

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**OPC unified architecture –  
Part 6: Mappings**

**Architecture unifiée OPC –  
Partie 6: Mappings**





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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) Encodings:

- added JSON encoding for PubSub (non-reversible);
- added JSON encoding for Client/Server (reversible);
- added support for optional fields in structures;
- added support for Unions.

- b) Transport mappings:
  - added WebSocket secure connection – WSS;
  - added support for reverse connectivity;
  - added support for session-less service invocation in HTTPS.
- c) Deprecated Transport (missing support on most platforms):
  - SOAP/HTTP with WS-SecureConversation (all encodings).
- d) Added mapping for JSON Web Token.
- e) Added support for Unions to NodeSet Schema.
- f) Added batch operations to add/delete nodes to/from NodeSet Schema.
- g) Added support for multi-dimensional arrays outside of Variants.
- h) Added binary representation for Decimal data types.
- i) Added mapping for an OAuth2 Authorization Framework.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
65E/718/FDIS	65E/734/RVD

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*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, with a few exceptions, 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.

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## OPC UNIFIED ARCHITECTURE –

### Part 6: Mappings

#### 1 Scope

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

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

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

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

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

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

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

ISO 8601-1:2019, *Date and time – Representations for information interchange – Part 1: Basic rules*

XML Schema Part 2: XML Schema Part 2: Datatypes  
<http://www.w3.org/TR/xmlschema-2/>

SOAP Part 1: SOAP Version 1.2 Part 1: Messaging Framework  
<http://www.w3.org/TR/soap12-part1/>

SSL/TLS: RFC 5246 – The TLS Protocol Version 1.2  
<http://tools.ietf.org/html/rfc5246.txt>

X.509 v3: ISO/IEC 9594-8 (ITU-T Rec. X.509), *Information technology – Open Systems Interconnection – The Directory: Public-key and attribute certificate frameworks*

HTTP: RFC 2616 – Hypertext Transfer Protocol – HTTP/1.1  
<http://www.ietf.org/rfc/rfc2616.txt>

HTTPS: RFC 2818 – HTTP Over TLS  
<http://www.ietf.org/rfc/rfc2818.txt>

Base64: RFC 3548 – The Base16, Base32, and Base64 Data Encodings  
<http://www.ietf.org/rfc/rfc3548.txt>

X690: ISO/IEC 8825-1 (ITU-T Rec. X.690), *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

IEEE-754: Standard for Floating-Point Arithmetic

HMAC: HMAC – Keyed-Hashing for Message Authentication  
<http://www.ietf.org/rfc/rfc2104.txt>

PKCS #1: PKCS #1 – RSA Cryptography Specifications Version 2.0  
<http://www.ietf.org/rfc/rfc2437.txt>

PKCS #12: PKCS #12 – Personal Information Exchange Syntax v1.1  
<http://www.ietf.org/rfc/rfc7292.txt>

FIPS 180-4: Secure Hash Standard (SHS)  
<https://csrc.nist.gov/publications/detail/fips/180/4/final>

FIPS 197: Advanced Encryption Standard (AES)  
<https://csrc.nist.gov/publications/detail/fips/197/final>

UTF-8: UTF-8, a transformation format of ISO 10646  
<http://www.ietf.org/rfc/rfc3629.txt>

RFC 3280: RFC 3280 – X.509 Public Key Infrastructure Certificate and CRL Profile  
<http://www.ietf.org/rfc/rfc3280.txt>

RFC 4514: RFC 4514 – LDAP: String Representation of Distinguished Names  
<http://www.ietf.org/rfc/rfc4514.txt>

NTP: RFC 1305 – Network Time Protocol (Version 3) Specification, Implementation and Analysis  
<http://www.ietf.org/rfc/rfc1305.txt>

Kerberos: Web Services Security – Kerberos Token Profile 1.1  
<http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-KerberosTokenProfile.pdf>

RFC 1738: RFC 1738 – Uniform Resource Locators (URL)  
<http://www.ietf.org/rfc/rfc1738.txt>

RFC 2141: RFC 2141 – URN Syntax  
<http://www.ietf.org/rfc/rfc2141.txt>

RFC 6455: RFC 6455 – The WebSocket Protocol  
<http://www.ietf.org/rfc/rfc6455.txt>

RFC 7159: The JavaScript Object Notation (JSON) Data Interchange Format  
<http://www.ietf.org/rfc/rfc7159.txt>

RFC 7523: JSON Web Token (JWT) Profile for OAuth 2.0 Client Authentication and Authorization Grants  
<https://tools.ietf.org/rfc/rfc7523.txt>

RFC 6749: The OAuth 2.0 Authorization Framework  
<http://www.ietf.org/rfc/rfc6749.txt>

OpenID-Core: OpenID Connect Core 1.0  
[http://openid.net/specs/openid-connect-core-1\\_0.html](http://openid.net/specs/openid-connect-core-1_0.html)

OpenID-Discovery: OpenID Connect Discovery 1.0  
[https://openid.net/specs/openid-connect-discovery-1\\_0.html](https://openid.net/specs/openid-connect-discovery-1_0.html)

RFC 6960: RFC 6960 – X.509 Internet Public Key Infrastructure Online Certificate Status Protocol – OCSP  
<https://www.ietf.org/rfc/rfc6960.txt>

### 3 Terms, definitions, abbreviated terms and symbols

#### 3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

##### 3.1.1

##### CertificateDigest

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

Note 1 to entry: This is the SHA1 hash of DER encoded form of the Certificate.

##### 3.1.2

##### DataEncoding

way to serialize OPC UA Messages and data structures

##### 3.1.3

##### DevelopmentPlatform

suite of tools and/or programming languages used to create software

##### 3.1.4

##### Mapping

specification on how to implement an OPC UA feature with a specific technology

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

##### 3.1.5

##### SecurityProtocol

protocol which ensures the integrity and privacy of UA Messages that are exchanged between OPC UA applications