



SLOVENSKI STANDARD
oSIST prEN IEC 62541-8:2018
01-november-2018

Enotna arhitektura OPC - 8. del: Dostop do podatkov

OPC Unified Architecture - Part 8: Data Access

iTeh STANDARD PREVIEW
(standards.itteh.ai)

Architecture unifiée OPC - Partie 8: Accès aux données

Ta slovenski standard je istoveten z: prEN IEC 62541-8:2018

<https://standards.itteh.ai/catalog/standards/sist/a44bbcb1-a287-4c3f-b99c-2dab315dacbd/sist-en-iec-62541-8-2020>

ICS:

25.040.40	Merjenje in krmiljenje industrijskih postopkov	Industrial process measurement and control
35.240.50	Uporabniške rešitve IT v industriji	IT applications in industry

oSIST prEN IEC 62541-8:2018

en,fr,de



65E/609/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 62541-8 ED3	
DATE OF CIRCULATION: 2018-08-17	CLOSING DATE FOR VOTING: 2018-11-09
SUPERSEDES DOCUMENTS: 65E/557/RR	

IEC SC 65E : DEVICES AND INTEGRATION IN ENTERPRISE SYSTEMS	
SECRETARIAT: United States of America	SECRETARY: Mr Donald (Bob) Lattimer
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

OPC Unified Architecture - Part 8: Data Access

PROPOSED STABILITY DATE: 2021

NOTE FROM TC/SC OFFICERS:

CONTENTS

FIGURES	4
TABLES	5
FOREWORD	2
1 Scope	9
2 Normative references	9
3 Terms, definitions and abbreviations	9
3.1 Terms and definitions	9
3.2 Abbreviations and symbols	10
4 Concepts	10
5 Model	11
5.1 General	11
5.2 SemanticsChanged	12
5.3 Variable Types	12
5.3.1 DataItem Type	12
5.3.2 AnalogItem Type	Error! Bookmark not defined.
5.3.3 DiscreteItem Type	14
5.3.4 ArrayItem Type	17
5.4 Address Space model	22
5.5 Attributes of DataItems	23
5.6 DataTypes	23
5.6.1 Overview	23
5.6.2 Range	23
5.6.3 EUInformation	24
5.6.4 ComplexNumberType	25
5.6.5 DoubleComplexNumberType	25
5.6.6 AxisInformation	26
5.6.7 AxisScaleEnumeration	26
5.6.8 XVType	26
6 Data Access specific usage of Services	27
6.1 General	27
6.2 PercentDeadband	27
6.3 Data Access status codes	27
6.3.1 Overview	27
6.3.2 Operation level result codes	28
6.3.3 LimitBits	29
Annex A (informative): OPC COM DA to UA Mapping	30
A.1 Introduction	30
A.2 Security Considerations	30
A.3 COM UA wrapper for OPC DA Server	31
A.3.1 Information Model mapping	31
A.3.2 Data and error mapping	34
A.3.3 Read data	37
A.3.4 Write Data	38
A.3.5 Subscriptions	38
A.4 COM UA proxy for DA Client	39
A.4.1 Guidelines	39

A.4.2	Information Model and Address Space mapping	39
A.4.3	Data and error mapping	43
A.4.4	Read data	45
A.4.5	Write data	46
A.4.6	Subscriptions	46

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN IEC 62541-8:2020

<https://standards.iteh.ai/catalog/standards/sist/a44bbcb1-a287-4c3f-b99c-2dab315dacbd/sist-en-iec-62541-8-2020>

FIGURES

Figure 1 – OPC <i>DataItems</i> are linked to automation data	11
Figure 2 – <i>DataItem VariableType</i> hierarchy.....	12
Figure 3 – Graphical view of a <i>YArrayItem</i>	19
Figure 4 – Representation of <i>DataItems</i> in the <i>AddressSpace</i>	22
Figure A.1 – Sample OPC UA Information Model for OPC DA	31
Figure A.2 – OPC COM DA to OPC UA data & error mapping.....	35
Figure A.3 - Status Code mapping.....	36
Figure A.4 – Sample OPC DA mapping of OPC UA Information Model and <i>Address Space</i> ..	40
Figure A.5 – OPC UA to OPC DA data & error mapping	43
Figure A.6 – OPC UA Status Code to OPC DA quality mapping.....	45

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN IEC 62541-8:2020](https://standards.iteh.ai/catalog/standards/sist/a44bbcb1-a287-4c3f-b99c-2dab315dacbd/sist-en-iec-62541-8-2020)

<https://standards.iteh.ai/catalog/standards/sist/a44bbcb1-a287-4c3f-b99c-2dab315dacbd/sist-en-iec-62541-8-2020>

TABLES

Table 1 – DataItem definition	12
Table 2 – <i>AnalogItem</i> definition	13
Table 3 – DiscreteItem definition	15
Table 4 – TwoStateDiscreteType definition.....	15
Table 5 – MultiStateDiscreteType definition.....	16
Table 6 – MultiStateValueDiscreteType definition.....	16
Table 7 – ArrayItem definition	17
Table 8 – YArrayItem definition.....	18
Table 9 – <i>YArrayItem</i> item description	19
Table 10 – XYArrayItem definition	20
Table 11 – ImageItem definition.....	20
Table 12 – CubelItem definition	21
Table 13 – NDimensionArrayItem definition	22
Table 14 – <i>Range</i> DataType structure	23
Table 15 – <i>Range</i> definition.....	23
Table 16 – <i>EUInformation</i> DataType structure	24
Table 17 – <i>EUInformation</i> definition	24
Table 18 – Examples from the UNECE Recommendation	24
Table 19 – ComplexNumberType DataType structure	25
Table 20 – ComplexNumberType definition	25
Table 21 – DoubleComplexNumberType DataType structure	25
Table 22 – DoubleComplexNumberType definition	26
Table 23 – AxisInformation DataType structure	26
Table 24 – AxisScaleEnumeration values	26
Table 25 – AxisScaleEnumeration definition.....	26
Table 26 – XVType DataType structure	27
Table 27 – XVType definition	27
Table 28 – Operation level result codes for BAD data quality	29
Table 29 – Operation level result codes for UNCERTAIN data quality	29
Table 30 – Operation level result codes for GOOD data quality	29
Table A.1 – OPC COM DA to OPC UA Properties mapping	33
Table A.2 – DataTypes and mapping.....	36
Table A.3 – Quality mapping	37
Table A.4 – OPC DA Read error mapping.....	38
Table A.5 – OPC DA Write error code mapping	38
Table A.6 – DataTypes and Mapping.....	44
Table A.7 – Quality mapping	45
Table A.8 – OPC UA Read error mapping.....	46
Table A.9 – OPC UA Write error code mapping	46

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPC UNIFIED ARCHITECTURE –

Part 8: Data access

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC 62541-8 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
65E/XX/DTR	65E/XX/RVC

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 third edition cancels and replaces the second edition of IEC 62541, published in 2015.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Added new VariableTypes for AnalogItems

- 52 b) Added an Annex that specifies a recommended mapping of OPC UA Dataaccess to OPC COM
53 DataAccess.
- 54 c) Changed the ambiguous description of "Bad_NotConnected".
- 55 d) Updated description for EUInformation to refer to latest revision of UNCEFACT units.

56

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

58 Throughout this document and the referenced other Parts of the series, certain document
59 conventions are used:

60 Italics are used to denote a defined term or definition that appears in the "Terms and definition"
61 clause in one of the parts of the series.

62 Italics are also used to denote the name of a service input or output parameter or the name of a
63 structure or element of a structure that are usually defined in tables.

64 The italicized terms and names are also often written in camel-case (the practice of writing
65 compound words or phrases in which the elements are joined without spaces, with each element's
66 initial letter capitalized within the compound). For example the defined term is AddressSpace instead
67 of Address Space. This makes it easier to understand that there is a single definition for
68 AddressSpace, not separate definitions for Address and Space.

69 A list of all parts of the IEC 62541 series, published under the general title *OPC Unified Architecture*,
70 can be found on the IEC website.

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

- 74 • reconfirmed,
- 75 • withdrawn,
- 76 • replaced by a revised edition, or
- 77 • amended.

78

79 The National Committees are requested to note that for this publication the stability date is 2021.

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

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

83

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.

84

85

86

OPC UNIFIED ARCHITECTURE –

Part 8: Data Access

87
88
89
90
91
92

93 1 Scope

94 This specification is part of the overall OPC Unified Architecture (OPC UA) standard series
95 and defines the information model associated with Data Access (DA). It particularly includes
96 additional *VariableTypes* and complementary descriptions of the *NodeClasses* and *Attributes*
97 needed for Data Access, additional *Properties*, and other information and behaviour.

98 The complete address space model, including all *NodeClasses* and *Attributes* is specified in
99 IEC 62541-3. The services to detect and access data are specified in IEC 62541-4.

100 2 Normative references

101 The following referenced documents are indispensable for the application of this document.
102 For dated references, only the edition cited applies. For undated references, the latest edition
103 of the referenced document (including any amendments) applies.

104 IEC TR 62541-1, *OPC Unified Architecture – Part 1: Overview and Concepts*

105 IEC 62541-3, *OPC unified architecture – Part 3: Address Space Model*

106 IEC 62541-4, *OPC unified architecture – Part 4: Services*

107 IEC 62541-5, *OPC unified architecture – Part 5: Information Model*

108 UN/CEFACT: **UNECE Recommendation N° 20**, *Codes for Units of Measure Used in*
109 *International Trade*, available at <http://www.unece.org/tradewelcome/un-centre-for-trade-facilitation-and-e-business-unecefact/outputs/cefactrecommendationsrec-index/list-of-trade-facilitation-recommendations-n-16-to-20.html>
110
111

112 3 Terms, definitions and abbreviations

113 3.1 Terms and definitions

114 For the purposes of this document, the terms and definitions given in IEC TR 62541-1,
115 IEC 62541-3, and IEC 62541-4 as well as the following apply.

116 3.1.1

117 **DatalItem**

118 link to arbitrary, live automation data, that is, data that represents currently valid information

119 Note 1 to entry: Examples of such data are

- 120 • device data (such as temperature sensors),
- 121 • calculated data,
- 122 • status information (open/closed, moving),
- 123 • dynamically-changing system data (such as stock quotes),
- 124 • diagnostic data.

125 3.1.2

126 **AnalogItem**

127 *DatalItems* that represent continuously-variable physical quantities (e.g., length, temperature),
128 in contrast to the digital representation of data in discrete items

129 Note 1 to entry: Typical examples are the values provided by temperature sensors or pressure sensors. OPC UA
130 defines a specific *VariableType* to identify an *AnalogItem*. *Properties* describe the possible ranges of *AnalogItems*.

131 **3.1.3**132 **DiscreteItem**

133 *DataItems* that represent data that may take on only a certain number of possible values (e.g.,
134 OPENING, OPEN, CLOSING, CLOSED)

135 Note 1 to entry: Specific *VariableTypes* are used to identify *DiscreteItems* with two states or with multiple states.
136 *Properties* specify the string values for these states.

137 **3.1.4**138 **ArrayItem**

139 *DataItems* that represent continuously-variable physical quantities and where each individual
140 data point consists of multiple values represented by an array (e.g., the spectral response of
141 a digital filter)

142 Note 1 to entry: Typical examples are the data provided by analyser devices. Specific *VariableTypes* are used to
143 identify *ArrayItem* variants.

144 **3.1.5**145 **EngineeringUnits**

146 units of measurement for *AnalogItems* that represent continuously-variable physical quantities
147 (e.g., length, mass, time, temperature)

148 Note 1 to entry: This standard defines *Properties* to inform about the unit used for the *DataItem* value and about
149 the highest and lowest value likely to be obtained in normal operation.

150 **3.2 Abbreviations and symbols**

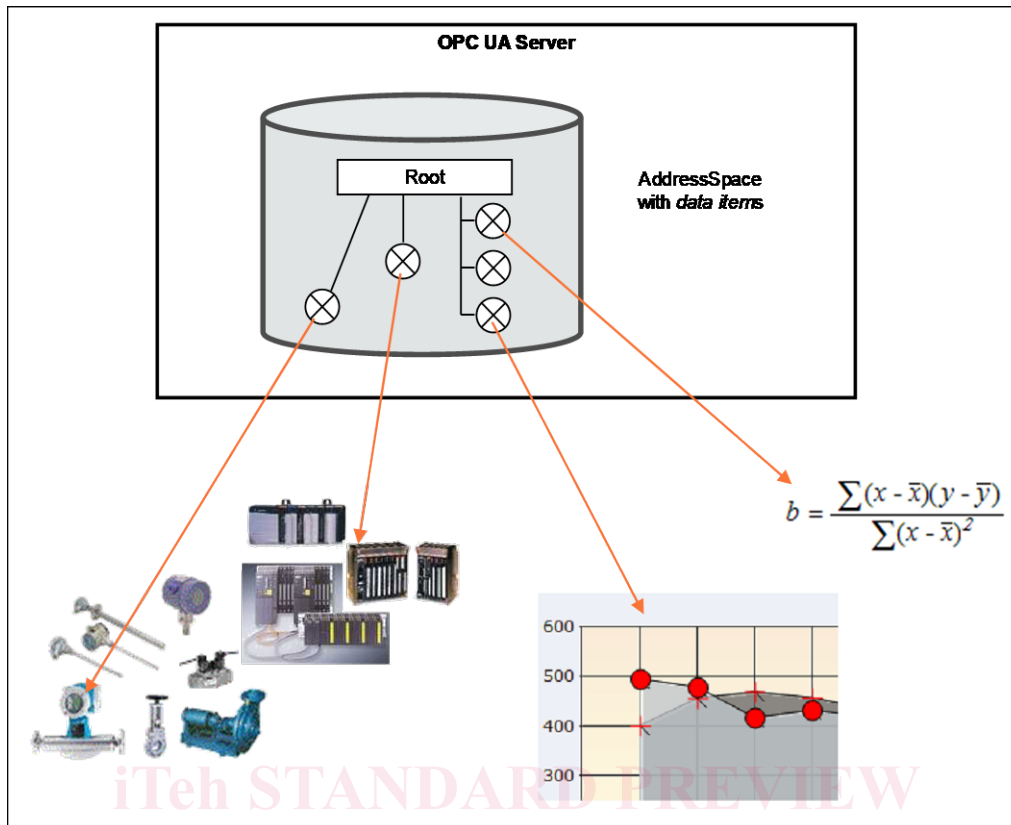
151	DA	Data Access
152	EU	Engineering Unit
153	UA	Unified Architecture

154 **4 Concepts**

155 Data Access deals with the representation and use of automation data in Servers.

156 Automation data can be located inside the *Server* or on I/O cards directly connected to the
157 *Server*. It can also be located in sub-servers or on other devices such as controllers and
158 input/output modules, connected by serial links via field buses or other communication links.
159 OPC UA Data Access *Servers* provide one or more OPC UA Data Access *Clients* with
160 transparent access to their automation data.

161 The links to automation data instances are called *DataItems*. Which categories of automation
162 data are provided is completely vendor-specific. Figure 1 illustrates how the *AddressSpace* of
163 a *Server* might consist of a broad range of different *DataItems*.



164

165

Figure 1 – OPC *Dataltems* are linked to automation data

166 *Clients* may read or write *Dataltems*, or monitor them for value changes. The *Services* needed
 167 for these operations are specified in IEC 62541-4. Changes are defined as a change in status
 168 (quality) or a change in value that exceeds a client-defined range called a *Deadband*. To
 169 detect the value change, the difference between the current value and the last reported value
 170 is compared to the *Deadband*.

171 5 Model

172 5.1 General

173 The *DataAccess* model extends the variable model by defining *VariableTypes*. The
 174 *DataltemType* is the base type. *ArrayItemtype*, *AnalogItemtype* and *DiscreteltemType* (and
 175 its *TwoState* and *MultiState* subtypes) are specializations. See Figure 2. Each of these
 176 *VariableTypes* can be further extended to form domain or server specific *Dataltems*.