# OPC unified architecture - Part 6: Mappings

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD



| | |
|---|---|
| See Eesti standard EVS-EN 62541-6:2015 sisaldab Euroopa standardi EN 62541-6:2015 ingliskeelset teksti. | This Estonian standard EVS-EN 62541-6:2015 consists of the English text of the European standard EN 62541-6:2015. |
| Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas | This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation. |
| Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 29.05.2015. | Date of Availability of the European standard is 29.05.2015. |
| Standard on kättesaadav Eesti Standardikeskusest. | The standard is available from the Estonian Centre for Standardisation. |

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 25.040.40, 35.100

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# OPC unified architecture - Part 6: Mappings (IEC 62541-6:2015)

Architecture unifiée OPC - Partie 6: Correspondances (IEC 62541-6:2015)

OPC Unified Architecture - Teil 6: Protokollabbildungen (IEC 62541-6:2015)




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## Foreword

The text of document 65E/377/CDV, future edition 2 of IEC 62541-6, prepared by SC 65E "Devices and integration in enterprise systems", of IEC/TC 65 "Industrial-process measurement, control and automation" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62541-6:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-01-29
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-04-29

This document supersedes EN 62541-6:2011.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

## Endorsement notice

The text of the International Standard IEC 62541-6:2015 was approved by CENELEC as a European Standard without any modification.

# Annex ZA
(normative)

## Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| IEC/TR 62541-1 | - | OPC unified architecture - Part 1: Overview and concepts | CLC/TR 62541-1 | - |
| IEC/TR 62541-2 | - | OPC unified architecture - Part 2: Security model | CLC/TR 62541-2 | - |
| IEC 62541-3 | - | OPC unified architecture - Part 3: Address Space Model | EN 62541-3 | - |
| IEC 62541-4 | - | OPC Unified Architecture - Part 4: Services | EN 62541-4 | - |
| IEC 62541-5 | - | OPC unified architecture - Part 5: Information Model | EN 62541-5 | - |
| IEC 62541-7 | - | OPC unified architecture - Part 7: Profiles | EN 62541-7 | - |
| IEEE 754 | 2008 | IEEE Standard for Binary Floating-Point Arithmetic | - | - |
| ITU-T X.509 | - | Information technology - Open systems interconnection - The Directory: Public-key and attribute certificate frameworks | - | - |
| ITU-T X.690 | 2002 | Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) | - | - |
| FIPS PUB 180-2 | 2002 | Secure Hash Standard | - | - |
| FIPS PUB 197 | 2001 | Advanced Encryption Standard (AES) | - | - |
| RFC 1305 | 1992 | Network Time Protocol (Version 3) - Specification, Implementation and Analysis | - | - |
| RFC 2104 | 1997 | HMAC: Keyed-Hashing for Message Authentication | - | - |
| RFC 2437 | 1998 | PKCS #1: RSA Cryptography Specifications Version 2.0 | - | - |

| Publication | Year | Title | EN/HD | Year |
|---|---|---|---|---|
| RFC 2616 | 1999 | Hypertext Transfer Protocol - HTTP/1.1 | - | - |
| RFC 3280 | 2002 | Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile | - | - |
| RFC 3548 | 2003 | The Base16, Base32, and Base64 Data Encodings | - | - |
| RFC 3629 | 2003 | UTF-8, a transformation format of ISO 10646 | - | - |
| RFC 4514 | 2006 | Lightweight Directory Access Protocol (LDAP): String Representation of Distinguished Names | - | - |
| RFC 5246 | 2008 | The Transport Layer Security (TLS) Protocol Version 1.2 | - | - |
| SOAP Part 1 | 2007 | SOAP Version 1.2 - Part 1: Messaging Framework | - | - |
| SOAP Part 2 | 2007 | SOAP Version 1.2 - Part 2: Adjuncts | - | - |
| WS-Addressing | 2004 | Web Services Addressing (WS-Addressing) | - | - |
| XML Encryption | 2002 | XML Encryption Syntax and Processing | - | - |
| XML Schema Part 1 | 2004 | XML Schema - Part 1: Structures | - | - |
| XML Schema Part 2 | 2004 | XML Schema - Part 2: Datatypes | - | - |
| XML Signature | 2008 | XML Signature Syntax and Processing | - | - |

CONTENTS

# 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, described 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*

XML Schema Part 1: XML Schema Part 1: Structures

http://www.w3.org/TR/xmlschema-1/

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/

SOAP Part 2: SOAP Version 1.2 Part 2: Adjuncts

http://www.w3.org/TR/soap12-part2/

XML Encryption: XML Encryption Syntax and Processing

http://www.w3.org/TR/xmlenc-core/

XML Signature: XML-Signature Syntax and Processing

http://www.w3.org/TR/xmldsig-core/

WS Security: SOAP Message Security 1.1

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

WS Addressing: Web Services Addressing (WS-Addressing)
http://www.w3.org/Submission/ws-addressing/

WS Trust: WS Trust 1.3
http://docs.oasis-open.org/ws-sx/ws-trust/v1.3/ws-trust.html

WS Secure Conversation: WS Secure Conversation 1.3
http://docs.oasis-open.org/ws-sx/ws-secureconversation/v1.3/ws-secureconversation.html

WS Security Policy: WS Security Policy 1.2
http://docs.oasis-open.org/ws-sx/ws-securitypolicy/200702/ws-securitypolicy-1.2-spec-os.html

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

X509: X.509 Public Key Certificate Infrastructure
http://www.itu.int/rec/T-REC-X.509-200003-I/e

WS-I Basic Profile 1.1: WS-I Basic Profile Version 1.1
http://www.ws-i.org/Profiles/BasicProfile-1.1.html

WS-I Basic Security Profile 1.1: WS-I Basic Security Profile Version 1.1
http://www.ws-i.org/Profiles/BasicSecurityProfile-1.1.html

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

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

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

IEEE-754: Standard for Binary Floating-Point Arithmetic
http://grouper.ieee.org/groups/754/

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

FIPS 180-2: Secure Hash Standard (SHA)
http://csrc.nist.gov/publications/fips/fips180-2/fips180-2.pdf

FIPS 197: Advanced Encyption Standard (AES)
http://www.csrc.nist.gov/publications/fips/fips197/fips-197.pdf

UTF8: UTF-8, a transformation format of ISO 10646
http://tools.ietf.org/html/rfc3629

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)

http://www.ietf.org/rfc/rfc1305.txt

Kerberos: WS Security Kerberos Token Profile 1.1

http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-KerberosTokenProfile.pdf

# 3 Terms, definitions, abbreviations 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 and IEC 62541-3 as well as the following apply.

**3.1.1**
**DataEncoding**
a way to serialize OPC UA *Messages* and data structures

**3.1.2**
**Mapping**
specifies 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.

**3.1.3**
**Security Protocol**
ensures the integrity and privacy of UA *Messages* that are exchanged between OPC UA applications

**3.1.4**
**Stack Profile**
a combination of *DataEncodings, SecurityProtocol* and *TransportProtocol Mappings*

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

**3.1.5**
**Transport Protocol**
a way to exchange serialized OPC UA *Messages* between OPC UA applications

## 3.2 Abbreviations and symbols

| | |
|---|---|
| API | Application Programming Interface |
| ASN.1 | Abstract Syntax Notation #1 (used in X690) |
| BP | WS-I Basic Profile Version |
| BSP | WS-I Basic Security Profile |
| CSV | Comma Separated Value (File Format) |
| HTTP | Hypertext Transfer Protocol |
| HTTPS | Secure Hypertext Transfer Protocol |
| IPSec | Internet Protocol Security |
| RST | Request Security Token |
| OID | Object Identifier (used with ASN.1) |
| RSTR | Request Security Token Response |