

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**OPC unified architecture –
Part 5: Information Model**

**Architecture unifiée OPC –
Partie 5: Modèle d'information**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.



IEC 62541-5

Edition 3.0 2020-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**OPC unified architecture –
Part 5: Information Model**

**Architecture unifiée OPC –
Partie 5: Modèle d'information**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.100.05

ISBN 978-2-8322-8592-3

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD	14
1 Scope	16
2 Normative references	16
3 Terms, definitions, abbreviated terms and conventions	17
3.1 Terms and definitions	17
3.2 Abbreviated terms	17
3.3 Conventions for Node descriptions	17
4 Nodelds and BrowseNames	19
4.1 Nodelds	19
4.2 BrowseNames	19
5 Common Attributes	19
5.1 General	19
5.2 Objects	20
5.3 Variables	20
5.4 VariableTypes	21
5.5 Methods	21
6 Standard ObjectTypes	21
6.1 General	21
6.2 BaseObjectType	22
6.3 ObjectTypes for the Server Object	22
6.3.1 ServerType	22
6.3.2 ServerCapabilitiesType	25
6.3.3 ServerDiagnosticsType	28
6.3.4 SessionsDiagnosticsSummaryType	29
6.3.5 SessionDiagnosticsObjectType	29
6.3.6 VendorServerInfoType	30
6.3.7 ServerRedundancyType	30
6.3.8 TransparentRedundancyType	31
6.3.9 NonTransparentRedundancyType	31
6.3.10 NonTransparentNetworkRedundancyType	32
6.3.11 OperationLimitsType	33
6.3.12 AddressSpaceFileType	34
6.3.13 NamespaceMetadataType	35
6.3.14 NamespacesType	36
6.4 ObjectTypes used as EventTypes	37
6.4.1 General	37
6.4.2 BaseEventType	37
6.4.3 AuditEventType	40
6.4.4 AuditSecurityEventType	41
6.4.5 AuditChannelEventType	42
6.4.6 AuditOpenSecureChannelEventType	42
6.4.7 AuditSessionEventType	43
6.4.8 AuditCreateSessionEventType	44
6.4.9 AuditUrlMismatchEventType	45
6.4.10 AuditActivateSessionEventType	45

6.4.11	AuditCancelEventType	46
6.4.12	AuditCertificateEventType	47
6.4.13	AuditCertificateDataMismatchEventType	47
6.4.14	AuditCertificateExpiredEventType	48
6.4.15	AuditCertificateInvalidEventType	48
6.4.16	AuditCertificateUntrustedEventType	48
6.4.17	AuditCertificateRevokedEventType	49
6.4.18	AuditCertificateMismatchEventType	49
6.4.19	AuditNodeManagementEventType	50
6.4.20	AuditAddNodesEventType	50
6.4.21	AuditDeleteNodesEventType	50
6.4.22	AuditAddReferencesEventType	51
6.4.23	AuditDeleteReferencesEventType	51
6.4.24	AuditUpdateEventType	52
6.4.25	AuditWriteUpdateEventType	52
6.4.26	AuditHistoryUpdateEventType	53
6.4.27	AuditUpdateMethodEventType	54
6.4.28	SystemEventType	54
6.4.29	DeviceFailureEventType	54
6.4.30	SystemStatusChangeEvent	55
6.4.31	BaseModelChangeEvent	55
6.4.32	GeneralModelChangeEvent	56
6.4.33	SemanticChangeEvent	56
6.4.34	EventQueueOverflowEventType	57
6.4.35	ProgressEventType	57
6.5	ModellingRuleType	58
6.6	FolderType	58
6.7	DataTypeEncodingType	58
6.8	AggregateFunctionType	58
7	Standard VariableTypes	59
7.1	General	59
7.2	BaseVariableType	59
7.3	PropertyType	59
7.4	BaseDataVariableType	60
7.5	ServerVendorCapabilityType	60
7.6	ServerStatusType	61
7.7	BuildInfoType	61
7.8	ServerDiagnosticsSummaryType	62
7.9	SamplingIntervalDiagnosticsArrayType	63
7.10	SamplingIntervalDiagnosticsType	63
7.11	SubscriptionDiagnosticsArrayType	63
7.12	SubscriptionDiagnosticsType	64
7.13	SessionDiagnosticsArrayType	65
7.14	SessionDiagnosticsVariableType	66
7.15	SessionSecurityDiagnosticsArrayType	69
7.16	SessionSecurityDiagnosticsType	69
7.17	OptionSetType	70
7.18	SelectionListType	71
7.19	AudioVariableType	72

8	Standard Objects and their Variables.....	73
8.1	General.....	73
8.2	Objects used to organise the AddressSpace structure	73
8.2.1	Overview	73
8.2.2	Root	73
8.2.3	Views	74
8.2.4	Objects	74
8.2.5	Types	75
8.2.6	ObjectTypes	75
8.2.7	VariableTypes	76
8.2.8	ReferenceTypes	77
8.2.9	DataTypes	78
8.2.10	EventTypes	78
8.3	Server Object and its containing Objects.....	79
8.3.1	General	79
8.3.2	Server Object	80
8.4	ModellingRule Objects	80
8.4.1	ExposesItsArray	80
8.4.2	Mandatory	81
8.4.3	Optional.....	81
8.4.4	OptionalPlaceholder	81
8.4.5	MandatoryPlaceholder	82
9	Standard Methods	82
9.1	GetMonitoredItems	82
9.2	ResendData.....	83
9.3	SetSubscriptionDurable	83
9.4	RequestServerStateChange.....	84
10	Standard Views	85
11	Standard ReferenceTypes	85
11.1	References	85
11.2	HierarchicalReferences.....	86
11.3	NonHierarchicalReferences	86
11.4	HasChild.....	87
11.5	Aggregates	87
11.6	Organizes	87
11.7	HasComponent	87
11.8	HasOrderedComponent	88
11.9	HasProperty.....	88
11.10	HasSubtype	88
11.11	HasModellingRule.....	89
11.12	HasTypeDefinition.....	89
11.13	HasEncoding	89
11.14	HasEventSource	90
11.15	HasNotifier.....	90
11.16	GeneratesEvent.....	90
11.17	AlwaysGeneratesEvent.....	91
12	Standard DataTypes	91
12.1	Overview.....	91

12.2	DataTypes defined in IEC 62541-3.....	91
12.3	DataTypes defined in IEC 62541-4.....	98
12.4	BuildInfo	99
12.5	RedundancySupport	99
12.6	ServerState.....	100
12.7	RedundantServerDataType	101
12.8	SamplingIntervalDiagnosticsDataType	101
12.9	ServerDiagnosticsSummaryDataType	102
12.10	ServerStatusDataType	102
12.11	SessionDiagnosticsDataType.....	103
12.12	SessionSecurityDiagnosticsDataType	106
12.13	ServiceCounterDataType	107
12.14	StatusResult	107
12.15	SubscriptionDiagnosticsDataType	107
12.16	ModelChangeStructureDataType	109
12.17	SemanticChangeStructureDataType	110
12.18	BitFieldMaskDataType	110
12.19	NetworkGroupDataType.....	110
12.20	EndpointUrlListDataType	111
12.21	KeyValuePair	111
12.22	EndpointType.....	112
Annex A	(informative) Design decisions when modelling the server information	113
A.1	Overview.....	113
A.2	ServerType and Server Object.....	113
A.3	Typed complex Objects beneath the Server Object	113
A.4	Properties versus DataVariables	113
A.5	Complex Variables using complex DataTypes	114
A.6	Complex Variables having an array.....	114
A.7	Redundant information.....	114
A.8	Usage of the BaseDataVariableType.....	115
A.9	Subtyping	115
A.10	Extensibility mechanism.....	115
Annex B	(normative) StateMachines	116
B.1	General.....	116
B.2	Examples of finite state machines	116
B.2.1	Simple state machine	116
B.2.2	State machine containing substates	117
B.3	Definition of state machine.....	118
B.4	Representation of state machines in the AddressSpace	118
B.4.1	Overview	118
B.4.2	StateMachineType	119
B.4.3	StateVariableType	120
B.4.4	TransitionVariableType.....	121
B.4.5	FiniteStateMachineType	122
B.4.6	FiniteStateVariableType	124
B.4.7	FiniteTransitionVariableType	125
B.4.8	StateType	126
B.4.9	InitialStateType	126
B.4.10	TransitionType.....	127

B.4.11	FromState.....	127
B.4.12	ToState.....	128
B.4.13	HasCause.....	128
B.4.14	HasEffect.....	129
B.4.15	HasSubStateMachine	129
B.4.16	TransitionEventType.....	130
B.4.17	AuditUpdateStateEventType	130
B.4.18	Special Restrictions on subtyping StateMachines	131
B.4.19	Specific StatusCodes for StateMachines.....	131
B.5	Examples of StateMachines in the AddressSpace.....	132
B.5.1	StateMachineType using inheritance	132
B.5.2	StateMachineType with a SubStateMachine using inheritance	133
B.5.3	StateMachineType using containment.....	134
B.5.4	Example of a StateMachine having Transition to SubStateMachine	134
Annex C (normative)	File Transfer	137
C.1	Overview.....	137
C.2	FileType.....	137
C.2.1	General	137
C.2.2	Open	138
C.2.3	Close.....	139
C.2.4	Read	140
C.2.5	Write.....	141
C.2.6	GetPosition.....	142
C.2.7	SetPosition	142
C.3	File System.....	143
C.3.1	FileDirectoryType	143
C.3.2	FileSystem Object	144
C.3.3	CreateDirectory	144
C.3.4	CreateFile.....	145
C.3.5	Delete.....	146
C.3.6	MoveOrCopy	147
C.4	Temporary file transfer.....	148
C.4.1	TemporaryFileTransferType.....	148
C.4.2	File transfer sequences	149
C.4.3	GenerateFileForRead	150
C.4.4	GenerateFileForWrite	151
C.4.5	CloseAndCommit.....	151
C.4.6	FileTransferStateMachineType	152
C.4.7	Reset.....	155
Annex D (normative)	DataTypeDictionary.....	156
D.1	Overview.....	156
D.2	Data Type Model.....	156
D.3	DataTypeDictionary, DataTypeDescription, DataTypeEncoding and DataTypeSystem.....	157
D.4	AddressSpace organization.....	159
D.5	Node definitions	161
D.5.1	HasDescription	161
D.5.2	DataTypeDictionaryType.....	161
D.5.3	DataTypeDescriptionType.....	162

D.5.4	DataTypeSystemType.....	162
D.5.5	OPC Binary	162
D.5.6	XML Schema	163
Annex E	(normative) OPC Binary Type Description System	164
E.1	Concepts	164
E.2	Schema description	165
E.2.1	TypeDictionary	165
E.2.2	TypeDescription.....	165
E.2.3	OpaqueType.....	166
E.2.4	EnumeratedType	166
E.2.5	StructuredType	167
E.2.6	FieldType	167
E.2.7	EnumeratedValue	169
E.2.8	ByteOrder.....	169
E.2.9	ImportDirective	170
E.3	Standard Type descriptions.....	170
E.4	Type description examples.....	171
E.4.1	A 128-bit signed integer.....	171
E.4.2	A 16-bit value divided into several fields	171
E.4.3	A structured type with optional fields	171
E.4.4	An array of integers	171
E.4.5	An array of integers with a terminator instead of a length prefix.....	171
E.4.6	A simple union.....	171
E.4.7	An enumerated type	172
E.4.8	A nullable array	172
E.5	OPC Binary XML schema.....	172
E.6	OPC Binary Standard TypeDictionary	174
Annex F	(normative) User Authorization.....	176
F.1	Overview.....	176
F.2	RoleSetType	176
F.2.1	RoleSetType definition.....	176
F.2.2	AddRole Method	176
F.2.3	RemoveRole Method	177
F.3	RoleType	178
F.3.1	RoleType definition.....	178
F.3.2	IdentityMappingRuleType	179
F.3.3	AddIdentity Method.....	180
F.3.4	RemoveIdentity Method	180
F.3.5	AddApplication Method	181
F.3.6	RemoveApplication Method	181
F.3.7	AddEndpoint Method	182
F.3.8	RemoveEndpoint Method.....	182
F.4	RoleMappingRuleChangedAuditEventType	183
Figure 1	– Standard AddressSpace structure	73
Figure 2	– Views organization	74
Figure 3	– Objects organization	75
Figure 4	– ObjectTypes organization.....	76

Figure 5 – VariableTypes organization	76
Figure 6 – ReferenceType definitions	77
Figure 7 – EventTypes organization	78
Figure 8 – Excerpt of diagnostic information of the Server	80
Figure B.1 – Example of a simple state machine	117
Figure B.2 – Example of a state machine having a sub-machine	117
Figure B.3 – The StateMachine Information Model	119
Figure B.4 – Example of a FiniteStateMachine type	124
Figure B.5 – Example of a FiniteStateMachine instance	124
Figure B.6 – Example of an initial State in a sub-machine	126
Figure B.7 – Example of a StateMachineType using inheritance	132
Figure B.8 – Example of a StateMachineType with a SubStateMachine using inheritance	133
Figure B.9 – Example of a StateMachineType using containment	134
Figure B.10 – Example of a StateMachine with Transitions from sub-states	135
Figure B.11 – Example of a StateMachineType having Transition to SubStateMachine	136
Figure C.1 – FileSystem example	144
Figure C.2 – Read file transfer example sequence	149
Figure C.3 – Write file transfer example sequence	149
Figure C.4 – File transfer States	152
Figure C.5 – FileTransferStateMachineType	153
Figure D.1 – DataType model	156
Figure D.2 – Example of DataType modelling	159
Figure D.3 – DataTypes organization	160
Figure E.1 – OPC Binary Dictionary structure	164
Table 1 – Examples of DataTypes	18
Table 2 – TypeDefinitionTable	18
Table 3 – Common Node Attributes	20
Table 4 – Common Object Attributes	20
Table 5 – Common Variable Attributes	21
Table 6 – Common VariableType Attributes	21
Table 7 – Common Method Attributes	21
Table 8 – BaseObjectType definition	22
Table 9 – ServerType definition	23
Table 10 – ServerCapabilitiesType definition	26
Table 11 – ServerDiagnosticsType definition	28
Table 12 – SessionsDiagnosticsSummaryType definition	29
Table 13 – SessionDiagnosticsObjectType definition	30
Table 14 – VendorServerInfoType definition	30
Table 15 – ServerRedundancyType definition	31
Table 16 – TransparentRedundancyType definition	31
Table 17 – NonTransparentRedundancyType definition	32

Table 18 – NonTransparentNetworkRedundancyType definition	32
Table 19 – OperationLimitsType definition	33
Table 20 – AddressSpaceFileType definition.....	34
Table 21 – NamespaceMetadataType definition	35
Table 22 – NamespacesType definition.....	37
Table 23 – BaseEventType definition	38
Table 24 – AuditEventType definition	41
Table 25 – AuditSecurityEventType definition	42
Table 26 – AuditChannelEventType definition	42
Table 27 – AuditOpenSecureChannelEventType definition.....	43
Table 28 – AuditSessionEventType definition.....	44
Table 29 – AuditCreateSessionEventType definition	44
Table 30 – AuditUrlMismatchEventType definition.....	45
Table 31 – AuditActivateSessionEventType definition	46
Table 32 – AuditCancelEventType definition	46
Table 33 – AuditCertificateEventType definition	47
Table 34 – AuditCertificateDataMismatchEventType definition	47
Table 35 – AuditCertificateExpiredEventType definition	48
Table 36 – AuditCertificateInvalidEventType definition	48
Table 37 – AuditCertificateUntrustedEventType definition	49
Table 38 – AuditCertificateRevokedEventType definition	49
Table 39 – AuditCertificateMismatchEventType definition	49
Table 40 – AuditNodeManagementEventType definition.....	50
Table 41 – AuditAddNodesEventType definition	50
Table 42 – AuditDeleteNodesEventType definition	51
Table 43 – AuditAddReferencesEventType definition	51
Table 44 – AuditDeleteReferencesEventType definition	52
Table 45 – AuditUpdateEventType definition.....	52
Table 46 – AuditWriteUpdateEventType definition.....	53
Table 47 – AuditHistoryUpdateEventType definition	53
Table 48 – AuditUpdateMethodEventType definition	54
Table 49 – SystemEventType definition	54
Table 50 – DeviceFailureEventType definition.....	55
Table 51 – SystemStatusChangeEvent definition	55
Table 52 – BaseModelChangeEvent definition.....	55
Table 53 – GeneralModelChangeEvent definition	56
Table 54 – SemanticChangeEvent definition	56
Table 55 – EventQueueOverflowEventType definition	57
Table 56 – ProgressEventType definition	57
Table 57 – ModellingRuleType definition.....	58
Table 58 – FolderType definition.....	58
Table 59 – DataTypeEncodingType definition	58
Table 60 – AggregateFunctionType definition	59

Table 61 – BaseVariableType definition	59
Table 62 – PropertyType definition	60
Table 63 – BaseDataVariableType definition	60
Table 64 – ServerVendorCapabilityType definition	61
Table 65 – ServerStatusType definition	61
Table 66 – BuildInfoType definition	62
Table 67 – ServerDiagnosticsSummaryType definition	62
Table 68 – SamplingIntervalDiagnosticsArrayType definition	63
Table 69 – SamplingIntervalDiagnosticsType definition	63
Table 70 – SubscriptionDiagnosticsArrayType definition	64
Table 71 – SubscriptionDiagnosticsType definition	65
Table 72 – SessionDiagnosticsArrayType definition	66
Table 73 – SessionDiagnosticsVariableType definition	67
Table 74 – SessionSecurityDiagnosticsArrayType definition	69
Table 75 – SessionSecurityDiagnosticsType definition	70
Table 76 – OptionSetType definition	71
Table 77 – SelectionListType definition	72
Table 78 – AudioVariableType definition	72
Table 79 – Root definition	73
Table 80 – Views definition	74
Table 81 – Objects definition	75
Table 82 – Types definition	75
Table 83 – ObjectTypes definition	76
Table 84 – VariableTypes definition	77
Table 85 – ReferenceTypes definition	78
Table 86 – DataTypes definition	78
Table 87 – EventTypes definition	79
Table 88 – Server definition	80
Table 89 – ExposesItsArray definition	81
Table 90 – Mandatory definition	81
Table 91 – Optional definition	81
Table 92 – OptionalPlaceholder definition	81
Table 93 – MandatoryPlaceholder definition	82
Table 94 – GetMonitoredItems Method AddressSpace definition	83
Table 95 – ResendData Method AddressSpace definition	83
Table 96 – SetSubscriptionDurable Method AddressSpace definition	84
Table 97 – RequestServerStateChange Method AddressSpace definition	85
Table 98 – References ReferenceType	86
Table 99 – HierarchicalReferences ReferenceType	86
Table 100 – NonHierarchicalReferences ReferenceType	86
Table 101 – HasChild ReferenceType	87
Table 102 – Aggregates ReferenceType	87
Table 103 – Organizes ReferenceType	87

Table 104 – HasComponent ReferenceType	88
Table 105 – HasOrderedComponent ReferenceType	88
Table 106 – HasProperty ReferenceType.....	88
Table 107 – HasSubtype ReferenceType	89
Table 108 – HasModellingRule ReferenceType.....	89
Table 109 – HasTypeDefinition ReferenceType	89
Table 110 – HasEncoding ReferenceType	90
Table 111 – HasEventSource ReferenceType	90
Table 112 – HasNotifier ReferenceType.....	90
Table 113 – GeneratesEvent ReferenceType.....	91
Table 114 – AlwaysGeneratesEvent ReferenceType	91
Table 115 – IEC 62541-3 DataType definitions	92
Table 116 – BaseDataType definition.....	93
Table 117 – Structure definition	94
Table 118 – Enumeration definition.....	95
Table 119 – ByteString definition	95
Table 120 – Number definition	95
Table 121 – Double definition	96
Table 122 – Integer definition	96
Table 123 – DateTime definition	96
Table 124 – String definition	96
Table 125 – UInteger definition	97
Table 126 – Image definition.....	97
Table 127 – UInt64 definition	97
Table 128 – DataTypeDefinition definition.....	97
Table 129 – EnumValueType definition	98
Table 130 – IEC 62541-4 DataType definitions	98
Table 131 – UserIdentityToken definition	99
Table 132 – BuildInfo structure	99
Table 133 – BuildInfo definition.....	99
Table 134 – RedundancySupport values	100
Table 135 – RedundancySupport definition	100
Table 136 – ServerState values	100
Table 137 – ServerState definition	101
Table 138 – RedundantServerDataType Structure	101
Table 139 – RedundantServerDataType definition	101
Table 140 – SamplingIntervalDiagnosticsDataType Structure	101
Table 141 – SamplingIntervalDiagnosticsDataType definition.....	101
Table 142 – ServerDiagnosticsSummaryDataType Structure.....	102
Table 143 – ServerDiagnosticsSummaryDataType definition.....	102
Table 144 – ServerStatusDataType Structure	103
Table 145 – ServerStatusDataType definition	103
Table 146 – SessionDiagnosticsDataType Structure	104

Table 147 – SessionDiagnosticsDataType definition	106
Table 148 – SessionSecurityDiagnosticsDataType Structure	106
Table 149 – SessionSecurityDiagnosticsDataType definition.....	106
Table 150 – ServiceCounterDataType Structure	107
Table 151 – ServiceCounterDataType definition.....	107
Table 152 – StatusResult Structure.....	107
Table 153 – StatusResult definition.....	107
Table 154 – SubscriptionDiagnosticsDataType structure.....	108
Table 155 – SubscriptionDiagnosticsDataType definition	109
Table 156 – ModelChangeStructureDataType structure	109
Table 157 – ModelChangeStructureDataType definition	109
Table 158 – SemanticChangeStructureDataType structure	110
Table 159 – SemanticChangeStructureDataType definition.....	110
Table 160 – BitFieldMaskDataType definition.....	110
Table 161 – NetworkGroupDataType Structure	111
Table 162 – NetworkGroupDataType definition	111
Table 163 – EndpointUrlListDataType Structure.....	111
Table 164 – EndpointUrlListDataType definition.....	111
Table 165 – KeyValuePair structure	111
Table 166 – EndpointType structure.....	112
Table B.1 – StateMachineType definition	120
Table B.2 – StateVariableType definition	121
Table B.3 – TransitionVariableType definition	122
Table B.4 – FiniteStateMachineType definition	123
Table B.5 – FiniteStateVariableType definition.....	125
Table B.6 – FiniteTransitionVariableType definition	125
Table B.7 – StateType definition	126
Table B.8 – InitialStateType definition.....	127
Table B.9 – TransitionType definition.....	127
Table B.10 – FromState ReferenceType	128
Table B.11 – ToState ReferenceType	128
Table B.12 – HasCause ReferenceType.....	129
Table B.13 – HasEffect ReferenceType	129
Table B.14 – HasSubStateMachine ReferenceType	130
Table B.15 – TransitionEventType	130
Table B.16 – AuditUpdateStateEventType	131
Table B.17 – Specific StatusCodes for StateMachines	131
Table C.1 – FileType.....	138
Table C.2 – Open Method AddressSpace definition	139
Table C.3 – Close Method AddressSpace definition	140
Table C.4 – Read Method AddressSpace definition.....	141
Table C.5 – Write Method AddressSpace definition.....	142
Table C.6 – GetPosition Method AddressSpace definition.....	142

Table C.7 – SetPosition Method AddressSpace definition	143
Table C.8 – FileDirectoryType.....	143
Table C.9 – CreateDirectory Method AddressSpace definition	145
Table C.10 – CreateFile Method AddressSpace definition.....	146
Table C.11 – Delete Method AddressSpace definition.....	147
Table C.12 – MoveOrCopy Method AddressSpace definition.....	148
Table C.13 – TemporaryFileTransferType	148
Table C.14 – GenerateFileForRead Method AddressSpace definition	150
Table C.15 – GenerateFileForWrite Method AddressSpace definition.....	151
Table C.16 – CloseAndCommit Method AddressSpace definition	152
Table C.17 – FileTransferStateMachineType.....	154
Table C.18 – FileTransferStateMachineType transitions	155
Table D.1 – HasDescription ReferenceType.....	161
Table D.2 – DataTypeDictionaryType definition.....	161
Table D.3 – DataTypeDescriptionType definition.....	162
Table D.4 – DataTypeSystemType definition.....	162
Table D.5 – OPC Binary definition	162
Table D.6 – XML Schema definition	163
Table E.1 – TypeDictionary components	165
Table E.2 – TypeDescription components	166
Table E.3 – OpaqueType components	166
Table E.4 – EnumeratedType components.....	167
Table E.5 – StructuredType components.....	167
Table E.6 – FieldType components	168
Table E.7 – EnumeratedValue components.....	169
Table E.8 – ImportDirective components.....	170
Table E.9 – Standard Type descriptions.....	170
Table F.1 – RoleSetType definition	176
Table F.2 – RoleType definition	178
Table F.3 – IdentityMappingRuleType.....	179
Table F.4 – RoleMappingRuleChangedAuditEventType definition	183

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPC UNIFIED ARCHITECTURE –

Part 5: Information Model

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.

International Standard IEC 62541-5 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition cancels and replaces the second edition published in 2015. This edition constitutes a technical revision.

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

- a) Added Annex F on User Authentication. Describes the Role Information Model that also allows configuration of Roles.
- b) Added new data types: "Union", "Decimal", "OptionSet", "DateString", "TimeString", "DurationString", NormalizedString", "DecimalString", and "AudioDataType".
- c) Added Method to request a state change in a Server.
- d) Added Method to set Subscription to persistent mode.

- e) Added Method to request resending of data from a Subscription.
- f) Added concept allowing to temporarily create a file to write to or read from a server in C.4.
- g) Added new Variable type to support Selection Lists.
- h) Added optional properties to FiniteStateMachineType to expose currently available states and transitions.
- i) Added UrisVersion Property to ServerType. This version information can be used for session-less service invocation.

The text of this standard is based on the following documents:

FDIS	Report on voting
65E/717/FDIS	65E/733/RVD

Full information on the voting for the approval of this International Standard 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.

Throughout this document and the other parts of the IEC 62541 series, certain document conventions are used:

Italics are used to denote a defined term or definition that appears in Clause 3 in one of the parts of the series.

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

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

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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.

OPC UNIFIED ARCHITECTURE –

Part 5: Information Model

1 Scope

This part of IEC 62541 defines the Information Model of the OPC Unified Architecture. The Information Model describes standardized *Nodes* of a *Server's AddressSpace*. These *Nodes* are standardized types as well as standardized instances used for diagnostics or as entry points to server-specific *Nodes*. Thus, the Information Model defines the *AddressSpace* of an empty OPC UA *Server*. However, it is not expected that all *Servers* will provide all of these *Nodes*.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 62541-3, *OPC Unified Architecture – Part 3: Address Space Model*

IEC 62541-4, *OPC Unified Architecture – Part 4: Services*

IEC 62541-6, *OPC Unified Architecture – Part 6: Mappings*

IEC 62541-7, *OPC Unified Architecture – Part 7: Profiles*

IEC 62541-9, *OPC Unified Architecture – Part 9: Alarms and Conditions*

IEC 62541-10, *OPC Unified Architecture – Part 10: Programs*

IEC 62541-11, *OPC Unified Architecture – Part 11: Historical Access*

ISO/IEC/IEEE 60559:2011, *Information technology – Microprocessor Systems – Floating-Point arithmetic*

IETF RFC 2045, Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies
<http://www.ietf.org/rfc/rfc2045.txt>

IETF RFC 2046, Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types
<https://www.ietf.org/rfc/rfc2046.txt>

IETF RFC 2047, Multipurpose Internet Mail Extensions (MIME) Part Three: Message Header Extensions for Non-ASCII Text
<http://www.ietf.org/rfc/rfc2047.txt>

XML Schema Part 1: Structures
<http://www.w3.org/TR/xmlschema-1/>