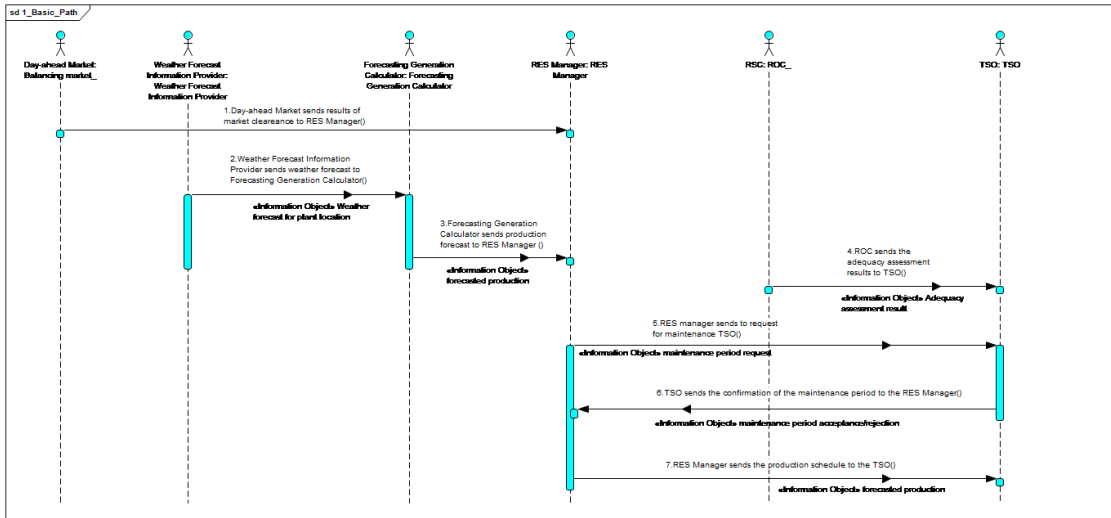
THIS

3. Technical Details

3.1. Actors

Actor Name	Actor Type	Actor Description	Further information specific to this Use Case
RES manager	Logical actor role (RES-CC control centre)	None	
TSO	Organisation	None	
ROC	Application	None	
balancing market	Logical actor (AM)	None	
Forecasting Generation Calculator	application	None	
Weather forecast provider	External system	None	

4. Step by Step Analysis of Use Case

4.1. Overview of Scenarios

No.	Scenario Name	Scenario Description	Primary Actor	Triggering Event	Pre-Condition	Post-Condition
1	Maintenance period requested	None		Maintenance period requested		
2	Basic path	None		Basic path		

Notes

4.2. Steps – Scenarios

Scenario Name:

Maintenance period requested

Step No.	Event.	Name of Process / Activity	Description of Process/ Activity.	Service	Information Producer (Actor)	Information Receiver (Actor)	Information Exchanged	Requirements, R-ID

Scenario Name:

Basic path

Step No.	Event.	Name of Process / Activity	Description of Process/ Activity.	Service	Information Producer (Actor)	Information Receiver (Actor)	Information Exchanged	Requirements, R-ID

5. Information Exchanged

Information exchanged ID	Name of Information	Description of Information Exchanged	Requirement

6. Requirements (optional)

Category Identifier	Name	Description	mRID
Req_ID	Req_Name	'RES generation forecast including scheduled maintenance'	

Identifier	Name	Description	mRID
1	Details of maintenance period	Details of maintenance period	1
2	Confirmation message	Confirmation message	2
3	Details of maintenance period	Details of maintenance period	3
4	Weather information forecast	Weather information forecast	4
5	Generation forecast	Generation forecast	5

bridge

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