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SYSTEMS REFERENCE DELIVERABLE

colour inside

Use case methodology – Part 4: Best practices in use case development for IEC standardization processes and some examples for application outside standardization

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FOREWORD

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IEC SRD 62559-4, which is a Systems Reference Deliverable, has been prepared by IEC systems committee Smart Energy.

The text of this Systems Reference Deliverable is based on the following documents:

Draft SRD	Report on voting
SyCSmartEnergy/105/DTS	SyCSmartEnergy/114/RVDTS

Full information on the voting for the approval of this Systems Reference Deliverable can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62559 series, published under the general title *Use case methodology*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

0.1 General

The IEC 62559 use case template and methodology evolved from work originally performed by the Electric Power Research Institute (EPRI) as part of the IntelliGrid program. The primary purpose of that effort was to develop descriptions of existing and future power systems and their functions and requirements. In the evolution of this effort, the value of use cases as a means to accurately and completely describe the requirements for these systems and functions was demonstrated. The use case template was contributed to the IEC and this became a Publicly Available Specification (IEC PAS 62559:2008). As the best practice of use cases evolved, IEC PAS 62559:2008 was cancelled and replaced by IEC 62559-2:2015 to reflect these updates.

This methodology was originally developed as part of the IntelliGrid Architecture developed by the Electrical Power Research Institute (EPRI) as a means to implement the “IntelliGrid vision” of the automated, self-healing, and efficient power system of the future. However, the aim of IEC 62559 has changed in such a way that it is now intended to describe a methodology which is generic enough to become applicable for all domains served by IEC or other standardization bodies.

Initially, IEC 62559 was dedicated to the smart grid domain, but with the introduction of systems committees within IEC’s organizational structure, the focus was widened to allow the use of the use case methodology also for other domains like active assisted living or smart cities. This document also explains how the generic methodology of IEC 62559 can be dedicated to a certain domain by complementary standards, e.g. the IEC 62913 series for smart energy [1], [2].

0.2 Objectives of this document

As defined by the IEC, the scope of IEC systems committees like Smart Energy (SyC SE), Active Assisted Living (SyC AAL) and others is to prepare and coordinate, in co-operation with IEC technical committees and subcommittees, the development of International Standards and other deliverables with emphasis on overall system aspects of technical systems and acceptable balance between cost and quality for the users of these technical systems.

While SyC SE's main focus is on standardization in the field of smart energy in order to provide systems level standardization, coordination and guidance in the areas of smart grid and smart energy, including interaction in the areas of heat and gas, SyC SE works also on methodology and tools to support the systems approach in standardization. In this regard, SyC SE has the aim to widely consult within the whole IEC community and the broader stakeholder community to provide overall systems level value, support and guidance to the TCs and other standards development groups, both inside and outside the IEC.

This document has therefore been developed to address the following objectives:

- To develop a standard methodology for determining and defining user requirements in a consistent and comprehensive manner. Standards often address only the technical issues that are included in technical specifications; however, it is just as vital to develop standards to assist users to clearly and comprehensively define their requirements.
- To clarify the distinction between “user requirements” (the “what” as needed by domain system experts) and “technical specifications” (the “how” as technical descriptions of systems, applications, and information flows to meet the “what”). Currently this distinction is an “invisible line” so that often the “what” and the “how” are mixed together – with technology-oriented project engineers jumping directly to the “how” without fully exploring the “what” with the domain system experts.

- To emphasize the critical need to determine all user requirements first, before any commitments are made on “how” to meet those requirements. Because automation and control systems are so complex and are becoming increasingly so, if all requirements are not clearly defined first, then the premature design of systems can block or seriously hinder meeting those requirements that were not initially recognized.
- To provide a means for testing the systems once implemented to ensure that the user requirements are truly met, regardless of what standards and technologies are ultimately incorporated by the vendors.

USE CASE METHODOLOGY –

Part 4: Best practices in use case development for IEC standardization processes and some examples for application outside standardization

1 Scope

This document 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. It complements the information in IEC TR 62559-1, IEC 62559-2 [3] and IEC 62559-3 [4] by providing users with best practices in:

- use cases drafting process,
- determining the skill sets of the people required,
- use case repository management, and
- using use cases for IEC or enterprise projects.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
use case
specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system

[SOURCE: ISO/IEC 19505-2:2012, 16.3.6]

3.1.2
business use case
use case that describes how business roles interact to execute a business process

Note 1 to entry: The business processes are derived from services, i.e. business transactions, which are needed to achieve different strategic goals for an organization; e.g. for the purpose of achieving specified and measurable results/products for internal or external customers.

Note 2 to entry: Business use cases are system agnostic.

[SOURCE: IEC TR 62559-1:2019, 3.8, modified – Note 2 to entry has been added.]

3.1.3
system use case
use case that describes how system and/or business roles of a given system interact to perform a function required to enable or facilitate the business processes described in business use cases

[SOURCE: IEC TR 62559-1:2019, 3.9]

3.1.4
actor
entity that communicates and interacts

Note 1 to entry: Actors can include people, software applications, systems, databases, and even the power system itself.

[SOURCE: IEC 62559-2:2015, 3.2]

3.2 Abbreviated terms

AAL	active assisted living
ATM	automated teller machine
CIM	common information model
CPU	central processing unit
RAMI 4.0	reference architectural model industry 4.0
SE	smart energy
SGAM	smart grid architecture model
SyC	systems committee
UCMR	use case management repository
UML	unified modelling language

4 Overview of the methodology

4.1 Concept of systems engineering

The use case methodology according to IEC 62559 is a subset of the science of systems engineering. Systems engineering methodology separates the concepts of “user requirements” from “technical specifications”: user requirements define “what” is needed without reference to any specific designs or technologies, while technical specifications define “how” to implement the automation systems in order to meet the user requirements.

4.2 Systems engineering methodology for use case development

4.2.1 General

The overall systems engineering methodology is illustrated in Figure 1 and consists of the following types of people and project steps.

a) Executives or other managers of an enterprise review business cases which describe and justify a perceived business need. They then approve specific projects.

b) Domain experts and project engineers are tasked to develop a project team to undertake the project. As one of the first undertakings of the project team, all domain system experts and other stakeholders (users) that could impact or be impacted by the project should be identified and represented (full time, part time, or as applicable) on the project team.

c) Domain experts review the stock of existing use cases for applicability and ideas to determine which content can inform their current effort. Preferably the use cases are stored in digital form in a so-called use case management repository (UCMR).

d) Domain experts develop a list of use cases (functional descriptions), covering not only the specific business need but other user needs and future possibilities that could impact or might be impacted by the project.

e) Domain experts, with possible assistance by project engineers who understand the use case process, draft the key use cases, capturing all the necessary user requirements.

f) Domain experts review and update these use cases to ensure their needs are captured correctly and to assess possible misunderstandings, overlaps, gaps, and other inconsistencies.

g) Project engineers assess and coordinate the use cases from which they develop a comprehensive and detailed user requirements document. This detailed user requirements document contains only user requirements.

h) Information and communication technology (ICT) specialists apply the appropriate standards and technologies, based on the user requirements document. If available, the strategic vision of a domain-specific reference architecture (e.g. IEC TR 62357-1 [5]) should be used to determine the key standards and technologies.

i) Design engineers develop the technical specifications, which combine the user requirements from the domain experts, the preferred standards and technologies from the information specialists, and the tactical approach to system development recommended by the architecture.

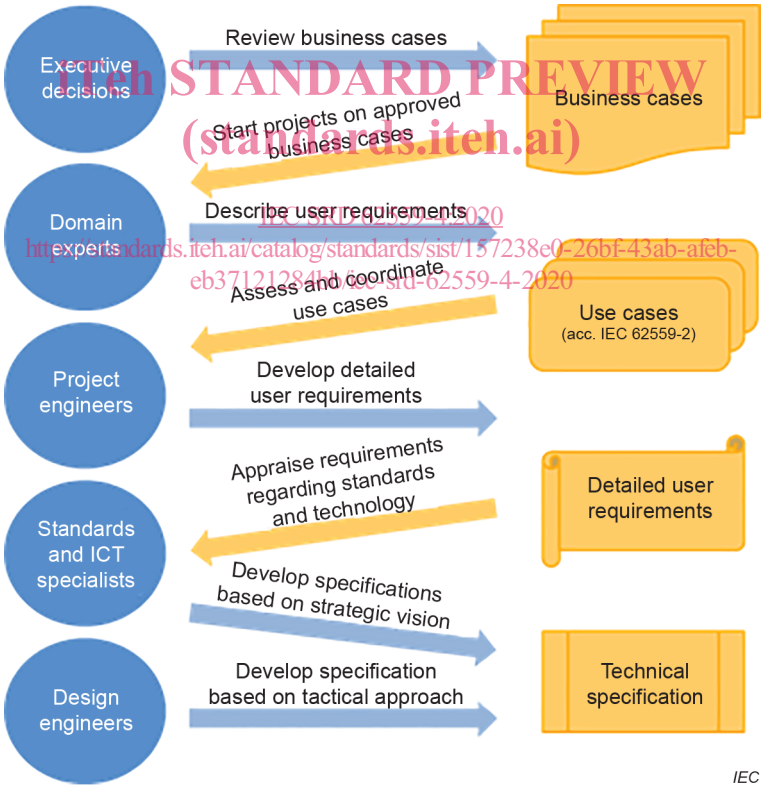

Figure 1 – Project definition process

The user requirements as elicited by the use case process and ultimately described in the detailed user requirements document cover the following aspects:

- functions from the user perspective, including functional description of processes, user choices, types of input data, types of results, and possibly display appearance;
- configuration issues, such as access to field data, electrically noisy environment, control centre LAN, or cross-organizational interactions;
- performance requirements, such as availability, response times, latency, precision, frequency of updated results, and other user parameters;

- security requirements, such as confidentiality, access restrictions, detection of failures and/or intrusions, failure management, and other safety, security, and failure issues;
- data management requirements, such as sizes, numbers of devices, amounts of data, expected growth over time, data access methods, data maintenance, and other data management considerations;
- constraints, such as contractual, legal, regulatory, safety rules, or other issues that could impact the requirements.

While a complete system engineering methodology covers both the identification of user requirements and the development of technical specifications, this document addresses only the methodology for determining and documenting the user requirements.

4.2.2 Overview of the phased approach

Although the IntelliGrid methodology, upon which this document is based, covers the entire process for developing systems, this document focuses only on the development of user requirements, and therefore concentrates on the first three phases, although it also addresses the remaining phases as they are applicable to user requirements.

Phase 1: Executives use business cases to approve projects in order to meet business needs. Although this step in the process involves executive decisions based on cost justification and other non-technical factors, from the architecture point of view, the key pre-requisite for these executives in making decisions to approve projects is that all strategic vision issues are addressed in the business cases.

Phase 2: Domain expert stakeholders give a first list of actors and describe their user requirements through the formal use case process. Use cases permit these experts to express their requirements in a formalized manner that can then be coordinated and solidified into more detailed functional and performance requirements in the next phase.

Phase 3: Project engineers develop the more detailed functional and performance requirements from the use cases that were developed by the domain experts.

Phase 4: Project engineers and IT specialists assess applicability to the project of the standards, technologies, and best practices identified in the appropriate technology review.

Phase 5: Design engineers develop the technical specifications based on strategic vision, tactical approach, applicable standards, and informed by the architecture.

4.2.3 Phase 1: Methodology for executives

4.2.3.1 Step 1: Recommendations for executives

The following are the general recommendations for executives in an enterprise.

- A domain-specific reference architecture should be adopted as a strategic vision for the enterprise information infrastructure.
- It should be ensured that the different users of the reference architecture understand how to utilize the relevant parts of reference architecture components, including functional descriptions and reference architecture strategic vision.
- A plan for implementing the reference architecture methods and standards-based technologies should be developed, based on the utility's specific business needs, the timeframe appropriate for meeting those needs, and the financial constraints.
- Feedback should be provided to the applicable standards organizations so that the standards can evolve to meet future needs and recommend standards that are created in the future.