

TECHNICAL REPORT



Communication networks and systems for power utility automation –
Part 80-3: Mapping to web protocols – Requirements and technical choices
(standards.iteh.ai)

[IEC TR 61850-80-3:2015](https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015)

<https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2015 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC TR 61850-80-3:2015
INTERNATIONAL STANDARD (PREVIEW)
(standards) (ch) ai

<https://standards.iteh.ai/catalog/standards/iec/360ae56995f4/iec-tr-61850-80-3-2015>

TECHNICAL REPORT



**Communication networks and systems for power utility automation –
Part 80-3: Mapping to web protocols – Requirements and technical choices**

STANDARD PREVIEW
(standards.iteh.ai)

[IEC TR 61850-80-3:2015](https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015)
<https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.200

ISBN 978-2-8322-2999-6

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references	10
3 Terms and definitions	11
4 Abbreviated terms	12
5 Main involved sub-systems and stakeholders	12
6 Requirements description	14
6.1 General.....	14
6.2 Scope of this clause.....	14
6.2.1 ACSI classes to be mapped.....	14
6.2.2 Network type	15
6.3 Requirements list.....	15
6.3.1 Transfer time	15
6.3.2 Throughput.....	15
6.3.3 Data integrity (error probability)	15
6.3.4 Reliability.....	15
6.3.5 Availability.....	15
6.3.6 Interoperability.....	16
6.3.7 Cyber security	16
6.3.8 Device size	17
6.3.9 Dynamic extension of the system.....	17
6.3.10 Sensitivity to cost or bandwidth.....	17
6.3.11 Availability of commercial and open source tools	17
6.3.12 Intellectual property	18
6.3.13 Perenniality / Stability of the solution	18
6.3.14 Request for additional resources and engineering	18
6.3.15 Simplicity and easy implementation of the communication solution	18
6.3.16 Ability to become a SCSM / Difficulty in filling the gap	18
6.3.17 One single solution for all smart grid applications	18
6.3.18 Products' time-to-market.....	18
6.3.19 Minimize standardization effort	19
7 SCSM technical description	19
7.1 Technology assessment and choice.....	19
7.2 XMPP overview.....	20
7.2.1 Principles	20
7.2.2 Address scheme	21
7.2.3 Scalability and redundancy.....	21
7.2.4 Server federation.....	22
7.2.5 Stanza example.....	22
7.2.6 Presence monitoring.....	23
7.3 Communication stack overview	23
7.4 Definition of the XML payload	25
7.5 Transport of XML payloads over XMPP.....	28
7.5.1 Mapping over XMPP overview	28

ITh STANDARD PREVIEW

(standards.iteh.ai)

IEC TR 61850-80-3:2015

http://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-

360ae56995f1/iec-tr-61850-80-3-2015

7.5.2	Rules for mapping solicited services	29
7.5.3	Mapping of unsolicited services	31
7.5.4	Usage of presence monitoring	31
7.6	Cyber security	32
7.6.1	Security with XMPP	32
7.6.2	Choice of technical solutions for security	33
7.7	Mapping synthesis	33
7.8	Synergy with existing 8-1 mapping	35
Annex A (informative) Use cases and requirements for each domain		38
A.1	Use cases for PV-inverters	38
A.1.1	Scope of this clause	38
A.1.2	Architecture overview	38
A.1.3	Use cases	39
A.2	Use cases for hydro and thermal generation	40
A.2.1	Scope of this clause	40
A.2.2	Architecture overview	40
A.2.3	Use cases	41
A.3	Use cases for wind power	43
A.3.1	Scope of this clause	43
A.3.2	Architecture overview	43
A.3.3	Use cases	46
A.4	Use cases for CHP	49
A.4.1	Scope of this clause	49
A.4.2	Architecture overview	50
A.4.3	Use cases	54
A.4.4	References for CHP domain	59
A.5	Use cases of domain Smart Customer (DR)	59
A.5.1	Scope of this clause	59
A.5.2	Architecture overview	60
A.5.3	Use cases	62
A.6	Use cases for E-Mobility	64
A.6.1	Scope of this clause	64
A.6.2	Architecture overview	64
A.6.3	Use cases	64
A.7	Use cases for VPP and Microgrid	70
A.7.1	Scope of this clause	70
A.7.2	Architecture overview	71
A.7.3	Use cases	72
A.8	Use cases for feeder automation	74
A.8.1	Scope of this clause	74
A.8.2	Architecture overview	74
A.8.3	Use cases	78
A.9	Required services and performances	79
Annex B (informative) Examples of MMS XER payloads		82
B.1	General	82
B.2	GetLogicalNodeDirectory	82
B.3	Report	88

Figure 1 – Architecture overview	13
Figure 2 – Device communicating with different trust levels	17
Figure 3 – Architecture main choices	20
Figure 4 – XMPP architecture overview	21
Figure 5 – XMPP Federation	22
Figure 6 – Example of a XMPP telegram	23
Figure 7 – Simplified communication stack	24
Figure 8 – XER encoding vs BER encoding	26
Figure 9 – ASN.1 abstract definition of MMS PDUs (extract)	27
Figure 10 – Example of XER payloads	27
Figure 11 – ACSI XML Message schema for XER payload (extract)	28
Figure 12 – XMPP architecture for IEC 61850	29
Figure 13 – XMPP using TLS and Simple Authentication and Security Layer (SASL)	32
Figure 14 – End to end security over XMPP	33
Figure 15 – Synthesis of SCSM 8-2 structure	34
Figure 16 – SCSM 8-1 and 8-2 synergy	35
Figure 17 – Control center with dual stack SCSM 8-1 / SCSM 8-2	36
Figure 18 – Gateway between SCSM 8-1 and SCSM 8-2	37
Figure A.1 – PV – Architecture overview for data connections to an industrial plant	38
Figure A.2 – PV – Architecture overview for data connections to a residential plant	39
Figure A.3 – Power plants – Typical power operator network architecture	41
Figure A.4 – Power plants – Relationship between the actors	41
Figure A.5 – Examples of the variety of topologies required/supported for wind power	44
Figure A.6 – Example of use within the wind plant	44
Figure A.7 – Example of use between the wind plant and a control center	45
Figure A.8 – Diagram of data use hierarchy levels in condition monitoring	45
Figure A.9 – Types of CHP plants	50
Figure A.10 – CHP – Example of a system architecture	51
Figure A.11 – Number of CHPs in Germany	52
Figure A.12 – CHP use cases and involved actors	53
Figure A.13 – CHP – Graphical presentation of frequency control within the European power system	55
Figure A.14 – CHP – Frequency control time characteristic	55
Figure A.15 – Smart customer – Main actors	60
Figure A.16 – Smart customer – Main elements of the smart customer domain (right column)	61
Figure A.17 – Smart customer – Logical model for customer premises communications	61
Figure A.18 – Smart customer – Communication relationships	62
Figure A.19 – E-Mobility – Architecture overview	64
Figure A.20 – Architectural picture of a microgrid	71
Figure A.21 – Architectural picture of a VPP	72
Figure A.22 – FA – Distributed architecture of a feeder automation system	75
Figure A.23 – FA – Semi-centralized architecture of a feeder automation system	76
Figure A.24 – FA – Centralized architecture of a feeder automation system	77

Table 1 – Main involved sub-systems and stakeholders	13
Table 2 – ACSI services to be mapped	24
Table 3 – MMS objects and services in use within this SCSM	25
Table 4 – Mapping synthesis.....	34
Table A.1 – Use case list	39
Table A.2 – Power plants – Use case list	42
Table A.3 – Wind – List of actors	46
Table A.4 – Wind – Use case list	47
Table A.5 – CHP – Use case list	54
Table A.6 – CHP – Other use cases not feasible with existing ACSI.....	59
Table A.7 – Smart customer – Use case list.....	63
Table A.8 – Smart customer – Other use cases not feasible with existing ACSI	63
Table A.9 – E-Mobility – Use case list	65
Table A.10 – VPP/Microgrid – Use case list	72
Table A.11 – VPP/Microgrid – Other use cases not feasible with existing ACSI.....	73
Table A.12 – FA – Use case list.....	78
Table A.13 – FA – Other use cases not feasible with existing ACSI.....	79
Table A.14 – Synthesis – Usage of modeling classes.....	79
Table A.15 – Synthesis of transfer times.....	80
Table A.16 – Synthesis – New proposed functions.....	81

[IEC TR 61850-80-3:2015](https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015)

<https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND
SYSTEMS FOR POWER UTILITY AUTOMATION –****Part 80-3: Mapping to web protocols –
Requirements and technical choices**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 61850-80-3, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
57/1584/DTR	57/1624/RVC

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 publication 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.

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.

A bilingual version of this publication may be issued at a later date.

ITEH STANDARD PREVIEW
(standards.iteh.ai)

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The usage of the IEC 61850 communication standard is largely spreading over all the domains connected to the smart grid, pushing the usage of technologies adapted to the connection of a very large number of applications and devices across the intra/internet (see related use cases in Annex A). The involved domains typically use already well-established protocols for exchanging data with IT level applications like resource planning, asset and maintenance management, etc. Therefore, it becomes imperative to provide an integration strategy that allows the integration of IEC 61850 into these various disparate protocols and information.

In this context, Web Protocols are considered the most appropriate technology for communication with backend systems and possibly field devices.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC TR 61850-80-3:2015](https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015)

<https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015>

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 80-3: Mapping to web protocols – Requirements and technical choices

1 Scope

This part of IEC 61850, which is a technical report, describes the requirements and gives an overview of the technical solution for using Web Protocols as a new communication mapping (SCSM) for the IEC 61850 standard.

NOTE The notion of Web Protocols covers here the Web Services technologies, extended by other well deployed technologies based on standards used in the IT domain (IETF, ISO, W3C, OASIS, etc.). The advantage is that due to a lot of professional knowledge and practical experiences in the IT world the risk of non-interoperable solutions in the smart grid domain will decrease.

The structure of this part of IEC 61850 illustrates a two-step approach:

- Collection of the use cases and requirements based upon emerging Smart Grid architectural considerations, taking into account the new extended scope of IEC 61850. Clause 6 proposes a synthesis of the global requirements, while the use cases of the various domains are described in Annex A. The considered domains are:
 - PV-inverters
 - Hydro and thermal generation
 - Wind power plants
 - Combined Heat and Power (CHP)
 - Smart customers
 - E-Mobility
 - Virtual Power Plants (VPP) and micro grids
 - Feeder automation
- Evaluation and selection of technologies in order to build a consistent SCSM. Clause 7 presents the future SCSM 8-2, including an overview of the main selected technology: XMPP. The following goals have been particularly considered for the definition of this SCSM:
 - Identify a single profile supporting all the services required by the domains and defined today in ACSI.
 - Cover the full life cycle of a IEC 61850 system, in collaboration with the System Management work in WG10 (from configuration, through conformance testing, down to maintenance). For this purpose, this part of IEC 61850 may recommend some changes to other parts of the IEC 61850 series such as Parts 6 and 10, etc.
 - Deploy cyber-security to ensure a secure environment (in compliance with the IEC 62351 series).
 - Propose rules for cohabitation with other mappings such as IEC 61850-8-1 and IEC 61850-9-2, and possibly recommend communication profiles depending on specific application context (pole-top equipment, inside DER, connection of DER, etc.).
 - Only the A-Profile is addressed here. Nevertheless, support of TCP/IP and UDP/IP is required for the T-Profiles.

What is not included in the study:

- Modification of objects specified in IEC 61850-7-3 and IEC 61850-7-4
- Introduction of several competing web protocols profiles

The namespace of this document is: "(Tr)IEC 61850-80-3:2015"

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *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 61850-7-3, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-4, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-8-1:2011, *Communication networks and systems for power utility automation – Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3*

IEC 62351 (all parts), *Power systems management and associated information exchange – Data and communications security*

ISO 9506 (all parts), *Industrial automation systems – Manufacturing Message Specification*

ISO/IEC 8824-1:2008, *Information technology – Abstract Syntax Notation One (ASN. 1): Specification of basic notation*

ISO/IEC 8825-1:2008, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO/IEC 8825-4:2008, *Information technology – ASN.1 encoding rules: XML Encoding Rules (XER)*

RFC 4330, *Simple Network Time Protocol (SNTP) Version 4 for IPv4, IPv6 and OSI, IETF, available at <http://www.ietf.org>*

RFC 6120, *Extensible Messaging and Presence Protocol (XMPP): Core*

RFC 6121, *Extensible Messaging and Presence Protocol (XMPP): Instant Messaging and Presence*

RFC 6122, *Extensible Messaging and Presence Protocol (XMPP): Address Format*

XEP-0198, Stream Management¹

XEP-0199, XMPP Ping²

3 Terms and definitions

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

3.1

electrical connection point

ECP

point of electrical connection between the DER source of energy (generation or storage) and any electric power system (EPS)

Note 1 to entry: Each DER (generation or storage) unit has an ECP connecting it to its local power system; groups of DER units have an ECP where they interconnect to the power system at a specific site or plant; a group of DER units plus local loads have an ECP where they are interconnected to the utility power system.

Note 2 to entry: For those ECPs between a utility EPS and a plant or site EPS, this point is identical to the point of common coupling (PCC) in IEEE 1547, *Standard for Interconnecting Distributed Resources with Electric Power Systems*.

3.2

electric power system

EPS

all installations and plant provided for the purpose of generating, transmitting and distributing electricity; particular installations, substations, lines or cables for the transmission and distribution of electricity

[SOURCE: IEC 60050-601:1985, 601-01-01, 601-01-02, modified (removal of Note to entry)]

<https://standards.iteh.ai/catalog/standards/sist/54d62d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015>

3.3

electrical network

grid

particular installations, substations, lines or cables for the transmission and distribution of electricity

Note 1 to entry: IEC 61850 also uses the following terms:

Utility Grid or Utility electrical network – this corresponds to the area EPS as defined in IEEE.

Facility Grid or Facility electrical network – this corresponds to the local EPS as defined in IEEE.

[SOURCE: IEC 60050-601:1985, 601-01-02, modified (modification of Note 1 to entry)]

3.4

point of common coupling

PCC

ECP between a utility electrical network and facility electrical network

Note 1 to entry: ECP and PCC are related to the physical connectivity of the electrical network only and are independent from application functions.

Note 2 to entry: Other terms used are POC, PUC and PGC with sometimes similar meanings. These are not further considered within IEC 61850, since ECP and PCC are sufficient.

¹ This specification defines an XMPP protocol extension for active management of an XML stream between two XMPP entities, including features for stanza acknowledgements and stream resumption.

² This specification defines an XMPP protocol extension for sending application-level pings over XML streams. Such pings can be sent from a client to a server, from one server to another, or end-to-end.

3.5

private network

network used by a unique entity mastering all the data flows, the performance seen by which is guaranteed in terms of bandwidth, throughput, transmission delay, availability, etc.

Note 1 to entry: A private network may be based on a public or shared infrastructure, as soon as the level of services can be guaranteed.

3.6

public network

network not used by a unique entity mastering all the data flows or if the performance seen by the entity using the network is not guaranteed in terms of bandwidth, throughput, transmission delay, availability, etc.

3.7

smart grid

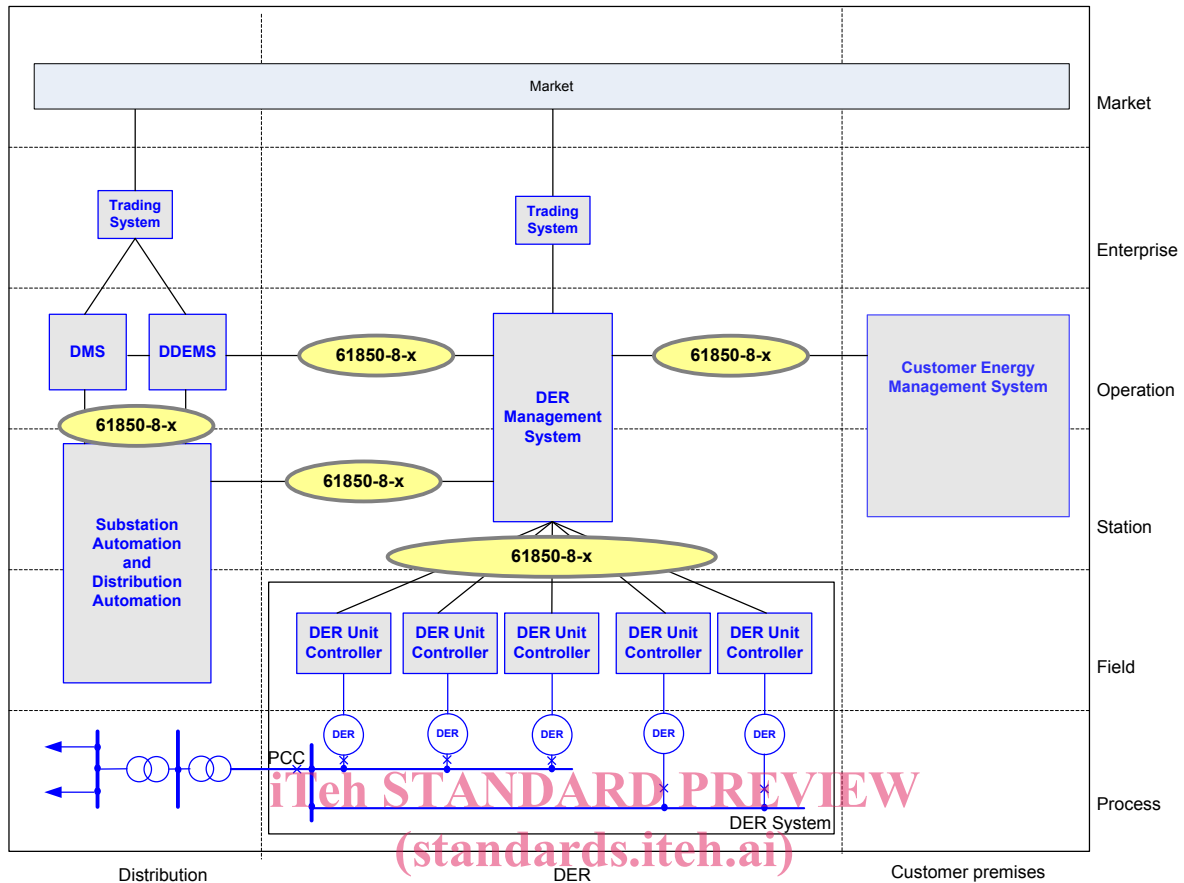
electric power system which uses communication networks for coordinating the actions of the generators and consumers connected to it in order to efficiently deliver sustainable, economic and secure electricity supplies

4 Abbreviated terms

CHP	Combined heat and power
DDEMS	DSO DER Energy Management System
DER	Distributed Energy Resource
DMS	Distribution Management System
DR	Demand Response
DSO	Distribution system operator
ECP	Electrical Connection Point
ENTSO-E	European network of transmission system operators for electricity
EPS	Electric Power System
PCC	Point of Common Coupling
SO	System operator
TSO	Transmission system operator
VPP	Virtual power plant
WAN	Wide Area Network

5 Main involved sub-systems and stakeholders

Figure 1 presents an overview of the main involved sub-systems and indicates for which interactions the new IEC 61850-8-2 web protocols mapping is intended. The sub-systems mentioned in the picture are then described in Table 1 together with other systems and stakeholders considered in this document.



IEC TR 61850-80-3:2015
Figure 1 – Architecture overview
<https://standards.itech.ai/catalog/standards/sist/94d02d7c-9a58-4131-bf62-360ae56995f4/iec-tr-61850-80-3-2015>
Table 1 – Main involved sub-systems and stakeholders

Type	Name	Description
Role	Aggregator	Offers services to aggregate energy production, storage capability and energy consumption. Acts towards the grid as one entity, including local aggregation of demand (Demand Response management) and supply (generation management). In cases where the aggregator is not a supplier, it maintains a contract with the supplier
Role	Balance responsible party	A party that has a contract proving financial security and identifying balance responsibility with the imbalance settlement responsible of the market balance area entitling the party to operate in the market. This is the only role allowing a party to buy or sell energy on a wholesale level
System	DER unit controller	Local controller for the DER unit. May control several DER local servers
System	DER local server	A processing unit interacting directly with the DER process by using proprietary communications means. Act as a communication server for the higher level systems
System	DER management system	Control Center of the VPP or Microgrid, used for monitoring and controlling the various sub-systems that are registered as participant in the VPP. Provides ancillary and balancing services to DSO
Role	DER operator	Any natural or legal person operating a DER plant (often this is either the plant owner or the DSO)
Role	DER owner	Any natural or legal entity owning a power generating facility like e.g. CHP plants, Wind power plants, PV plants
Role	DER manufacturer	Entity in charge of designing, producing and selling DER Units. May be also in charge of the maintenance
System	DER unit	One or several devices at process level that are controlled by the same system at field level. All included devices have the same type (e.g. PV) and can be for generation purpose as well as for storage