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**Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung –
Teil 7-1: Grundlegende Kommunikationsstruktur –
Grundsätze und Modelle
(IEC 57/2035/CDV:2018);
Englische Fassung EN 61850-7-1:2011/prA1:2018**

Communication networks and systems for power utility automation –
Part 7-1: Basic communication structure –
Principles and models
(IEC 57/2035/CDV:2018);
English version EN 61850-7-1:2011/prA1:2018

Réseaux et systèmes de communication pour l'automatisation des systèmes électriques –
Partie 7-1: Structure de communication de base –
Principes et modèles
(IEC 57/2035/CDV:2018);
Version anglaise EN 61850-7-1:2011/prA1:2018

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2019-04-05 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

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Gesamtumfang 122 Seiten

DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

Nationales Vorwort

Die Englische Fassung des europäischen Dokuments EN 61850-7-3:2011/prA1:2018 „Kommunikationsnetze und -systeme für die Automatisierung in der elektrischen Energieversorgung – Teil 7-1: Grundlegende Kommunikationsstruktur – Grundsätze und Modelle“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 57/2035/CDV:2018 „Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Principles and models“ unverändert in den Entwurf EN 61850-7-3:2011/prA1:2018 übernommen worden.

Das internationale Dokument wurde vom TC 57 „Power systems management and associated information exchange“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

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Document history

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND
SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 7-1: Basic communication structure –
Principles and models

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.
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International Standard IEC 61850-7-1 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

This second edition cancels and replaces the first edition published in 2003. This second edition constitutes a technical revision.

50 Compared to the first edition, this second edition introduces:

- 51 • the model for statistical and historical statistical data,
- 52 • the concepts of proxies, gateways, LD hierarchy and LN inputs,
- 53 • the model for time synchronisation,
- 54 • the concepts behind different testing facilities,
- 55 • the extended logging function.

56 It also clarifies the following points:

- 57 • the use of numbers for data extension,
- 58 • the use of namespaces,
- 59 • the mode and behaviour of a logical node,
- 60 • the use of range and deadbanded values,
- 61 • the access to control actions and others.

62 Compared to the second edition, this first revision of the second edition:

- 63 • provides clarifications and corrections to the second edition of IEC 61850-7-1, based 55
64 on the tissues = {828, 874, 948, 1060, 1072, 1129, 1151, 1196, 1251, 1268, 1312, 1396,
65 1437, 1468, 1491};
- 66 • re-edit the clause 8.2.3 on gateways and proxies;
- 67 • re-edit the complete clauses 13 and 14 about namespaces and rules for extension of
68 object classes;
- 69 • include three new normative annexes respectively for LGOS/LSVS engineering (G),
70 GOOSE/SMV Subscription Configuration (H) and use case scenarios examples for
71 clarifying the common rules of clause 14 (J);
- 72 • introduces in the informative annex I, the concept of decoupling domain namespaces from
73 basic namespaces envisaged in edition 3 of this document;
- 74 • re-edit the clause 8.2.3 on gateways and proxies;
- 75 • updates all excerpts from other documents (e.g. IEC 61850-7-2, IEC 61850-7-3 and IEC
76 61850-7-4) that have been modified by this amendment.

77 The text of this document is based on the following documents:

FDIS	Report on voting

78
79 Full information on the voting for the approval of this standard can be found in the report on
80 voting indicated in the above table.

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

82 A list of all parts of the IEC 61850 series, under the general title: *Communication networks*
83 *and systems for power utility automation* can be found on the IEC website.

84 The committee has decided that the contents of this publication will remain unchanged until
85 the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data
86 related to the specific publication. At this date, the publication will be

- 87 • reconfirmed,
- 88 • withdrawn,

- replaced by a revised edition, or
- amended.

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

The National Committees are requested to note that for this document the stability date is

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

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

98

INTRODUCTION

99 *No change.*

**COMMUNICATION NETWORKS AND
SYSTEMS FOR POWER UTILITY AUTOMATION –**

**Part 7-1: Basic communication structure –
Principles and models**

1 Scope

No change.

2 Normative references

No change.

3 Terms and definitions

No change.

4 Abbreviated terms

Add the following terms.

MICS	Model implementation conformance statement
PICS	Protocol implementation conformance statement
SICS	SCL implementation conformance statement

5 Overview of the IEC 61850 series concepts

5.1 Objective

No change.

5.2 Topology and communication functions of substation automation systems

No change.

5.3 The information models of substation automation systems

Add the following footnote at the end of the third paragraph below figure 3:

There is one exception: the proxy/gateway application. For details, refer to 8.2.3 Gateways and proxies.

5.4 Applications modelled by logical nodes defined in IEC 61850-7-4

Change figure 4 with the following one.

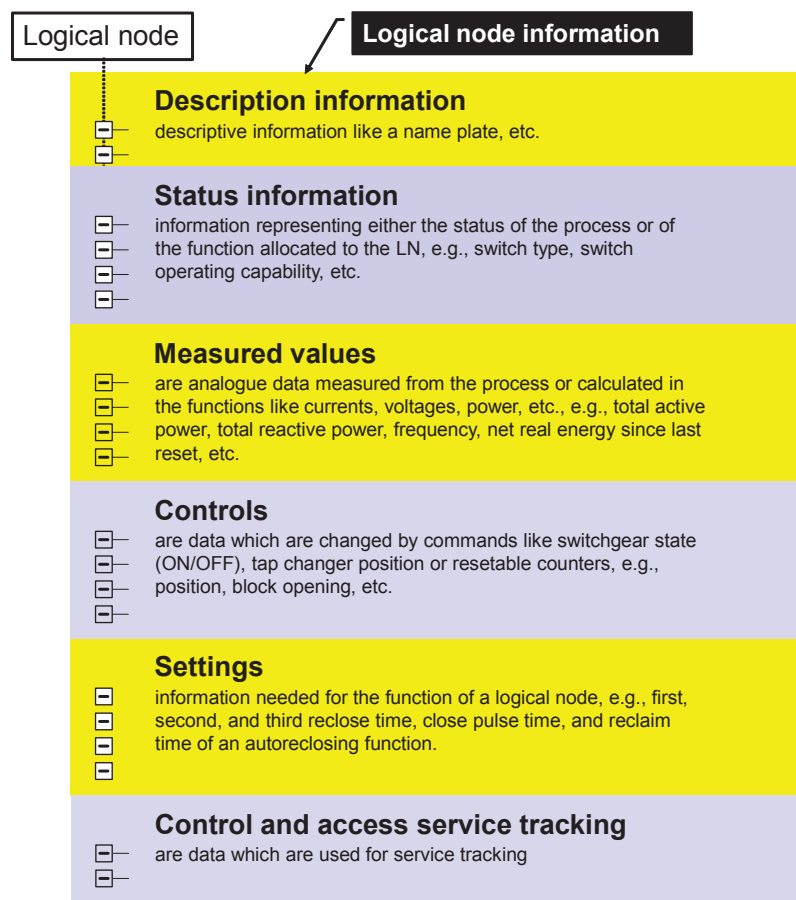


Figure 4 – Logical node information categories

5.5 The semantic is attached to data

Change the first table in the clause by the following one.

Attribute name	Attribute type	FC	TrgOp	(Value/value range) Description	PresCond
stVal	DpStatusKind	ST	dchg	Status value of the controllable data object.	M
ctlModel	CtlModelKind	CF	dchg	Control model of IEC 61850-7-2 that reflects the behaviour of the data.	M

Below this table, change the last item of the dash list by the following one.

- the presence conditions, e.g. mandatory (M) or optional (O). These conditions specify presence of elements in a given context (one LN, or one CDC, or one data attribute type, or one data object for dataNs) and are specified in IEC 61850-7-2.

After this dash list, change the first paragraph by the following one and remove the table after the paragraph.

The data attribute names are standardised (i.e., they are reserved) names that have a specific semantic in the context of the IEC 61850 series. The semantic of all data attribute names is defined in IEC 61850-7-3.

5.6 The services to exchange information

No change.

141 **5.7 Services mapped to concrete communication protocols**

142 *No change.*

143 **5.8 The configuration of the automation system**

144 *No change.*

145 **5.9 Summary**

146 *No change.*

6 Modelling approach of the IEC 61850 series**6.1 Decomposition of application functions and information***No change.***6.2 Creating information models by stepwise composition***Change the table 2 with the following one.***Table 2 – Logical node class XCBR (conceptual)**

Descriptions
External equipment name plate
Name plate of the logical node
Controls
Switch position (see below for details)
Block opening
Block closing
Charger motor enabled
Control authority at station level. Switches between station and higher level.
...
Status information
Mode
Behaviour
Health
External equipment health
Operation counter
Local operation (Indicates the switchover between local and remote operation; local = TRUE, remote = FALSE)
Circuit breaker operating capability
Point on wave switching capability
Circuit breaker operating capability when fully charged
...

Change the table below the figure 11 with the following one.

Data object name	Explanation
...	...
Pos	(controllable) Circuit breaker/switch position.
...	...

6.3 Example of an IED composition*No change.***6.4 Information exchange models****6.4.1 General***No change.*

6.4.2 Output model

6.4.2.1 Control model concept

Replace the figure 14 by the following one (“on-blocked” and “test-blocked” changed by “blocked” and “test/blocked”).

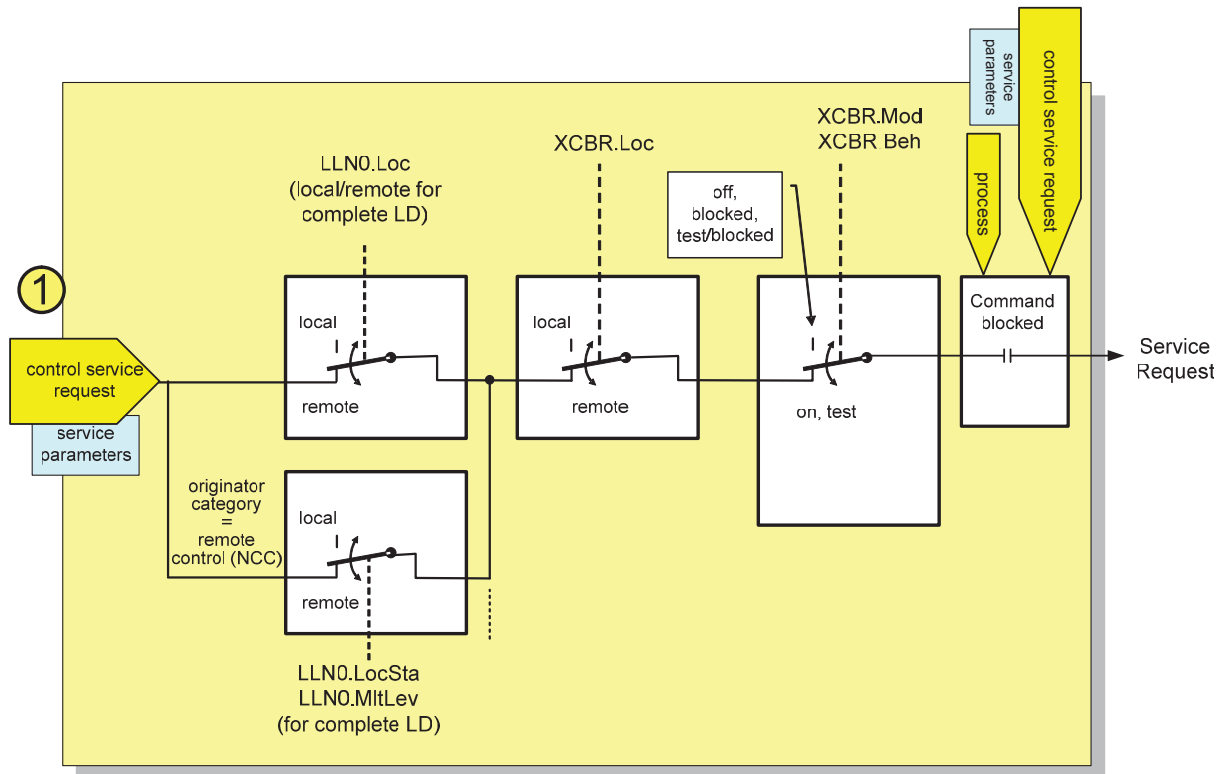


Figure 14 – Output model (step 1) (conceptual)

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6.4.2.2 GSE and SMV model concept

Add the following text after the second paragraph below figure 16.

The fact of receiving GOOSE and SMV messages by an IED is called subscription. How to define subscriptions by means of configuration tools is given in the normative Annex H.

6.4.2.3 Attributes of data and control blocks

No change.

6.4.2.4 Setting data and setting group control block

Change table 3 with the following one.

177

Table 3 – Excerpt of integer status setting

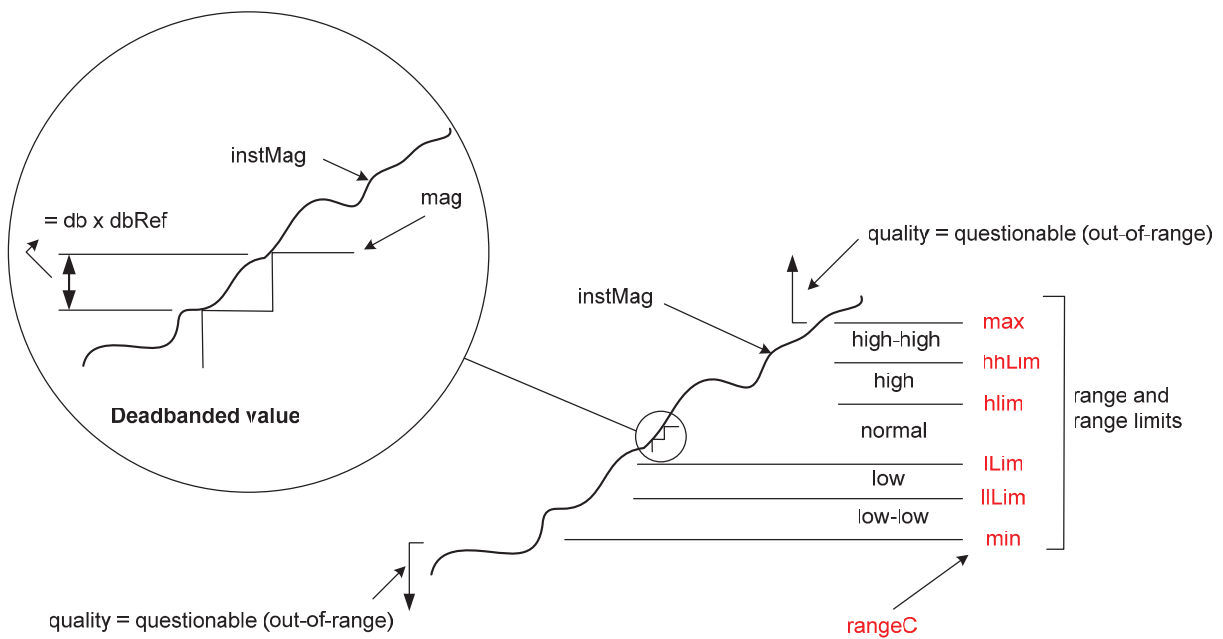
ING class					
Attribute name	Attribute type	FC	TrgOp	Value/value range	PresCond
DataAttribute for configuration, description and extension					
<i>setting</i>					
setVal	INT32	SP	dchg	The value of the status setting.	M
setVal	INT32	SG, SE		The value of the status setting.	M
<i>configuration, description and extension</i>					
minVal	INT32	CF	dchg	Minimum setting for 'setVal'.	O
maxVal	INT32	CF	dchg	Maximum setting for 'setVal'.	O
stepSize	INT32U	CF	dchg	(range=[1...(maxVal-minVal)]) Step between the individual values of 'setVal'.	O
units	Unit	CF	dchg	Unit for 'setVal', 'minVal', 'maxVal', 'stepSize'.	O
d	VISIBLE STRING255	DC		Textual description of the data. In case it is used within the CDC LPL, the description refers to the logical node.	O
...	...	...			...

178

179 **6.4.3 Input model**180 **6.4.3.1 Input analogue signal acquisition**181 *No change.*182 **6.4.3.2 Data attribute value processing, monitoring and event detection**183 *Change the last sentence of the second paragraph with the following sentence.*

184 The value of mag shall be updated to the current value of instMag when the value has
 185 changed according to the value of the configuration parameters db and dbRef of this data.

186 *Change the figure 19 and the subsequent paragraph with the following.*



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Figure 19 – Range and deadbanded value (conceptual)

The value of the deadband configuration db shall represent the percentage of the deadband reference $dbRef$ in units of 0.001% (fixed deadband). A value of $dbRef$ of 0 means that the value db shall represent the percentage of the last transmitted values in units of 0,001 %. This allows for a deadband calculation that is related to the last refreshed value (variable deadband).

Change figure 20 with the following one.

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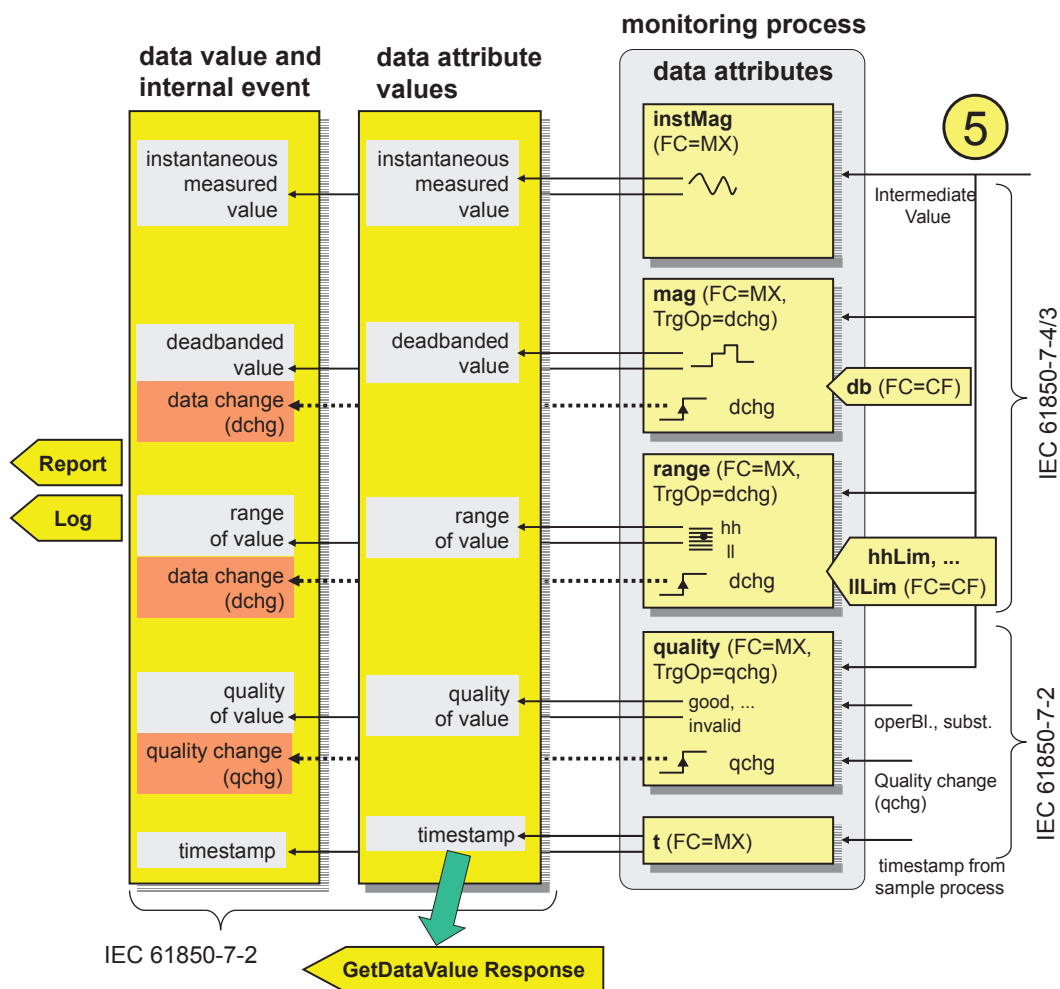


Figure 20 – Input model for analogue values (step 2) (conceptual)

Remove the fourth paragraph below figure 20.

200 **6.4.3.3 Data reporting and logging**

201 *No change.*

202 **6.4.3.4 Peer-to-peer data value publishing**

203 *No change.*

204 **6.4.3.5 Sampled value publishing**

205 *No change.*

206 **6.4.4 Model for statistical and historical statistical data**

207 *Change figure 28 with the following one.*

208

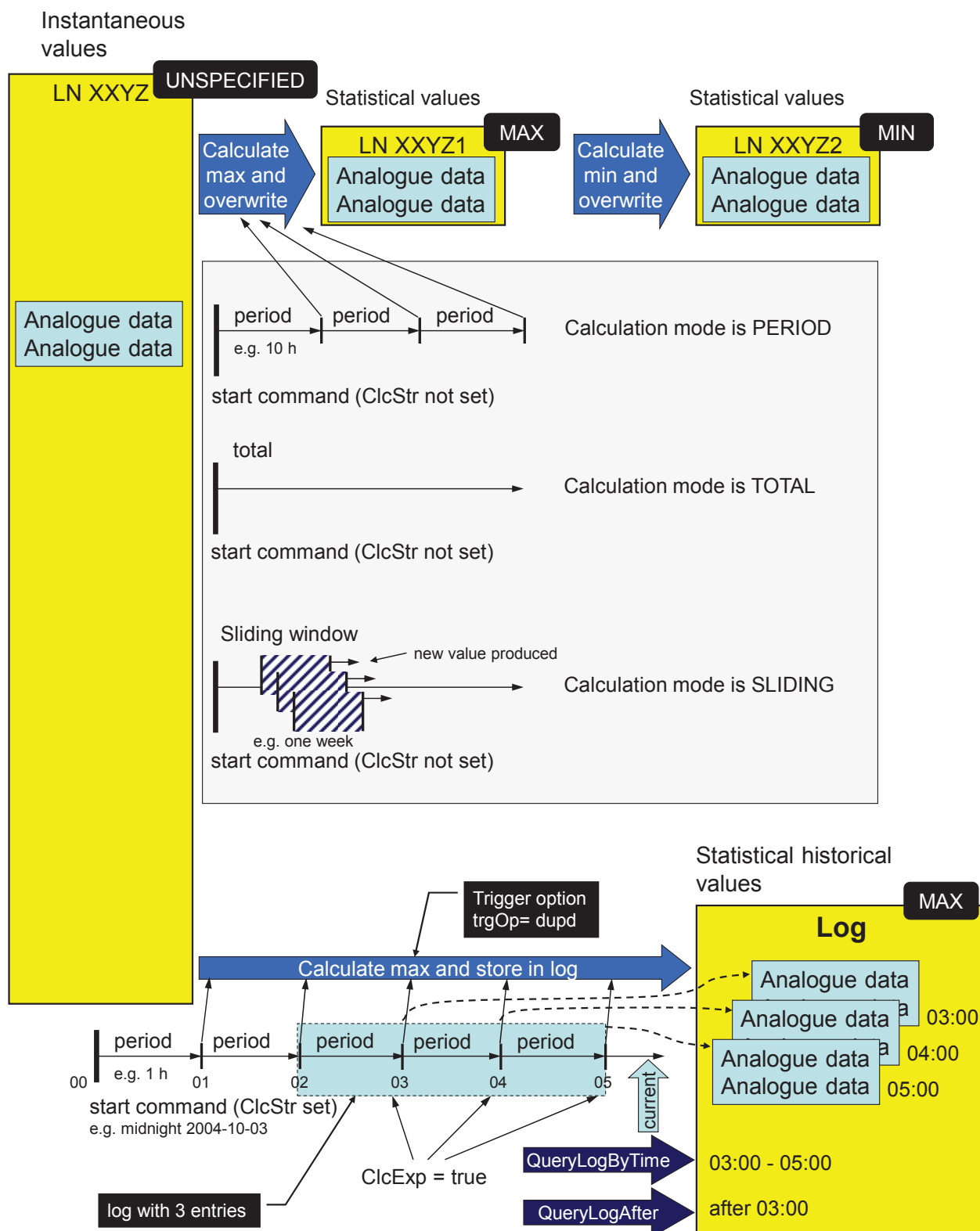


Figure 28 – Conceptual model of statistical and historical statistical data (1)

211 *Change the paragraph before the last paragraph of clause 6.4.4 by the following.*

212 The lower part of the figure shows the conceptual model of the historical statistical data. In
213 this model, the values are calculated periodically (in this case the maximum values with
214 calculation mode set to PERIOD) and are stored in sequence in a log. The calculation in the
215 example starts at midnight of 2004-10-03. The interval is 1 h. After the first hour, the first log
216 entry is written. After the second hour, the second entry contains the value of the second
217 hour. After 5 h, the log contains the values of the last three hours (intervals 02-03, 03-04, 04-
218 05). The expiration of the statistical calculation is indicated by the “event” ClcExp set to true
219 and at this moment the statistical values that have the trigger option dupd are logged even if
220 the values have not changed. The same concept can be applied to the reporting of statistical
221 data.

222 *Remove the last paragraph of clause 6.4.4 (before the note).*

223 **6.4.5 Model for system functions**

224 **6.4.5.1 General**

225 *Remove the last two sentences from the text.*

226 **6.4.5.2 Time synchronization**

227 *No change.*

228 **6.4.5.3 Time management**

229 *No change.*

230 **6.4.5.4 Time supervision**

231 *No change.*

232 **6.4.5.5 GOOSE and SMV supervision**

233 *Add the following text at the end of the text.*

234 The normative Annex G describes the configuration flow with regards to these supervision
235 logical nodes.

236 **6.4.5.6 Service tracking**

237 *No change.*

238 **7 Application view**

239 **7.1 General**

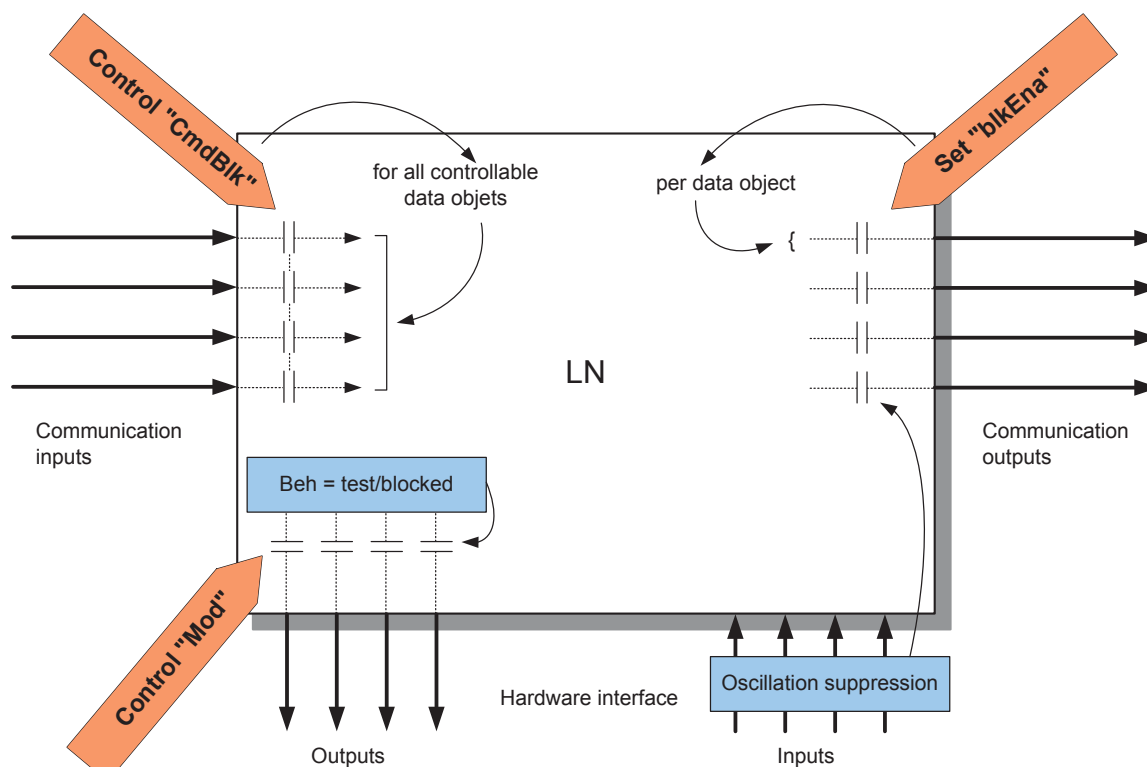
240 *No change.*

241 **7.2 First modelling step – Logical nodes and data**

242 *No change.*

243 **7.3 Mode and behaviour of a logical node**

244 *Change “on-blocked” by “blocked” in the first paragraph below figure 37.*

7.4 Use of measurement ranges and alarms for supervision functions*No change.***7.5 Data used for limiting the access to control actions***No change.***7.6 Data used for blocking functions described by logical nodes***No change.***7.7 Data used for logical node inputs/outputs blocking (operational blocking)****7.7.1 General***Change figure 39 by the following one ("TEST-Blocked" by "test/blocked").***Figure 39 – Data used for logical node inputs/outputs blocking (IEC 61850-7-4)****7.7.2 Blocking incoming commands***Add at the end of the last paragraph the following text.**or CmdBlk itself.***7.7.3 Blocking process outputs***Change the paragraph by the following one.*

The data Mod (Mode) is used to put an LN in different modes. The mode test/blocked (Beh= test/blocked) shall be interpreted as the mode which explicitly disables any physical outputs having an effect on the process. For example, when XCBR.Beh = test/blocked, the physical outputs for closing/opening the breaker are blocked.

7.7.4 Blocking oscillating inputs

No change.

7.8 Data used for testing

7.8.1 General

No change.

7.8.2 Multicast signals used for simulation

Add at the end of the second paragraph below figure 40 the following text and remove the note.

The preceding example doesn't imply any specific sequence with regards to connecting the simulation device and setting the data Sim.stVal to TRUE. Different sequences may be used. However, a state machine diagram can be found in IEC 61850-7-4 that describes the different states involved and illustrates the supervision of GOOSE/SV subscription with regards to LGOS/LSVS.St and LGOS/LSVS.SimSt.

7.8.3 Input signals used for testing

No change.

7.8.4 Test mode

Replace the figure 42 by the following one ("on-blocked" changed by "blocked")

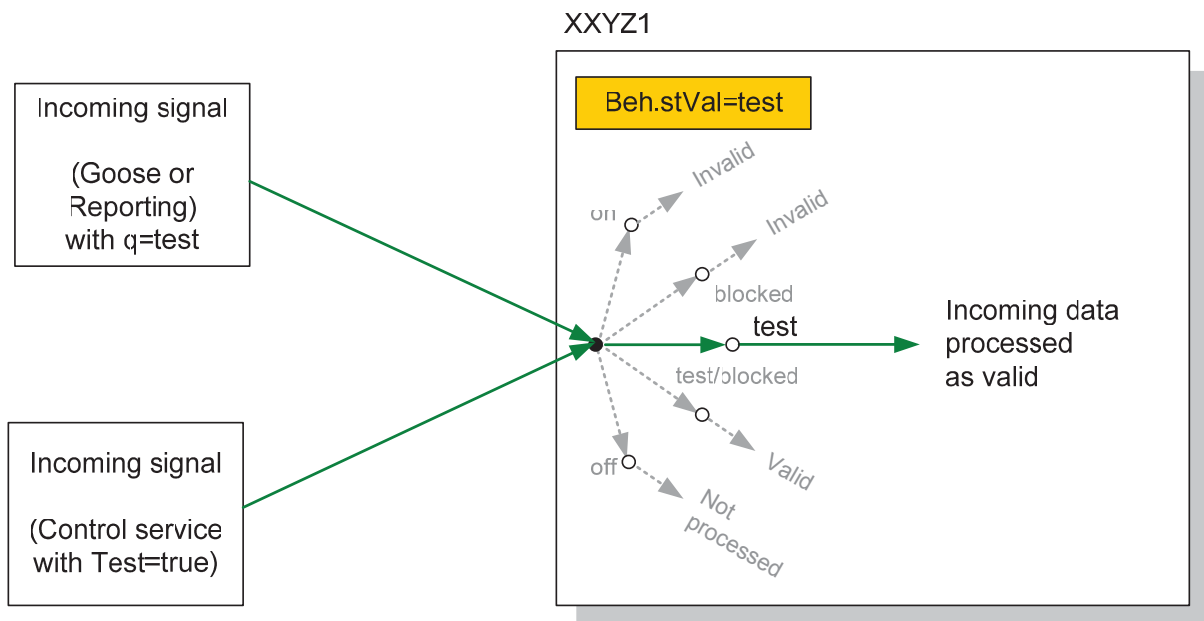


Figure 42 – Test mode example

Replace the last paragraph by the following one.

The detailed requirements for the different states of Mod/Beh can be found in IEC 61850-7-4.

7.9 Logical node used for extended logging functions

No change.

8 Device view

8.1 General

No change.

8.2 Second modelling step – logical device model

8.2.1 The logical device concept

Replace the second paragraph below figure 44 with the following one.

In the example of figure 45, logical device “LD1” contains three logical nodes: LLN0, LPHD and LN, the latter representing an application specific LN as defined in the IEC 61850-7-x series. The logical node zero (LLN0) represents common data of the logical device. For example, the mode of LLN0 is used to control the mode of the whole logical device and, as a result, the mode of every logical node being part of the logical device. The logical node physical device (LPHD) represents common data of the physical device hosting the logical device. LLN0 shall be defined in any logical device while LPHD shall be defined in at least one logical device. The figure 45 shows an example of a logical device called “SYS”¹. Such a logical device shall contain all system logical nodes (Group L) belonging to the same IED with the following exceptions:

- LLN0 and LPHD for the reasons explained earlier.
- LCCH as a physical device may have more than one access point.
- Proxy/gateways as their modelling may expose many logical devices that contain system logical nodes (see clause 8.2.3).

Note: This logical device may be formed by a hierarchy of logical devices (see 8.2.5 Logical devices management hierarchy)

8.2.2 The device nameplate

No change.

8.2.3 Gateways and proxies

Replace the whole clause by the following one.

Gateways are network interconnection devices that translate protocols to other protocols. For example, gateways may convert non IEC 61850 data into IEC 61850 data.

Proxies are special devices that mirror logical devices located in other IEC 61850 physical devices. Hence, these logical devices are, from a functional point of view, transparent. They can be identified independently of their location (in a separate device connected to the network or in a proxy device).

Logical devices allows for the building of proxies and/or gateways.

¹ The name of the logical device could have been something other than “SYS”.

322 Figure 47 shows how a physical device is mapped to a device acting as a proxy and/or a
323 gateway. In the figure, LN refers to an application specific LN as defined in the IEC 61850-7-x
324 series.

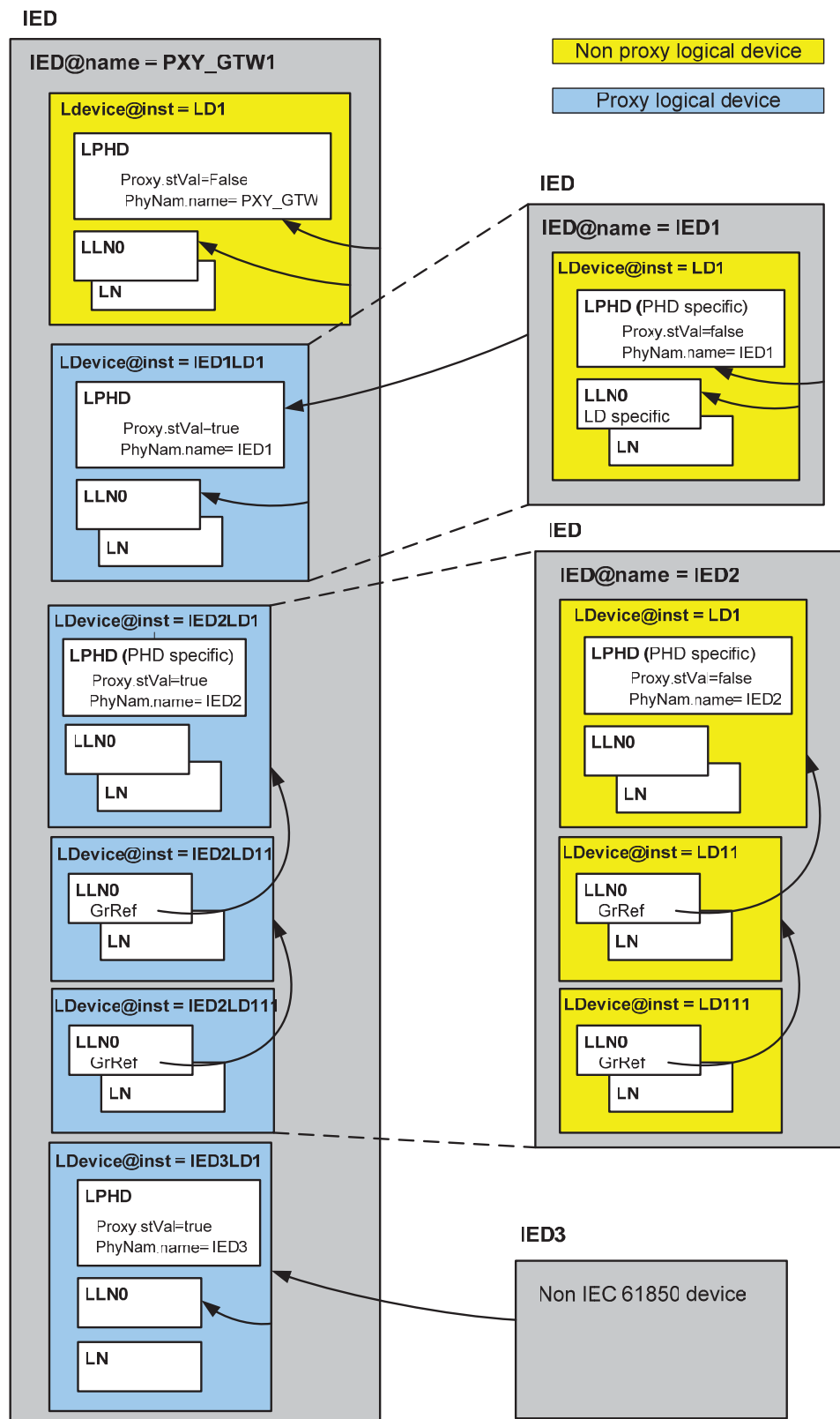
325 The logical device IED1LD1 is “copied” to the proxy/gateway. The LPHD of IED1LD1 in the
326 proxy/gateway represents the physical device IED1.

327 Logical devices that mirror logical devices of other physical devices shall provide a LPHD that
328 represents the remote physical device on which the original LD resides (e.g., IED1LD1).
329 These logical devices shall have the data LPHD.Proxy.stVal of the LPHD set to TRUE.

330 Logical devices that do not mirror logical devices of other physical devices shall provide a
331 LPHD that represents the physical device on which they reside. In figure 47, this logical
332 device is PXY_GTW1LD1, which shall be implemented to represent the information about the
333 proxy/gateway itself. The logical nodes LLN0 and LPHD of this logical device shall represent
334 information about the proxy/gateway device. The logical device may also contain domain
335 specific logical nodes.

336 In the example, the physical device IED2 is also proxied by the proxy/gateway. The device
337 contains a hierarchy of logical devices. In this case, the LPHD that represents the remote
338 physical device in the proxy/gateway is declared only at the root of the hierarchy.

339 Figure 47 also shows how non IEC 61850 external physical devices are mapped to the
340 proxy/gateway device. IED3LD1 is used to represent the information related to the non
341 IEC 61850 physical device IED3. The LPHD of IED3LD1 represents the physical device IED3.
342 The data supplied by IED3 is mapped to different logical nodes into IED3LD1.



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Figure 47 – Logical devices in proxies or gateways²

The Figure 48 – Logical devices in proxies or gateways (functional naming) shows the same example using the functional naming of the logical devices. One can see that it is possible to

² IED@name, LDevice@inst and LDevice@ldName are SCL elements (IEC 61850-6).

make the names of the proxied logical devices exactly the same as the ones in the source logical devices. This is possible as long as the respective access points (Server of the Proxy and original Server) are not connected to the same network: the name of the logical device shall unique within the scope of a network.

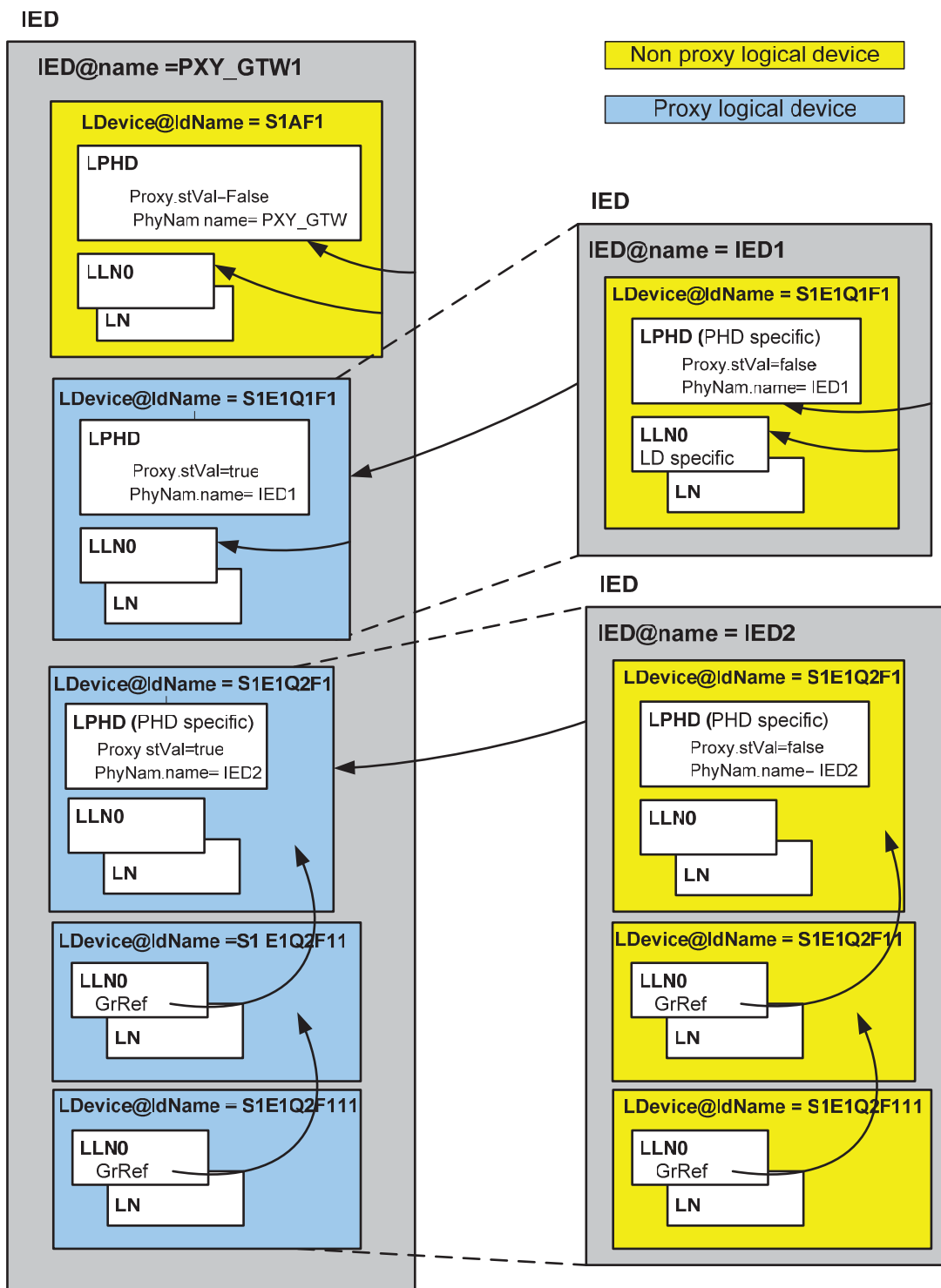


Figure 48 – Logical devices in proxies or gateways (functional naming)³

³ IED@name, LDevice@inst and LDevice@ldName are SCL elements (IEC 61850-6).

8.2.4 Logical devices for monitoring external device health

Change figure 48 with the following one.

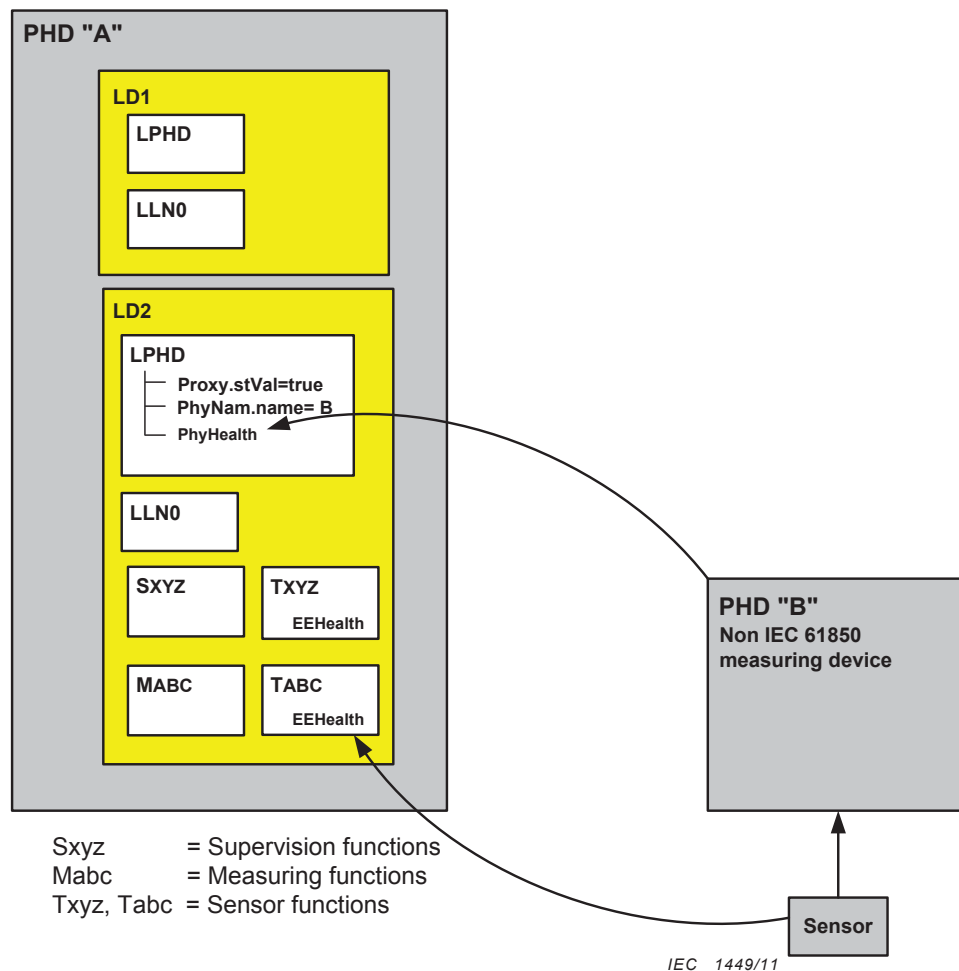


Figure 49 – Logical devices for monitoring external device health

8.2.5 Logical devices management hierarchy

In the first paragraph below figure 49, change “object reference setting group” with “object reference setting”.

Change the third item in the dash list with the following.

- the logical node class LPHD shall be present in any root logical device, i.e. any LD where the LLN0 does not contain a data object GrRef. It may also be present at other levels of the hierarchy,

9 Communication view**9.1 General**

No change.

9.2 The service models of the IEC 61850 series

In table 5, update the services for Transmission of sampled values with the following.

Transmission of sampled values	Fast and cyclic transfer of samples, for example, of instrument transformers.	Multicast SVC: SendMSVMessage GetMSVCBValues SetMSVCBValues GetMsvReference GetMSVElementNumber
--------------------------------	---	--

9.3 The virtualisation

No change.

9.4 Basic information exchange mechanisms

No change.

9.5 The client-server building blocks

No change.

9.6 Logical nodes communicate with logical nodes

Update the CDC ORG in figure 60 with the setSrcCB attribute.

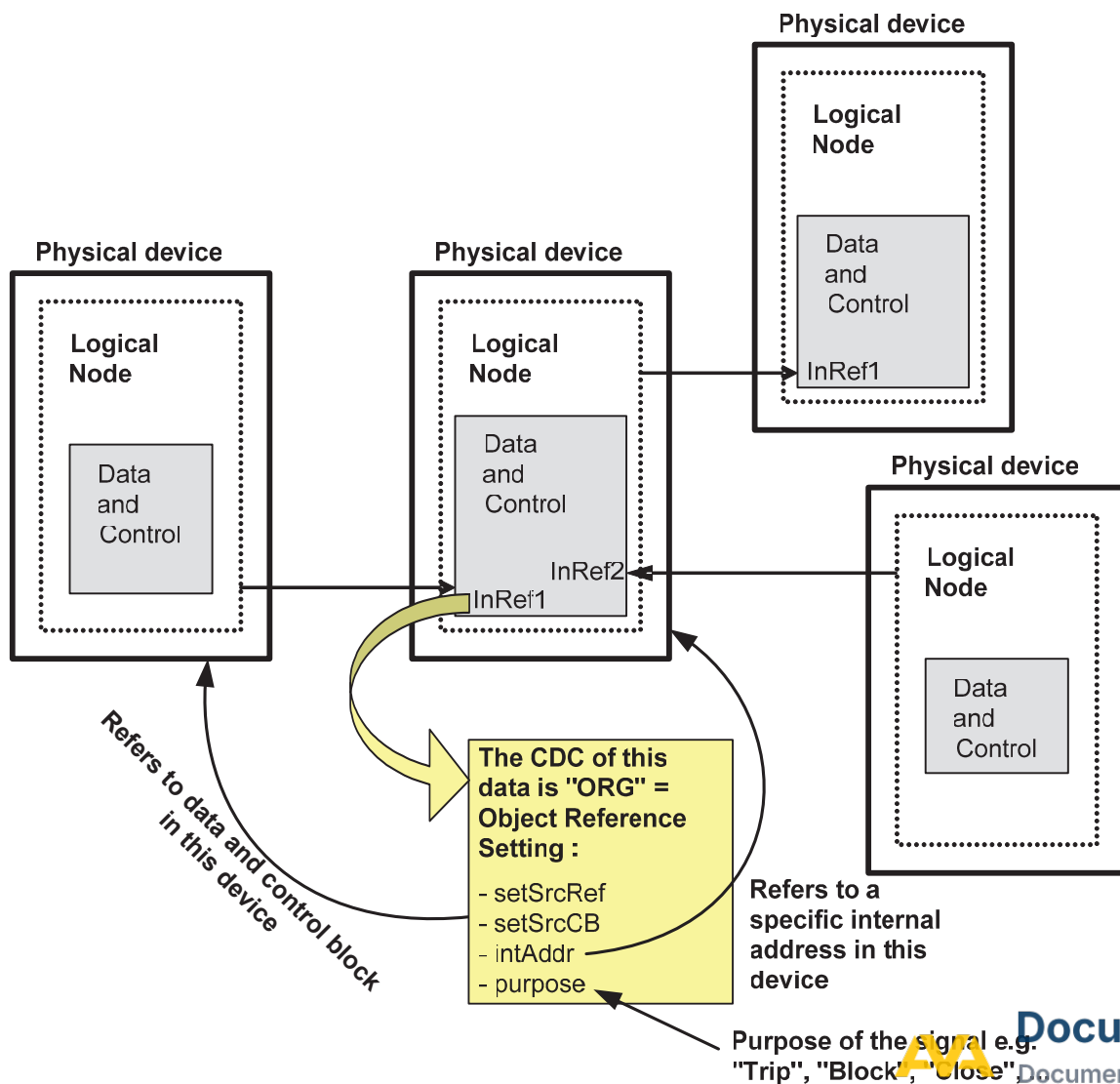


Figure 61 – Logical nodes communicate with logical nodes

Change the last paragraph of the clause with the following paragraph.

Note that the SCL configuration language (see IEC 61850-6) allows to configure the data flow between LNs using special elements called LN inputs (see Annex H).

9.7 Interfaces inside and between devices

No change.

10 Where physical devices, application models and communication meet

No change.

11 Relationships between IEC 61850-7-2, IEC 61850-7-3 and IEC 61850-7-4**11.1 Refinements of class definitions**

No change.

11.2 Example 1 – Logical node and data object class

Update the whole example with the definitions found in IEC 61850-7-3 and IEC 61850-7-4 of this amendment.

Table 6 shows an example of a list of data object classes for a circuit breaker. The name of the circuit breaker class is "XCBR". The data object classes that make up the circuit breaker are grouped into four categories (descriptions, status information, controls, and settings). Each category comprises some data object classes, for example, "Mode" and "Switch position". These data object classes are referenced by their data object name: "Mod" and "Pos". To be more precise, each data object class also has a common data class, defining the details, i.e. the attributes of the data object class. The last column specifies the presence conditions that can be applicable to the data object class, i.e. whether this data object class is mandatory (M), optional (O), in some cases forbidden (F) or can be instantiated many times (multi).

Table 6 – Logical node circuit breaker

Logical Node: Circuit breaker		Name: XCBR	
Data object Class	Data object Name	Common Data Class (CDC)	PresConds/ds
Descriptions			
Name plate of the logical node.	NamPlt	LPL - Logical node name plate	O/O
Name plate of external (electrical, mechanical or communication) equipment to which the logical node is associated.	EEName	DPL - Device name plate	O/F
Controllable Data			
(controllable) Operating mode of the domain logical node that may be changed by operator. Processing of the quality status ('q') of the received data is the prerequisite for correct interpretation of the operating mode.	Mod	ENC - Controllable integer status	O/O
(controllable) Circuit breaker/switch position.	Pos	DPC - Controllable Double Point	M/F
(controllable) If true, 'open' action has been blocked; can be set from another logical node. Operating capability ('XCBR.CBOPCap' and 'XSWI.SwOpCap' for circuit breaker and switch, respectively) does not reflect the blocked opening.	BlkOpn	SPC - Controllable single point	M/F
(controllable) If true, 'close' action has been blocked; can be set from another logical node. Operating capability ('XCBR.CBOPCap' and 'XSWI.SwOpCap' for circuit breaker and switch, respectively) does not reflect the blocked closing.	BlkCls	SPC - Controllable single point	M/F
(controllable) If true, the charger motor, used to prevent overload of the power supply after a busbar trip, has been enabled.	ChMotEna	SPC - Controllable single point	O/F
(controllable) If true, control authority is at station level and control from remote is disabled; otherwise control from remote is allowed.	LocSta	SPC - Controllable single point	O/F
Status information			
Read-only value, describing the behaviour of a domain logical node. It depends on the current operating mode of the logical node ('DomainLN.Mod'), and the current operating mode of the logical device that contains it ('LLNO.Mod'). Processing of the quality status ('q') of the received data is the prerequisite for correct interpretation of 'DomainLN.Beh'.	Beh	ENS - Integer status	M/M
Reflects the state of the logical node related hardware and software. More detailed information related to the source of the problem may be provided by specific attribute of the logical node.	Health	ENS - Integer status	O/O
If true, the control behaviour is allowed at this level.	Loc	SPS - Single point status	M/F
State of external (electrical, mechanical or communication) equipment to which the logical node is associated.	EEHealth	ENS - Integer status	O/F
Count of operations; not resettable from remote, but may be reset from local.	OpCnt	INS - Integer status	M/O

Logical Node: Circuit breaker		Name: XCBR	
Data object Class	Data object Name	Common Data Class (CDC)	PresCond nds/ds
If true, the operation has been switched (from remote) to local. This changeover is always done locally with a physical key or toggle switch, which may have a set of contacts from which the position can be read.	LockKey	SPS - Single point status	O/F
Physical capability of the circuit breaker to operate, which reflects the available energy in the drive.	CBOPCap	ENS - Integer status	O/F
Point on wave switching capability	POWCap	ENS - Integer status	O/F
Operation capability available when the switch mechanism is fully charged, as the maximum number of close-open cycles to be performed. For example when one close-open cycle can be performed, 'MaxOpCap'=1.	MaxOpCap	ENS - Integer status	O/O
Setting information			
Closing time of the breaker. The time is used to compensate for the breaker closing time, i.e., the closing command will be given a defined time before phase coincidence. This is a property of the breaker that is subject to ageing.	CBTmms	ING - Integer setting	O/F

406

407 Since many data object classes use the same details (ATTRIBUTES), these details are
 408 therefore collected for re-use in common data classes (common to many data object classes).
 409 The common data classes are defined in IEC 61850-7-3. As an example, the "controllable
 410 double point" (DPC) common data class for "Pos" is shown in Table 7.

411

Table 7 – Controllable double point (DPC)

cdcid = DPC, UML class name = DPC					
Attribute name	Attribute type	FC	TrgOp	(Value/Value range) Description	PresCond
DataAttribute for status					
origin	Originator	ST		See 'SPC.origin'.	O
ctlNum	INT8U	ST		See 'SPC.ctlNum'.	O
stVal	DpStatusKind	ST	dchg	Status value of the controllable data object.	M
q	Quality	ST	qchg	Quality of the value in 'stVal'.	M
t	Timestamp	ST		Timestamp of the last change of the value in any of 'stVal' or 'q'.	M
stSeld	BOOLEAN	ST	dchg	See 'SPC.stSeld'.	MFsbo
DataAttribute for control mirror					
opRcvd	BOOLEAN	OR	dchg	inherited from: ControlTestingCDC	O
opOk	BOOLEAN	OR	dchg	inherited from: ControlTestingCDC	O
tOpOk	Timestamp	OR		inherited from: ControlTestingCDC	O
DataAttribute for substitution and blocked					
subEna	BOOLEAN	SV		inherited from: SubstitutionCDC	MFsubst
subVal	DpStatusKind	SV		Value used to substitute 'stVal'.	MFsubst
subQ	Quality	SV		inherited from: SubstitutionCDC	MFsubst
subID	VisString64	SV		inherited from: SubstitutionCDC	MFsubst
blkEna	BOOLEAN	BL		inherited from: SubstitutionCDC	O
DataAttribute for configuration, description and extension					
pulseConfig	PulseConfig	CF	dchg	See 'SPC.pulseConfig'.	O
ctlModel	CtlModelKind	CF	dchg	See 'SPC.ctlModel'.	M
sboTimeout	INT32U	CF	dchg	See 'SPC.sboTimeout'.	MFsbo
sboClass	SboClassKind	CF	dchg	(default=operate-once) See 'SPC.sboClass'.	O
operTimeout	INT32U	CF	dchg	See 'SPC.operTimeout'.	MFenhanced
d	VisString255	DC		inherited from: BasePrimitiveCDC	O
dU	Unicode255	DC		inherited from: BasePrimitiveCDC	O
cdcName	VisString255	EX		inherited from: BasePrimitiveCDC	O
dataNs	VisString255	EX		inherited from: BasePrimitiveCDC	MOdataNs
Parameters for control services					
ctlVal	BOOLEAN			Service parameter that determines the control activity ('false' for off, 'true' for on).	

412 The "DPC" common data class is composed of a list of about 20 data attributes and optionally
 413 parameters for control services. Each attribute has a name, type, functional constraint, trigger
 414 option, value/value range, and an indication of whether the attribute is mandatory or optional.

415 At least all the mandatory attributes of all mandatory Data object classes of the "XCBR" in
 416 Table 6 make up the attributes of the "XCBR". Optional Data object classes (for example,
 417 Point on wave switching capability – POWCap) and optional data attributes (for example,
 418 origin – Originator) shall be implemented if relevant by an application or requested by a
 419 specification.