



SLOVENSKI STANDARD
oSIST prEN IEC 62541-6:2018
01-november-2018

Enotna arhitektura OPC - 6. del: Načrtovanje

OPC unified architecture - Part 6: Mappings

OPC Unified Architecture - Teil 6: Protokollabbildungen

iTeh STANDARD PREVIEW
Architecture unifiée OPC - Partie 6: Correspondances
(standards.iteh.ai)

Ta slovenski standard je istoveten z: prEN IEC 62541-6:2018

<https://standards.iteh.ai/catalog/standards/sist/51a28e6f-ba43-410d-96df-a49a1f4e795c/sist-en-iec-62541-6-2020>

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 62541-6:2018

en,fr,de



65E/607/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:

IEC 62541-6 ED3

DATE OF CIRCULATION:

2018-08-17

CLOSING DATE FOR VOTING:

2018-11-09

SUPERSEDES DOCUMENTS:

65E/555/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"/>
iTeh STANDARD PREVIEW (standards.iec.ch)	
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 https://standards.iec.ch/catalog/standards/sist/51a28e6f-ba43-410d-96df-a49a1f4e795c/sist-6-2020 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 6: Mappings

PROPOSED STABILITY DATE: 2021

NOTE FROM TC/SC OFFICERS:

CONTENTS

FIGURES	4
TABLES.....	5
FOREWORD	8
1 Scope	11
2 Normative references.....	11
3 Terms, definitions and conventions	13
3.1 Terms and definitions	13
3.2 Abbreviations and symbols.....	14
4 Overview.....	14
5 Data encoding.....	15
5.1 General	15
5.1.1 Overview.....	15
5.1.2 Built-in Types	15
5.1.3 Guid.....	16
5.1.4 ByteString	17
5.1.5 ExtensionObject.....	17
5.1.6 Variant	17
5.1.7 Decimal.....	18
5.2 OPC UA Binary	18
5.2.1 General.....	18
5.2.2 Built-in Types	19
5.2.3 Decimal.....	27
5.2.4 Enumerations	27
5.2.5 Arrays	27
5.2.6 Structures	27
5.2.7 Structures with optional fields	29
5.2.8 Unions	31
5.2.9 Messages	32
5.3 OPC UA XML	33
5.3.1 Built-in Types	33
5.3.2 Decimal.....	39
5.3.3 Enumerations	39
5.3.4 Arrays	40
5.3.5 Structures	40
5.3.6 Structures with optional fields	40
5.3.7 Unions	41
5.3.8 Messages	41
5.4 OPC UA JSON	41
5.4.1 General.....	41
5.4.2 Built-in Types	42
5.4.3 Decimal.....	46
5.4.4 Enumerations	46
5.4.5 Arrays	46
5.4.6 Structures	47
5.4.7 Structures with optional fields	47
5.4.8 Unions	48

5.4.9	Messages	48
6	Message Security Protocols	48
6.1	Security handshake	48
6.2	Certificates	50
6.2.1	General	50
6.2.2	Application Instance Certificate	50
6.2.3	Certificate Chains	51
6.3	Time synchronization	52
6.4	UTC and International Atomic Time (TAI)	52
6.5	Issued User Identity Tokens	52
6.5.1	Kerberos	52
6.5.2	JSON Web Token (JWT)	52
6.5.3	OAuth2	53
6.6	WS Secure Conversation	55
6.7	OPC UA Secure Conversation	55
6.7.1	Overview	55
6.7.2	MessageChunk structure	55
6.7.3	MessageChunks and error handling	59
6.7.4	Establishing a Secure Channel	59
6.7.5	Deriving keys	61
6.7.6	Verifying Message Security	62
7	Transport Protocols	63
7.1	OPC UA Connection Protocol	63
7.1.1	Overview	63
7.1.2	Message structure	63
7.1.3	Establishing a connection	66
7.1.4	Closing a connection en-iec-62541-6-2020	67
7.1.5	Error handling	68
7.2	OPC UA TCP	69
7.3	SOAP/HTTP	69
7.4	OPC UA HTTPS	69
7.4.1	Overview	69
7.4.2	Session-less Services	70
7.4.3	XML Encoding	71
7.4.4	OPC UA Binary Encoding	72
7.4.5	JSON Encoding	72
7.5	WebSockets	72
7.5.1	Overview	72
7.5.2	Protocol Mapping	73
7.5.3	Security	74
7.6	Well known addresses	74
8	Normative Contracts	75
8.1	OPC Binary Schema	75
8.2	XML Schema and WSDL	75
Annex A (normative)	Constants	76
A.1	Attribute Ids	76
A.2	Status Codes	76
A.3	Numeric Node Ids	76

Annex B (normative) OPC UA Nodeset.....	78
Annex C (normative) Type declarations for the OPC UA native Mapping	79
Annex D (normative) WSDL for the XML Mapping	80
D.1 XML Schema.....	80
D.2 WSDL Port Types.....	80
D.3 WSDL Bindings	80
Annex E (normative) Security settings management.....	81
E.1 Overview	81
E.2 SecuredApplication	82
E.3 CertificateIdentifier	85
E.4 CertificateStoreIdentifier.....	86
E.5 CertificateList	87
E.6 CertificateValidationOptions	87
Annex F (normative) Information Model XML Schema	88
F.1 Overview	88
F.2 UANodeSet	88
F.3 UANode	89
F.4 Reference	90
F.5 RolePermission	91
F.6 UAType	91
F.7 UAInstance	91
F.8 UAVariable	92
F.9 UAMethod	92
F.10 TranslationType	93
F.11 UADeclaration	94
F.12 DataTypeDefinition	94
F.13 DataTypeField	94
F.14 Variant	95
F.15 Example (Informative)	95
F.16 UANodeSetChanges.....	98
F.17 NodesToAdd	99
F.18 ReferencesToDelete	99
F.19 ReferenceToDelete	99
F.20 NodesToDelete	100
F.21 NodeToDelete	100
F.22 UANodeSetChangesStatus.....	100
F.23 NodeSetStatusList.....	100
F.24 NodeSetStatus	101

FIGURES

Figure 1 – The OPC UA Stack Overview	15
Figure 2 – Encoding Integers in a binary stream.....	19
Figure 3 – Encoding Floating Points in a binary stream	19
Figure 4 – Encoding Strings in a binary stream	20
Figure 5 – Encoding Guids in a binary stream	21
Figure 6 – Encoding XmlElement in a binary stream.....	21

Figure 7 – A String Nodeld	22
Figure 8 – A Two Byte Nodeld.....	22
Figure 9 – A Four Byte Nodeld	23
Figure 10 – Security handshake	49
Figure 11 – OPC UA Secure Conversation MessageChunk	56
Figure 12 – OPC UA Connection Protocol Message structure.....	63
Figure 13 – Client initiated OPC UA Connection Protocol connection	66
Figure 14 – Server initiated OPC UA Connection Protocol connection	67
Figure 15 – Closing a OPC UA Connection Protocol connection.....	67
Figure 16 – Scenarios for the HTTPS Transport.....	70
Figure 19 – Setting up Communication over a WebSocket.....	73

TABLES

Table 1 – Built-in Data Types	16
Table 2 – Guid structure.....	16
Table 3 – Layout of Decimal	18
Table 4 – Supported Floating Point Types	19
Table 5 – Nodeld components.....	21
Table 6 – Nodeld Data Encoding values	22
Table 7 – Standard Nodeld Binary Data Encoding	22
Table 8 – Two Byte Nodeld Binary Data Encoding.....	22
Table 9 – Four Byte Nodeld Binary Data Encoding	23
Table 10 – ExpandedNodeld Binary Data Encoding	23
Table 11 – DiagnosticInfo Binary Data Encoding	24
Table 12 – QualifiedName Binary Data Encoding	24
Table 13 – LocalizedText Binary Data Encoding	25
Table 14 – Extension Object Binary Data Encoding	25
Table 15 – Variant Binary Data Encoding	26
Table 16 – Data Value Binary Data Encoding	27
Table 17 – Sample OPC UA Binary Encoded structure	28
Table 17 – Sample OPC UA Binary Encoded Structure with optional fields.....	30
Table 18 – Sample OPC UA Binary Encoded Structure	32
Table 18 – XML Data Type Mappings for Integers	33
Table 19 – XML Data Type Mappings for Floating Points.....	33
Table 20 – Components of Nodeld	35
Table 21 – Components of ExpandedNodeld.....	36
Table 22 – Components of Enumeration.....	39
Table 23 – JSON Object Definition for a Nodeld.....	43
Table 24 – JSON Object Definition for an ExpandedNodeld	43
Table 25 – JSON Object Definition for a StatusCode	44
Table 26 – JSON Object Definition for a DiagnosticInfo.....	44
Table 27 – JSON Object Definition for a QualifiedName	45

Table 28 – JSON Object Definition for a LocalizedText.....	45
Table 29 – JSON Object Definition for a ExtensionObject.....	45
Table 30 – JSON Object Definition for a Variant.....	45
Table 31 – JSON Object Definition for a DataValue	46
Table 32 – JSON Object Definition for a Decimal	46
Table 33 – JSON Object Definition for a <i>Structures</i> with Optional Fields.....	47
Table 34 – JSON Object Definition for a Union	48
Table 35 – SecurityPolicy	49
Table 36 – Application Instance Certificate.....	51
Table 37 – Kerberos UserTokenPolicy.....	52
Table 38 – JWT UserTokenPolicy.....	53
Table 39 – JWT IssuerEndpointUrl Definition	53
Table 40 – Access Token Claims.....	54
Table 41 – OPC UA Secure Conversation Message header.....	56
Table 42 – Asymmetric algorithm Security header	57
Table 43 – Symmetric algorithm Security header	58
Table 44 – Sequence header.....	58
Table 45 – OPC UA Secure Conversation Message footer	58
Table 46 – OPC UA Secure Conversation Message abort body	59
Table 47 – OPC UA Secure Conversation OpenSecureChannel Service.....	60
Table 48 – PRF inputs for RSA based SecurityPolicies	61
Table 49 – Cryptography key generation parameters.....	61
Table 50 – OPC UA Connection Protocol Message header.....	64
Table 51 – OPC UA Connection Protocol Hello Message.....	64
Table 52 – OPC UA Connection Protocol Acknowledge Message	65
Table 53 – OPC UA Connection Protocol Error Message	65
Table 54 – OPC UA Connection Protocol ReverseHello Message.....	65
Table 55 – OPC UA Connection Protocol error codes	68
Table 57 – WebSocket Protocols Mappings.....	73
Table 58 – Well known addresses for Local Discovery Servers.....	74
Table A.1 – Identifiers assigned to Attributes	76
Table E.1 – SecuredApplication.....	82
Table E.2 – CertificateIdentifier	85
Table E.3 – Structured directory store	86
Table E.4 – CertificateStoreIdentifier.....	86
Table E.5 – CertificateList	87
Table E.6 – CertificateValidationOptions	87
Table F.1 – UANodeSet.....	89
Table F.2 – UANode.....	90
Table F.3 – Reference	91
Table F.4 – RolePermission	91
Table F.5 – UANodeSet Type Nodes	91
Table F.6 – UANodeSet Instance Nodes	91

Table F.7 – UAInstance	92
Table F.8 – UAVariable	92
Table F.9 – UAMethod	93
Table F.10 – TranslationType	94
Table F.11 – UADeclaration	94
Table F.12 – DataTypeDefinition	94
Table F.13 – DataTypeField	95
Table F.14 – UANodeSetChanges	98
Table F.15 – NodesToAdd	99
Table F.16 – ReferencesToChange	99
Table F.17 – ReferencesToChange	99
Table F.18 – NodesToDelete	100
Table F.19 – ReferencesToChange	100
Table F.20 – UANodeSetChangesStatus	100
Table F.21 – NodeSetStatusList	101
Table F.22 – NodeSetStatus	101

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN IEC 62541-6:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/51a28e6f-ba43-410d-96df-a49a1f4e795c/sist-en-iec-62541-6-2020>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPC UNIFIED ARCHITECTURE –

Part 6: Mappings

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 cooperation 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 62541-6 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:

- 51 a) Encodings:
- 52 • Added JSON encoding for PubSub (non-reversible)
- 53 • Added JSON encoding for Client/Server (reversible)
- 54 • Added support for optional fields in structures
- 55 • Added support for Unions
- 56 b) Transport mappings:
- 57 • Added WebSocket secure connection - WSS
- 58 • Added support for reverse connectivity.
- 59 • Added support for session-less service invocation in HTTPS
- 60 c) Deprecated Transport (missing support on most platforms):
- 61 • SOAP/HTTP with WS-SecureConversation (all encodings)
- 62
- 63 d) Added mapping for JSON Web Token
- 64 e) Added support for Unions to NodeSet Schema
- 65 f) Added batch operations to add/delete nodes to NodeSet Schema
- 66 g) Added support for multi-dimensional arrays outside of Variants
- 67 h) Added binary representation for Decimal data types
- 68 i) Added mapping for an OAuth2 Authorization Framework

iTeh STANDARD PREVIEW (standards.iteh.ai)

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

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

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

75 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.

77 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.

82 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.

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

- 87 • reconfirmed,
- 88 • withdrawn,
- 89 • replaced by a revised edition, or
- 90 • amended.

91

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

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

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

96 **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.**

97

98

99

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN IEC 62541-6:2020

<https://standards.iteh.ai/catalog/standards/sist/51a28e6f-ba43-410d-96df-a49a1f4e795c/sist-en-iec-62541-6-2020>

100 **OPC Unified Architecture Specification**

101 **Part 6: Mappings**

106 **1 Scope**

107 This part specifies the OPC Unified Architecture (OPC UA) mapping between the security
108 model described in IEC TR 62541-2, the abstract service definitions, described in IEC 62541-
109 4, the data structures defined in IEC 62541-5 and the physical network protocols that can be
110 used to implement the OPC UA specification.

111 **2 Normative references**

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

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

117 IEC TR 62541-2, *OPC Unified Architecture – Part 2: Security Model*

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

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

120 IEC 62541-5, *OPC Unified Architecture – Part 5: Information Model*

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

122 IEC 62541-12, *OPC Unified Architecture – Part 12: Discovery and Global Services*

123 IEC 62541-14, *OPC Unified Architecture – Part 14: PubSub*

124

125 XML Schema Part 1: XML Schema Part 1: Structures

126 <http://www.w3.org/TR/xmlschema-1/>

127 XML Schema Part 2: XML Schema Part 2: Datatypes

128 <http://www.w3.org/TR/xmlschema-2/>

129 SOAP Part 1: SOAP Version 1.2 Part 1: Messaging Framework

130 <http://www.w3.org/TR/soap12-part1/>

131 SOAP Part 2: SOAP Version 1.2 Part 2: Adjuncts

132 <http://www.w3.org/TR/soap12-part2/>

133 XML Encryption: XML Encryption Syntax and Processing

134 <http://www.w3.org/TR/xmlenc-core/>

135 XML Signature: XML-Signature Syntax and Processing

136 <http://www.w3.org/TR/xmldsig-core/>

137 WS Security: SOAP Message Security 1.1

138 <http://www.oasis-open.org/committees/download.php/16790/wss-v1.1-spec-os-SOAPMessageSecurity.pdf>

140 WS Addressing: Web Services Addressing (WS-Addressing)

141 <http://www.w3.org/Submission/ws-addressing/>

- 142 SSL/TLS: RFC 5246 – The TLS Protocol Version 1.2
<http://tools.ietf.org/html/rfc5246.txt>
- 143 X.509 v3: X.509 Public Key Certificate Infrastructure
<http://www.itu.int/rec/T-REC-X.509-200003-I/e>
- 144 HTTP: RFC 2616 – Hypertext Transfer Protocol – HTTP/1.1
<http://www.ietf.org/rfc/rfc2616.txt>
- 145 HTTPS: RFC 2818 – HTTP Over TLS
<http://www.ietf.org/rfc/rfc2818.txt>
- 146 Base64: RFC 3548 – The Base16, Base32, and Base64 Data Encodings
<http://www.ietf.org/rfc/rfc3548.txt>
- 147 X690: ITU-T X.690 – Basic (BER), Canonical (CER) and Distinguished (DER) Encoding Rules
<http://www.itu.int/ITU-T/studygroups/com17/languages/X.690-0207.pdf>
- 148 X200: ITU-T X.200 – Open Systems Interconnection – Basic Reference Model
<http://www.itu.int/rec/T-REC-X.200-199407-I/en>
- 149 IEEE-754: Standard for Binary Floating-Point Arithmetic
<http://grouper.ieee.org/groups/754/>
- 150 HMAC: HMAC – Keyed-Hashing for Message Authentication
<http://www.ietf.org/rfc/rfc2104.txt>
- 151 PKCS #1: PKCS #1 – RSA Cryptography Specifications Version 2.0
<http://www.ietf.org/rfc/rfc2437.txt>
- 152 PKCS #12: PKCS 12: Personal Information Exchange Syntax
<http://www.ietf.org/rfc/rfc7292.txt>
- 153 FIPS 180-2: Secure Hash Standard (SHA)
<http://csrc.nist.gov/publications/fips/fips180-2/fips180-2.pdf>
- 154 FIPS 197: Advanced Encryption Standard (AES)
<http://www.csrc.nist.gov/publications/fips/fips197/fips-197.pdf>
- 155 UTF-8: UTF-8, a transformation format of ISO 10646
<http://www.ietf.org/rfc/rfc3629.txt>
- 156 RFC 3280: RFC 3280 – X.509 Public Key Infrastructure Certificate and CRL Profile
<http://www.ietf.org/rfc/rfc3280.txt>
- 157 RFC 4514: RFC 4514 – LDAP: String Representation of Distinguished Names
<http://www.ietf.org/rfc/rfc4514.txt>
- 158 NTP: RFC 1305 – Network Time Protocol (Version 3)
<http://www.ietf.org/rfc/rfc1305.txt>
- 159 Kerberos: WS Security Kerberos Token Profile 1.1
<http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-KerberosTokenProfile.pdf>
- 160 RFC 1738: RFC 1738 - Uniform Resource Locators (URL)
<http://www.ietf.org/rfc/rfc1738.txt>
- 161 RFC 2141: RFC 2141 - URN Syntax
<http://www.ietf.org/rfc/rfc2141.txt>
- 162 RFC 6455: RFC 6455 - The WebSocket Protocol
<http://www.ietf.org/rfc/rfc6455.txt>
- 163 RFC 7159: The JavaScript Object Notation (JSON) Data Interchange Format
<http://www.ietf.org/rfc/rfc7159.txt>

185 <http://www.ietf.org/rfc/rfc7159.txt>
 186 RFC 7523: JSON Web Token (JWT) Profile for OAuth 2.0
 187 <https://tools.ietf.org/rfc/rfc7523.txt>
 188 RFC 6749: The OAuth 2.0 Authorization Framework
 189 <http://www.ietf.org/rfc/rfc6749.txt>
 190 OpenID-Core: OpenID Connect Core 1.0
 191 http://openid.net/specs/openid-connect-core-1_0.html
 192 OpenID-Discovery: OpenID Connect Discovery 1.0
 193 https://openid.net/specs/openid-connect-discovery-1_0.html
 194 RFC 6960: RFC 6960 - Online Certificate Status Protocol - OCSP
 195 <https://tools.ietf.org/rfc/rfc6960.txt>
 196

197 **3 Terms, definitions and conventions**

198 **3.1 Terms and definitions**

199 For the purposes of this document the terms and definitions given in IEC TR 62541-1 IEC TR
 200 62541-1, IEC TR 62541-2 and IEC 62541-3 as well as the following apply.

201 **3.1.1**

202 **CertificateDigest**

203 a short identifier used to uniquely identify an X.509v3 *Certificate*.

204 Note 1 to entry: This is the SHA1 hash of DER encoded form of the *Certificate*.
(standards.iteh.ai)

205 **3.1.2**

206 **DataEncoding**

207 a way to serialize OPC UA *Messages* and data structures.
SIST EN IEC 62541-6-2020
<https://standards.iteh.ai/catalog/standards/sist/51a28e6f-ba43-410d-96df-a49a1f4e795c/sist-en-iec-62541-6-2020>

208 **3.1.3**

209 **DevelopmentPlatform**

210 a suite a tools and/or programming languages used to create software.

211 **3.1.4**

212 **Mapping**

213 specifies how to implement an OPC UA feature with a specific technology.

214 Note 1 to entry: For example, the OPC UA Binary Encoding is a *Mapping* that specifies how to serialize OPC UA
 215 data structures as sequences of bytes.

216 **3.1.5**

217 **SecurityProtocol**

218 ensures the integrity and privacy of UA *Messages* that are exchanged between OPC UA
 219 applications

220 **3.1.6**

221 **StackProfile**

222 a combination of *DataEncodings*, *SecurityProtocol* and *TransportProtocol Mappings*

223 Note 1 to entry: OPC UA applications implement one or more *StackProfiles* and can only communicate with OPC
 224 UA applications that support a *StackProfile* that they support.

225 **3.1.7**

226 **TransportConnection**

227 a full-duplex communication link established between OPC UA applications.

228 Note 1 to entry: A TCP/IP socket is an example of a *TransportConnection*.

229 **3.1.8**

230 **TransportProtocol**

231 a way to exchange serialized OPC UA *Messages* between OPC UA applications