IEC TR 61850-7-6

Edition 1.0 2019-01

TECHNICAL REPORT

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Communication networks and systems for power utility automation – Part 7-6: Guideline for definition of Basic Application Profiles (BAPs) using IEC 61850

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CONTENTS

FOREWORD 6
INTRODUCTION 8
1 Scope 9
2 Normative references 9
3 Terms and definitions 10
4 Methodology for profiling 11
4.1 General 11
4.2 IEC 61850 profiling concept 12
4.2.1 General 12
4.2.2 IEC 61850 profile definition 13
4.3 Basic Application Profiles (BAPs) 14
4.4 Basic Application Interoperability Profiles (BAIOPs) 16
4.5 Process from a use case to interoperability on SGAM function layer 18
4.6 Managing profiles 20
4.7 Implementation of BAPs in real projects 20
Annex A (informative) Example for BAP of distributed automation function “reverse blocking” using BAP template 21
A.1 Functional description 21
A.2 Description of use case and associated roles/actors 23
A.2.1 List of roles / actors 23
A.2.2 Use case 23
A.2.3 Sequence diagram of typical interactions 24
A.3 Logical architecture 25
A.4 Allocation variants (conditional) 25
A.5 Functional variants 25
A.5.1 Core functional variants 25
A.5.2 Noncore functional variants 25
A.6 Performance requirements 26
A.6.1 Functional related 26
A.6.2 Service related 26
A.7 Description of data model per actor 26
A.7.1 General 26
A.7.2 PTOC for blocked function (infeed bay) 27
A.7.3 PTOC for blocking function 1 to n (outflow bay(s)) 28
A.7.4 Monitoring 28
A.8 Communication services 29
A.9 Device related requirements (conditional) – Test behaviour 29
A.10 Engineering tool related requirements 29
A.11 Naming rules 29
A.12 Capabilities for testing 29
Annex B (informative) Example for BAP of “condition monitoring diagnosis functions of on-load tap changer” using BAP template 30
B.1 Functional description 30
B.2 Description of use case and associated roles/actors 32
B.2.1 List of roles / actors 32
B.2.2 Use case 33
B.2.3 Sequence diagram of typical interactions 34

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(standards.iteh.ai)
IEC TR 61850-7-6:2019
https://standards.iteh.ai/catalog/standards/sist/bb06c3ec-a830-45ea-8589-da5f3475e34a/iec-tr-61850-7-6-2019

B.3 Logical Architecture 37
B.3.1 Overview 37
B.3.2 Monitoring operation property 38
B.3.3 Monitoring operation counts 38
B.3.4 Monitoring contact abrasion 39
B.3.5 Monitoring LTC oil temperature and flow 39
B.3.6 Monitoring operation of oil filter unit 40
B.4 Allocation variants (conditional) 40
B.5 Functional variants 40
B.6 Performance requirements 40
B.6.1 Functional related 40
B.6.2 Service related 40
B.7 Description of data model per actor 41
B.7.1 General 41
B.7.2 SLTC 41
B.7.3 YLTC 44
B.7.4 TTRQ 44
B.7.5 TCTR 44
B.7.6 SIML 45
B.7.7 TTMP 45
B.7.8 KFIL 46
B.8 Communication services 46
B.9 Device related requirements (conditional) 46
B.10 Engineering tool related requirements 46
B.11 Naming rules 46
B.12 Capabilites for testing 46
Annex C (informative) Example for BAP of protection function “line distance protection” using BAP template 47
C.1 Functional description 47
C.2 Description of use case and associated roles/actors 47
C.2.1 List of roles / actors 47
C.2.2 Use case 48
C.2.3 Sequence diagram of typical interactions 49
C.3 Logical architecture 50
C.4 Allocation variants (conditional) 50
C.5 Functional variants 50
C.5.1 Core functional variants 50
C.5.2 Noncore functional variants (different features for testing) 51
C.6 Performance requirements) 51
C.6.1 Functional related 51
C.6.2 Service related 51
C.7 Description of data model per actor 52
C.8 Communication services 54
C.8.1 General 54
C.8.2 Variant FA: 54
C.8.3 Variant FB: 55
C.9 Device related requirements (conditional) 55
C.9.1 Degraded operation behaviour 55
C.10 Engineering tool related requirements 56

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(standards.iteh.ai)
IEC TR 61850-7-6:2019
https://standards.iteh.ai/catalog/standards/sist/bb06c3ec-a830-45ea-8589-da5b475e34a/iec-tr-61850-7-6-2019

C.11 Naming rules 56
C.12 Capabilites for testing 56
Annex D (informative) Example of BAIOP for BAP reverse blocking (without process bus) 57
D.1 General 57
D.2 Test description 57
D.2.1 General 57
D.2.2 Normal sequence of reverse blocking 58
D.2.3 Functional description of test environment 60
D.2.4 Test reverse blocking – role blocking (without output to process) 60
D.2.5 Test reverse blocking – role blocked 62
Annex E (informative) Example of BAIOP for BAP of “condition monitoring diagnosis functions of on-load tap changer” 65
E.1 General 65
E.2 Test description 65
E.2.1 Overview 65
E.2.2 Sequence of monitoring the motor drive current value 66
Bibliography 68

Figure 1 – Stakeholders collaborate in user groups to create a common IOP profile 12
Figure 2 – Framework for profiling IEC 61850 13
Figure 3 – Aggregating BAPs 16
Figure 4 – Framework for testing a profile 18
Figure 5 – Relation between BAP and SGAM interoperability 19
Figure 6 – Device features covered by profiles depending on compatibility levels according to IEC Technical Committee 65, Industrial-process measurement, control and automation 19
Figure 7 – BAPs and BAIOPs as building blocks for user/project specific implementation and testing 20
Figure A.1 – Behaviour in the event of faults on an outflow bay 21
Figure A.2 – Behaviour in the event of busbar faults 22
Figure A.3 – List of roles / actors reverse blocking 23
Figure A.4 – Use case reverse blocking 23
Figure A.5 – Sequence diagram reverse blocking 24
Figure A.6 – Logical architecture reverse blocking 25
Figure B.1 – Structure of LTC 30
Figure B.2 – Overview of system configuration of LTC condition monitoring 31
Figure B.3 – Typical system configuration of LTC condition monitoring system 31
Figure B.4 – Use cases 33
Figure B.5 – Sequence diagram for monitoring operation property 34
Figure B.6 – Sequence diagram for monitoring operation counts 35
Figure B.7 – Sequence diagram for monitoring contact abrasion 35
Figure B.8 – Sequence diagram for monitoring oil temperature and flow 36
Figure B.9 – Sequence diagram for monitoring operation of oil filter unit 36
Figure B.10 – Logical architecture 37
Figure B.11 – Logical architecture for monitoring operation property 38

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IEC TR 61850-7-6:2019
https://standards.iteh.ai/catalog/standards/sist/bb06c3ec-a830-45ea-8589-da5b475e54a/iec-tr-61850-7-6-2019

Figure B.12 – Logical architecture for monitoring operation counts 38
Figure B.13 – Logical architecture for monitoring contact abrasion 39
Figure B.14 – Logical architecture for monitoring LTC oil temperature and flow 39
Figure B.15 – Logical architecture for monitoring operation of oil filter unit 40
Figure C.1 – Use case distance protection 48
Figure C.2 – Sequence diagram distance protection 49
Figure C.3 – Logical architecture distance protection 50
Figure D.1 – Normal sequence of application function reverse blocking 58
Figure D.2 – Functional test environment 60
Figure D.3 – Test of role “blocking” 60
Figure D.4 – Test of role “blocked” 62
Figure E.1 – Sequence of monitoring the motor drive current value 66

Table A.1 – Selection of data attributes for PTOC of actor blocked 27
Table A.2 – Selection of data attributes for PTOC of actor blocking 28
Table A.3 – Selection of data attributes of PTOC for monitoring 28
Table B.1 – List of actors 32
Table B.2 – Selection of data attributes of SLTC 41
Table B.3 – Selection of data attributes of YLTC 44
Table B.4 – Selection of data attributes of TTRQ 44
Table B.5 – Selection of data attributes of TCTR 44
Table B.6 – Selection of data attributes of SIML 45
Table B.7 – Selection of data attributes of TTMP 45
Table B.8 – Selection of data attributes of KFIL 46
Table C.1 – Description of data model 52
Table C.2 – Services for variant FA 54
Table C.3 – Services for variant FB 55
Table C.4 – Degraded operation behaviours 56
Table D.1 – Description of normal operation of application function reverse blocking 58
Table D.2 – Description of sequence for test of role “blocking” 61
Table D.3 – Description of sequence for test of role “blocked” 63
Table E.1 – Description of the sequence of monitoring the motor drive current value 67

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-6: Guideline for definition of Basic Application Profiles (BAPs) using IEC 61850

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International Standard IEC 61850 has been prepared IEC technical committee 57: Power systems management and associated information exchange.

The text of this Technical Report is based on the following documents:

Draft TR	Report on voting
57/1986/DTR	57/2034/RVDTR

Full information on the voting for the approval of this Technical Report 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 61850 series, published under the general title *Communication networks and systems for power utility automation*, can be found on the IEC website.

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INTRODUCTION

The IEC 61850 series of standards offers a broad basis for communication networks and systems in power utility automation. Due to its broad coverage of power utility automation applications, it is up to the standard's user (utility, vendor, system integrator, etc.) to pick and choose specific options from the standard in order to meet the requirements of the intended objective. As a consequence, implementations of IEC 61850 represent specific subsets of the standard.

In the context of standards the term "profile" is commonly used to describe a subset of an entity (e.g. standard, model, rules).

Accordingly an IEC 61850 standard profile contains a selection of data models (mandatory elements), applicable communication services and relevant engineering conventions (based on the Substation Configuration Language SCL defined in IEC 61850-6) for an application function of a specific use case in the domain of power utility automation.

Depending on the scope and objective different profile types can be distinguished:

- User profile – defined subset that is valid for a specific user / organization (e.g. utility)
- Product / device profile – implemented subset in a specific vendor product /device
- Domain profile – defined subset for a specific domain and relevant use cases (e.g. monitoring of substation)
- Application / function profile – subset covering a specific application or function (e.g. substation interlocking)

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These profile types target the reduction of complexity and facilitation of interoperability for their specific scope and during engineering and device / substation lifetime. In order to achieve both these goals, a properly defined profile and appropriate implementations (processes, tools, products) that support the profile are required.

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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-6: Guideline for definition of Basic Application Profiles (BAPs) using IEC 61850

1 Scope

This part of IEC 61850, which is a technical report, is focused on building application / function profiles and specifies a methodology to define Basic Application Profiles (BAPs). These Basic Application Profiles provide a framework for interoperable interaction within or between typical substation automation functions. BAPs are intended to define a subset of features of IEC 61850 in order to facilitate interoperability in a modular way in practical applications.

It is the intention of this document to provide a common and generic way to describe the functional behaviour of a specific application function in the domain of power utility automation systems as a common denominator of various possible interpretations/implementations of using IEC 61850.

The guidelines in this document are based on the functional definitions of

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- IEC 61850-5, Communication requirements for functions and device models, which gives a comprehensive overview of all application functions needed in a state-of-the-art substation automation implementation.
- IEC TR 61850-7-500, Basic information and communication structure – Use of logical nodes for modelling application functions and related concepts and guidelines for substations, which illustrates and explains application functions for the substation/protection domain of Logical Nodes in modelling simple and complex functions, to improve common understanding in modelling and data exchange, and finally to lead to interoperable implementations.
- IEC TR 61850-90-3, Using IEC 61850 for condition monitoring diagnosis and analysis, which gives use cases and data modelling for condition monitoring diagnosis and analysis functions for substation and power grid facilities.

This document does not describe the applications and respective implementation requirements; the focus is on their typical information exchange including data and communication services and engineering conventions.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61850-5:2013, *Communication networks and systems for power utility automation - Part 5: Communication requirements for functions and device models*

IEC 61850-7-2, *Communication networks and systems for power utility automation - Part 7-2: Basic information and communication structure - Abstract communication service interface (ACSI)*

IEC TR 61850-90-3, *Communication networks and systems for power utility automation - Part 90-3: Using IEC 61850 for condition monitoring diagnosis and analysis*

IEC TR 62361-103:2018, *Power systems management and associated information exchange - Interoperability in the long term - Part 103: Standard profiling*

3 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
Basic Application Profile
BAP
user/user group agreed-upon selection and interpretation of relevant parts of the applicable standards and specifications, intended to be used as building blocks for interoperable user/project specifications

Note 1 to entry: BAPs must not have options; all selected criteria are required to facilitate interoperability. For implementation in projects, BAPs might be extended or refined to meet the user specific requirements.

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[SOURCE: CEN-CENELEC-ETSI SG-CG Report on Interoperability CEN_9762_CLC_9624 – Clause 12.1, Terms and definitions]

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3.2
Basic Application Interoperability Profile
BAIOP
interoperability test for BAPs defined by test sequences and test cases

[SOURCE: CEN-CENELEC-ETSI SG-CG Report on Interoperability CEN_9762_CLC_9624 – Clause 12.1, Terms and definitions]

3.3
compliance
accordance of the whole implementation with specified requirements or standards

Note 1 to entry: Some requirements in the specified standards may not be implemented.

[SOURCE: CEN-CENELEC-ETSI SG-CG Report on Interoperability CEN_9762_CLC_9624 – Clause 12.1, Terms and definitions]

3.4
conformance
accordance of the implementation of a product, process or service with all specified requirements or standards

Note 1 to entry: Additional features to those in the requirements / standards may be included.

Note 2 to entry: All features of the standard/specification are implemented and in accordance, but some additional features are not covered by the standard/specification.

[SOURCE: CEN-CENELEC-ETSI SG-CG Report on Interoperability CEN_9762_CLC_9624 – Clause 12.1, Terms and definitions]

3.5
conformance test
check of data flow on communication channels in accordance with the standard conditions concerning access organization, formats and bit sequences, time synchronization, timing, signal form & level and reaction to errors

Note 1 to entry: The conformance test can be carried out and certified to the standard or to specifically described parts of the standard. The conformance test should be carried out by an ISO 9001 certified organisation or system integrator.

Note 2 to entry: Beside the ISO 9001 certification also an accreditation by an appropriate entity is required for the testing organization or system integrator to perform a conformance test.

[SOURCE: IEC 61850-4:2011, 3.17, modified (addition of Note 2 to entry)]

3.6
interoperability
ability of two or more IEDs from the same vendor, or different vendors, to exchange and use information for correct execution of the specified functions

[SOURCE: IEC 61850-2:2003, 2.85]

3.7
interoperability testing
testing performed to verify that communicating entities within a system are interoperable, i.e. they are able to exchange information in a semantically and syntactic correct way

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Note 1 to entry: During interoperability testing, entities are tested against peer entities known to be correct (profiles).

[SOURCE: CEN-CENELEC-ETSI SG-CG Report on Interoperability CEN_9762_CLC_9624 – Clause 12.1, Terms and definitions]

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3.8
profile
agreed-upon subset of derived from a specification

Note 1 to entry: A common profile is required for achieving interoperability especially in those cases when a specification could have more than one interpretation and there are probably many optional features.

[SOURCE: IEC TR 62361-103:2018, 3.11]

3.9
SGAM
Smart Grid Architecture Model, the 3D-Model for Smart Grid mappings
High level conceptual model of the Smart Grid developed by the CENELEC M/490 Reference Architecture working group describing main actors of the Smart Grid and their main interactions.

[SOURCE: CEN-CENELEC-ETSI SG-CG Report on Interoperability CEN_9762_CLC_9624 – Clause 12.1, Terms and definitions]

4 Methodology for profiling

4.1 General

In general, profiling within a standard and between standards and specifications helps to both facilitate interoperability and meet expectations of different projects where these will be implemented.

Out of this broad basis of the definitions of the IEC 61850 standard series, specific subsets (selected by vendors) are implemented in products and systems.

IEC 61850 applications can also differ dependent on user type, region and philosophy. Stakeholders officially request guidelines and tools to facilitate interoperability in projects and therefore the challenge is to find a common concept/guideline to both facilitate interoperability and meet expectations of different projects.

Flexibility of standards which were created to meet the requirements of the industry of the global world, containing many options, contradicts with the goal of interoperability of functions. If a function can be implemented in more than one way in products, the risk that those products will be unable to perform the function in an interoperable way is high. To facilitate the goal of interoperability in addition to the mandatory elements the mandatory inclusion of selected optional elements offered by the standard may be defined. That limitation of options offered by a standard is done by defining commonly agreed subsets (profiles), which might be interpreted as disadvantageous inflexibility against specific user requirements.

To facilitate the goal of interoperability, a common understanding and interpretation of the related standard and the identical use of functional elements for required layers to fulfil application functions is necessary. This can be achieved by defining profiles. They could be best provided by User Groups in the domain of substation automation. A User Group consists of interested parties, e.g. utilities, vendors, certification bodies, test labs, system integrators and regulators, see Figure 1.

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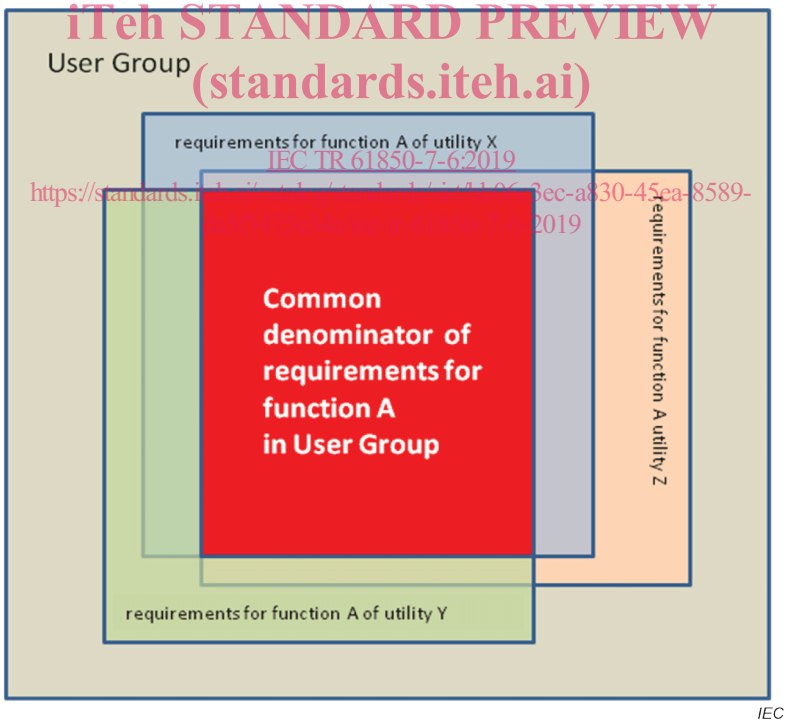


Figure 1 – Stakeholders collaborate in user groups to create a common IOP profile

IEC TR 62361-103:2018, 4.1, defines a common concept and framework for the process of profiling within the IEC.

4.2 IEC 61850 profiling concept

4.2.1 General

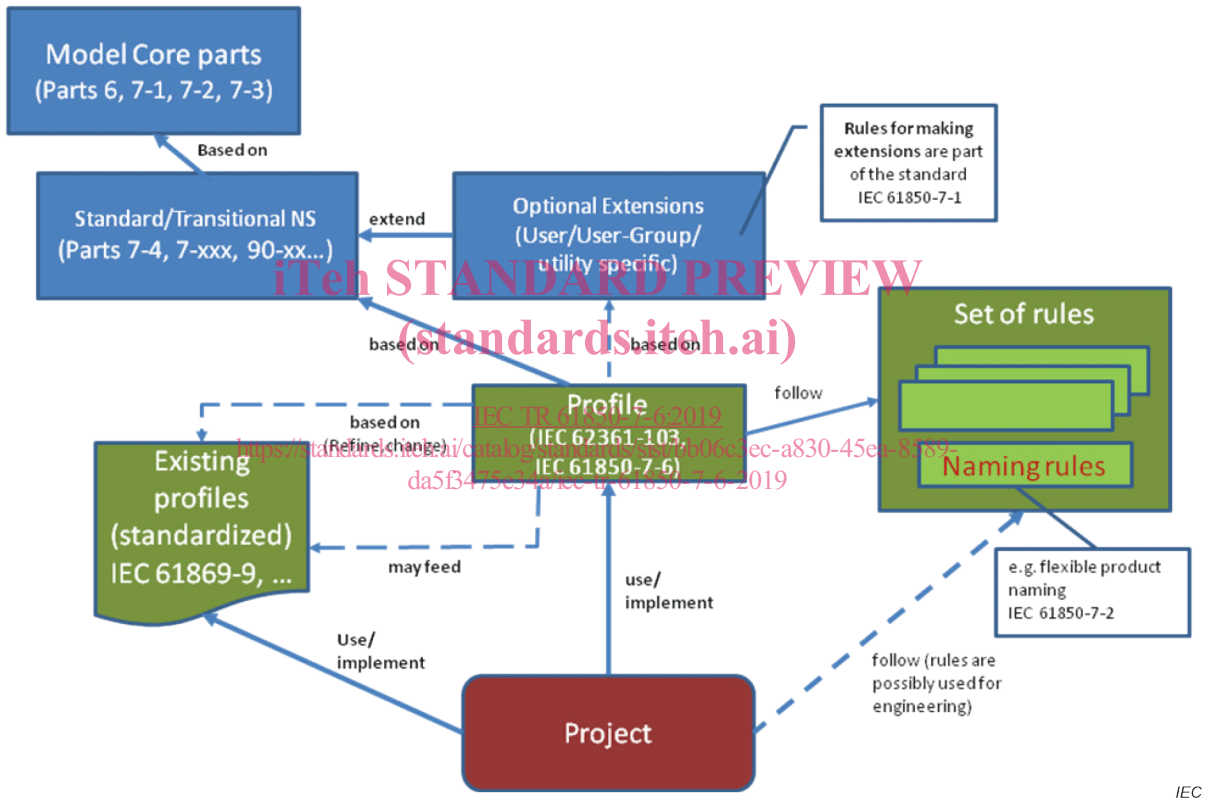
The primary goal of the IEC 61850 series is to facilitate interoperability in a modular way between subsystems and components in order to enable more or less complex system

functions. Therefore the IEC 61850 series covers specifications for functional and non-functional requirements, information and communication aspects for devices and systems as well as device and system engineering. With that the IEC 61850 series offers a broad basis for communication networks and systems in power utility automation.

Due to its broad coverage of power utility automation functions and applications, it is up to the user of the standard (utility, vendor, system integrator etc.) to pick and choose specific options offered by the standard in order to meet the requirements according to their intended project objectives. As a consequence, implementations of IEC 61850 represent specific subsets of the standard instead of covering it as a whole.

IEC 61850 profiles express (interoperability) requirements of actors' roles in a specific business context to be fulfilled by devices and systems.

4.2.2 IEC 61850 profile definition



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https://standards.iteh.ai/catalog/standards/sist/6b06c3ec-a830-45ea-8589-da5f3475c34a/iec-tr-61850-7-6-2019

Figure 2 – Framework for profiling IEC 61850

Figure 2 shows the main relationship between the different elements constituting the profiling activity of IEC 61850.

An IEC 61850 standard profile may contain a selection of data models (with mandatory and optional elements) and communication services applicable for a specific role within a detailed use case. The data models and communication services are all based on the same core parts as described in Figure 2.

It is acknowledged that a profile cannot be less demanding than the standard itself, i.e. a field or item said to be mandatory (or forbidden) by the standard shall remain mandatory (or forbidden) in a profile. The standard represents a sort of minimum base line.