Standards
With UML Examples

NettedAutomation GmbH
Information & Communication Systems

IEC 61850 and IEC 61400-25

GLOBAL Standards for all Energy Systems

Generation, Transmission, Distribution, ... Smart Grids –
Design, Specification, Engineering, Configuration, Automation,
SCADA, Measuring, Condition Monitoring;
Information Modeling, Exchange and Management

Stack and API Integration
Embedded Controller, Software Support
Gateways (DNP3, Modbus, IEC 60870-104, ...)
Consultancy, Training

3,000+ Experts from 750+ Companies from 75+ Countries trained (2012-08)

NettedAutomation GmbH
Im Eichbaeumle 108
76139 Karlsruhe / Germany
Tel +49-721-684844
Fax +49-721-679387
schwarz@scc-online.de
http://nettedautomation.com

http://blog.iec61850.com

IEC 1906 AWARD

UCA International Users Group

USE61400-25
IEC 61400-25 user group

Dipl.-Ing. Karlheinz Schwarz, Karlsruhe/Germany

Editor of IEC 61850 and IEC 61400-25 (Wind Power Plants)
Member of IEC TC 57 WG 10, WG 17 (DER), WG 18 (Hydro Power Plants)
Member of IEC TC 88 PT 25 (IEC 61400-25, Wind Power Plants)
Convenor of IEC TC 88 IEC 61400-25-6 (Condition Monitoring)

You get comprehensive, first-hand, and neutral knowledge and experience

IEC 61850 & IEC 61400-25 SCC

Motivation: sustainable interoperability

The standards IEC 61850 „Communication networks and systems for power utility automation“ and IEC 61400-25 „Communications for monitoring and control of wind power plants“ provide support for **sustainable interoperability: Information Models, Information Exchange Methods, Protocol Mappings, and System Configuration Language (SCL)** for Power Systems (Generation, Transmission, and Distribution for HV, MV, and LV, ...).

Data Models

IEC 61850-7-4xx

Substations (7-4)
160 LN
900 DO

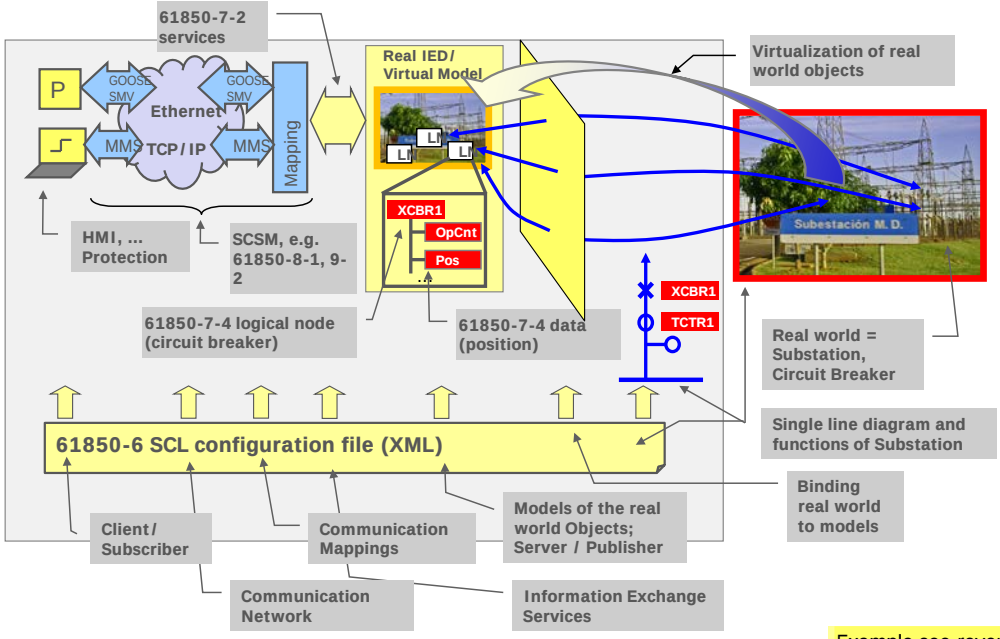
Hydro Power (410)
63 LN
350 DO

Decentralized Energy Res. (420)
50 LN
450 DO

IEC 61400-25-2

Wind Power
16 LN
250 DO

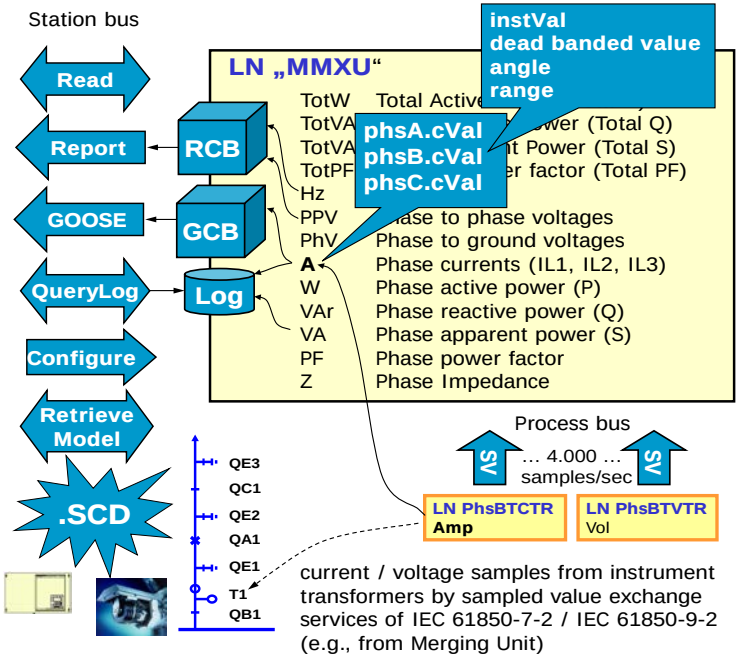
Logical Nodes (LN) represent real-world **Inputs, Outputs, Ratings, and Settings of functions** or **equipment**. A LN provides a list of named data objects (DO). The LN “XCBR” represents a real “circuit breaker” with the data object (DO) “Pos” (Position)**.** IEC 61850-7-2 defines **Information Exchange Methods**, e.g., for the position (with Client/Server services, GOOSE, SMV). **Data flow** is specified by a **SCL** file (IEC 61850-6).



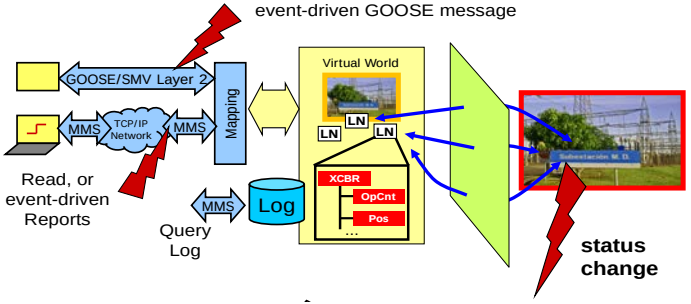
Example see reverse side

Example: Measurement LN "MMXU" represents power, voltages, currents, impedances, ... in a three-phase electrical system. The values can be communicated by various services. The LN "MMXU" comprises values for measurements, monitoring, configuration, settings, description, and substitution. These values can be communicated by various services like read (polling), reporting, GOOSE, logging and log query. Recording and logging are build upon monitored value changes. The SCL configuration file .SCD (System Configuration Description) specifies the single line diagram of the substation, the information model, the parameters of the control blocks for reporting and logging, GOOSE, SV, the binding to the process and the data flow.

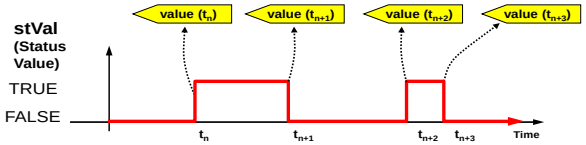
LN and data objects



Information flow (example)



Reports/GOOSE from server/publisher to client/subscriber (or store entries into IED log)

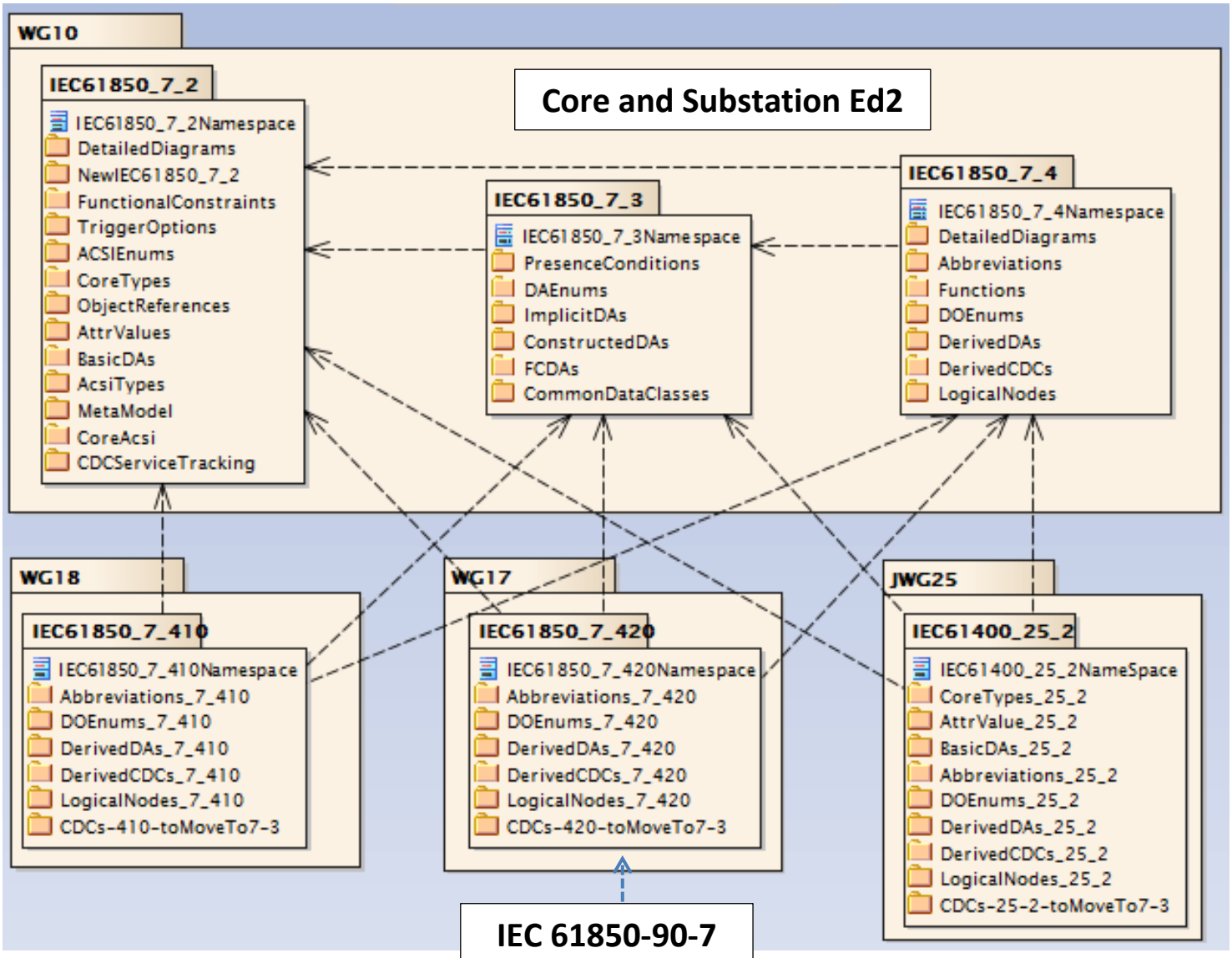


© NettedAutomation GmbH, 2008-2012; by Karlheinz Schwarz, SCC (Karlsruhe/Germany), schwarz@scc-online.de 2012-04-19

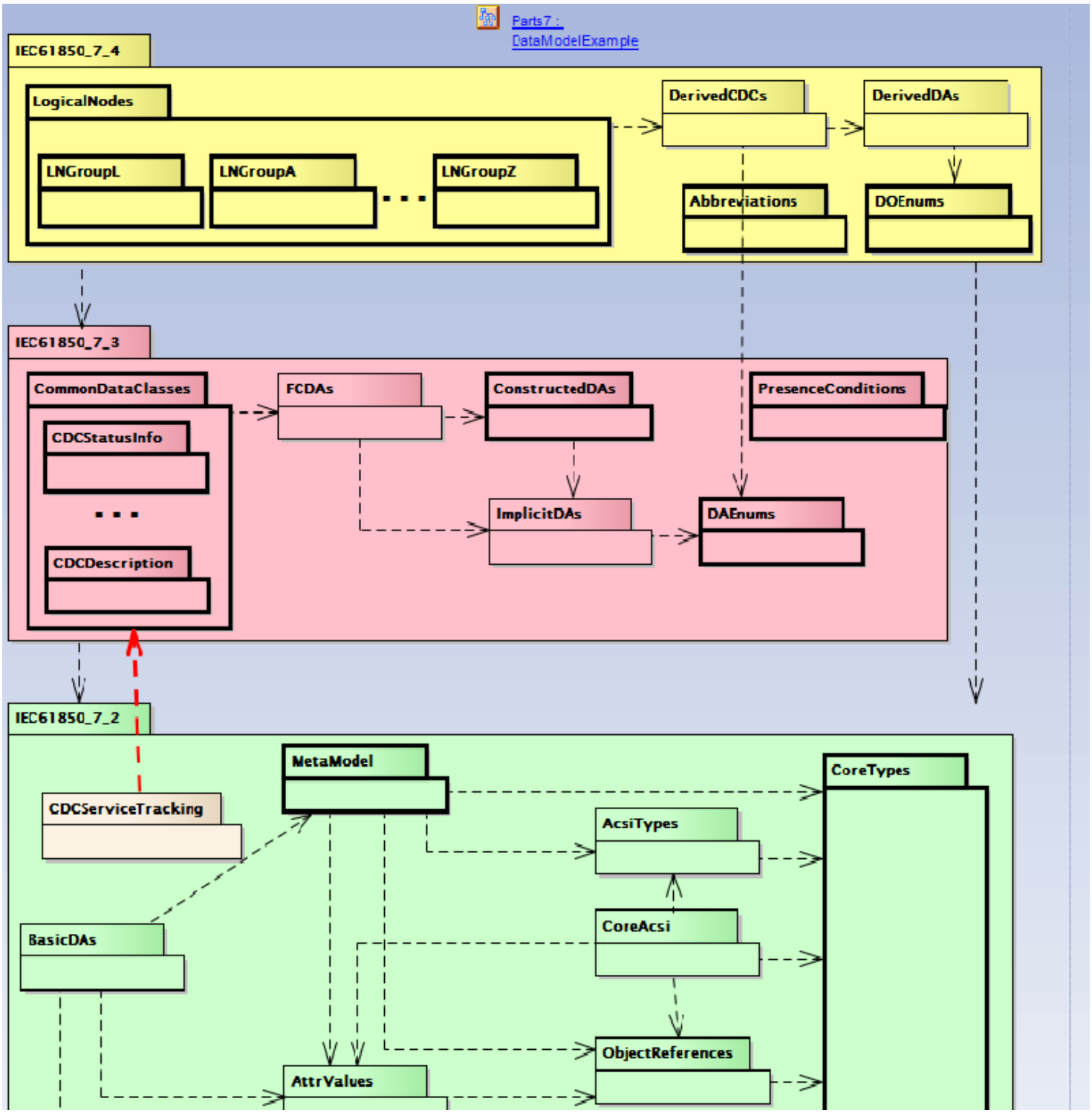
UML Model for IEC 61850 Ed2

(Enterprise Architect)

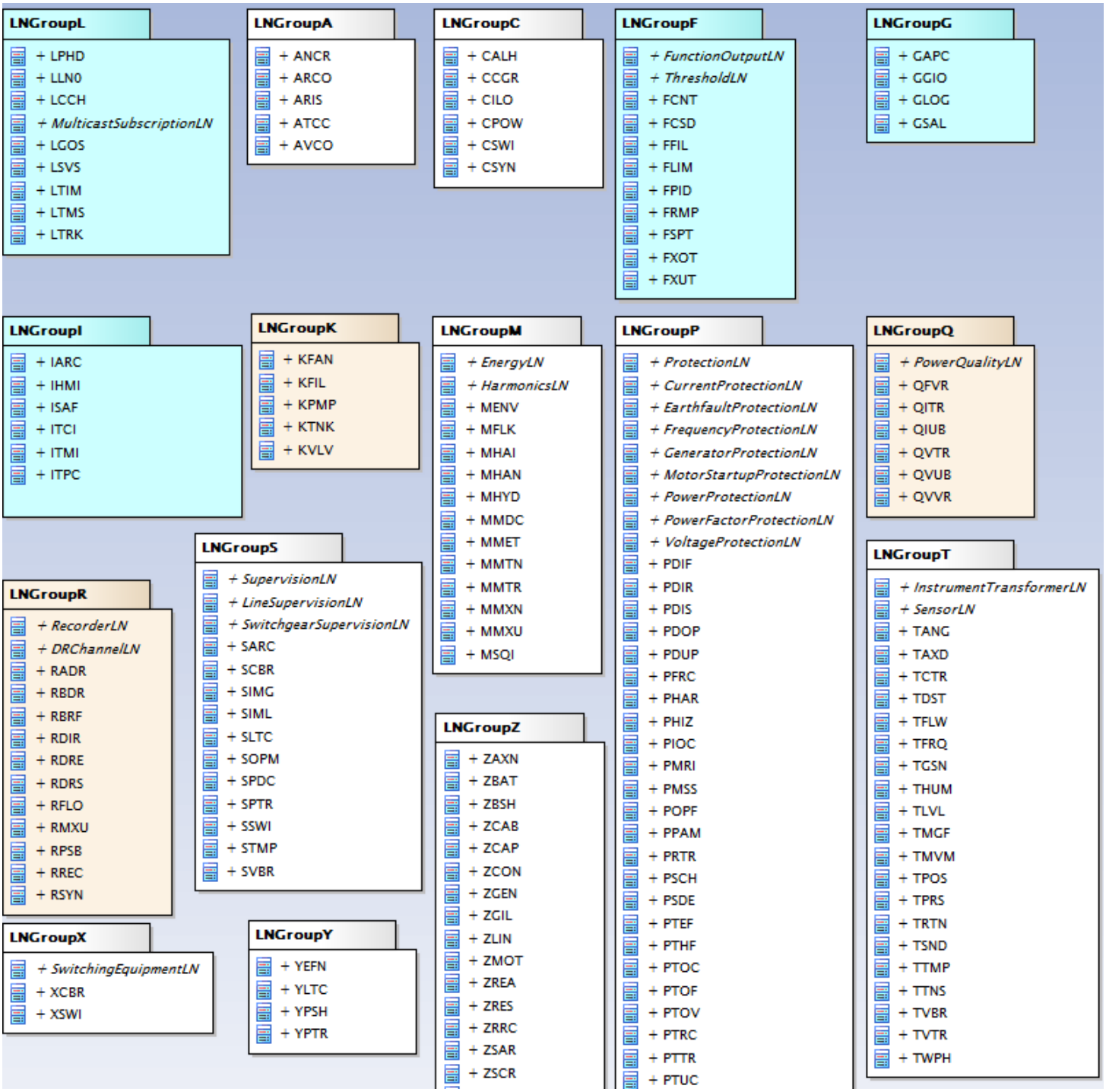
2012-08-31



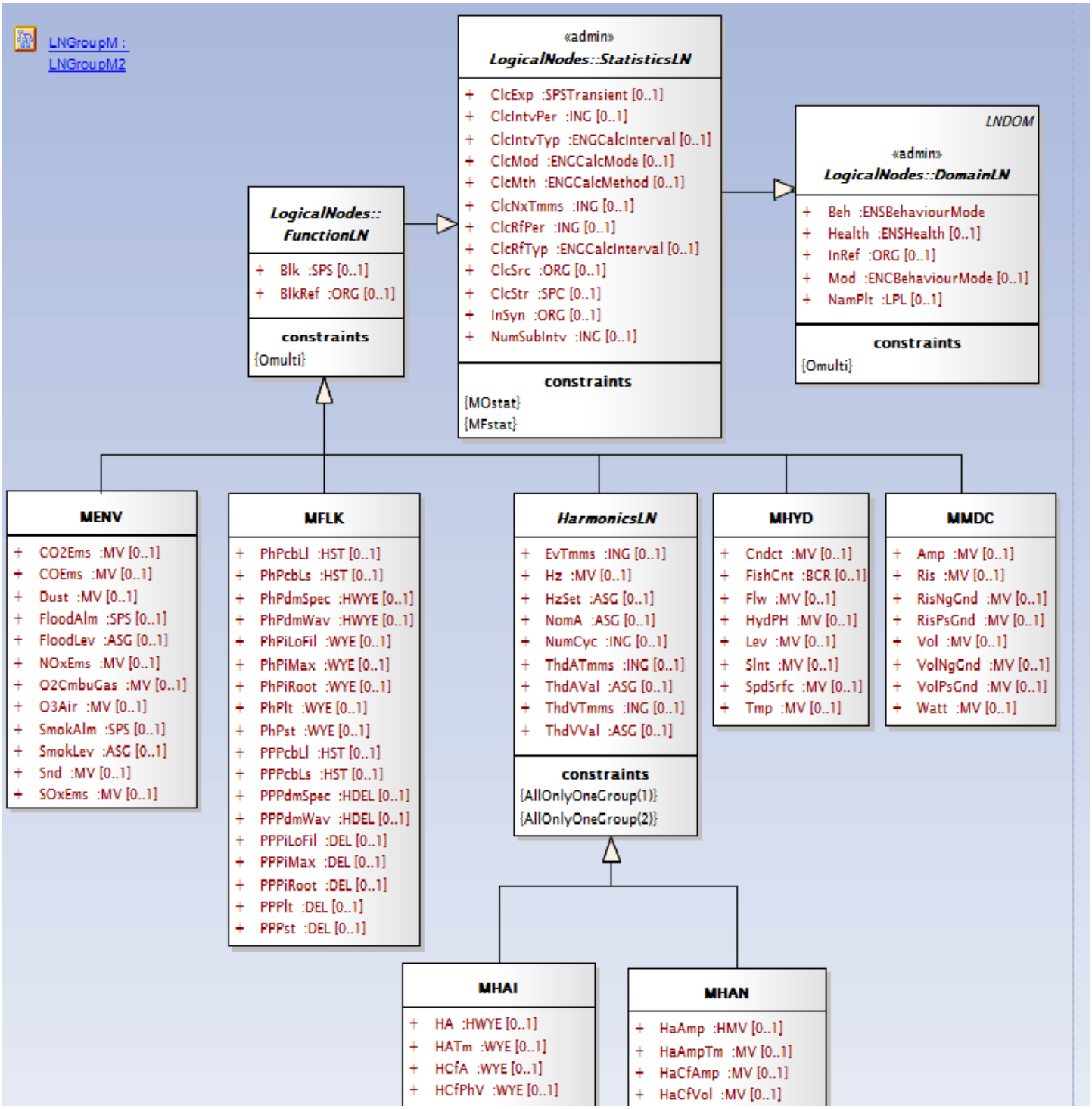
UML Model for IEC 61850-7-x Ed2



UML Model for IEC 61850-7-4 Ed2 Logical Node Groups

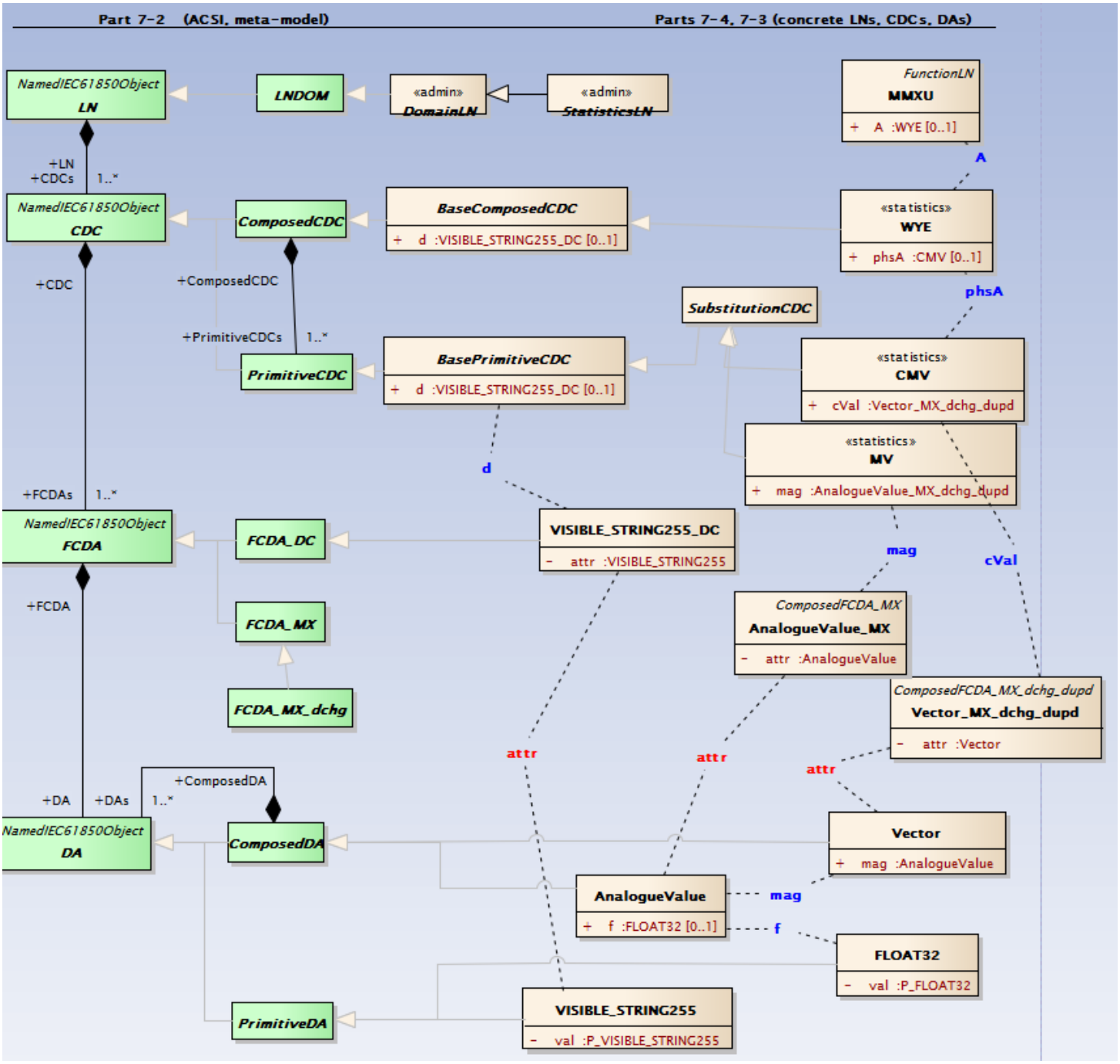


UML Model for IEC 61850-7-4 Ed2 Logical Nodes (Mxxx)



2012-08-31

Example of UML Model for IEC 61850-7-4 Ed2 (MMXU)



2012-08-31

Published Documents IEC 61850 (2012-07-09): Communication networks and systems for power utility automation

	Part	Current Title	Edition	Stability Date	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	IEC/TR 61850-1	Part 1: Introduction and overview	1.0 (2003-04-28)	2012				0	0	0	0	0	0	0	0						
2	IEC/TS 61850-2	Part 2: Glossary	1.0 (2003-08-07)	2012				0	0	0	0	0	0	0	0						
3	IEC 61850-3	Part 3: General requirements	1.0 (2002-01-16)	2012			0	0	0	0	11	11	11	11	11						
4	IEC 61850-4	Part 4: System and project management	1.0 (2002-01)	2004			0	0	0	0	0	0	0								
			2.0 (2011-04-11)	2015									0	0							
5	IEC 61850-5	Part 5: Communication requirements for functions and device models	1.0 (2003-07-24)	2012					1	2 (1)				3 (1)							
6	IEC 61850-6	Part 6: Configuration description language for communication in electrical substations related to IEDs	1.0 (2004-03)	2006				43	73 (30)	84 (11)	86 (2)	87 (1)									
			2.0 (2009-12-17)	2013								0	8	25 (17)	37 (12)						
7	IEC 61850-7-1	Part 7-1: Basic communication structure - Principles and models	1.0 (2003-07)	2005										7							
			2.0 (2011-07-15)	2013											3 (3)						
8	IEC 61850-7-2	Part 7-2: Basic information and communication structure - Abstract communication service interface (ACSI)	1.0 (2003-05)	2005										177							
			2.0 (2010-08-24)	2015									2	12 (10)	21 (8)						
9	IEC 61850-7-3	Part 7-3: Basic communication structure - Common data classes	1.0 (2003-05)	2005									60								
			2.0 (2010-12-16)	2013									5	11 (6)	17 (6)						
10	IEC 61850-7-4	Part 7-4: Basic communication structure - Compatible logical node classes and data object classes	1.0 (2003-05)	2005									120								
			2.0 (2010-03-31)	2015									19	50 (31)	63 (13)						
11	IEC 61850-7-410	Part 7-410: Hydroelectric power plants - Communication for monitoring and control	1.0 (2007-08-10)	2010						33 (0)											
12	IEC 61850-7-420	Part 7-420: Basic communication structure - Distributed energy resources logical nodes	1.0 (2009-03-10)	2011								37 (19)									
13	IEC 61850-7-510	Part 7-510: Basic communication structure -Hydroelectric power plants - Modelling concepts and guidelines	1.0 (2012-03)	2017																	
14	IEC 61850-8-1	Part 8-1: Specific communication service mapping (SCSM) - Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3	1.0 (2004-05)	2005				99 (2)													
			2.0 (2011-06-17)	2016										6	12 (6)						
15	IEC 61850-9-1	Part 9-1: Specific Communication Service Mapping (SCSM) - Sampled values over serial unidirectional multidrop point to point link	1.0 (2003-05-12)	2010																	
16	IEC 61850-9-2	Part 9-2: Specific communication service mapping (SCSM) - Sampled values over ISO/IEC 8802-3	1.0 (2004-04)	2005				10 (0)													
			2.0 (2011-09-22)	2016										0	1 (1)						
17	IEC 61850-10	Part 10: Conformance testing	1.0 (2005-05-30)	2012				14													
18	IEC/TS 61850-80-1	Part 80-1: Guideline to exchanging information from a CDC-based data model using IEC 60870-5-101 or IEC 60870-5-104	1.0 (2008-12-11)	2011																	
19	IEC/TR 61850-90-1	Part 90-1: Use of IEC 61850 for the communication between substations	1.0 (2010-03-16)	2014																	
20	IEC/TR 61850-90-5	Part 90-5: Use of IEC 61850 to transmit synchrophasor information according to IEEE C37.118	1.0 (2012-06)	2015																	

2012-07-09

	Draft Documents (2012-07-12)		Edition	Stability Date	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	IEC/TR 61850-7-5	Part 7-5: Usage of information models SAS	1.0 (2012?)												?						
2	IEC/TR 61850-7-500	Part 7-500: Use of LN to model functions (SAS)	1.0 (2012?)												?						
3	IEC/TR 61850-7-520	Part 7-520: Use of LN (DER)	1.0 (2012?)												?						
4	IEC/TR 61850-8-2	Part 8-2: Web service mapping	1.0 (2012?)												?						
5	IEC/TR 61850-10-2	Part 10-2: Interoperability test for hydro equipment	1.0 (2012?)												?						
6	IEC/TR 61850-90-2	Part 90-2: Using IEC 61850 for SS-CC communication	1.0 (2012?)												?						
7	IEC/TR 61850-90-3	Part 90-3: Using IEC 61850 for Condition Monitoring	1.0 (2012?)												?						
8	IEC/TR 61850-90-4	Part 90-4: Network Engineering Guidelines	1.0 (2012?)												?						
9	IEC/TR 61850-90-6	Part 90-6: Use of IEC 61850 for Distribution Automation	1.0 (2012?)												?						
10	IEC/TR 61850-90-7	Part 90-7: Object Models for PV, Storage … inverters, …	1.0 (2012?)												?						
11	IEC/TR 61850-90-8	Part 90-8: Object Models for Electrical Transportation	1.0 (2012?)												?						
12	IEC/TR 61850-90-9	Part 90-9: Object Models for Batteries	1.0 (2012?)												?						
13	IEC/TR 61850-90-410	Part 90-410: Communication network structures in hydro power plants	1.0 (2012?)												?						
14	IEC/TR 61850-90-9	Part 90-9: Object Models for Batteries	1.0 (2012?)												?						
15	IEC/TR 61850-90-10	Part 90IEC 61850-10: Object models for schedules	1.0 (2012?)												?						
16	IEC/TR 61850-90-11	Part 90-11: Methodologies for modelling of logics for IEC 61850 based applications	1.0 (2012?)												?						
17	IEC/TR 61850-90-12	Part 90-12: Wide area network engineering guidelines	1.0 (2012?)												?						
18	IEC/TR 61850-90-13	Part 90-13: Extension of IEC 61850 information models to also include logical nodes and data models for steam and gas turbines	1.0 (2012?)												?						
19	IEC/TR 61850-90-14	Part 90-14: Using IEC 61850 for FACTS data modelling	1.0 (2012?)												?						
20	IEC/TR 61850-90-15	Part 90-15: Hierarchical DER system model	1.0 (2012?)												?						
21	IEC/TR 61850-100-1	Part 100-1: Functional testing of IEC 61850 based systems	1.0 (2012?)												?						

IEC 61850 and IEC 61400-25 Logical Node Classes

(This is an inofficial list compiled by Karlheinz Schwarz, SCC, schwarz@scc-online.de)
http://blog.iec61850.com/

2012-08-08

Remarks:

Part	Source	Comments
IEC 61850-7-4 Ed2	Standard	
IEC 61850-7-410 Ed1	Standard	Several LN classes have been moved to IEC 61850-7-4 Ed2
IEC 61850-7-420 Ed1	Standard	Several LN classes have been extended in IEC 61850-90-7; List of LNs in Ed2 added on page 8
IEC 61400-25-2 Ed1	Standard	
Other docs		Several other documents contain object models ... and other documents are under preparation: 90-8, ...

Remark:
Ext1=few extensions, Ext2=several extensions, Ext3=many extensions, New=new
In addition, many definitions have changed ... based on Tissues ...

LN Group	#	Clause	Description	Name	Part	Remark
L System LNs	1	5.3.2	Physical device information	LPHD	7-4 Ed2	Ext1
	2	5.3.3	Common Logical Node	Common LN	7-4 Ed2	Ext3
	3	5.3.4	Logical node zero	LLN0	7-4 Ed2	Ext1
	4	5.3.5	Physical Communication channel Supervision	LCCH	7-4 Ed2	New
	5	5.3.6	GOOSE subscription	LGOS	7-4 Ed2	New
	6	5.3.7	Sampled value subscription	LSVS	7-4 Ed2	New
	7	5.3.8	Time management	LTIM	7-4 Ed2	New
	8	5.3.9	Time master supervision	LTMS	7-4 Ed2	New
	9	5.3.10	Service tracking	LTRK	7-4 Ed2	New
A Automatic Control	10	5.4.2	Neutral current regulator	ANCR	7-4 Ed2	Ext3
	11	5.4.3	Reactive power control	ARCO	7-4 Ed2	Ext1
	12	5.4.4	Resistor control	ARIS	7-4 Ed2	New
	13	5.4.5	Automatic tap changer controller	ATCC	7-4 Ed2	Ext1
	14	5.4.6	Voltage control	AVCO	7-4 Ed2	Ext1
C Control	15	5.5.2	Alarm handling	CALH	7-4 Ed2	Ext1
	16	5.5.3	Cooling group control	CCGR	7-4 Ed2	Ext1
	17	5.5.4	Interlocking	CILO	7-4 Ed2	
	18	5.5.5	Point-on-wave switching	CPOW	7-4 Ed2	Ext2
	19	5.5.6	Switch controller	CSWI	7-4 Ed2	Ext1
	20	5.5.7	Synchronizer controller	CSYN	7-4 Ed2	New

IEC 61850 and IEC 61400-25 Logical Node Classes

LN Group	#	Clause	Description	Name	Part	Remark
D Decentralized Energy Resources	21	5.2.2	DER plant corporate characteristics at the ECP	DCRP	7-420 Ed2	
	22	5.2.3	Operational characteristics at ECP	DOPR	7-420 Ed2	
	23	5.2.4	DER operational authority at the ECP	DOPA	7-420 Ed2	
	24	5.2.5	Operating mode at ECP	DOPM	7-420 Ed2	
	25	5.2.6	Status information at the ECP	DPST	7-420 Ed2	
	26	5.2.7	DER economic dispatch parameters	DCCT	7-420 Ed2	
	27	5.2.8	DER energy and/or ancillary services schedule control	DSCC	7-420 Ed2	
	28	5.2.9	DER energy and/or ancillary services schedule	DSCH	7-420 Ed2	
	29	5.3.2	DER controller characteristics	DRCT	7-420 Ed2	
	30	5.3.3	DER controller status	DRCS	7-420 Ed2	
	31	5.3.4	DER supervisory control	DRCC	7-420 Ed2	
	32	6.1.2	DER unit generator	DGEN	7-420 Ed2	
	33	6.1.3	DER generator ratings	DRAT	7-420 Ed2	
	34	6.1.4	DER advanced generator ratings	DRAZ	7-420 Ed2	
	35	6.1.5	Generator cost	DCST	7-420 Ed2	
	36	6.2.2	Excitation ratings	DREX	7-420 Ed2	
	37	6.2.3	Excitation	DEXC	7-420 Ed2	
	38	6.3.2	Speed/Frequency Controller	DSFC	7-420 Ed2	
	39	7.1.3	Reciprocating Engine	DCIP	7-420 Ed2	
	40	7.2.3	Fuel cell controller	DFCL	7-420 Ed2	
	41	7.2.4	Fuel cell stack	DSTK	7-420 Ed2	
	42	7.2.5	Fuel processing module	DFPM	7-420 Ed2	
	43	7.3.3	Photovoltaics module ratings	DPVM	7-420 Ed2	
	44	7.3.4	Photovoltaics array characteristics	DPVA	7-420 Ed2	
	45	7.3.5	Photovoltaics array controller	DPVC	7-420 Ed2	
	46	7.3.6	Tracking controller	DTRC	7-420 Ed2	
	47	7.4.3	CHP system controller	DCHC	7-420 Ed2	
	48	7.4.4	Thermal storage	DCTS	7-420 Ed2	
	49	7.4.5	Boiler	DCHB	7-420 Ed2	
	50	7.1.3	Reciprocating Engine	DCIP	7-420 Ed2	
	51	7.2.3	Fuel cell controller	DFCL	7-420 Ed2	
	52	8.1.3	Fuel delivery system	DFLV	7-420 Ed2	
F Functional Blocks	53	5.6.2	Counter	FCNT	7-4 Ed2	New
	54	5.6.3	Curve shape description	FCSD	7-4 Ed2	New
	55	5.6.4	Generic Filter	FFIL	7-4 Ed2	New
	56	5.6.5	Control function output limitation	FLIM	7-4 Ed2	New
	57	5.6.6	PID regulator	FPID	7-4 Ed2	New
	58	5.6.7	Ramp function	FRMP	7-4 Ed2	New
	59	5.6.8	Set-point control function	FSPT	7-4 Ed2	New
	60	5.6.9	Action at over threshold	FXOT	7-4 Ed2	New
	61	5.6.10	Action at under threshold	FXUT	7-4 Ed2	New
	62	7.2.2	Counter	FCNT	7-410 Ed1	
	63	7.2.3	Curve shape description	FCSD	7-410 Ed1	
	64	7.2.4	Generic Filter	FFIL	7-410 Ed1	
	65	7.2.5	Control function output limitation	FLIM	7-410 Ed1	
	66	7.2.6	PID regulator	FPID	7-410 Ed1	
	67	7.2.7	Ramp function	FRMP	7-410 Ed1	
	68	7.2.8	Set-point control function	FSPT	7-410 Ed1	
	69	7.2.9	Action at over threshold	FXOT	7-410 Ed1	
	70	7.2.10	Action at under threshold	FXUT	7-410 Ed1	
	71	8.4.2	Sequencer	FSEQ	7-420 Ed2	

IEC 61850 and IEC 61400-25 Logical Node Classes

LN Group	#	Clause	Description	Name	Part	Remark
G Generic	72	5.7.2	Generic automatic process control	GAPC	7-4 Ed2	Ext1
	73	5.7.3	Generic process I/O	GGIO	7-4 Ed2	Ext2
	74	5.7.4	Generic log	GLOG	7-4 Ed2	New
	75	5.7.5	Generic security application	GSAL	7-4 Ed2	New
H Hydro Power	76	7.3.2	Turbine - generator shaft bearing	HBRG	7-410 Ed1	
	77	7.3.3.	Combinator	HCOM	7-410 Ed1	
	78	7.3.4	Hydropower dam	HDAM	7-410 Ed1	
	79	7.3.5	Dam leakage supervision	HDLS	7-410 Ed1	
	80	7.3.6	Gate position indicator	HGPI	7-410 Ed1	
	81	7.3.7	Dam gate	HGTE	7-410 Ed1	
	82	7.3.8	Intake gate	HITG	7-410 Ed1	
	83	7.3.9	Joint control	HJCL	7-410 Ed1	
	84	7.3.10	Leakage supervision	HLKG	7-410 Ed1	
	85	7.3.11	Water level indicator	HLVL	7-410 Ed1	
	86	7.3.12	Mechanical brake	HMBR	7-410 Ed1	
	87	7.3.13	Needle control	HNDL	7-410 Ed1	
	88	7.3.14	Water net head data	HNHD	7-410 Ed1	
	89	7.3.15	Dam over-topping protection	HOTP	7-410 Ed1	
	90	7.3.16	Hydropower / water reservoir	HRES	7-410 Ed1	
	91	7.3.17	Hydropower unit sequencer	HSEQ	7-410 Ed1	
	92	7.3.18	Speed monitoring	HSPD	7-410 Ed1	
	93	7.3.19	Hydropower unit	HUNT	7-410 Ed1	
	94	7.3.20	Water control	HWCL	7-410 Ed1	
I Interfacing and Archiving	95	5.8.2	Archiving	IARC	7-4 Ed2	Ext1
	96	5.8.3	Human machine interface	IHMI	7-4 Ed2	Ext2
	97	5.8.4	Safety alarm function	ISAF	7-4 Ed2	New
	98	5.8.5	Telecontrol interface	ITCI	7-4 Ed2	Ext3
	99	5.8.6	Telemonitoring interface	ITMI	7-4 Ed2	Ext2
	100	5.8.7	Teleprotection communication interfaces	ITPC	7-4 Ed2	New
	101	7.4.2	Safety alarm function	ISAF	7-410 Ed1	
K Mechanical and non-electric primary equipment	102	5.9.2	Fan	KFAN	7-4 Ed2	New
	103	5.9.3	Filter	KFIL	7-4 Ed2	New
	104	5.9.4	Pump	KPMP	7-4 Ed2	New
	105	5.9.5	Tank	KTNK	7-4 Ed2	New
	106	5.9.6	Valve control	KVLV	7-4 Ed2	New
	107	7.5.2	Fan	KFAN	7-410 Ed1	
	108	7.5.3	Filter	KFIL	7-410 Ed1	
	109	7.5.4	Pump	KPMP	7-410 Ed1	
	110	7.5.5	Tank	KTNK	7-410 Ed1	
	111	7.5.6	Valve control	KVLV	7-410 Ed1	

IEC 61850 and IEC 61400-25 Logical Node Classes

LN Group	#	Clause	Description	Name	Part	Remark
M Metering and measurement	112	5.10.2	Environmental information	MENV	7-4 Ed2	New
	113	5.10.3	Flicker Measurement Name	MFLK	7-4 Ed2	New
	114	5.10.4	Harmonics or interharmonics	MHAI	7-4 Ed2	Ext1
	115	5.10.5	Non phase related harmonics or interharmonics	MHAN	7-4 Ed2	Ext1
	116	5.10.6	Hydrological information	MHYD	7-4 Ed2	New
	117	5.10.7	DC measurement	MMDC	7-4 Ed2	New
	118	5.10.8	Meteorological information	MMET	7-4 Ed2	New
	119	5.10.9	Metering	MMTN	7-4 Ed2	New
	120	5.10.10	Metering	MMTR	7-4 Ed2	
	121	5.10.11	Non phase related Measurement	MMXN	7-4 Ed2	
	122	5.10.12	Measurement	MMXU	7-4 Ed2	Ext3
	123	5.10.13	Sequence and imbalance	MSQI	7-4 Ed2	
	124	5.10.14	Metering Statistics	MSTA	7-4 Ed2	removed
	125	7.6.2	Environmental information	MENV	7-410 Ed1	
	126	7.6.3	Hydrological information	MHYD	7-410 Ed1	
	127	7.6.4	DC measurement	MMDC	7-410 Ed1	
	128	7.6.5	Meteorological information	MMET	7-410 Ed1	
	129	8.1.2	Fuel characteristics	MFUL	7-420 Ed2	
	130	8.5.3	Pressure measurements	MPRS	7-420 Ed2	
	131	8.5.4	Heat measured values	MHET	7-420 Ed2	
	132	8.5.5	Flow measurements	MFLW	7-420 Ed2	
	133	8.5.7	Emissions measurements	MENV	7-420 Ed2	
P Protection functions	134	5.11.2	Differential	PDIF	7-4 Ed2	Ext1
	135	5.11.3	Direction comparison	PDIR	7-4 Ed2	
	136	5.11.4	Distance	PDIS	7-4 Ed2	Ext1
	137	5.11.5	Directional overpower	PDOP	7-4 Ed2	
	138	5.11.6	Directional underpower	PDUP	7-4 Ed2	
	139	5.11.7	Rate of change of frequency	PFRC	7-4 Ed2	
	140	5.11.8	Harmonic restraint	PHAR	7-4 Ed2	
	141	5.11.9	Ground detector	PHIZ	7-4 Ed2	
	142	5.11.10	Instantaneous overcurrent	PIOC	7-4 Ed2	
	143	5.11.11	Motor restart inhibition	PMRI	7-4 Ed2	
	144	5.11.12	Motor starting time supervision	PMSS	7-4 Ed2	
	145	5.11.13	Over power factor	POPF	7-4 Ed2	
	146	5.11.14	Phase angle measuring	PPAM	7-4 Ed2	
	147	5.11.15	Rotor protection	PRTR	7-4 Ed2	New
	148	5.11.16	Protection scheme	PSCH	7-4 Ed2	
	149	5.11.17	Sensitive directional earthfault	PSDE	7-4 Ed2	
	150	5.11.18	Transient earth fault	PTEF	7-4 Ed2	Ext1
	151	5.11.19	Tyristor protection	PTHF	7-4 Ed2	New
	152	5.11.20	Time overcurrent	PTOC	7-4 Ed2	
	153	5.11.21	Overfrequency	PTOF	7-4 Ed2	
	154	5.11.22	Overvoltage	PTOV	7-4 Ed2	
	155	5.11.23	Protection trip conditioning	PTRC	7-4 Ed2	
	156	5.11.24	Thermal overload	PTTR	7-4 Ed2	Ext2
	157	5.11.25	Undercurrent	PTUC	7-4 Ed2	Ext1
	158	5.11.26	Underfrequency	PTUF	7-4 Ed2	
	159	5.11.27	Undervoltage	PTUV	7-4 Ed2	
	160	5.11.28	Underpower factor	PUPF	7-4 Ed2	
	161	5.11.29	Voltage controlled time overcurrent	PVOC	7-4 Ed2	
	162	5.11.30	Volts per Hz	PVPH	7-4 Ed2	
	163	5.11.31	Zero speed or underspeed	PZSU	7-4 Ed2	
	164	7.7.2	Rotor protection	PRTR	7-410 Ed1	
	165	7.7.3	Thyristor protection	PTHF	7-410 Ed1	

IEC 61850 and IEC 61400-25 Logical Node Classes

LN Group	#	Clause	Description	Name	Part	Remark
Q Power quality events	166	5.12.2	Frequency Variation	QFVR	7-4 Ed2	New
	167	5.12.3	Current Transient	QITR	7-4 Ed2	New
	168	5.12.4	Current Unbalance Variation	QIUB	7-4 Ed2	New
	169	5.12.5	Voltage Transien	QVTR	7-4 Ed2	New
	170	5.12.6	Voltage Unbalance Variation	QVUB	7-4 Ed2	New
	171	5.12.7	Voltage Variation	QVVR	7-4 Ed2	New
R Protection related functions	172	5.13.2	Disturbance recorder channel analogue	RADR	7-4 Ed2	Ext1
	173	5.13.3	Disturbance recorder channel binary	RBDR	7-4 Ed2	Ext1
	174	5.13.4	Breaker failure	RBRF	7-4 Ed2	Ext1
	175	5.13.5	Directional element	RDIR	7-4 Ed2	
	176	5.13.6	Disturbance recorder function	RDRE	7-4 Ed2	
	177	5.13.7	Disturbance record handling	RDRS	7-4 Ed2	
	178	5.13.8	Fault locator	RFLO	7-4 Ed2	Ext3/min
	179	5.13.9	Differential measurements	RMXU	7-4 Ed2	New
	180	5.13.10	Power swing detection/blocking	RPSB	7-4 Ed2	New
	181	5.13.11	Autoreclosing	RREC	7-4 Ed2	Ext1
	182	5.13.12	Synchronism-check	RSYN	7-4 Ed2	
	183	7.8.2	synchronising or synchro-check device	RSYN	7-410 Ed1	
S Supervision and monitoring	184	5.14.2	Monitoring and diagnostics for arcs	SARC	7-4 Ed2	
	185	5.14.3	Circuit breaker supervision	SCBR	7-4 Ed2	New
	186	5.14.4	Insulation medium supervision (gas)	SIMG	7-4 Ed2	Ext1
	187	5.14.5	Insulation medium supervision (liquid)	SIML	7-4 Ed2	Ext3
	188	5.14.6	Tap changer Supervision	SLTC	7-4 Ed2	New
	189	5.14.7	Supervision of Operating Mechanism	SOPM	7-4 Ed2	New
	190	5.14.8	Monitoring and diagnostics for partial discharges	SPDC	7-4 Ed2	New New
	191	5.14.9	Power Transformer Supervision	SPTR	7-4 Ed2	New
	192	5.14.10	Circuit Switch Supervision	SSWI	7-4 Ed2	New
	193	5.14.11	Temperature supervision	STMP	7-4 Ed2	New
	194	5.14.12	Vibration supervision	SVBR	7-4 Ed2	New
	195	7.9.2	temperature supervision	STMP	7-410 Ed1	
	196	7.9.3	vibration supervision	SVBR	7-410 Ed1	
	197	8.5.6	Vibration conditions	SVBR	7-420 Ed2	
	198	8.5.2	Temperature measurements	STMP	7-420 Ed2	
T Instrument Ttransformers and sensors	199	5.15.2	Angle	TANG	7-4 Ed2	New
	200	5.15.3	Axial displacement	TAXD	7-4 Ed2	New
	201	5.15.4	Current transformer	TCTR	7-4 Ed2	Ext1
	202	5.15.5	Distance	TDST	7-4 Ed2	New
	203	5.15.6	Liquid flow	TFLW	7-4 Ed2	New
	204	5.15.7	Frequency	TFRQ	7-4 Ed2	New
	205	5.15.8	Generic sensor	TGSN	7-4 Ed2	New
	206	5.15.9	Humidity	THUM	7-4 Ed2	New
	207	5.15.10	LMedia level	TLVL	7-4 Ed2	New
	208	5.15.11	Magnetic field	TMGF	7-4 Ed2	New
	209	5.15.12	Movement senso	TMVM	7-4 Ed2	New
	210	5.15.13	Position indicator	TPOS	7-4 Ed2	New
	211	5.15.14	Pressure sensor	TPRS	7-4 Ed2	New
	212	5.15.15	Rotation transmitter	TRTN	7-4 Ed2	New
	213	5.15.16	Sound pressure sensor	TSND	7-4 Ed2	New
	214	5.15.17	Temperature sensor	TTMP	7-4 Ed2	New
	215	5.15.18	Mechanical tension / stress	TTNS	7-4 Ed2	New
	216	5.15.19	Vibration sensor	TVBR	7-4 Ed2	New
	217	5.15.20	Voltage transformer	TVTR	7-4 Ed2	Ext
	218	5.15.21	Water acidity	TWPH	7-4 Ed2	New
	219	7.10.2	Angle sensor	TANG	7-410 Ed1	

IEC 61850 and IEC 61400-25 Logical Node Classes

LN Group	#	Clause	Description	Name	Part	Remark
	220	7.10.3	Axial displacement sensor	TAXD	7-410 Ed1	
	221	7.10.4	Distance sensor	TDST	7-410 Ed1	
	222	7.10.5	Flow sensor	TFLW	7-410 Ed1	
	223	7.10.6	Frequency sensor	TFRQ	7-410 Ed1	
	224	7.10.7	Humidity sensor	THUM	7-410 Ed1	
	225	7.10.8	Level sensor	TLEV	7-410 Ed1	
	226	7.10.9	Magnetic field sensor	TMGF	7-410 Ed1	
	227	7.10.10	Movement sensor	TMVM	7-410 Ed1	
	228	7.10.11	Position indicator	TPOS	7-410 Ed1	
	229	7.10.12	Pressure sensor	TPRS	7-410 Ed1	
	230	7.10.13	Rotation transmitter	TRTN	7-410 Ed1	
	231	7.10.14	Sound pressure sensor	TSND	7-410 Ed1	
	232	7.10.15	Temperature sensor	TTMP	7-410 Ed1	
	233	7.10.16	Mechanical tension /stress sensor	TTNS	7-410 Ed1	
	234	7.10.17	Vibration sensor	TVBR	7-410 Ed1	
	235	7.10.18	Water pH sensor	TWPH	7-410 Ed1	
W Wind Turbines	236	Table 7	Wind turbine general information	WTUR	61400-25-2 Ed1	
	237	Table 8	Wind turbine rotor information	WROT	61400-25-2 Ed1	
	238	Table 9	Wind turbine transmission information	WTRM	61400-25-2 Ed1	
	239	Table 10	Wind turbine generator information	WGEN	61400-25-2 Ed1	
	240	Table 11	Wind turbine converter information	WCNV	61400-25-2 Ed1	
	241	Table 12	Wind turbine transformer information	WTRF	61400-25-2 Ed1	
	242	Table 13	Wind turbine nacelle information	WNAC	61400-25-2 Ed1	
	243	Table 14	Wind turbine yawing information	WYAW	61400-25-2 Ed1	
	244	Table 15	Wind turbine tower information	WTOW	61400-25-2 Ed1	
	245	Table 16	Wind power plant meteorological information	WMET	61400-25-2 Ed1	
	246	Table 17	Wind power plant alarm information	WALM	61400-25-2 Ed1	
	247	Table 18	Wind turbine state log information	WSLG	61400-25-2 Ed1	
	248	Table 19	Wind turbine analogue log information	WALG	61400-25-2 Ed1	
	249	Table 20	Wind turbine report information	WREP	61400-25-2 Ed1	
	250	Table 21	Wind power plant active power control information	WAPC	61400-25-2 Ed1	
	251	Table 22	Wind power plant reactive power control information	WRPC	61400-25-2 Ed1	
X Switchgear	252	5.16.2	Circuit breaker	XCBR	7-4 Ed2	
	253	5.16.3	Circuit switch	XSWI	7-4 Ed2	
	254	8.3.2	Fuse	XFUS	7-420 Ed2	
Y Power transformers	255	5.17.2	Earth fault neutralizer (Petersen coil)	YEFN	7-4 Ed2	Ext2
	256	5.17.3	Tap changer	YLTC	7-4 Ed2	Ext1
	257	5.17.4	Power shunt	YPSH	7-4 Ed2	
	258	5.17.5	Power transformer	YPTR	7-4 Ed2	Ext2

IEC 61850 and IEC 61400-25 Logical Node Classes

LN Group	#	Clause	Description	Name	Part	Remark
Z further power system equipment	259	5.18.2	Auxiliary network	ZAXN	7-4 Ed2	Ext1
	260	5.18.3	Battery	ZBAT	7-4 Ed2	Ext1
	261	5.18.4	Bushing	ZBSH	7-4 Ed2	Ext1
	262	5.18.5	Power cable	ZCAB	7-4 Ed2	
	263	5.18.6	Capacitor bank	ZCAP	7-4 Ed2	
	264	5.18.7	Converter	ZCON	7-4 Ed2	Ext1
	265	5.18.8	Generator	ZGEN	7-4 Ed2	
	266	5.18.9	Gas insulated line	ZGIL	7-4 Ed2	
	267	5.18.10	Power overhead line	ZLIN	7-4 Ed2	Ext3
	268	5.18.11	Motor	ZMOT	7-4 Ed2	
	269	5.18.12	Reactor	ZREA	7-4 Ed2	Ext3
	270	5.18.13	Resistor	ZRES	7-4 Ed2	New
	271	5.18.14	Rotating reactive component	ZRRC	7-4 Ed2	Ext3
	272	5.18.15	Surge arrestor	ZSAR	7-4 Ed2	
	273	5.18.16	Semi-conductor controlled rectifier	ZSCR	7-4 Ed2	New
	274	5.18.17	Synchronous machine	ZSMC	7-4 Ed2	New
	275	5.18.18	Thyristor controlled frequency converter	ZTCF	7-4 Ed2	
	276	5.18.19	Thyristor controlled reactive component	ZTCR	7-4 Ed2	
	277	7.11.2	Neutral resistor	ZRES	7-410 Ed1	
	278	7.11.3	Semiconductor rectifier controller	ZSCR	7-410 Ed1	
	279	7.11.4	Synchronous machine	ZSMC	7-410 Ed1	
	280	6.4.2	Rectifier	ZRCT	7-420 Ed2	
	281	6.4.3	Inverter	ZINV	7-420 Ed2	
	282	8.2.2	Battery systems	ZBAT	7-420 Ed2	
	283	8.2.3	Battery charger	ZBTC	7-420 Ed2	

7410-FDIS ED2 (2012-08-08)

ACTM	Control mode selection.
AJCL	Joint control function, to balance total power from different sources.
APSS	PSS Control. Common information of a PSS function.
APST	PSS 2A/B filter. Represents a filter according to IEEE 421.5-2005.
APSF	PSS 4B filter. Represents a filter according to IEEE 421.5-2005.
FHBT	Heart beat function of a controlling device.
FSCH	Scheduler. This LN represents a task scheduler
FXPS	Functional priority status.
HBRG	Turbine – generator shaft bearing.
HCOM	Combinator (3D CAM or 2D CAM)
HDAM	Hydropower dam.
HDFL	Deflector control.
HDLS	Dam leakage supervision.
HEBR	Electrical brake.
HGPI	Gate position indicator.
HGOV	Governor control.
HGTE	Dam gate.
HITG	Intake gate.
HJCL	Power plant joint control function.
HLKG	Leakage supervision.
HLVL	Water level indicator.
HMBR	Mechanical brake for the generator shaft.
HNDL	Needle control.
HNHD	Net head data.
HOTP	Dam overtopping protection.
HRES	Water reservoir.
HSEQ	Start / stop sequencer.
HSPD	Speed monitoring.
HSST	Surge shaft or surge tank.
HTGV	Guide vanes (wicket gate).
HTRB	Runner blades.
HTRK	Trash rack,
HTUR	Turbine.
HUNT	Hydropower production unit.
HVLV	Valve.
HWCL	Water control function.
IFIR	Generic fire detection and alarm function.
IHND	Generic physical human – machine interface.
KHTR	Heater.
PRTR	Rotor protection.
RFBC	Field breaker configuration.
SFLW	Media flow supervision.
SLEV	Media level supervision.
SPOS	Device position supervision.
SPRS	Media pressure supervision.
XFFL	Field flashing.