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Draft amendment for statistical data
and historical statistical data

Draft R0-71
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Editor's note

Version 0-71

Text with regard to the impact on part 7-3 added (see yellow marked text on pages 2, 7, 8, 9. 2005-06-20

Figures 1 and 2 revised (LN name: XXYZ instead of WXYZ) – 2005-06-16

Version 0-7:

Some editorial issues have been taken into account:

- LN class names are now 4 character
- corrected some text in table in 7-4 extensions
- statistical data is now also applicable to integer based data
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Version 0-6:

We have received comments from several experts. This has let to the following revised draft.
The version R0-3 uses the **log model** for the historical statistical values instead of the **special LN class HST and special common data classes like HST-MV** etc. The functionality is the same as in R0-2. This revised model is more flexible and much simpler. There is no need to define in the future new common data classes that have attributes for analogue values.

The version R0-6 uses setting data for the Logical Node to instead of a new CDC. The intend was to use as much existing models and services as possible. R0-6 takes the comments from Siemens (see version 0-5 into account).

This version 0-6 has been used for the Draft CDV of IEC 61400-25-2.

A specific log "HourlyLog" (can be any name of course) could store all hourly values of MAX, MIN, ...

The access of the historical data uses QueryLogByTime and QueryLogAfter – instead of reading by array index.

NOTE   These proposed draft amendments are intended to be included in the first amendments of the corresponding parts of IEC 61850. In the meantime they will be included in the CDV of IEC 61400-25-2.

The draft proposal takes the requirements and discussions of IEC TC 88 PT 25 (from the meeting in Denver, May 2005 and earlier), IEC TC 57 WG 10, 17 and 18 into account.

This document contains the following proposed draft amendments:

1. IEC 61850-7-1:2003 Amendment 1 (page 2)

2. IEC 61850-7-3:2003 Amendment 1 (page 6)

3. IEC 61850-7-4:2003 Amendment 1 (page 9)

Note: The part 61850-6 extensions need extra attention!

Extensions for IEC 61850-7-1:2003

Introduction to the information models for statistical data and historical statistical data

DRAFT R0-7 for comments
(2005-05-19)

NOTE   The following text is intended to be included in the first amendment to IEC 61850-7-1:2003. In the mean time it is published as a normative annex to 2CD IEC 61400-25-2. Once the text is incorporated in the amendment to IEC 61850-7-1:2003 it will be removed from IEC 61400-25-2.

1 Introduction

The analogue values defined in IEC 61850-7-3:2003 specify the following two basic data attributes as defined, e.g., in the common data class MV (measured value):

| instMag | AnalogueValue | instantaneous value, e.g., a voltage measurement |
| mag | AnalogueValue | dead band filtered value |

In many application domains like the wind power plants it is required to provide additional information of a basic analogue value:

– statistical information (e.g., minimum value calculated for a specified time period, e.g., minimum value of last 1 hour)

– historical statistical information (e.g., log of minimum values of the sequence of values calculated above, e.g., last 24 hourly values)

This additional information may be derived from the basic analogue values. It may be the only information provided – depending on the application requirements.

The following examples show some possible data and how they are derived or related respectively:

– instMag (present value) [as defined in IEC 61850-7-3:2003]

– instMag (present value) $\rightarrow$ instMag (max value of last day – called statistical data)

– instMag (max value of last month)

NOTE   The "$\rightarrow$" means: right value has been derived from left value.

The specific semantic of the value instMag is defined by a special data object of a logical node instance. One logical node instance represents either the present values or maximum values, etc.

1 **2 Model for statistical and historical statistical data**

2 The models for the statistical and historical statistical data are explained conceptually in
3 **Figure 1**. On the left hand side are the basic data representing the current values (PRES), i.e.
4 some instantaneous analogue (or integer) values that are contained in the logical node in-
5 stance XXYZ.
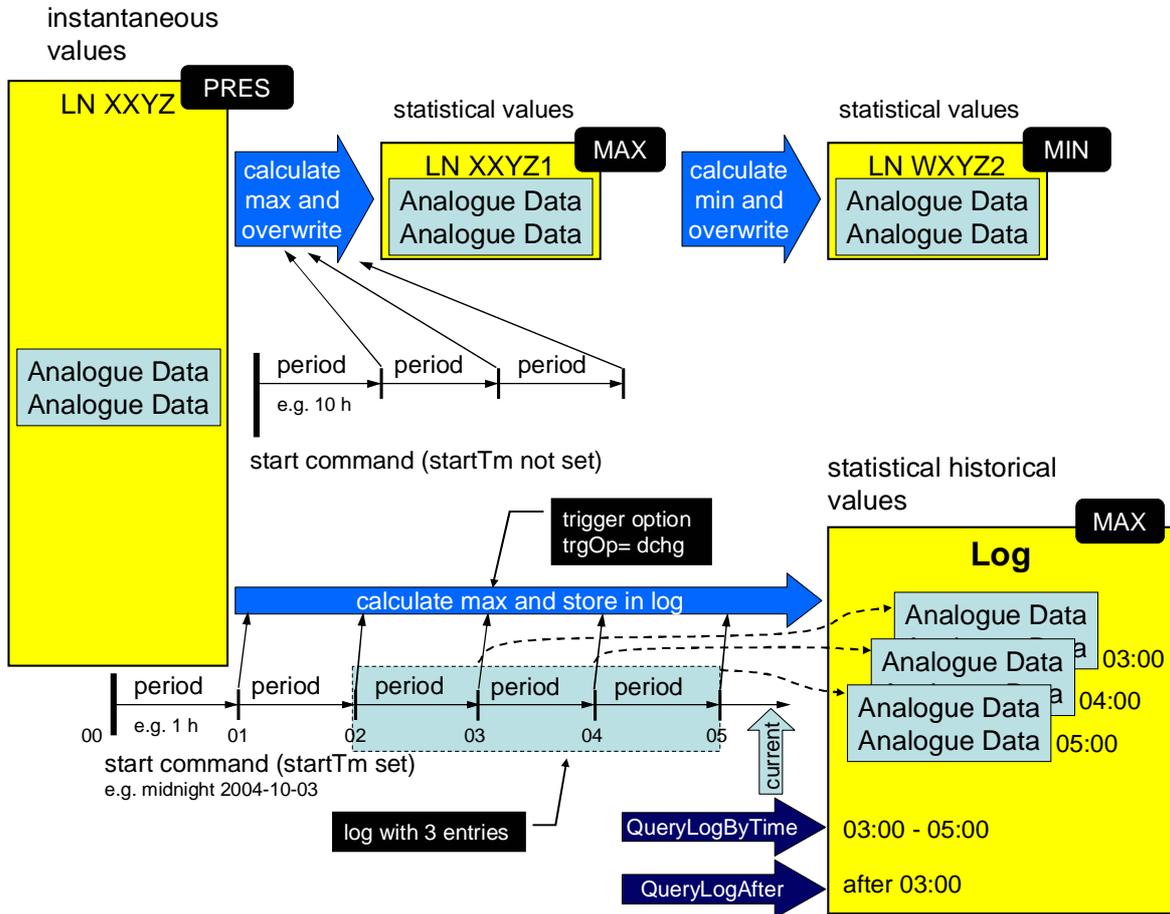
6

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

8 The upper half depicts the method defined for statistical values. The first example is the in-
9 stance XXYZ1 of the logical node class XXYZ. The analogue values represent the calculated
10 maximum values derived from the instance XXYZ. The logical node XXYZ1 has a special set-
11 ting data that indicates that the values are maximum values: CalcMthd equals MAX. The cal-
12 culation is based on the setting data CalcPd. The period starts after a start command or by
13 local means. At the end of the period the calculated maximum values of the instance XXYZ1
14 are overwritten by the new values.

15 The maximum values can be used to calculate the minimum maximum values in – of course –
16 a much longer period than for the maximum calculation in XXYZ1. The instance XXYZ2 may
17 represent the minimum value of the max value of the last 10 days.

18 The lower part of the figure shows the conceptual model of the historical statistical data. In
19 this model the calculated values (in this case the maximum values) are stored in sequence in
20 a log. The calculation in the example starts at midnight of 2004-10-03. The interval is 1 h. Af-
21 ter that first hour the first log entry is written. After the second hour the second entry contains
22 the value of the second hour. After five (5) hours the log contains the values of the last three
23 hours (intervals 02-03, 03-04, 04-05).

1 The statistical data model is based on the calculation of analogue values contained in other
2 logical nodes. The top logical node LN XXYZ in **Figure 2** comprises three technological logi-
3 cal nodes of the same Type (e.g. MMXU). The top logical node (LN XXYZ) represents the in-
4 stantaneous measured values. The second and third logical nodes are the statistical logical
5 nodes, i.e., the logical nodes that represent the calculated values (LN XXYZ1 represents the
6 MIN values, the LN XXYZ2 the MAX values).
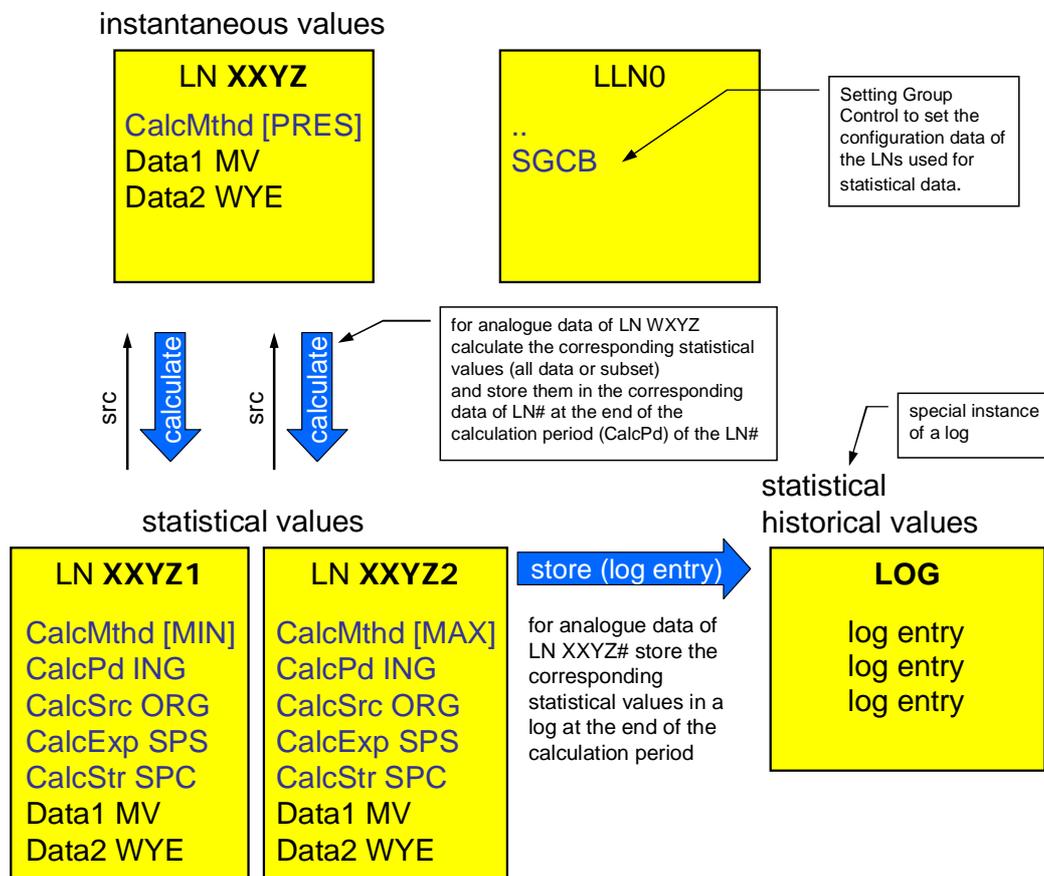
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8   **Figure 2 – Conceptual model of statistical and historical statistical data (2)**

9   The two logical nodes on the left of the bottom in Figure **2** (XXYZ1 and XXYZ2) represent
10 minimum (MIN) and maximum (MAX) values of the analogue data represented in the top logi-
11 cal node (XXYZ). The setting data CalcSrc (calculation source) of the two logical nodes have
12 each the value XXYZ (this is a reference to the source logical nodes). Each logical node with
13 analogue data can be used as a source. Additionally they have the data CalcStr (calculation
14 start) and CalcExp (calculation expired) and the setting data CalcPd (calculation period) and
15 CalcSrc (calculation source).

16 All setting data attributes (e.g., the calculation period or source or calculation method,
17 CalcMthd) can be changed by means of the Setting-Group-Control-Block class model. The
18 SGCB (setting group control block) is located in the LLN0 of the corresponding logical device.
19 With the settings CalcMthd, CalcPd and CalcSrc the behaviour of the logical node can be con-
20 trolled. The data CalcMthd specifies what kind of analogue data values are represented by
21 this logical node. In this case the logical node XXYZ1 represents the minimum (MIN) values.
22 The data CalcPd represents the calculation interval for a statistical value. The data CalcSrc is
23 based on the new common data class ORG (Object Reference Setting) specified in the first
24 amendment to IEC 61850-7-4:2003.

25 A logical node representing statistical data (e.g. MAX values calculated every 5 min) can be
26 used to calculate the MIN value of the MAX values in a longer period (e.g., a day). The new
27 data object CalcStr shall be used to Start (and Stop – usually the calculation is completed
28 when the attribute CalcExp is set to TRUE) the calculation of the statistical data. The "event"

CalcExp set to TRUE can be used as an event to report the new value (the statistical value) by the report control block or it may be logged as historical statistical data for later retrieval.

NOTE 1 The data names of the "Data" in all logical nodes shown in the figure are the same, i.e., in all three logical nodes. The data are contained in different logical node instances (XXYZ, XXYZ1, and XXYZ2). These result in the following references: XXYZ.Data1, XXYZ1.Data1, and XXYZ2.Data1.

NOTE 2 The models introduced and explained in this clause are informative. The final model will be contained in the amendments to IEC 61850-7-4:2003 and IEC 61850-7-3:2003.

3 Amendments required in other parts

The above briefly described amendments of the information modelling methods defined for various application domains of IEC 61850 are defined in detail in the amendment 1 of the following parts:

Statistical data

Part	Amended definition
IEC 61850-7-3:2003	ORG: Object Reference Setting class
IEC 61850-7-4:2003	data class for each LN with analogue data classes that are used to model statistical data: CalcMthd of CDC ING CalcPd of CDC ING CalcSrc of new CDC ORG CalcStr of CDC SPC CalcEx of CDC SPS
IEC 61850-6:2003	new CDC ORG, new XML schema

Extensions for IEC 61850-7-3:2003

CDCs for statistical data and historical statistical data

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(2005-05-19)

NOTE   The following text is intended to be included in the first amendment to IEC 61850-7-3:2003. In the mean time it is published as a normative annex to CDV of IEC 61400-25-2. Once the text is incorporated in the amendment to IEC 61850-7-3:2003 it will be removed from IEC 61400-25-2.

1 Common data class for object reference setting group

1.1 Object reference setting group common data class (ORG)

1.1.1 Class model

Table 1 defines the common data class "Object reference setting group". This common data class is used to specify the object reference to the logical node of which the statistical data have been calculated. This CDC shall be used, i.e., for the DATA **CalcSrc** to be included in the "Optional Logical Node Information" of the Common Logical Node defined in IEC 61850-7-4:2003.

NOTE   The conceptual model of the statistical data model is defined in the first amendment to IEC 61850-7-1:2003.

Table 1 – Object reference setting group common data class specification

ORG class					
Attribute Name	**Attribute Type**	**FC**	**TrgOp**	**Value/Value Range**	**M/O/C**
DataName	Inherited from Data Class (see IEC 61850-7-2)				
DataAttribute					
Setting					
setVal	VISIBLE STRING129	SP		Object Reference	AC_NSG_M
setVal	VISIBLE STRING129	SG, SE		Object Reference	AC_SG_M
configuration, description and extension					
d	VISIBLE STRING255	DC		Text	O
dU	UNICODE STRING255	DC			O
cdcNs	VISIBLE STRING255	EX			AC_DLNDA_M
cdcName	VISIBLE STRING255	EX			AC_DLNDA_M
dataNs	VISIBLE STRING255	EX			AC_DLN_M
Services					
As defined in Table 39					

1.1.2 Setting Value (setVal)

The data attribute **setVal** (Setting Value) represents the object reference to another DATA (LN, DO or DA). In this context the data shall be used to reference the logical node whose analogue data attributes are used to calculate the value contained in this logical node instance.

EXAMPLE   The logical node "AB" [for PRES] may contain the present values (PRES). The logical node "CD" [for MAX] may contain the MAX values of the data contained in logical node "AB". In this case logical node "CD" references logical node "AB". A third logical node may reference the logical node CD and represent the MIN of the MAX value.

1.1.3 Configuration, description and extension

The data attributes d, dU, cdcNs, cdcName, and dataNs are the same as defined in IEC 61850-7-3:2003.

2 Impact on existing common data class

Some attributes of the existing CDCs can be used for the representation of statistical and historical statistical information. Those attributes, e.g., "mag" of CDC MV shall represent the value according to the value of the DATA "CalcMthd" of a logical node. If, for example, "CalcMthd" has the value PRES then the attribute shall represent the present value.

The following attributes may be used for statistical and historical statistical information:

CDC BCR
actVal	INT128
frVal	INT128

MV
instMag	AnalogueValue
mag	AnalogueValue

CMV
instCVal	Vector
cVal	Vector

HMV
har	ARRAY[0..numHar] OF Vector

HWYE
phsAHar	ARRAY[0..numHar] OF Vector
phsBHar	ARRAY[0..numHar] OF Vector
phsCHar	ARRAY[0..numHar] OF Vector
neutHar	ARRAY[0..numHar] OF Vector
netHar	ARRAY[0..numHar] OF Vector
resHar	ARRAY[0..numHar] OF Vector

HDEL
phsABHar	ARRAY[0..numHar] OF Vector
phsBCHar	ARRAY[0..numHar] OF Vector
phsCAHar	ARRAY[0..numHar] OF Vector

Extensions for IEC 61850-7-4:2003

Logical node extension for statistical DATA
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(2005-05-19)

NOTE   The following text is intended to be included in the first amendment to IEC 61850-7-4:2003. In the mean time it is published as a normative annex to 2CD IEC 61400-25-2. Once the text is incorporated in the amendment to IEC 61850-7-4:2003 it will be removed from IEC 61400-25-2.

3 Logical node extension for statistical data

3.1 Data for calculation method for analogue and statistical analogue values

The following extension of the common logical node class (as defined in 5.3.3 of IEC 61850-7-4:2003) shall be added to the common logical node.

Common Logical Node class				
Attribute Name	**Attr. Type**	**Explanation**	**T**	**M/O**
LNName		Shall be inherited from Logical-Node Class (see IEC 61850-7-2)		
Data				
Mandatory Logical Node Information (Shall be inherited by ALL LN but LPHD)				
...				
Information for statistical information				
CalcExp	SPS	Calculation period expired	T	O
CalcStr	SPC	Start calculation at time operTm (if set) or immediately		O
CalcMthd	ING	Calculation Method of statistical data. Allowed values PRES | MIN | MAX |TOTMIN | TOTMAX |AVG | SDV |		O
CalcPd	ING	Calculation Period of statistical data, shall be in seconds		O
CalcSrc	ORG	Object Reference to Source logical node		O

The data CalcMthd shall be included in any logical node that represents analogue or counting information if the calculation method is unequal PRES. The data CalcExp, CalcStr, CalcPd and CalcSrc shall be included in any logical node that represents statistical data (MIN, MAX, …).

Editor's Note: The M/O column requires a condition to specify that all five (or no) new data shall be supported.

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3.2 Data name semantics

The following extension of the data name semantic (as defined in IEC 61850-7-4) shall be added to the Table 9 in IEC 61850-7-4:2003.

Table 9 – Description of Data

Data Name	Semantics
...	
CalcExpd	Indicates that the calculation period of a statistical logical node has expired. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.
CalcStr	Starts the calculation of statistical data. Either at once, or if available and set at operTm of the control model. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.
CalcMthd	The calculation method specifies how the Data Attributes that represent analogue values have been calculated. The calculation method shall be the same for all data of a given logical node instance. The possible values shall be : <table><tr><td>*value*</td><td>*Description*</td></tr><tr><td>PRES</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are present values.</td></tr><tr><td>MIN</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are **minimum** values calculated during the corresponding calculation period **calPd**.</td></tr><tr><td>MAX</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are **maximum** values calculated during the corresponding calculation period **calPd**.</td></tr><tr><td>TOTMIN</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are **total minimum** values calculated since the start of the system</td></tr><tr><td>TOTMAX</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are **total maximum** values calculated since the start of the system</td></tr><tr><td>AVG</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are **average** values calculated during the corresponding calculation period **calPd**.</td></tr><tr><td>SDV</td><td>Indicates that all analogue values (i. e. all common attributes **i** and **f**) are **standard deviation** values calculated during the corresponding calculation period **calPd**.</td></tr></table> This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc. No data object "CalcMethd" in a logical node is equivalent to the value PRES. This makes the new definition backward compatible with the current definition of part 7-4. NOTE 1 – If different calculation periods are required for the data of a logical node, then different logical nodes could be instantiated – with different calculation periods. NOTE 2 – The calculation algorithm and number of samples used for the calculation is an implementation issue.
CalcPd	The calculation period of a statistical logical node. The period shall always be in seconds [s]. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc. NOTE 3 – The calculation algorithm and number of samples used for the calculation is an implementation issue.
CalcSrc	The reference to the logical node whose analogue data attributes are used to calculate the value contained in this logical node instance. This DATA shall be mandatory for all logical nodes that are intended to represent statistical data, indicated by the common data classes, e.g., CDC MV, CMV, WYE, etc.