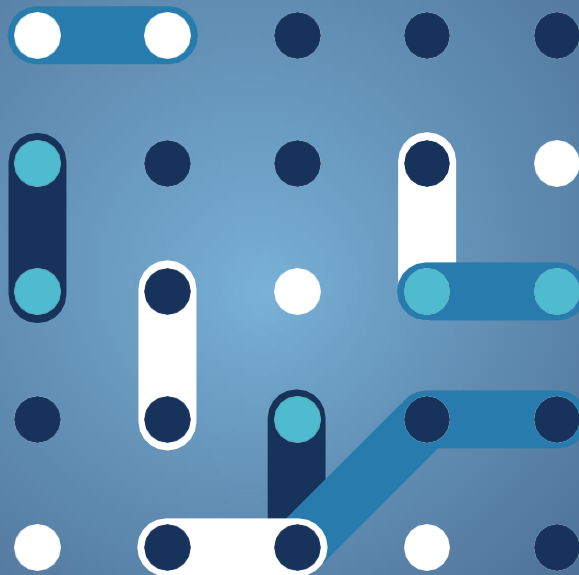# bridge

Use Case repository

"Action 1– Set up a use case repository"

Data Management Working Group

Use Case repository

"Action 1– Set up a use case repository"

April 2021

LEGAL NOTICE

DOCUMENT INFORMATION

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Bridge WG/TF Chairmanship

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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 a an easily accessible tool that will be used for alignment of new BRIDGE projects started recently (such as X-FLEX) with ongoing projects (such as EU-SysFlex) 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, it has been identified some errors, 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 make 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.

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 of 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, it has agreed with the partners participating in the action, on the final installation of the template, adapted to the special needs (if any) of the BRIDGE Community.

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

XFLEX 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 –involving also 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"
- ETIP-SNET WG4 "Digitisation of the electricity system and Customer participation"
- Use Case Explorer WG of the Energy vertical of the OPEN-DEI project (coordination between IoT Large Scale Pilots).

4. Standard IEC 62559-2

International Standard IEC 62559 has been published by IEC Technical Committee 8 on System aspects of electrical energy supply.

For complex systems, the use case methodology supports a common understanding of functionalities, actors and processes across different technical committees or even different organizations. 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.
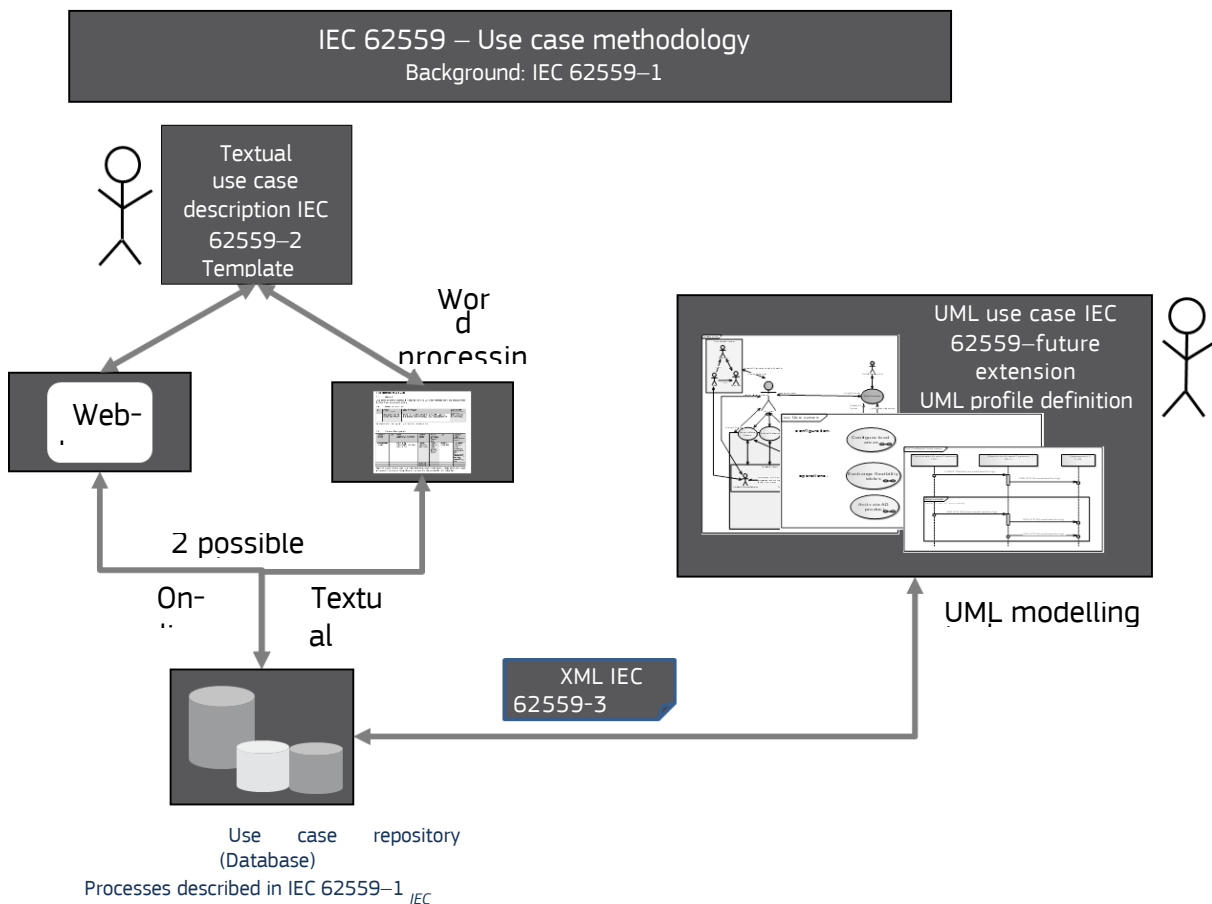
Figure 1: IEC 62559 standard series

IEC 62559-1 – Concept and processes in standardization

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 serialized 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 standardization process.

IEC 62559-4 – Best practices in use case development for IEC standardization 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

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

Secondly, it has been developed the use 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

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 utilizing 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.

from the uploaded XML Use Case.
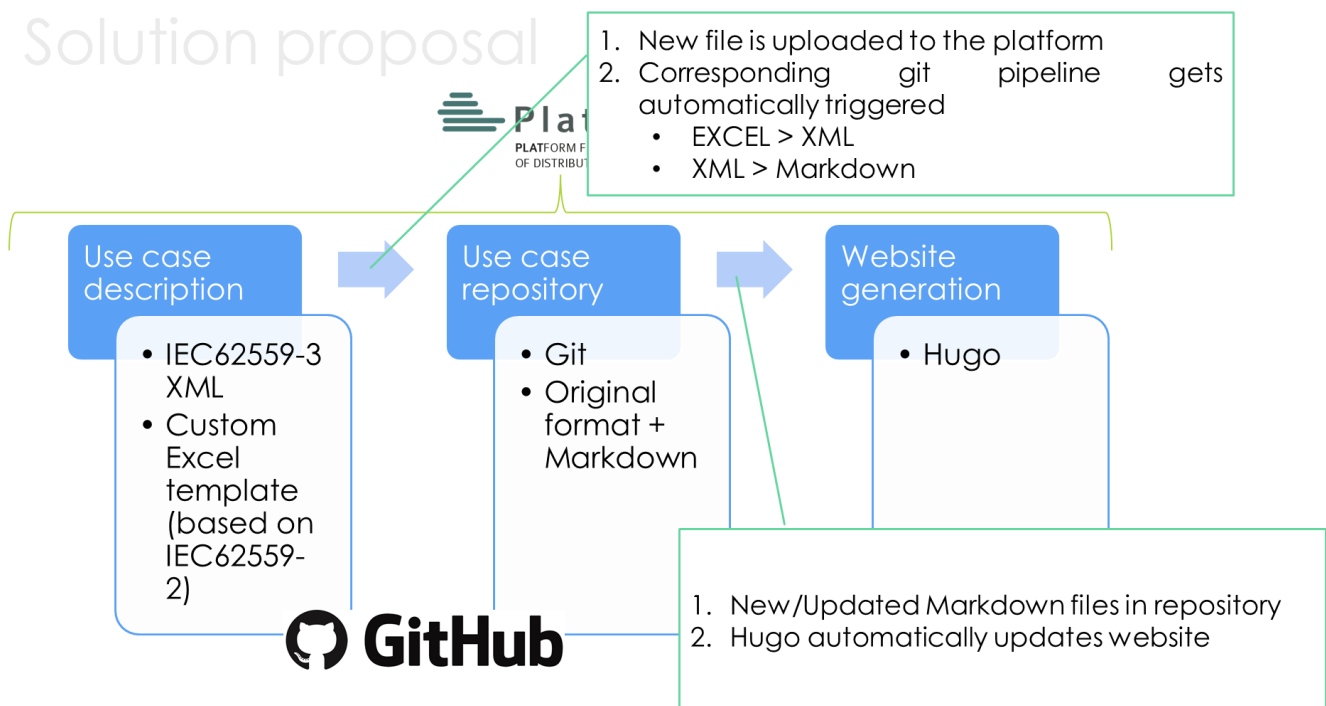
Figure 2: Use case repository development process

5.3 How Use case repository works.

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

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)
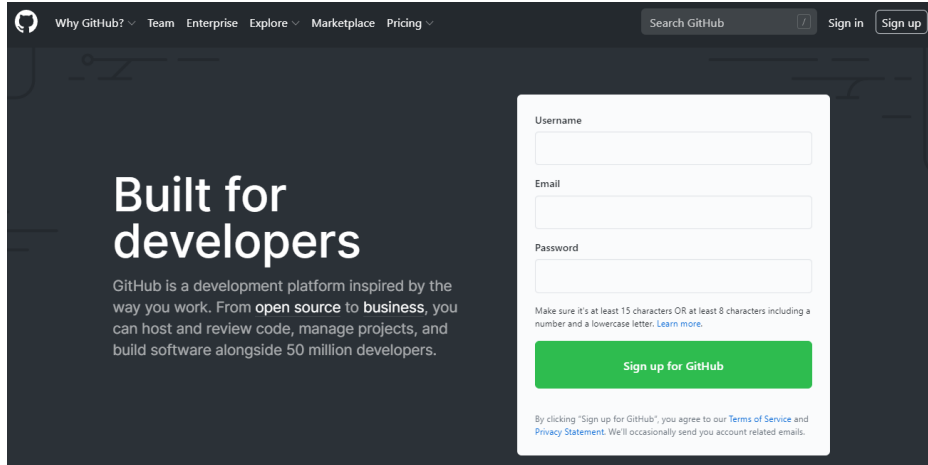
Figure 3: Sign up of GitHub page

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

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

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)
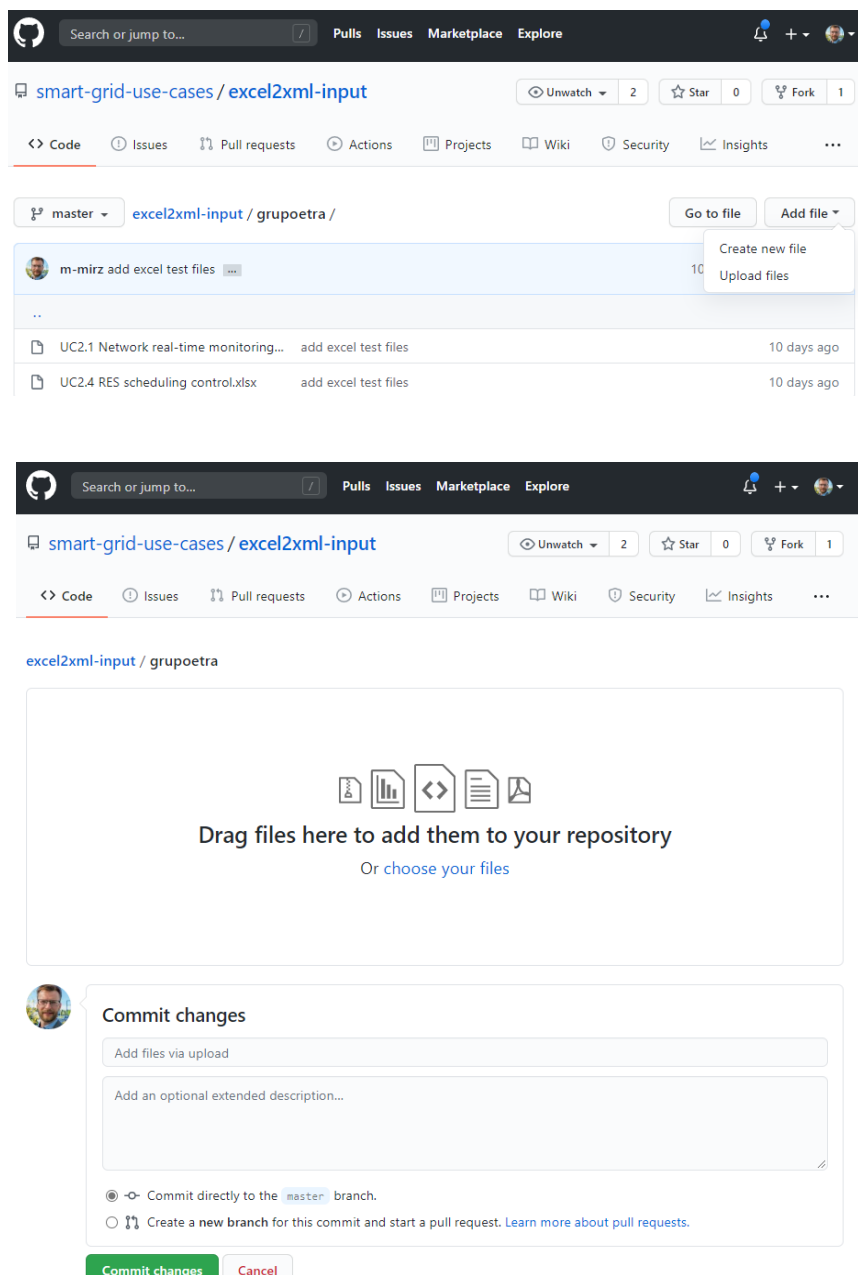- Finally, click "commit changes"

Figure 5: Upload Excel Use Case File and commit changes

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)
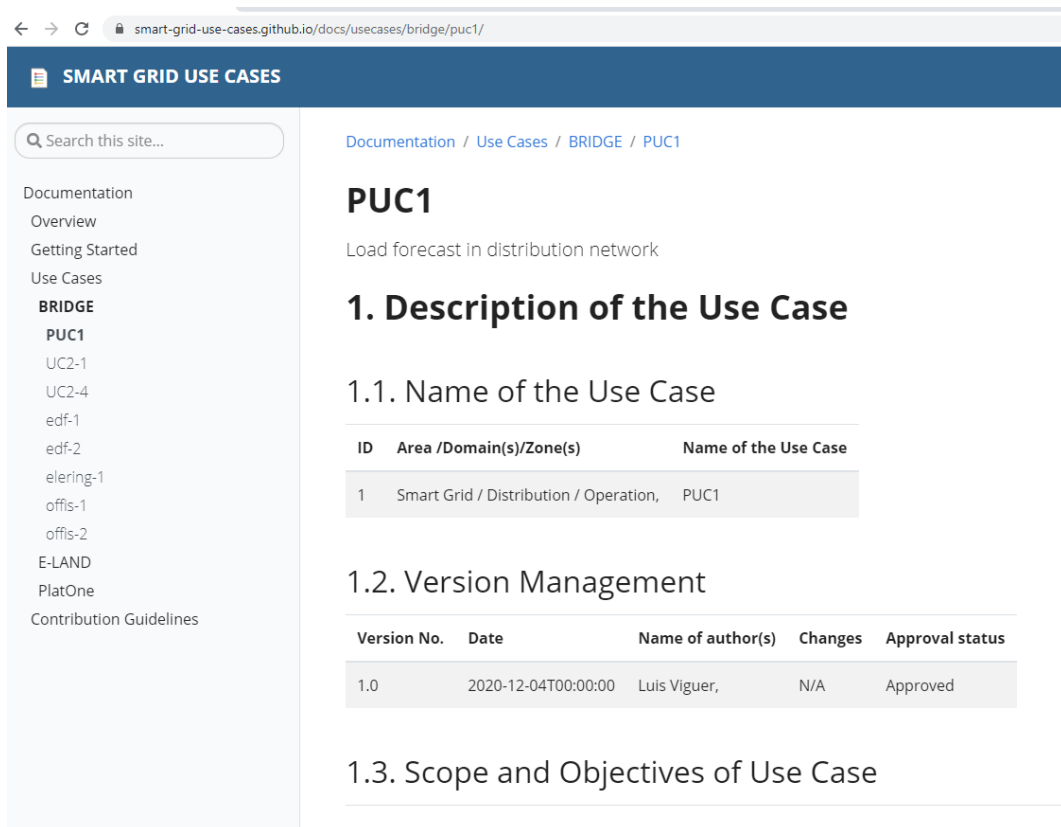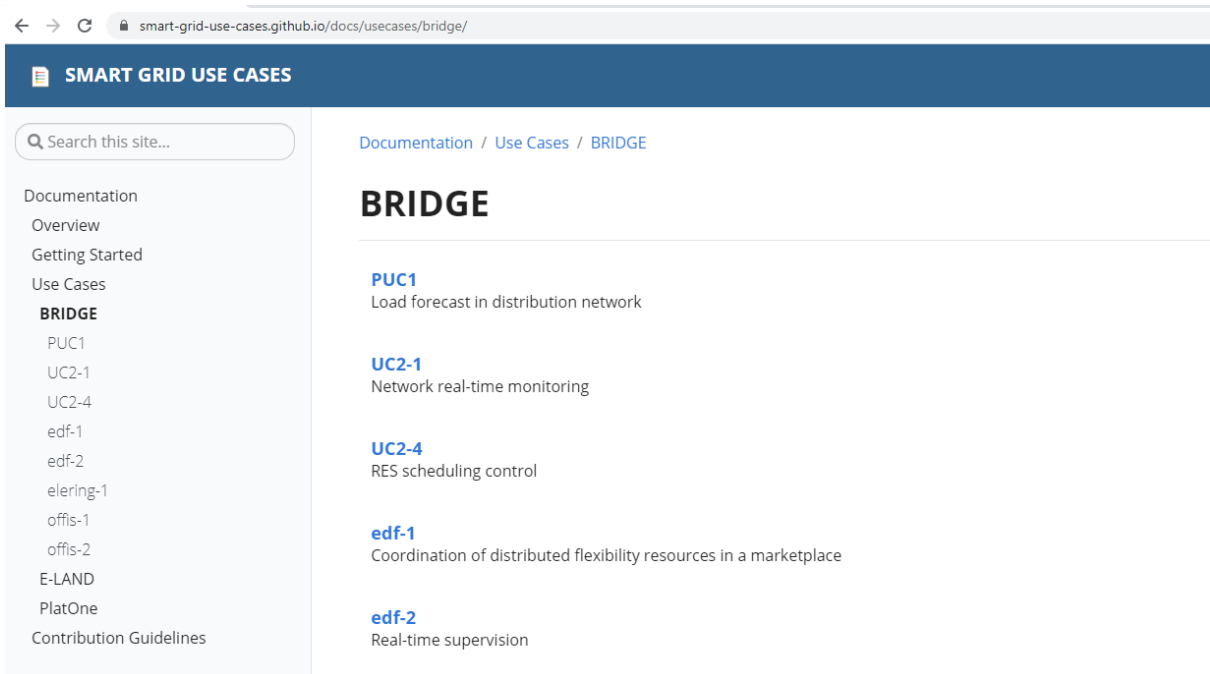
Figure 6: BRIDGE Use case Repository website

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

6. 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, it has been identified some errors, 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 make 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.

7. 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
DSO	Distribution System Operator

8. Table of figures

bridge