

## TECHNICAL REPORT



**Communication networks and systems for power utility automation –  
Part 90-6: Use of IEC 61850 for Distribution Automation Systems**



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## TECHNICAL REPORT



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### Communication networks and systems for power utility automation – Part 90-6: Use of IEC 61850 for Distribution Automation Systems

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## CONTENTS

FOREWORD.....	9
INTRODUCTION.....	11
1 Scope.....	13
1.1 General.....	13
1.2 Namespace information .....	13
1.3 Code components .....	13
2 Normative references .....	14
3 Terms, definitions, abbreviated terms and definitions of fault types .....	15
3.1 Terms and definitions.....	16
3.2 Abbreviated terms.....	16
3.2.1 Proposed specifically for the data model part of the report.....	16
3.2.2 Existing abbreviations used in the original IEC 61850 data object names model .....	17
3.3 Definitions of fault types.....	29
4 Common actors .....	29
5 Requirements and use cases.....	38
5.1 General.....	38
5.2 Use case 1: Fault indication and report.....	39
5.2.1 General .....	39
5.2.2 Use case 1a: Generic use case – Not fault type specific .....	39
5.2.3 Use case 1b: Overcurrent non directional Fault Localization and Indication (F1C/NC).....	58
5.2.4 Use case 1c: Phase to earth faults, non directional fault detection (F2) .....	59
5.2.5 Use case 1d: Overcurrent and Phase to earth faults detection non directional (F3) .....	59
5.2.6 Use case 1e: Overcurrent, directional and non directional, fault detection (F4).....	60
5.2.7 Use case 1f: Overcurrent, non directional, phase to earth faults, directional and non directional fault detection (F5).....	60
5.2.8 Use case 1g: Overcurrent and phase to earth faults, directional and non directional fault detection (F6) .....	60
5.3 Use case 2: FLISR based on local control.....	60
5.3.1 General .....	60
5.3.2 Use case 2a: FLISR using sectionalizers detecting fault current .....	60
5.3.3 Use case 2b: FLISR using sectionalizers detecting feeder voltage (SDFV) .....	72
5.4 Use case 3: FLISR based on centralized control .....	89
5.4.1 General .....	89
5.4.2 Use case 3a: FLISR in a radial feeder based on centralized control .....	89
5.4.3 Use case 3b: FLISR in an open loop feeder based on centralized control .....	98
5.5 Use case 4: FLISR based on distributed control.....	104
5.5.1 General .....	104
5.5.2 Use case 4a: FLISR in an open loop network based on distributed control – Type A .....	105
5.5.3 Use case 4b: FLISR based on distributed control – Type B.....	129
5.6 Use case 5: Centralized Voltage and Var Control.....	146
5.6.1 Description of the use case .....	146

5.6.2	Diagrams of use case .....	148
5.6.3	Technical details.....	149
5.6.4	Step by step analysis of use case .....	150
5.6.5	Information exchanged .....	152
5.7	Use case 6: Anti-islanding protection based on communications .....	152
5.7.1	Description of the use case .....	152
5.7.2	Diagrams of use case .....	154
5.7.3	Technical details.....	157
5.7.4	Step by step analysis of use case .....	158
5.7.5	Information exchanged .....	161
5.8	Use Case 7: Automatic transfer switch .....	161
5.8.1	Description of the use case .....	161
5.8.2	Diagrams of use case .....	162
5.8.3	Technical details.....	164
5.8.4	Step by step analysis of use case .....	164
5.8.5	Information exchanged .....	166
5.9	Use Case 8: Monitor energy flows (Energy flow related Use cases) .....	166
5.9.1	Use case breakdown .....	166
5.9.2	Monitor Energy flows .....	168
5.9.3	Elaborate the direction of the energy flow .....	169
5.10	Use Case 9: Environment situation awareness.....	172
5.10.1	Description of the use case .....	172
5.11	Use case 10: Configuration of IEDs participating in distributed control.....	175
5.11.1	Description of the use case .....	175
6	Information models .....	190
6.1	Mapping of requirements on LNs .....	190
6.1.1	Mapping of the requirements of Fault Identification and report .....	190
6.1.2	Mapping of the requirements of FLISR based on local control – Type 2 .....	192
6.1.3	Mapping of the requirements of FLISR based on centralized control – Type 3 .....	195
6.1.4	Mapping of the requirements of FLISR based on distributed control – Type 4 .....	196
6.1.5	Mapping of the requirements of VVC use case – Type 5 .....	204
6.1.6	Mapping of the requirements of anti-islanding protection use case – Type 6 .....	206
6.1.7	Mapping of the requirements of automatic transfer switch use case – Type 7 .....	207
6.1.8	Mapping of the requirements of Monitor energy flows related Use case – Type 8 .....	209
6.1.9	Mapping of Environment situation awareness use case – Type 9 .....	210
6.2	Mapping summary of the set of UCs over the LNs (existing or new) .....	213
7	Logical node classes and data objects modelling .....	214
7.1	General.....	214
7.2	Logical node classes.....	214
7.2.1	General .....	214
7.2.2	Abstract LN of 90-6 namespace (Abstract90-6LNs) .....	214
7.2.3	LN of Group A (LNGroupA_90_6) .....	219
7.2.4	LN of Group D (LNGroupD_90_6) .....	230
7.2.5	LN of Group K (LNGroupK_90_6) .....	232
7.2.6	LN of Group M (LNGroupM_90_6) .....	236

7.2.7	LN from Group P (LNGroupP_90_6)	249
7.2.8	LN of Group R (LNGroupR_90_6)	251
7.2.9	LN of Group S (LNGroupS_90_6)	253
7.3	Data semantics	265
7.4	Enumerated data attribute types	271
7.4.1	General	271
7.4.2	Actual source (ActualSourceKind enumeration)	272
7.4.3	AffectedPhases90_6Kind enumeration	273
7.4.4	ATSAutoReturnModeKind enumeration	273
7.4.5	ATSSequenceResultKind enumeration	274
7.4.6	ATSSequenceStatusKind enumeration	274
7.4.7	FaultConfirmationModeKind enumeration	275
7.4.8	FaultPermanenceKind enumeration	275
7.4.9	FaultSourceTypeKind enumeration	276
7.4.10	GateStatusKind enumeration	276
7.4.11	IslandingStateKind enumeration	277
7.4.12	momentary close request in case of use of RFV automation (MomentaryCloseResultKind enumeration)	277
7.4.13	NormalSourceKind enumeration	277
7.4.14	RFVFuncTypeKind enumeration	277
7.4.15	Result of the latest restoration process (SequenceEndResultKind enumeration)	278
7.4.16	SequenceStatusKind enumeration	278
7.5	SCL enumerations (from DOEnums_90_6)	279
8	Communication and architectures	281
8.1	Types of communication architecture	281
8.1.1	General	281
8.1.2	Digital communication with remote monitoring	281
8.1.3	Digital communications with remote monitoring and control	282
8.1.4	Digital communication with distributed control	282
8.2	Architectures matching use cases	283
8.3	Cyber-security	284
9	Configuration	284
Annex A (informative)	Interpretation of logical node tables	294
A.1	General interpretation of logical node tables	294
A.2	Conditions for element presence	294
Annex B (informative)	Typical Grid topologies considered in this report	297
Bibliography		298
Figure 1	Actors top level hierarchy	30
Figure 2	System Actors SGAM positioning (function)	31
Figure 3	System Actors SGAM positioning (not function related)	32
Figure 4	Fault indication – Main use case	41
Figure 5	Fault indication for FPI – T1	42
Figure 6	Fault indication and report for FPI – T2	43
Figure 7	Fault indication for FPI – T3,T4 (with communication to HV/MV SS) in the context of FLISR as described in 5.4	44

Figure 8 – Fault indication for FPI – T3,T4 (without communication to HV/MV SS) in the context of FLISR as described in 5.4.....	45
Figure 9 – Voltage Presence/Absence .....	59
Figure 10 – FLISR use case breakdown.....	63
Figure 11 – Fault location sequence diagram .....	64
Figure 12 – Fault isolation sequence diagram .....	65
Figure 13 – Service restoration sequence diagram.....	66
Figure 14 – A distribution grid configuration in a multi-source network based on open loops .....	73
Figure 15 – The basic behavior of distribution feeder in FLISR using sectionalizers detecting feeder voltage .....	75
Figure 16 – FLISR-SDFV use case break down .....	76
Figure 17 – FLISR-SDFV Fault Location and Identification sequence diagram .....	77
Figure 18 – FLISR-SDFV Fault Location and Identification sequence diagram .....	78
Figure 19 – FLISR-SDFV Fault Location and Identification sequence diagram .....	78
Figure 20 – FLISR-SDFV Fault Location and Identification sequence diagram .....	79
Figure 21 – Auxiliary use cases for FLISR using SDFV .....	79
Figure 22 – FLISR-SDFV Set X specific time sequence diagram .....	80
Figure 23 – FLISR-SDFV Set Y specific time sequence diagram .....	80
Figure 24 – FLISR-SDFV Release blocking of closing sequence diagram .....	80
Figure 25 – FLISR-SDFV Set functional type sequence diagram .....	81
Figure 26 – FLISR-SDFV Set connection direction sequence diagram .....	81
Figure 27 – FLISR-SDFV Supervisory sequence diagram .....	81
Figure 28 – Common actors in a distribution system with FLISR using SDFV .....	83
Figure 29 – Centralized FLISR in a radial feeder – Use cases.....	91
Figure 30 – Centralized FLISR for radial feeder – Fault location sequence diagram .....	92
Figure 31 – Centralized FLISR for radial feeder – Fault isolation sequence diagram .....	93
Figure 32 – Centralized FLISR for radial feeder – Service restoration sequence diagram .....	93
Figure 33 – Centralized FLISR for open loop – Use case breakdown .....	100
Figure 34 – Centralized FLISR for open loop – Service restoration sequence diagram .....	101
Figure 35 – A distributed DAS for an open loop overhead feeder .....	107
Figure 36 – Distributed FLISR in an open loop network – Upstream use cases breakdown .....	110
Figure 37 – Distributed FLISR in an open loop network – Operation use cases breakdown .....	111
Figure 38 – Distributed FLISR in an open loop network – Topology discovery sequence diagram .....	112
Figure 39 – Distributed FLISR in an open loop network – FLISR operation sequence diagram .....	114
Figure 40 – Logical selectivity – FLI along the MV feeder .....	131
Figure 41 – Logical selectivity – FLI inside the EU plant .....	132
Figure 42 – Logical selectivity – FLI along the MV feeder and anti-islanding .....	133
Figure 43 – Distributed FLISR 4b – Use case breakdown.....	134
Figure 44 – Distributed FLISR 4b – For further analysis .....	135
Figure 45 – Volt-Var Control – Use case breakdown .....	148

Figure 46 – Volt-Var Control – Sequence diagram .....	149
Figure 47 – Possible fault location on the feeder.....	153
Figure 48 – Anti-islanding protection – Use case breakdown.....	154
Figure 49 – Anti-islanding protection – Role diagram .....	155
Figure 50 – Anti-islanding protection – Sequence diagram.....	156
Figure 51 – Automatic transfer switch – Scenario flowchart.....	163
Figure 52 – Automatic transfer switch – Use cases breakdown .....	163
Figure 53 – Automatic transfer switch – Activity flowchart .....	165
Figure 54 – Monitor energy flows – use case breakdown .....	167
Figure 55 – Sequence diagram for the “Monitor energy flows” use case.....	168
Figure 56 – Environment situation awareness – Use cases breakdown .....	173
Figure 57 – Environment situation awareness – Sequence diagram .....	174
Figure 58 – The schematic diagram of remote configuration process .....	178
Figure 59 – Configuration of IEDs participating in distributed control – Use case diagram .....	179
Figure 60 – Configuration of IEDs participating in distributed control – Sequence diagram .....	180
Figure 61 – Possible arrangement of LNs to support fault passage indication .....	192
Figure 62 – Typical Arrangement of LNs to support FLISR using sectionalizers detecting fault current .....	193
Figure 63 – Typical Arrangement of LNs to support FLISR using SDFV .....	194
Figure 64 – Logical arrangement of LNs to support FLISR using SDFV.....	194
Figure 65 – Typical Arrangement of LNs to FLISR based on centralized control.....	196
Figure 66 – Typical arrangement of LNs to support distributed fault location (case 4a) .....	197
Figure 67 – Typical arrangement of LNs (between FeCtl) to support distributed fault location (case 4a) .....	198
Figure 68 – Typical arrangement of LNs to support distributed fault isolation (case 4a) .....	199
Figure 69 – Typical arrangement of LNs (between FeCtl) to support distributed fault isolation (case 4a) .....	199
Figure 70 – Possible arrangement to support distributed service restoration .....	200
Figure 71 – Break down of LNs and relationships to support distributed service restoration .....	201
Figure 72 – Possible LN arrangement of breakers related functions, contributing to distributed FLISR (case 4b) .....	203
Figure 73 – Possible LN arrangement of disconnectors related functions, contributing to distributed FLISR (case 4b) .....	204
Figure 74 – Possible LN arrangement for the mapping for tap changer control.....	205
Figure 75 – Possible LN arrangement for the mapping for capacitor bank control .....	206
Figure 76 – Breakdown of LNs and relationships to support unintentional islanding protection .....	207
Figure 77 – Possible arrangement of LNs to perform automatic transfer switch.....	209
Figure 78 – Possible arrangement of LNs to Monitor energy flows related Use cases .....	210
Figure 79 – Possible arrangement of LNs to support Environment situation awareness use cases .....	212
Figure 80 – Class diagram LogicalNodes_90_6::LogicalNodes_90_6 .....	214
Figure 81 – Class diagram Abstract90-6LNs::LN AbstractLN 90_6 .....	215



Figure 82 – Statechart diagram LNGroupA_90_6::AATS Generic state-machine .....	219
Figure 83 – Statechart diagram LNGroupA_90_6::AATS Normal-Back-up .....	220
Figure 84 – Class diagram LNGroupA_90_6::LN GroupA 90_6 .....	221
Figure 85 – Class diagram LNGroupD_90_6::LN GroupD 90_6 .....	231
Figure 86 – Class diagram LNGroupK_90_6::LN GroupK 90_6 .....	233
Figure 87 – Class diagram LNGroupM_90_6::LN GroupM (1) 90_6 .....	236
Figure 88 – Class diagram LNGroupM_90_6::LN GroupM (2) 90_6 .....	237
Figure 89 – Class diagram LNGroupP_90_6::LN GroupP 90_6 .....	249
Figure 90 – Class diagram LNGroupR_90_6::LN GroupR 90_6 .....	251
Figure 91 – Class diagram LNGroupS_90_6::LN GroupS (1) 90_6 .....	253
Figure 92 – Class diagram LNGroupS_90_6::LN GroupS (2) 90_6 .....	254
Figure 93 – Class diagram DOEnums_90_6::DO Enumerations 90_6 .....	272
Figure 94 – Centralised distribution automation architecture with monitoring .....	281
Figure 95 – Centralised distribution automation architecture with monitoring and control .....	282
Figure 96 – Distributed control architecture .....	282
Figure 97 – Mixed distribution automation architecture combining distributed and centralised monitoring and control .....	283
Figure 98 – Distributed feeder automation system for an open loop overhead feeder .....	285
Figure 99 – Configuration process for the information exchange between substation automation and grid automation systems .....	286
Figure B.1 – Typical grid topologies .....	297
Table 1 – Normative abbreviations for data object names .....	17
Table 2 – Normative abbreviations for data object names .....	17
Table 3 – Time based Fault types .....	29
Table 4 – List of common actors .....	33
Table 5 – Mapping of Fault Identification and report use case 1 requirements onto LNs .....	190
Table 6 – Mapping of FLISR using sectionalizers detecting fault current use case 2a requirements onto LNs .....	193
Table 7 – Mapping of FLISR using SDFV use case 2b requirements onto LNs .....	195
Table 8 – Mapping of Distributed FLISR (fault location) use case 4a onto LNs .....	196
Table 9 – Mapping of Distributed FLISR (fault isolation) use case 4a onto LNs .....	198
Table 10 – Mapping of Distributed FLISR (service restoration) use case 4a onto LNs .....	200
Table 11 – Mapping of Distributed FLISR use case 4b requirements onto LNs .....	202
Table 12 – Mapping of anti-islanding use case requirements onto LNs .....	206
Table 13 – Mapping of automatic transfer switch use case requirements onto LNs .....	208
Table 14 – Energy flow related use case requirement mapping over LNs .....	210
Table 15 – Mapping of Environment situation awareness use cases to existing or new LNs .....	211
Table 16 – Data objects of AutomatedSequenceLN .....	216
Table 17 – Data objects of AutomaticSwitchingLN .....	217
Table 18 – Data objects of ASWI .....	222
Table 19 – Data objects of AATS .....	224
Table 20 – Data objects of AFSI .....	226

Table 21 – Data objects of AFSL.....	227
Table 22 – Data objects of ASRC.....	229
Table 23 – Data objects of DISL .....	232
Table 24 – Data objects of KFIM.....	234
Table 25 – Data objects of KILL .....	235
Table 26 – Data objects of MENVExt .....	238
Table 27 – Data objects of MMETExt .....	240
Table 28 – Data objects of MMTNExt.....	242
Table 29 – Data objects of MMTRExt.....	244
Table 30 – Data objects of MMXNExt.....	246
Table 31 – Data objects of MMXUExt.....	247
Table 32 – Data objects of PTRCExt.....	249
Table 33 – Data objects of RRFV .....	251
Table 34 – Data objects of SCPI.....	255
Table 35 – Data objects of SFOD.....	256
Table 36 – Data objects of SFPI .....	257
Table 37 – Data objects of SFST .....	259
Table 38 – Data objects of SGPD .....	260
Table 39 – Data objects of SSMK .....	262
Table 40 – Data objects of SPSE .....	263
Table 41 – Data objects of SVPI .....	264
Table 42 – Attributes defined on classes of LogicalNodes_90_6 package .....	265
Table 43 – Literals of ActualSourceKind .....	273
Table 44 – Literals of AffectedPhases90_6Kind .....	273
Table 45 – Literals of ATSAutoReturnModeKind .....	274
Table 46 – Literals of ATSSequenceResultKind .....	274
Table 47 – Literals of ATSSequenceStatusKind .....	275
Table 48 – Literals of FaultConfirmationModeKind .....	275
Table 49 – Literals of FaultPermanenceKind.....	276
Table 50 – Literals of FaultSourceTypeKind.....	276
Table 51 – Literals of GateStatusKind.....	276
Table 52 – Literals of IslandingStateKind .....	277
Table 53 – Literals of MomentaryCloseResultKind .....	277
Table 54 – Literals of NormalSourceKind .....	277
Table 55 – Literals of RFVFuncTypeKind .....	278
Table 56 – Literals of SequenceEndResultKind.....	278
Table 57 – Literals of SequenceStatusKind.....	278
Table 58 – Distribution automation architecture matching the use cases.....	283
Table 59 – Mapping information models onto the protocol.....	284
Table A.1 – Interpretation of logical node tables .....	294
Table A.2 – Conditions for presence of elements within a context .....	294

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**COMMUNICATION NETWORKS AND SYSTEMS  
FOR POWER UTILITY AUTOMATION –****Part 90-6: Use of IEC 61850 for Distribution Automation Systems**

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IEC 61850-90-6, 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
57/1929/DTR	57/2008/RVDTR

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

As a reminder a Joint Ad Hoc Group (JAHWG 51) had been set up between IEC Technical Committee 38 and IEC TC 57 in order to capture the requirements elaborated by the experts of the Fault Passage Indicators domain, which resulted in the publication of IEC TR 62689-100 in October 2016.

As agreed in the term of reference of this JAHWG 51, IEC TC 57 merged the conclusions of the above work within this document.

In return, it was agreed that IEC 62689-3, dealing with *Current and Voltage sensors or detectors, to be used for fault passage indication purposes – Part 3: Communication*, should be based on the content of IEC TR 61850-90-6.

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

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## INTRODUCTION

IEC 61850 consists of the following parts, under the general title *Communication networks and systems for power utility automation* (all parts may have not been published yet).

- Part 1: Introduction and overview
- Part 2: Glossary
- Part 3: General requirements
- Part 4: System and project management
- Part 5: Communication requirements for functions and device models
- Part 6: Configuration description language for communication in electrical substations related to IEDs
- Part 7-1: Basic communication structure – Principles and models
- Part 7-2: Basic communication structure – Abstract communication service interface (ACSI)
- Part 7-3: Basic communication structure – Common data classes
- Part 7-4: Basic communication structure – Compatible logical node classes and data classes
- Part 7-410: Hydroelectric power plants – Communication for monitoring and control
- Part 7-420: Basic communication structure – Distributed energy resources logical nodes
- Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3
- Part 80-1: Guideline to exchange information from a CDC based data model using IEC 60870-5-101/104
- Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3
- Part 90-1: Use of IEC 61850 for the communication between substations
- Part 90-2: Using IEC 61850 for the communication between substations and control centres<sup>1</sup>
- Part 90-3: Using IEC 61850 for condition monitoring
- Part 90-4: Network Engineering Guidelines – Technical report
- Part 90-5: Using IEC 61850 to transmit synchrophasor information according to IEEE C37.118
- Part 90-7: Object models for power converters in distributed energy resources (DER) systems
- Part 90-8: Object model for E-mobility
- Part 10: Conformance testing

In addition to the above, the IEC 61850 basic communication structure for Wind Turbines has been published as IEC 61400-25, *Wind turbines – Communications for monitoring and control of wind power plants*.

IEC 61850-1 is an introduction and overview of the IEC 61850 series. It describes the philosophy, work approach and contents of the other parts.

Distribution Automation (DA) is a concept which emerged in the 1970s to promote the application of computer and communication technologies for the betterment of distribution system operating performance. It is in general used as an umbrella term to capture the deployment of automation technologies for protection, control, monitoring, and operation of distribution systems. These technologies enable electric utilities to monitor, control, and

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<sup>1</sup> Under preparation. Stage at the time of publication: IEC/PWI 61850-90-2:2018.

operate distribution components in a real-time or non-real-time mode. The industry is also pushing towards smart and active distribution networks which support the high penetration of Distributed Energy Resources (DERs) and have better supply reliability and operation efficiency. As a result, DA concepts are also being extended in the form of Advanced Distribution Automation (ADA), which includes automation of DERs and demand response programs.

A widely-recognized instance of a DA project involves utilization of communication and information technology to enable real-time monitoring and control of switching devices including circuit breakers, line reclosers, automatic sectionalizers as well as capacitor banks and line regulators in MV networks. This control can be achieved in local, distributed, and central means. Local control is implemented inside a device based on local measurements. Distributed control involves peer-to-peer communication among relevant field devices. Central control is SCADA-like and is implemented in a substation or control room. This category of DA is also referred to as Feeder Automation (FA). Before the deployment of FA, the switching operations have to be done by the field crew, requiring physical patrolling of the feeder route to locate faults and manual verification of every switching action. Evidently, this practice prolongs the switching time and gives rise to extended outage times and system inefficiencies. With the application of data collection and real-time control through FA, these switching tasks are accomplished in an automated fashion giving rise to accelerated restoration times which are much less than those offered by the legacy systems.

## COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

### Part 90-6: Use of IEC 61850 for Distribution Automation Systems

#### 1 Scope

##### 1.1 General

The contents of Distribution Automation (DA) vary between different countries, regions, even between different utilities in the same country. DA may cover HV/MV substations, MV networks, LV networks, distributed energy resources, as well as demand sides. This part of IEC 61850, which is a technical report, provides basic aspects that need to be considered when using IEC 61850 for information exchange between systems and components to support Distribution Automation applications, within MV network automation, as presented in Annex B.

In particular, this document:

- defines use cases for typical DA applications that require information exchange between two or more components/systems
- provides modelling of components commonly used in DA applications
- proposes new logical nodes and the extensions to the existing logical nodes that can be used in typical DA applications.
- provides guidelines for the communication architecture and services to be used in DA applications
- provides configuration methods for IEDs to be used in DA systems.

Its content also results from the merge of the preparatory work exposed in IEC TR 62689-100 – *Current and voltage sensors or detectors, to be used for fault passage indication purposes – Part 100: Requirements and proposals for the IEC 61850 series data model extensions to support fault passage indicators applications.*

##### 1.2 Namespace information

The parameters which identify this new release of this namespace are:

- Namespace Version: 2018
- Namespace Revision: A
- UML model file which reflects this namespace edition: wg10uml02v20draft20-wg18uml02v11b-wg17uml02v22-jwg25uml02v04c-tc17uml0-tc38uml0.eap, UML model version WG10UML02v20draft20
- Namespace release date: 2018-05-20
- Namespace name: "(Tr)IEC61850-90-6:2018A"

The name space "(Tr)IEC61850-90-6:2018A" is considered as "transitional" since the models are expected to be included in IEC 61850-7-4xx Edition 2. Potential extensions/modifications may happen if/when the models are moved to the International Standard status.

##### 1.3 Code components

This IEC standard includes Code Components i.e. components that are intended to be directly processed by a computer. Such content is any text found between the markers <CODE BEGINS> and <CODE ENDS>, or otherwise is clearly labelled in this standard as a Code Component.

The purchase of this IEC standard carries a copyright license for the purchaser to sell software containing Code Components from this standard to end users either directly or via distributors, subject to IEC software licensing conditions, which can be found at: [www.iec.ch/CCv1](http://www.iec.ch/CCv1).

In this document, code components are contained in the tables and XML code lines located within Clause 7.

A separate file contains the electronic version of these code components.

The Code Components included in this IEC document are also available in a light version (without the description textual elements) as electronic machine readable file at:

[http://www.iec.ch/tc57/supportdocuments/IEC\\_61850-90-6.NSD.2018A.light.zip](http://www.iec.ch/tc57/supportdocuments/IEC_61850-90-6.NSD.2018A.light.zip)

The Code Component(s) included in this IEC standard are potentially subject to maintenance works and the user shall select the latest release in the repository located at: <http://www.iec.ch/tc57/supportdocuments>.

The latest version/release of the document will be found by selecting the file of name: IEC\_61850-90-6.NSD.{VersionStateInfo}.light.zip with the filed VersionStateInfo of the highest value.

In case of any differences between the code components available at the address given above and the IEC pdf published content, the code component(s) published on the IEC web site (see above) is(are) valid; they may be subject to updates. See history files of these code components.

## 2 Normative references

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

IEC TS 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

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

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*

IEC 61850-6:2009/AMD1:2018

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*

IEC 61850-7-2:2010/AMD1:2018<sup>2</sup>

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-3:2010/AMD1:2018<sup>3</sup>

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-7-4:2010/AMD1:2018<sup>4</sup>

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*

<sup>2</sup> Under preparation. Stage at the time of publication: IEC/AFDIS 61850-7-2/AMD1:2018.

<sup>3</sup> Under preparation. Stage at the time of publication: IEC/AFDIS 61850-7-3/AMD1:2018.

<sup>4</sup> Under preparation. Stage at the time of publication: IEC/AFDIS 61850-7-3/AMD1:2018.