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# Service Modelling Language

# National foreword

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# Service Modelling Language

Langage de Modélisation de Service

Sprache zur Modellierung von Dienstleistungen

This Technical Report was approved by CEN on 10 July 2022. It has been drawn up by the Technical Committee CEN/TC 310.

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# Contents

Page

**European foreword** ... 3

**Introduction** ... 4

**1 Scope** ... 6

**2 Normative references** ... 6

**3 Terms, definitions, abbreviated terms and construct labels** ... 6
**3.1 Terms and definitions** ... 6
**3.2 Abbreviated terms** ... 7
**3.3 Construct labels** ... 7

**4 Service Modelling Architecture and Language** ... 8
**4.1 Overview** ... 8
**4.2 Model Driven Service Engineering Architecture (MDSEA)** ... 8
**4.3 Service modelling language (SML)** ... 10
**4.4 Actor construct representing an Organization's or a Person's role** ... 10
**4.5 SML Use Case Example** ... 11
**4.6 Service modelling templates** ... 15
**4.6.1 Overview of constructs** ... 15
**4.6.2 Templates and their usages** ... 16
**4.6.3 Ordering of Templates** ... 17
**4.6.4 Modalities of template attributes and class relationships** ... 17

**5 SML Constructs** ... 17
**5.1 Service** ... 17
**5.2 Decision** ... 19
**5.3 Functionality** ... 19
**5.4 Value** ... 20
**5.5 Performance Indicator** ... 21
**5.6 Product** ... 21
**5.7 Process** ... 22
**5.8 Resource** ... 23
**5.9 Service Level Agreement (SLA)** ... 24
**5.10 Organization** ... 25
**5.11 Person** ... 26
**5.12 Service Vendor** ... 27
**5.13 Customer** ... 27
**5.14 User** ... 28
**5.15 Service Provider** ... 29
**5.16 Stakeholder** ... 30

**Annex A** (informative) **Basic concepts of service modelling at BSM level** ... 31

**Annex B** (informative) **Service modelling languages, tools and MDSEA** ... 34

**Annex C** (informative) **Example of a service modelling at BSM level** ... 37

**Annex D** (informative) **Industry Pilots to in the MSEE and PSYMBIOSYS Project** ... 41

**Annex E** (informative) **From BSM to TIM and to TSM levels** ... 43

**Bibliography** ... 45

## European foreword

This document (CEN/TR 17859:2022) has been prepared by Technical Committee CEN/TC 310 “Advanced automation technologies and their applications”, the secretariat of which is held by BSI.

During its preparation, contributions have been received from the European FP7 Integrated Project Manufacturing Service Ecosystem (MSEE) and from the H2020 project PYMBIOSYS.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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# Introduction

It is generally considered that Manufacturing Enterprises will progressively migrate from traditional product-centric business to product-based, service-oriented virtual enterprises and ecosystems. This is a long and complex process that needs to be carefully assessed, prepared and planned. In particular, it would be necessary for a company that decides to pursue a manufacturing servitization project, to know clearly where it is (the current position) and where to go (the target position) so that strengths, weaknesses and needed investments can be identified. Enterprise Modelling offers the basic concepts for models, methods and tools to support this servitization process.

Benefits for the user result from a coordinated use of a common modelling language in the design and operation of service system. This leads to considerable quality improvement in the design process and cost reduction in the system operation.

A standardized Service Modelling Language (SML) is expected to foster the development of more compatible products in enterprise service modelling and hence reduce problems in the interoperation of such ICT products. SML will facilitate not only the modelling of services and service systems but will also support the development of interoperable software among co-operating organizations.

In addition, the SML will have a positive impact on improving interoperability of model based, service-oriented products, enabling European virtual factories and enterprises to adapt to the future internet infrastructure.

The SML with its associated meta-model reduces costly and fragmented development in this domain. SML focuses on modelling of manufacturing services that a company can develop to support its products.

The main added value of the proposed SML will be threefold:

i. Identification of the language constructs needed to define services needed by the business user.

ii. Integration of existing modelling languages constructs into one coherent meta-model.

iii. Definition of an MDSEA framework based on MDI/MDA to host the language and offer methods of model transformation between the modelling levels.

Three categories of enterprises are considered for this SML Technical report:

a) SMEs or large companies active in model based servitization or in the process of designing business models that include servitization aspects. The benefits of an SML standard are seen in a contribution to ease enterprise interoperability between organisations without the need of strong (re)engineering.

b) National/Regional projects or IT consultancies willing to integrate an SML standard in their project/domain. This business model together with the MSEE Toolbox (as described in Annex D) will enable the transfer of MSEE technology to other projects beyond those already existing. Four use cases deploying the MSEE technology in SMEs of the industry sectors Machine Tools, Observation, Furniture and Textile elaborated in the European PSYMBIOSYS project are presented in Annex D. The use cases demonstrate the applicability and the benefits of (SML) standard-based solutions

c) Large industrial enterprises, who need business models aimed at offering IT assets to other large industrial partners who are looking for standards-based solutions. A standard for language modelling will ease enterprise interoperability between the partners of such enterprise network and create measurable value.

This specification applies to manufacturing enterprises but can also apply to other classes of enterprises. It is intended for use by system engineers, IT and research specialists who are concerned with developing and deploying product related services in VMEs and Ecosystems. The constructs specified in this

document are also intended to be used by those business users who are making decisions based on business rather than technical concerns. For this reason, many of the details are simplified or omitted compared to their equivalents (where they exist) in ISO 19440:2020.

Compared to ISO 19440:2020, SML employs fewer constructs and has a simpler structure. The SML can be considered as a derivation (but not a formal specialization) of the more general modelling language proposed in ISO 19440:2020. The modelling constructs of this proposed Technical Report are complementary to those constructs and support the design and implementation of future enterprise systems providing extended products (products + services) to the market.

NOTE Where SML constructs have the same name as those in IS19440, their meaning is the same, but their attributes are simplified (and sometimes rephrased) to include only those relevant to service modelling.

This document specifies a Service Modelling Language defined according to a Model Driven Service Engineering Architecture (MDSEA), to support the design and implementation of the service system in a virtual manufacturing enterprise environment. It also specifies a set of constructs for a Service Modelling Language.

Five annexes are provided addressing the basics concepts of service modelling, service modelling languages, tools and MDSEA, an example of service modelling at BSM level, industrial pilots to validate the SML and the progression between MDSEA levels.

The MDSEA is derived from [1] with necessary adaptation and extension to cover the modelling of service (and its system) in its most general forms. The modelling language addressed in this document is specified only at the Business Service Modelling (BSM) level of MDSEA.

# 1 Scope

This document specifies constructs for modelling and specifying product-related service systems in general business terms, recognising the service environment and the product lifecycle. The constructs and their meta-model are consistent with the Model Driven Service Engineering Architecture (MDSEA). They are intended for use by business users to address their business concerns and decision-making, and by systems engineers and IT/researchers using a model-driven engineering approach in the design, development and deployment of service systems in Virtual Manufacturing Enterprises (VMEs), business ecosystems and other application areas.

# 2 Normative references

There are no normative references in this document.

# 3 Terms, definitions, abbreviated terms and construct labels

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 https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

## 3.1 Terms and definitions

**3.1.1**
**construct-based modelling language**
set of constructs and rules for valid groupings, which define the syntax of the modelling language

**3.1.2**
**construct template**
common structure that allows the identification and description of distinct modelling language constructs and the assignment of their properties

**3.1.3**
**extended product**
product enriched with associated product related services

**3.1.4**
**manufacturing service ecosystem**
manufacturing system of products bundled with associated services

**3.1.5**
**service modelling language**
set of constructs and rules for valid groupings of enterprise services, which define the syntax of the modelling language

**3.1.6**
**servitization**
process in a manufacturing enterprise to augment the value of products with services to better satisfy customer needs and sustainability

[SOURCE: ISO 19440:2020, modified]