

Communication networks and systems for power utility automation —

Part 7-420: Basic communication structure —
Distributed energy resources logical nodes

National foreword

This British Standard is the UK implementation of EN 61850-7-420:2009. It is identical to IEC 61850-7-420:2009.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© BSI 2009

ISBN 978 0 580 56442 0

ICS 33.200

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2009

Amendments issued since publication

Amd. No.	Date	Text affected
----------	------	---------------

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 61850-7-420

June 2009

ICS 33.200

English version

**Communication networks and systems for power utility automation -
Part 7-420: Basic communication structure -
Distributed energy resources logical nodes
(IEC 61850-7-420:2009)**

Systèmes et réseaux de communication
pour l'automatisation des services
de distribution d'énergie -
Partie 7-420: Structure
de communication de base -
Nœuds logiques de ressources
d'énergie distribuées
(CEI 61850-7-420:2009)

Kommunikationsnetze und -systeme
für die Automatisierung
in der elektrischen Energieversorgung -
Teil 7-420: Grundlegende
Kommunikationsstruktur -
Logische Knoten für die
dezentrale Energieversorgung
(IEC 61850-7-420:2009)

This European Standard was approved by CENELEC on 2009-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

© 2009 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 61850-7-420:2009 E

 **Documents**
Document Sharing Hub

Foreword

The text of document 57/981/FDIS, future edition 1 of IEC 61850-7-420, prepared by IEC TC 57, Power systems management and associated information exchange, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61850-7-420 on 2009-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2010-02-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2012-05-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61850-7-420:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60364-7-712	NOTE	Harmonized as HD 60364-7-712:2005 (not modified).
IEC 60870-5-101	NOTE	Harmonized as EN 60870-5-101:2003 (not modified).
IEC 60870-5-104	NOTE	Harmonized as EN 60870-5-104:2006 (not modified).
IEC 61800-4	NOTE	Harmonized as EN 61800-4:2003 (not modified).
IEC 61850	NOTE	Harmonized in EN 61850 series (not modified).
IEC 61850-6	NOTE	Harmonized as EN 61850-6:2004 (not modified).
IEC 61850-7-1	NOTE	Harmonized as EN 61850-7-1:2003 (not modified).
IEC 61850-8	NOTE	Harmonized in EN 61850-8 series (not modified).
IEC 61850-9	NOTE	Harmonized in EN 61850-9 series (not modified).
IEC 61850-10	NOTE	Harmonized as EN 61850-10:2005 (not modified).
IEC 61968	NOTE	Harmonized in EN 61968 series (not modified).
IEC 61970-301	NOTE	Harmonized as EN 61970-301:2004 (not modified).
IEC 62056	NOTE	Harmonized in EN 62056 series (not modified).
ISO/IEC 7498-1	NOTE	Harmonized as EN ISO/IEC 7498-1:1995 (not modified).

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61850-7-2	2003	Communication networks and systems in substations - Part 7-2: Basic communication structure for substation and feeder equipment - Abstract communication service interface (ACSI)	EN 61850-7-2	2003
IEC 61850-7-3	2003	Communication networks and systems in substations - Part 7-3: Basic communication structure for substation and feeder equipment - Common data classes	EN 61850-7-3	2003
IEC 61850-7-4	2003	Communication networks and systems in substations - Part 7-4: Basic communication structure for substation and feeder equipment - Compatible logical node classes and data classes	EN 61850-7-4	2003
IEC 61850-7-410	- ¹⁾	Communication networks and systems for power utility automation - Part 7-410: Hydroelectric power plants - Communication for monitoring and control	EN 61850-7-410	2007 ²⁾
ISO 4217	- ¹⁾	Codes for the representation of currencies and funds	-	-

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
1 Scope.....	12
2 Normative references	12
3 Terms, definitions and abbreviations	13
3.1 Terms and definitions	13
3.2 DER abbreviated terms	18
4 Conformance.....	20
5 Logical nodes for DER management systems.....	20
5.1 Overview of information modelling (informative)	20
5.1.1 Data information modelling constructs	20
5.1.2 Logical devices concepts.....	21
5.1.3 Logical nodes structure	22
5.1.4 Naming structure	22
5.1.5 Interpretation of logical node tables	23
5.1.6 System logical nodes LN Group: L (informative)	24
5.1.7 Overview of DER management system LNs	27
5.2 Logical nodes for the DER plant ECP logical device	29
5.2.1 DER plant electrical connection point (ECP) logical device (informative)	29
5.2.2 LN: DER plant corporate characteristics at the ECP Name: DCRP.....	31
5.2.3 LN: Operational characteristics at ECP Name: DOPR.....	31
5.2.4 LN: DER operational authority at the ECP Name: DOPA.....	32
5.2.5 LN: Operating mode at ECP Name: DOPM	33
5.2.6 LN: Status information at the ECP Name: DPST	34
5.2.7 LN: DER economic dispatch parameters Name: DCCT	35
5.2.8 LN: DER energy and/or ancillary services schedule control Name: DSCC	36
5.2.9 LN: DER energy and/or ancillary services schedule Name: DSCH	37
5.3 Logical nodes for the DER unit controller logical device	38
5.3.1 DER device controller logical device (informative)	38
5.3.2 LN: DER controller characteristics Name: DRCT.....	38
5.3.3 LN: DER controller status Name: DRCS	39
5.3.4 LN: DER supervisory control Name: DRCC.....	40
6 Logical nodes for DER generation systems.....	42
6.1 Logical nodes for DER generation logical device	42
6.1.1 DER generator logical device (informative)	42
6.1.2 LN: DER unit generator Name: DGEN	42
6.1.3 LN: DER generator ratings Name: DRAT	44
6.1.4 LN: DER advanced generator ratings Name: DRAZ	45
6.1.5 LN: Generator cost Name: DCST.....	46
6.2 Logical nodes for DER excitation logical device.....	47
6.2.1 DER excitation logical device (informative)	47
6.2.2 LN: Excitation ratings Name: DREX.....	47
6.2.3 LN: Excitation Name: DEXC	48
6.3 Logical nodes for DER speed/frequency controller	49

6.3.1	Speed/frequency logical device (informative)	49
6.3.2	LN: Speed/Frequency controller Name: DSFC	49
6.4	Logical nodes for DER inverter/converter logical device	50
6.4.1	Inverter/converter logical device (informative)	50
6.4.2	LN: Rectifier Name: ZRCT	51
6.4.3	LN: Inverter Name: ZINV	53
7	Logical nodes for specific types of DER	55
7.1	Logical nodes for reciprocating engine logical device	55
7.1.1	Reciprocating engine description (informative)	55
7.1.2	Reciprocating engine logical device (informative)	55
7.1.3	LN: Reciprocating engine Name: DCIP	56
7.2	Logical nodes for fuel cell logical device	57
7.2.1	Fuel cell description (informative)	57
7.2.2	Fuel cell logical device (informative)	59
7.2.3	LN: Fuel cell controller Name: DFCL	60
7.2.4	LN: Fuel cell stack Name: DSTK	61
7.2.5	LN: Fuel processing module Name: DFPM	62
7.3	Logical nodes for photovoltaic system (PV) logical device	63
7.3.1	Photovoltaic system description (informative)	63
7.3.2	Photovoltaics system logical device (informative)	65
7.3.3	LN: Photovoltaics module ratings Name: DPVM	67
7.3.4	LN: Photovoltaics array characteristics Name: DPVA	68
7.3.5	LN: Photovoltaics array controller Name: DPVC	69
7.3.6	LN: Tracking controller Name: DTRC	70
7.4	Logical nodes for combined heat and power (CHP) logical device	72
7.4.1	Combined heat and power description (informative)	72
7.4.2	Combined heat and power logical device (informative)	75
7.4.3	LN: CHP system controller Name: DCHC	76
7.4.4	LN: Thermal storage Name: DCTS	77
7.4.5	LN: Boiler Name: DCHB	78
8	Logical nodes for auxiliary systems	78
8.1	Logical nodes for fuel system logical device	78
8.1.1	Fuel system logical device (informative)	78
8.1.2	LN: Fuel characteristics Name: MFUL	80
8.1.3	LN: Fuel delivery system Name: DFLV	80
8.2	Logical nodes for battery system logical device	81
8.2.1	Battery system logical device (informative)	81
8.2.2	LN: Battery systems Name: ZBAT	82
8.2.3	LN: Battery charger Name: ZBTC	83
8.3	Logical node for fuse device	84
8.3.1	Fuse logical device (informative)	84
8.3.2	LN: Fuse Name: XFUS	84
8.4	Logical node for sequencer	85
8.4.1	Sequencer logical device	85
8.4.2	LN: Sequencer Name: FSEQ	85
8.5	Logical nodes for physical measurements	86
8.5.1	Physical measurements (informative)	86
8.5.2	LN: Temperature measurements Name: STMP	86

8.5.3	LN: Pressure measurements Name: MPRS	87
8.5.4	LN: Heat measured values Name: MHET	87
8.5.5	LN: Flow measurements Name: MFLW	88
8.5.6	LN: Vibration conditions Name: SVBR	90
8.5.7	LN: Emissions measurements Name: MENV	90
8.5.8	LN: Meteorological conditions Name: MMET	91
8.6	Logical nodes for metering	91
8.6.1	Electric metering (informative)	91
9	DER common data classes (CDC)	92
9.1	Array CDCs	92
9.1.1	E-Array (ERY) enumerated common data class specification	92
9.1.2	V-Array (VRY) visible string common data class specification	92
9.2	Schedule CDCs	93
9.2.1	Absolute time schedule (SCA) settings common data class specification	93
9.2.2	Relative time schedule (SCR) settings common data class specification	94
	Annex A (informative) Glossary	96
	Bibliography	98

Figure 1	– Example of a communications configuration for a DER plant	10
Figure 2	– IEC 61850 modelling and connections with CIM and other IEC TC 57 models	11
Figure 3	– Information model hierarchy	21
Figure 4	– Example of relationship of logical device, logical nodes, data objects, and common data classes	22
Figure 5	– Overview: Conceptual organization of DER logical devices and logical nodes	28
Figure 6	– Illustration of electrical connection points (ECP) in a DER plant	29
Figure 7	– Inverter / converter configuration	50
Figure 8	– Example of a reciprocating engine system (e.g. Diesel Gen-Set)	55
Figure 9	– Example of LNs in a reciprocating engine system	56
Figure 10	– Fuel cell – Hydrogen/oxygen proton-exchange membrane fuel cell (PEM)	58
Figure 11	– PEM fuel cell operation	58
Figure 12	– Example of LNs used in a fuel cell system	59
Figure 13	– Example: One line diagram of an interconnected PV system	64
Figure 14	– Schematic diagram of a large PV installation with two arrays of several sub-arrays	65
Figure 15	– Example of LNs associated with a photovoltaics system	66
Figure 16	– Two examples of CHP configurations	73
Figure 17	– CHP unit includes both domestic hot water and heating loops	74
Figure 18	– CHP unit includes domestic hot water with hybrid storage	74
Figure 19	– CHP unit includes domestic hot water without hybrid storage	74
Figure 20	– Example of LNs associated with a combined heat and power (CHP) system	75

Table 1 – Interpretation of logical node tables.....	23
Table 2 – LPHD class	25
Table 3 – Common LN class	26
Table 4 – LLN0 class	27
Table 5 – DER plant corporate characteristics at the ECP, LN (DCRP)	31
Table 6 – Operational characteristics at the ECP, LN (DOPR)	32
Table 7 – DER operational authority at the ECP, LN (DOPA)	33
Table 8 – Operating mode at the ECP, LN (DOPM).....	34
Table 9 – Status at the ECP, LN (DPST).....	35
Table 10 – DER Economic dispatch parameters, LN (DCCT)	35
Table 11 – DER energy schedule control, LN (DSCC).....	36
Table 12 – DER Energy and ancillary services schedule, LN (DSCH)	37
Table 13 – DER controller characteristics, LN DRCT	38
Table 14 – DER controller status, LN DRCS	39
Table 15 – DER supervisory control, LN DRCC.....	40
Table 16 – DER unit generator, LN (DGEN)	42
Table 17 – DER Basic Generator ratings, LN (DRAT).....	44
Table 18 – DER advanced generator ratings, LN (DRAZ).....	46
Table 19 – Generator cost, LN DCST	47
Table 20 – Excitation ratings, LN (DREX)	47
Table 21 – Excitation, LN (DEXC)	48
Table 22 – Speed/frequency controller, LN (DSFC).....	49
Table 23 – Rectifier, LN (ZRCT).....	51
Table 24 – Inverter, LN (ZINV).....	53
Table 25 – Reciprocating engine, LN (DCIP).....	57
Table 26 – Fuel cell controller, LN (DFCL)	60
Table 27 – Fuel cell stack, LN (DSTK)	61
Table 28 – Fuel cell processing module, LN (DFPM).....	62
Table 29 – Photovoltaic module characteristics, LN (DPVM)	67
Table 30 – Photovoltaic array characteristics, LN (DPVA)	68
Table 31 – Photovoltaic array controller, LN (DPVC).....	69
Table 32 – Tracking controller, LN (DTRC)	70
Table 33 – CHP system controller, LN (DCHC)	76
Table 34 – CHP thermal storage, LN (DCTS)	77
Table 35 – CHP Boiler System, LN (DCHB)	78
Table 36 – Fuel types	79
Table 37 – Fuel characteristics, LN (MFUL)	80
Table 38 – Fuel systems, LN (DFLV)	81
Table 39 – Battery systems, LN (ZBAT)	82
Table 40 – Battery charger, LN (ZBTC).....	83
Table 41 – Fuse, LN (XFUS).....	84
Table 42 – Sequencer, LN (FSEQ).....	85
Table 43 – Temperature measurements, LN (STMP).....	86

Table 44 – Pressure measurements, LN (MPRS)	87
Table 45 – Heat measurement, LN (MHET).....	88
Table 46 – Flow measurement, LN (MFLW)	89
Table 47 – Vibration conditions, LN (SVBR).....	90
Table 48 – Emissions measurements, LN (MENV)	91
Table 49 – E-Array (ERY) common data class specification	92
Table 50 – V-Array (VRY) common data class specification	92
Table 51 – Schedule (SCA) common data class specification	93
Table 52 – Schedule (SCR) common data class specification	94

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION ±

Part 7-420: Basic communication structure ± Distributed energy resources logical nodes

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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.

International Standard IEC 61850-7-420 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The text of this standard is based on the following documents:

FDIS	Report on voting
57/981/FDIS	57/988/RVD

Full information on the voting for the approval of this standard 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.

In Clauses 5 to 8 of this document, each subclause contains an initial informative clause, followed by normative clauses. Specifically, any subclause identified as informative is informative; any clause with no identification is considered normative.

A list of all parts of the IEC 61850 series, 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 maintenance result date indicated on the IEC web site 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.

INTRODUCTION

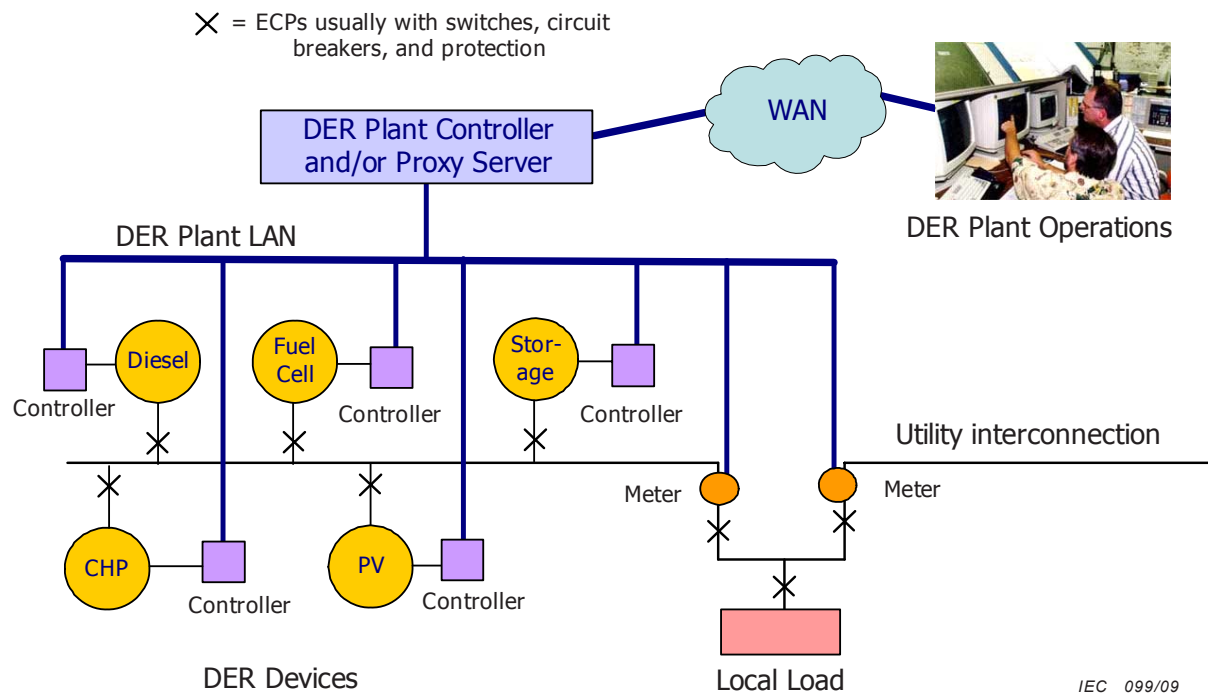
Increasing numbers of DER (distributed energy resources) systems are being interconnected to electric power systems throughout the world. As DER technology evolves and as the impact of dispersed generation on distribution power systems becomes a growing challenge - and opportunity, nations worldwide are recognizing the economic, social, and environmental benefits of integrating DER technology within their electric infrastructure.

The manufacturers of DER devices are facing the age-old issues of what communication standards and protocols to provide to their customers for monitoring and controlling DER devices, in particular when they are interconnected with the electric utility system. In the past, DER manufacturers developed their own proprietary communication technology. However, as utilities, aggregators, and other energy service providers start to manage DER devices which are interconnected with the utility power system, they are finding that coping with these different communication technologies present major technical difficulties, implementation costs, and maintenance costs. Therefore, utilities and DER manufacturers recognize the growing need to have one international standard that defines the communication and control interfaces for all DER devices. Such standards, along with associated guidelines and uniform procedures would simplify implementation, reduce installation costs, reduce maintenance costs, and improve reliability of power system operations.

The logical nodes in this document are intended for use with DER, but may also be applicable to central-station generation installations that are comprised of groupings of multiple units of the same types of energy conversion systems that are represented by the DER logical nodes in this document. This applicability to central-station generation is strongest for photovoltaics and fuel cells, due to their modular nature.

Communications for DER plants involve not only local communications between DER units and the plant management system, but also between the DER plant and the operators or aggregators who manage the DER plant as a virtual source of energy and/or ancillary services. This is illustrated in Figure 1.

Example of a Communications Configuration for a DER Plant



Key

- CHP combined heat and power
- WAN wide area network
- DER distributed energy resources
- PV photovoltaics
- LAN local area network

Figure 1 ± Example of a communications configuration for a DER plant

In basic terms, “communications” can be separated into four parts:

- information modelling (the types of data to be exchanged – nouns),
- services modelling (the read, write, or other actions to take on the data – verbs),
- communication protocols (mapping the noun and verb models to actual bits and bytes),
- telecommunication media (fibre optics, radio systems, wireless systems, and other physical equipment).

This document addresses only the IEC 61850 information modelling for DER. Other IEC 61850 documents address the services modelling (IEC 61850-7-2) and the mapping to communication protocols (IEC 61850-8-x). In addition, a systems configuration language (SCL) for DER (IEC 61850-6-x) would address the configuration of DER plants.

The general technology for information modelling has developed to become well-established as the most effective method for managing information exchanges. In particular, the IEC 61850-7-x information models for the exchange of information within substations have become International Standard. Many of the components of this standard can be reused for information models of other types of devices.

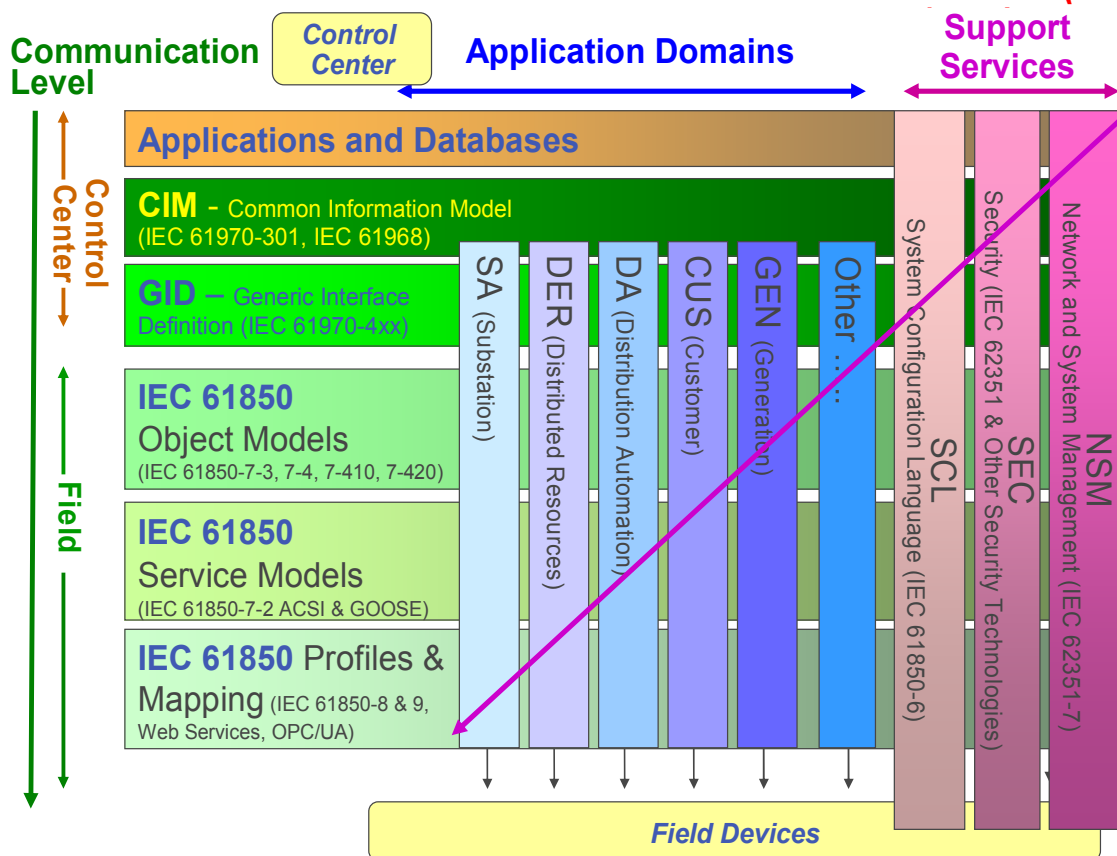
In addition to the IEC 61850 standards, IEC TC 57 has developed the common information model (CIM) that models the relationships among power system elements and their

information elements so that these relationships can be communicated across systems. Although this standard does not address these CIM relationships for DER, it is fully compatible with the CIM concepts.

The interrelationship between IEC TC 57 modelling standards is illustrated in Figure 2. This illustration shows as horizontal layers the three components to an information exchange model for retrieving data from the field, namely, the communication protocol profiles, the service models, and the information models. Above these layers is the information model of utility-specific data, termed the common information model (CIM), as well as all the applications and databases needed in utility operations. Vertically, different information models are shown:

- substation automation (IEC 61850-7-4),
- large hydro plants (IEC 61850-7-410),
- distributed energy resources (DER) (IEC 61850-7-420),
- distribution automation (under development),
- advanced metering infrastructure (as pertinent to utility operations) (pending).

IEC 61850 Models and the Common Information Model (CIM)



IEC 100/09

Figure 2 ± IEC 61850 modelling and connections with CIM and other IEC TC 57 models

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION ±

Part 7-420: Basic communication structure ± Distributed energy resources logical nodes

1 Scope

This International Standard defines the IEC 61850 information models to be used in the exchange of information with distributed energy resources (DER), which comprise dispersed generation devices and dispersed storage devices, including reciprocating engines, fuel cells, microturbines, photovoltaics, combined heat and power, and energy storage.

The IEC 61850 DER information model standard utilizes existing IEC 61850-7-4 logical nodes where possible, but also defines DER-specific logical nodes where needed.

2 Normative references

The following referenced documents are indispensable for the application 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 61850-7-2:2003, *Communication networks and systems in substations ± Part 7-2: Basic communication structure for substations and feeder equipment ± Abstract communication service interface (ACSI)* ¹⁾

IEC 61850-7-3:2003, *Communication networks and systems in substations ± Part 7-3: Basic communication structure for substations and feeder equipment ± Common data classes* ¹⁾

IEC 61850-7-4:2003, *Communication networks and systems in substations ± Part 7-4: Basic communication structure for substations and feeder equipment ± Compatible logical node classes and data classes* ¹⁾

IEC 61850-7-410, *Communication networks and systems for power utility automation ± Part 7-410: Hydroelectric power plants ± Communication for monitoring and control*

ISO 4217, *Codes for the representation of currencies and funds*

¹⁾ A new edition of this document is in preparation.

3 Terms, definitions and abbreviations

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

3.1 Terms and definitions

3.1.1

ambient temperature

temperature of the medium in the immediate vicinity of a device

[IEC/TS 62257-8-1:2007, definition 3.15 modified]

3.1.2

combined heat and power (CHP) co-generation

production of heat which is used for non-electrical purposes and also for the generation of electric energy

[IEV 602-01-24, modified]

NOTE Conventional power plants emit the heat produced as a useless byproduct of the generation of electric energy into the environment. With combined heat and power, the excess heat is captured for domestic or industrial heating purposes or – in form of steam – is used for driving a steam turbine connected to an air-conditioner compressor. Alternatively, the production of heat may be the primary purpose of combined heat and power, whereas excess heat is used for the generation of electric energy.

3.1.3

common data class

CDC

classes of commonly used data structures which are defined in IEC 61850-7-3

3.1.4

device

material element or assembly of such elements intended to perform a required function

[IEV 151-11-20]

NOTE A device may form part of a larger device.

3.1.5

electrical connection point

ECP

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

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 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 the IEEE 1547 “*Standard for Interconnecting Distributed Resources with Electric Power Systems*”.

3.1.6

electric power system

EPS

facilities that deliver electric power to a load

[IEEE 1547]

3.1.7

event

event information

- a) something that happens in time [IEV 111-16-04]
- b) monitored information on the change of state of operational equipment [IEV 371-02-04]

NOTE In power system operations, an event is typically state information and/or state transition (status, alarm, or command) reflecting power system conditions.

3.1.8

fuel cell

- a) generator of electricity using chemical energy directly by ionisation and oxidation of the fuel [IEV 602-01-33];
- b) cell that can change chemical energy from continuously supplied reactants to electric energy by an electrochemical process [IEV 482-01-05]

3.1.9

fuel cell stack

individual fuel cells connected in series

NOTE Fuel cells are stacked to increase voltage.

[US DOE]

3.1.10

function

a computer subroutine; specifically: one that performs a calculation with variables provided by a program and supplies the program with a single result

[Merriam-Webster dictionary]

NOTE This term is very general and can often be used to mean different ideas in different contexts. However, in the context of computer-based technologies, it is used to imply software or computer hardware tasks.

3.1.11

generator

- a) energy transducer that transforms non-electric energy into electric energy [IEV 151-13-35];
- b) device that converts kinetic energy to electrical energy, generally using electromagnetic induction

The reverse conversion of electrical energy into mechanical energy is done by an electric motor, and motors and generators have many similarities. The prime mover source of mechanical energy may be a reciprocating or turbine steam engine, water falling through a hydropower turbine or waterwheel, an internal combustion engine, a wind turbine, a hand crank, or any other source of mechanical energy. [WIKI 2007-12]

3.1.12

information

- a) intelligence or knowledge capable of being represented in forms suitable for communication, storage or processing [IEV 701-01-01];
- b) knowledge concerning objects, such as facts, events, things, processes, or ideas, including concepts, that within a certain context has a particular meaning [ISO/IEC 2382-1, definition 01.01.01]

NOTE Information may be represented for example by signs, symbols, pictures, or sounds.

3.1.13

information exchange

communication process between two or more computer-based systems in order to transmit and receive information

NOTE The exchange of information between systems requires interoperable communication services.

3.1.14

insolation

solar radiation that has been received

[Merriam-Webster dictionary]

3.1.15

inverter

a) static power converter (SPC);

b) device that converts DC electricity into AC electricity, equipment that converts direct current from the array field to alternating current, the electric equipment used to convert electrical power into a form or forms of electrical power suitable for subsequent use by the electric utility

[IEC 61727:2004, definition 3.8]

NOTE Any static power converter with control, protection, and filtering functions used to interface an electric energy source with an electric utility system. Sometimes referred to as power conditioning subsystems, power conversion systems, solid-state converters, or power conditioning units.

3.1.16

irradiance

density of radiation incident on a given surface usually expressed in watts per square centimeter or square meter

[Merriam-Webster dictionary]

NOTE "Irradiance" is used when the electromagnetic radiation is incident on the surface. "Radiant exitance" or "radiant emittance" is used when the radiation is emerging from the surface. The SI units for all of these quantities are watts per square metre ($\text{W}\cdot\text{m}^{-2}$), while the cgs units are ergs per square centimeter per second ($\text{erg}\cdot\text{cm}^{-2}\cdot\text{s}^{-1}$, often used in astronomy). These quantities are sometimes called intensity, but this usage leads to confusion with radiant intensity, which has different units.

3.1.17

measured value

physical or electrical quantity, property or condition that is to be measured

[IEC 61850-7-4]

NOTE 1 Measured values are usually monitored, but may be calculated from other values. They are also usually considered to be analogue values.

NOTE 2 The result of a sampling of an analogue magnitude of a particular quantity.

3.1.18

membrane

the separating layer in a fuel cell that acts as electrolyte (a ion-exchanger) as well as a barrier film separating the gases in the anode and cathode compartments of the fuel cell

[US DOE]

3.1.19

monitor

to check at regular intervals selected values regarding their compliance to specified values, ranges of values or switching conditions

[IEV 351-22-03]

3.1.20

photovoltaic cell

device in which the photovoltaic effect is utilized

[IEV 521-04-34]

3.1.21

photovoltaic system

- a) a complete set of components for converting sunlight into electricity by the photovoltaic process, including the array and balance of system components [US DOE];
- b) a system comprises all inverters (one or multiple) and associated BOS (balance-of-system components) and arrays with one point of common coupling, described in IEC 61836 as PV power plant [IEC 61727:2004, definition 3.7]

NOTE The component list and system configuration of a photovoltaic system varies according to the application, and can also include the following sub-systems: power conditioning, energy storage, system monitoring and control and utility grid interface.

3.1.22

photovoltaics PV

of, relating to, or utilizing the generation of a voltage when radiant energy falls on the boundary between dissimilar substances (as two different semiconductors)

[Merriam-Webster dictionary]

3.1.23

point of common coupling PCC

point of a power supply network, electrically nearest to a particular load, at which other loads are, or may be, connected [IEV 161-07-15]

NOTE 1 These loads can be either devices, equipment or systems, or distinct customer's installations.

NOTE 2 In some applications, the term "point of common coupling" is restricted to public networks.

NOTE 3 The point where a local EPS is connected to an area EPS [IEEE 1547]. The local EPS may include distributed energy resources as well as load (see IEV definition which only includes load).

3.1.24

power conversion

power conversion is the process of converting power from one form into another

This could include electromechanical or electrochemical processes.

In electrical engineering, power conversion has a more specific meaning, namely converting electric power from one form to another. This could be as simple as a transformer to change the voltage of AC power, but also includes far more complex systems. The term can also refer to a class of electrical machinery that is used to convert one frequency of electrical power into another frequency.

One way of classifying power conversion systems is according to whether the input and output are alternating current (AC) or direct current (DC), thus:

DC to DC

- DC to DC converter
- Voltage stabiliser
- Linear regulator

AC to DC

- Rectifier
- Mains power supply unit (PSU)

- Switched-mode power supply
DC to AC
 - Inverter
AC to AC
 - Transformer/autotransformer
 - Voltage regulator
- [WIKI 2007-12]

3.1.25

prime mover

equipment acting as the energy source for the generation of electricity

NOTE Examples include diesel engine, solar panels, gas turbines, wind turbines, hydro turbines, battery storage, water storage, air storage, etc.

3.1.26

PV array

- a) a mechanically integrated assembly of modules or panels and support structure that forms a d.c. electricity-producing unit

An array does not include foundation, tracking apparatus, thermal control, and other such components.

- b) a mechanically and electrically integrated assembly of PV modules, and other necessary components, to form a DC power supply unit [IEC 60364-7-712:2002, definition 712.3.4]

NOTE A PV array may consist of a single PV module, a single PV string, or several parallel-connected strings, or several parallel-connected PV sub-arrays and their associated electrical components. For the purposes of this standard the boundary of a PV array is the output side of the PV array disconnecting device. Two or more PV arrays, which are not interconnected in parallel on the generation side of the power conditioning unit, shall be considered as independent PV arrays.

3.1.27

PV module

the smallest complete environmentally protected assembly of interconnected cells

[IEC/TS 62257-7-1:2006, definition 3.34]

NOTE Colloquially referred to as a "solar module".

3.1.28

PV string

a circuit of series-connected modules

[IEC/TS 62257-7-1:2006, definition 3.36]

3.1.29

reciprocating engine

piston engine

an engine in which the to-and-fro motion of one or more pistons is transformed into the rotary motion of a crankshaft

[Merriam-Webster dictionary]

NOTE The most common form of reciprocating engines is the internal combustion engine using the burning of gasoline, diesel fuel, oil or natural gas to provide pressure. In DER systems, the most common form is the diesel engine.

3.1.30

reformat

hydrocarbon fuel that has been processed into hydrogen and other products for use in fuel cells

[US DOE]

3.1.31

set point

the level or point at which a variable physiological state (as body temperature or weight) tends to stabilize

[Merriam-Webster Dictionary]

3.1.32

set point command

command in which the value for the required state of operational equipment is transmitted to a controlled station where it is stored

[IEV 371-03-11]

NOTE A setpoint is usually an analogue value which sets the controllable target for a process or sets limits or other parameters used for managing the process.

3.1.33

standard test conditions

STC

a standard set of reference conditions used for the testing and rating of photovoltaic cells and modules

The standard test conditions are:

- a) PV cell temperature of 25 °C;
- b) irradiance in the plane of the PV cell or module of 1 000 W/m²;
- c) light spectrum corresponding to an atmospheric air mass of 1,5

[IEC/TS 62257-7-1:2006, definition 3.46]

3.1.34

turbine

machine for generating rotary mechanical power from the energy in a stream of fluid

The energy, originally in the form of head or pressure energy, is converted to velocity energy by passing through a system of stationary and moving blades in the turbine.

[US DOE]

3.2 DER abbreviated terms

Clause 4 of IEC 61850-7-4 defines abbreviated terms for building concatenated data names. The following DER abbreviated terms are proposed as additional terms for building concatenated data names.

Term	Description	Term	Description
Abs	Absorbing	El	Elevation
Acc	Accumulated	Em	Emission
Act	Active, activated	Emg	Emergency
Algn	Alignment	Encl	Enclosure
Alt	Altitude	Eng	Engine
Amb	Ambient	Est	Estimated
Arr	Array	ExIm	Export/import
Aval	Available	Exp	Export
Azi	Azimuth	Forc	Forced
Bas	Base	Fuel	Fuel
Bck	Backup	Fx	Fixed
Bnd	Band	Gov	Governor
Cal	Calorie, caloric	Heat	Heat
Cct	Circuit	Hor	Horizontal
Cmpl	Complete, completed	Hr	Hour
Cmut	Commute, commutator	Hyd	Hydrogen (suggested in addition to H ₂)
Cnfg	Configuration	Id	Identity
Cntt	Contractual	Imp	Import
Con	Constant	Ind	Independent
Conn	Connected, connections	Inert	Inertia
Conv	Conversion, converted	Inf	Information
Cool	Coolant	Insol	Insolation
Cost	Cost	Isld	Islanded
Csmp	Consumption, consumed	Iso	Isolation
Day	Day	Maint	Maintenance
Db	Deadband	Man	Manual
Dc	Direct current	Mat	Material
Dct	Direct	Mdul	Module
DCV	DC voltage	Mgt	Management
Deg	Degrees	Mrk	Market
Dep	Dependent	Obl	Obligation
DER	Distributed energy resource	Off	Off
Dff	Diffuse	On	On
Drt	Derate	Ox	Oxidant
Drv	Drive	Oxy	Oxygen
ECP	Electrical connection point	Pan	Panel
Efc	Efficiency		

Term	Description	Term	Description
PCC	Point of common coupling	Snw	Snow
Perm	Permission	Srt	Short
Pk	Peak	Stab	Stabilizer
Plnt	Plant, facility	Stp	Step
Proc	Process	Thrm	Thermal
Pv	Photovoltaics	Tilt	Tilt
Qud	Quad	Tm	Time
Rad	Radiation	Trk	Track
Ramp	Ramp	Tur	Turbine
Rdy	Ready	Unld	Unload
Reg	Regulation	Util	Utility
Rng	Range	Vbr	Vibration
Rsv	Reserve	Ver	Vertical
Schd	Schedule	Volm	Volume
Self	Self	Wtr	Water (suggested in addition to H ₂ O)
Ser	Series, serial	Wup	Wake up
Slp	Sleep	Xsec	Cross-section

4 Conformance

Claiming conformance to this specification shall require the provision of a model implementation conformance statement (MICS) document identifying the standard data object model elements supported by the system or device, as specified in IEC 61850-10.

5 Logical nodes for DER management systems

5.1 Overview of information modelling (informative)

5.1.1 Data information modelling constructs

Data information models provide standardized names and structures to the data that is exchanged among different devices and systems. Figure 3 illustrates the object hierarchy used for developing IEC 61850 information models.

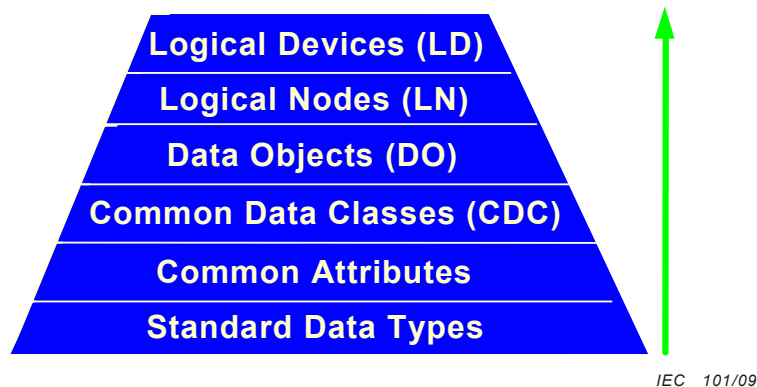


Figure 3 ± Information model hierarchy

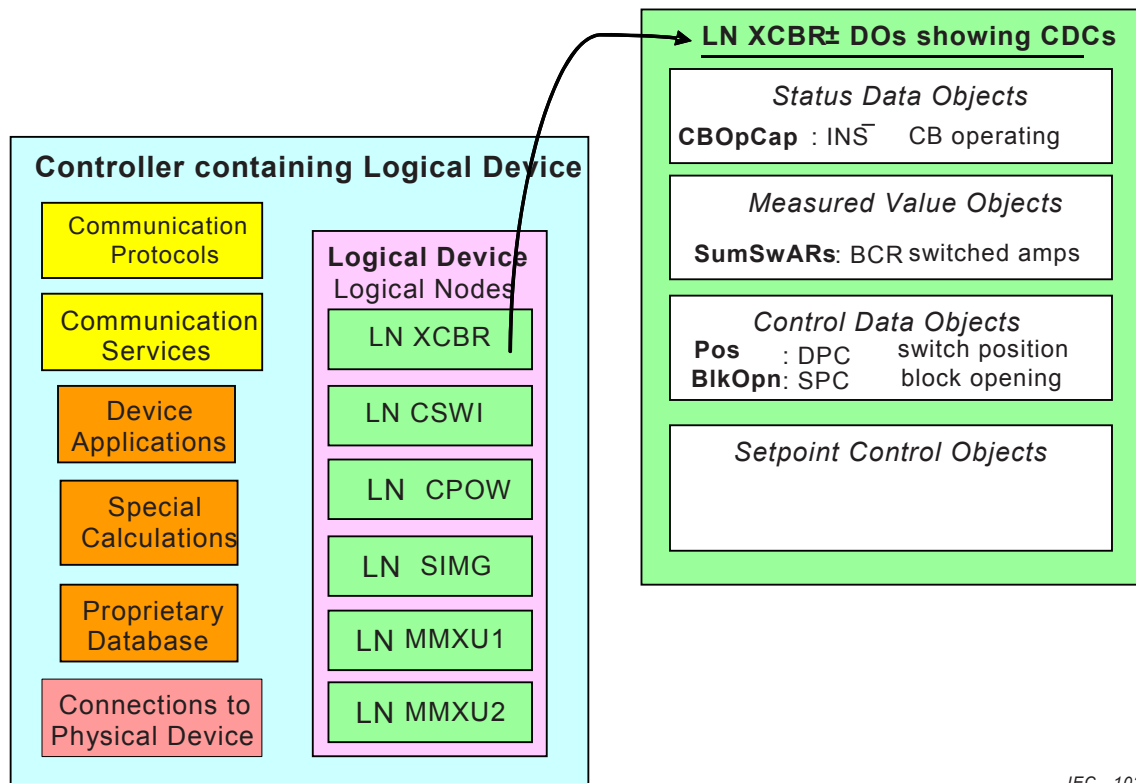
The process from the bottom up is described below:

- a) Standard data types: common digital formats such as Boolean, integer, and floating point.
- b) Common attributes: predefined common attributes that can be reused by many different objects, such as the quality attribute. These common attributes are defined in Clause 6 of IEC 61850-7-3.
- c) Common data classes (CDCs): predefined groupings building on the standard data types and predefined common attributes, such as the single point status (SPS), the measured value (MV), and the controllable double point (DPC). In essence, these CDCs are used to define the type or format of data objects. These CDCs are defined in IEC 61850-7-3 or in Clause 9 of this document. All units defined in the CDCs shall conform to the SI units (international system of units) listed in IEC 61850-7-3.
- d) Data objects (DO): predefined names of objects associated with one or more logical nodes. Their type or format is defined by one of the CDCs. They are listed only within the logical nodes. An example of a DO is “Auto” defined as CDC type SPS. It can be found in a number of logical nodes. Another example of a DO is “RHz” defined as a SPC (controllable single point), which is found only in the RSYN logical node.
- e) Logical nodes (LN): predefined groupings of data objects that serve specific functions and can be used as “bricks” to build the complete device. Examples of LNs include MMXU which provides all electrical measurements in 3-phase systems (voltage, current, watts, vars, power factor, etc.); PTUV for the model of the voltage portion of under voltage protection; and XCBR for the short circuit breaking capability of a circuit breaker. These LNs are described in Clause 5 of IEC 61850-7-4.
- f) Logical devices (LD): the device model composed of the relevant logical nodes for providing the information needed for a particular device. For instance, a circuit breaker could be composed of the logical nodes: XCBR, XSWI, CPOW, CSWI, and SMIG. Logical devices are not directly defined in any of the documents, since different products and different implementations can use different combinations of logical nodes for the same logical device.

5.1.2 Logical devices concepts

Controllers or servers contain the IEC 61850 logical device models needed for managing the associated device. These logical device models consist of one or more physical device models as well as all of the logical nodes needed for the device.

Therefore a logical device server can be diagrammed as shown in Figure 4.



IEC 102/09

Figure 4 ± Example of relationship of logical device, logical nodes, data objects, and common data classes

5.1.3 Logical nodes structure

The logical nodes (LNs) for DER devices are defined in the tables found in Clauses 5 to 8. For each LN implemented, all mandatory items shall be included (those indicated as an M in the M/O/C column). For clarity, these LNs are organized by typical logical devices that they may be a part of, but they may be used or not used as needed. The organization of IEC 61850 DER information models is illustrated in Figure 5. This illustration does not include all LNs that might be implemented, nor all possible configurations, but exemplifies the approach taken to create information models.

5.1.4 Naming structure

NOTE This is extracted from IEC 61850-7-2 Edition 2 (to be published) for informative purposes only – if any conflict is found, the original must be considered the definitive source.

The ObjectReference the various paths through a data object shall be:

LDName/LNName.
DataObjectName[.SubDataObjectName[. ...]].
DataAttributeName[(NumArrayElement)][.SubDataAttributeName[. ...]]

The following naming conventions (structure, lengths and character set) for object names and object references shall apply:

- LDName ≤ 64 characters, application specific
- LNName = [LN-Prefix] LN class name [LN-Instance-ID]
 - LN-Prefix = m characters (application specific); it may start with any character
 - LN class name = 4 characters (for example, compatible logical node name as defined in IEC 61850-7-4)
 - LN-Instance-ID = n numeric characters (application specific),

- m+n ≤ 7 characters
- DataObjectClassName ≤ 10 characters (as, for example, used in IEC 61850-7-4);
no DataObjectClassName shall end with a numeric character
- DataObjectName = DataObjectClassName[Data-Instance-ID]
- Data-Instance-ID = n numeric characters, optional; n shall be equal for all instances of the same data class
- FCD ≤ 61 characters including all separators "." (without the value of the FC)
- FCDA ≤ 61 characters including all separators "." (without the value of the FC)
- DataSetName ≤ 52 characters
- CBName = [CB-Prefix] CB class name [CB-Instance-ID]
 - CB-Prefix = m characters (application specific)
 - CB class name = 4 characters (as defined in this part of the standard)
 - CB-Instance-ID = n numeric characters (application specific)
 - m+n ≤ 7 characters

5.1.5 Interpretation of logical node tables

NOTE This is extracted from IEC 61850-7-4 Edition 2 (to be published) for informative purposes only – if any conflict is found, the original must be considered the definitive source.

The interpretation of the headings for the logical node tables is presented in Table 1.

Table 1 ± Interpretation of logical node tables

Column heading	Description
Data object name	Name of the data object
Common data class	Common data class that defines the structure of the data object. See IEC 61850-7-3. For common data classes regarding the service tracking logical node (LTRK), see IEC 61850-7-2.
Explanation	Short explanation of the data object and how it is used.
T	Transient data objects – the status of data objects with this designation is momentary and must be logged or reported to provide evidence of their momentary state. Some T may be only valid on a modelling level. The TRANSIENT property of DATA OBJECTS only applies to BOOLEAN process data attributes (FC=ST) of that DATA OBJECTS. Transient DATA OBJECT is identical to normal DATA OBJECT, except that for the process state change from TRUE to FALSE no event may be generated for reporting and for logging. For transient data objects, the falling edge shall not be reported if the transient attribute is set to true in the SCL-ICD file. It is recommended to report both states (TRUE to FALSE, and FALSE to TRUE), i.e. not to set the transient attribute in the SCL-ICD file for those DOs, and that the client filter the transitions that are not "desired".
M/O/C	This column defines whether data objects are mandatory (M) or optional (O) or conditional (C) for the instantiation of a specific logical node. NOTE The attributes for data objects that are instantiated may also be mandatory or optional based on the CDC (attribute type) definition in IEC 61850-7-3. The entry C is an indication that a condition exists for this data object, given in a note under the LN table. The condition decides what conditional data objects get mandatory. C may have an index to handle multiple conditions.

The LN type and the LNName attribute are inherited from logical-node class (see IEC 61850-7-2). The LN class names are individually given in the logical node tables. The LN instance name shall be composed of the class name, the LN-Prefix and LN-Instance-ID according to Clause 19 of IEC 61850-7-2.

All data object names are listed alphabetically in Clause 6 [*applies to IEC 61850-7 only*]. Despite some overlapping, the data objects in the logical nodes classes are grouped for the convenience of the reader into some of the following categories.

a) Data objects without category (Common information)

Data objects without category (Common information) is information independent of the dedicated function represented by the LN class. Mandatory data objects (M) are common to all LN classes i.e. shall be used for all LN classes dedicated for functions. Optional data objects (O) may be used for all LN classes dedicated for functions. These dedicated LN classes show if optional data objects of the common logical node class are mandatory in the LN.

b) Measured values

Measured values are analogue data objects measured from the process or calculated in the functions such as currents, voltages, power, etc. This information is produced locally and cannot be changed remotely unless substitution is applicable.

c) Controls

Controls are data objects which are changed by commands such as switchgear state (ON/OFF), tap changer position or resettable counters. They are typically changed remotely, and are changed during operation much more often than settings.

d) Metered values

Metered values are analogue data objects representing quantities measured over time, e.g. energy. This information is produced locally and cannot be changed remotely unless substitution is applicable.

e) Status information

Status information is a data object, which shows either the status of the process or of the function allocated to the LN class. This information is produced locally and cannot be changed remotely unless substitution is applicable. Data objects such as “start” or “trip” are listed in this category. Most of these data objects are mandatory.

f) Settings

Settings are data objects which are needed for the function to operate. Since many settings are dependent on the implementation of the function, only a commonly agreed minimum is standardised. They may be changed remotely, but normally not very often.

5.1.6 System logical nodes LN Group: L (informative)

NOTE This is extracted from IEC 61850-7-4 Edition 2 (to be published) for informative purposes only – if any conflict is found, the original must be considered the definitive source.

5.1.6.1 General

In this subclause, the system specific information is defined. This includes system logical node data (for example logical node behaviour, nameplate information, operation counters) as well as information related to the physical device (LPHD) implementing the logical devices and logical nodes. These logical nodes (LPHD and common LN) are independent of the application domain. All other logical nodes are domain specific, but inherit mandatory and optional data from the common logical node.

5.1.6.2 LN: Physical device information Name: LPHD

This LN is introduced in this part to model common issues for physical devices. See Table 2.

Table 2 ± LPHD class

LPHD Class				
Data object name	Common data class	Explanation	T	M/O/C
LNName		Shall be inherited from logical-node class (see IEC 61850-7-2)		
Data				
PhyNam	DPL	Physical device name plate		M
PhyHealth	ENS	Physical device health		M
OutOv	SPS	Output communications buffer overflow		O
Proxy	SPS	Indicates if this LN is a proxy		M
InOv	SPS	Input communications buffer overflow		O
NumPwrUp	INS	Number of power ups		O
WrmStr	INS	Number of warm starts		O
WacTrg	INS	Number of watchdog device resets detected		O
PwrUp	SPS	Power up detected		O
PwrDn	SPS	Power down detected		O
PwrSupAlm	SPS	External power supply alarm		O
RsStat	SPC	Reset device statistics		O
Data sets (see IEC 61850-7-2)				
Control blocks (see IEC 61850-7-2)				
Services (see IEC 61850-7-2)				

5.1.6.3 LN: Common logical node Name: Common LN

The common logical node class provides data which are mandatory or conditional to all dedicated LN classes. It also contains data which may be used in all dedicated logical node classes like input references and data for the statistical calculation methods. See Table 3.

Table 3 ± Common LN class

Common LN Class				
Data object name	Common data class	Explanation	T	M/O/C
LNName		Shall be inherited from logical-node class (see IEC 61850-7-2)		
Data				
Mandatory logical node information (Shall be inherited by ALL LN except LPHD)				
Mod	ENC	Mode		C
Beh	ENS	Behaviour		M
Health	ENS	Health		C1
NamPlt	LPL	Name plate		C1
Optional logical node information (May be inherited)				
InRef1	ORG	General input		O
BlkRef1	ORG	Block reference show the receiving of dynamically blocking signal		O
Blk	SPS	Dynamically blocking of function described by the LN		O
CmdBlk	SPC	Blocking of control sequences of controllable data objects		C2
ClcExp	SPS	Calculation period expired	T	O
ClcStr	SPC	Start calculation at time operTmh (if set) or immediately		O
ClcMth	ENG	Calculation Method of statistical data. Allowed values PRES MIN MAX AVG SDV TREND RATE		C3
CICMod	ENG	Calculation mode. Allowed values: TOTAL PERIOD SLIDING		O
CLCIntvTyp	ENG	Calculation interval type. Allowed values: ANYTIME CYCLE PER_CYCLE HOUR DAY WEEK		O
ClcPerms	ING	Calculation period in milliseconds. If ClcIntvTyp is equal ANYTIME Calculation Period shall be defined.		O
ClcSrc	ORG	Object reference to source logical node		O
ClcTyp	ENS	Calculation type		C
GrRef	ORG	Reference to a higher level logical device		O
Data sets (see IEC 61850-7-2)				
Control blocks (see IEC 61850-7-2)				
Services (see IEC 61850-7-2)				

5.1.6.4 LN: Logical node zero Name: LLN0

This LN shall be used to address common issues for Logical Devices. See Table 4.

Table 4 ± LLN0 class

LLN0 Class				
Data object name	Common data class	Explanation	T	M/O/C
LNName		Shall be inherited from logical-node class (see IEC 61850-7-2)		
Data				
LocKey	SPS	Local operation for complete logical device		O
RemCtlBlk	SPC	SPC remote control blocked		O
LocCtlBeh	SPS	SPS Local control behaviour		O
OpTmh	INS	Operation time		O
Controls				
Diag	SPC	Run diagnostics		O
LEDRs	SPC	LED reset	T	O
Settings				
MltLev	SPG	Select mode of authority for local control (True – control from multiple levels above the selected one is allowed, False – no other control level above allowed)		O

5.1.7 Overview of DER management system LNs

Figure 5 shows a conceptual view of the logical nodes which could be used for different parts of DER management systems.

Overview: Logical Devices and Logical Nodes for Distributed Energy Resource (DER) Systems

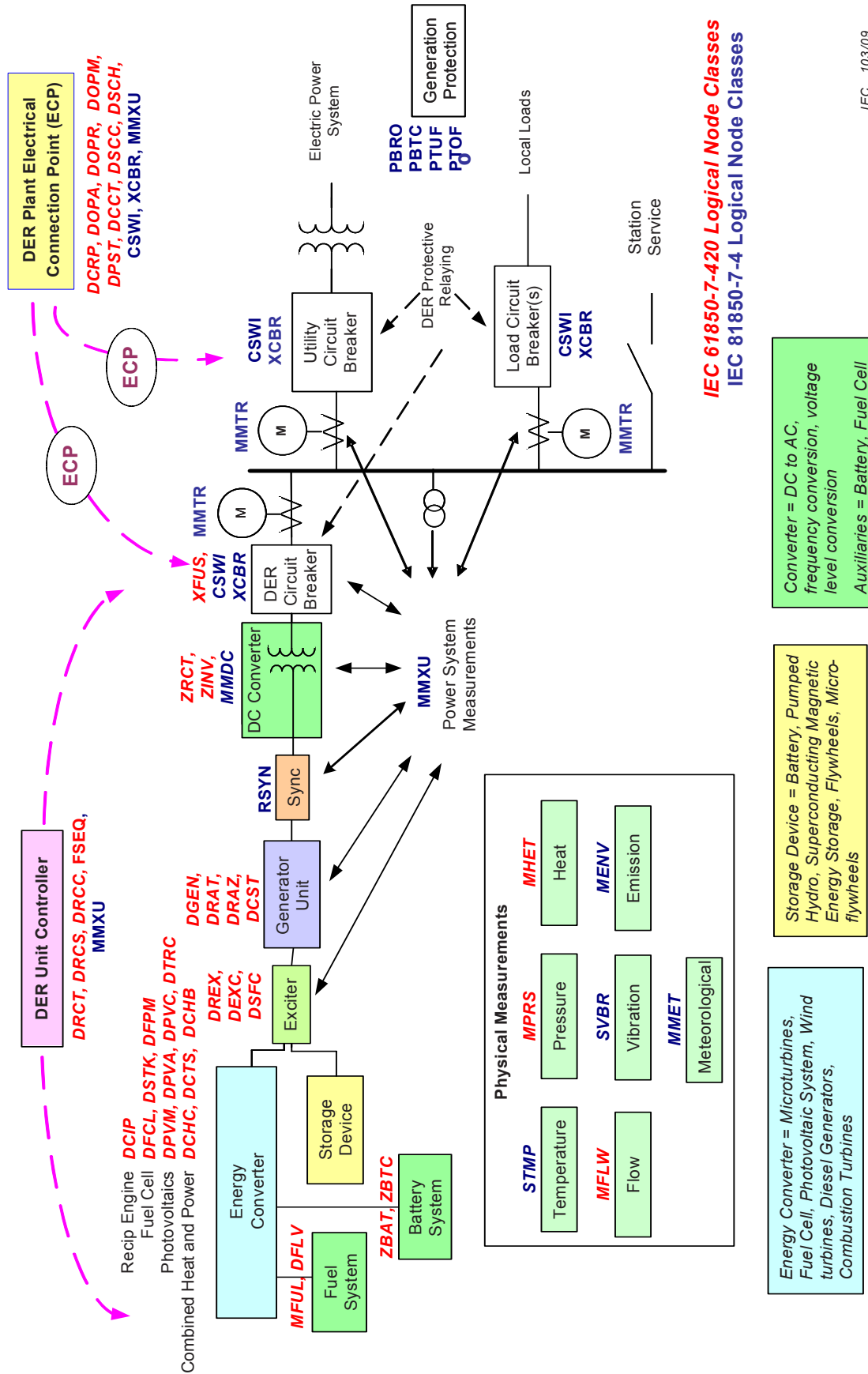


Figure 5 ± Overview: Conceptual organization of DER logical devices and logical nodes

IEC 103/09