

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**OPC unified architecture –
Part 100: Device Interface**

**Architecture unifiée OPC –
Partie 100: Interface d'appareils**





THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2015 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
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 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.

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: csc@iec.ch.

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.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

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 aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 60 000 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.

Service Clients - webstore.iec.ch/csc

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



IEC 62541-100

Edition 1.0 2015-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**OPC unified architecture –
Part 100: Device Interface**

**Architecture unifiée OPC –
Partie 100: Interface d'appareils**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 25.040.40; 35.100

ISBN 978-2-8322-2299-7

**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..... | 6 |
| 1 Scope..... | 8 |
| 2 Reference documents | 8 |
| 3 Terms, definitions, abbreviations and used data types | 8 |
| 3.1 Terms and definitions | 8 |
| 3.2 Abbreviations | 10 |
| 3.3 Used data types | 10 |
| 4 Fundamentals..... | 10 |
| 4.1 OPC UA..... | 10 |
| 4.2 Conventions used in this document..... | 11 |
| 4.2.1 Conventions for Node descriptions | 11 |
| 4.2.2 NodeIds and BrowseNames | 12 |
| 5 Device model..... | 13 |
| 5.1 General..... | 13 |
| 5.2 TopologyElementType..... | 14 |
| 5.3 FunctionalGroupType | 16 |
| 5.4 Identification FunctionalGroup | 18 |
| 5.5 UIElement Type | 19 |
| 5.6 DeviceType..... | 19 |
| 5.7 Device support information | 22 |
| 5.7.1 General | 22 |
| 5.7.2 Device Type Image | 23 |
| 5.7.3 Documentation..... | 23 |
| 5.7.4 Protocol support files | 23 |
| 5.7.5 Images | 24 |
| 5.8 DeviceSet entry point | 24 |
| 5.9 ProtocolType..... | 25 |
| 5.10 BlockType..... | 26 |
| 5.11 Configurable components..... | 28 |
| 5.11.1 General pattern..... | 28 |
| 5.11.2 ConfigurableObjectType..... | 28 |
| 6 Device vommunication model..... | 29 |
| 6.1 General..... | 29 |
| 6.2 Network | 30 |
| 6.3 ConnectionPoint..... | 31 |
| 6.4 ConnectsTo and ConnectsToParent ReferenceTypes..... | 33 |
| 6.5 NetworkSet Object (mandatory)..... | 34 |
| 7 Device integration host model | 35 |
| 7.1 General..... | 35 |
| 7.2 DeviceTopology Object | 36 |
| 7.3 Online/Offline..... | 37 |
| 7.3.1 General | 37 |
| 7.3.2 IsOnline ReferenceType..... | 38 |
| 8 AddIn Capabilities | 39 |
| 8.1 Overview..... | 39 |

| | | |
|-------|---|----|
| 8.2 | Offline-Online data transfer | 40 |
| 8.2.1 | Definition | 40 |
| 8.2.2 | TransferServices Type | 40 |
| 8.2.3 | TransferServices Object | 41 |
| 8.2.4 | TransferToDevice Method | 41 |
| 8.2.5 | TransferFromDevice Method | 42 |
| 8.2.6 | FetchTransferResultData Method | 43 |
| 8.3 | Locking | 45 |
| 8.3.1 | Overview | 45 |
| 8.3.2 | LockingServices Type | 45 |
| 8.3.3 | LockingServices Object | 47 |
| 8.3.4 | MaxInactiveLockTime Property | 47 |
| 8.3.5 | InitLock Method | 48 |
| 8.3.6 | ExitLock Method | 48 |
| 8.3.7 | RenewLock Method | 49 |
| 8.3.8 | BreakLock Method | 49 |
| 9 | Specialized topology elements | 50 |
| 9.1 | General | 50 |
| 9.2 | Block Devices (BlockOriented DeviceType) | 50 |
| 9.3 | Modular Devices | 51 |
| 10 | Profiles | 52 |
| 10.1 | General | 52 |
| 10.2 | Device Server Facets | 52 |
| 10.3 | Device Client Facets | 53 |
| | Annex A (normative) Namespace and mappings | 55 |
| | Bibliography | 56 |
| | Figure 1 – Device model overview | 13 |
| | Figure 2 – Components of the TopologyElementType | 14 |
| | Figure 3 – FunctionalGroupType | 16 |
| | Figure 4 – Analyser Device use for FunctionalGroups (UA Companion ADI) | 17 |
| | Figure 5 – PLCOpen use for FunctionalGroups (UA Companion PLCOpen) | 18 |
| | Figure 6 – Example of an Identification FunctionalGroup | 19 |
| | Figure 7 – DeviceType | 20 |
| | Figure 8 – Integration of support information within a DeviceType | 22 |
| | Figure 9 – Standard entry point for Devices | 25 |
| | Figure 10 – Example of a ProtocolType hierarchy with instances that represent specific communication profiles | 26 |
| | Figure 11 – BlockType hierarchy | 27 |
| | Figure 12 – Configurable component pattern | 28 |
| | Figure 13 – ConfigurableObjectType | 29 |
| | Figure 14 – Initial example of a communication topology | 30 |
| | Figure 15 – NetworkType | 30 |
| | Figure 16 – Example of ConnectionPointType hierarchy | 31 |
| | Figure 17 – ConnectionPointType | 32 |
| | Figure 18 – ConnectionPoint usage | 33 |

| | |
|---|----|
| Figure 19 – Type hierarchy for ConnectsTo and ConnectsToParent References | 33 |
| Figure 20 – Example with ConnectsTo and ConnectsToParent References | 34 |
| Figure 21 – Example of an automation system..... | 35 |
| Figure 22 – Example of a Device topology..... | 36 |
| Figure 23 – Online component for access to device data | 37 |
| Figure 24 – Type hierarchy for <i>IsOnline Reference</i> | 39 |
| Figure 25 – TransferServicesType..... | 40 |
| Figure 26 – TransferServices | 41 |
| Figure 27 – LockingServicesType..... | 46 |
| Figure 28 – LockingServices | 47 |
| Figure 29 – Block-oriented Device structure example..... | 50 |
| Figure 30 – Modular Device structure example | 51 |
| | |
| Table 1 – DataTypes defined in IEC 62541-3..... | 10 |
| Table 2 – Type definition table | 11 |
| Table 3 – Examples of DataTypes | 12 |
| Table 4 – TopologyElementType definition | 15 |
| Table 5 – ParameterSet definition | 15 |
| Table 6 – MethodSet definition..... | 15 |
| Table 7 – FunctionalGroupType definition..... | 16 |
| Table 8 – UIElementType definition..... | 19 |
| Table 9 – DeviceType definition | 20 |
| Table 10 – DeviceHealth values | 22 |
| Table 11 – DeviceTypeImage definition | 23 |
| Table 12 – Documentation definition | 23 |
| Table 13 – ProtocolSupport definition..... | 23 |
| Table 14 – ImageSet definition..... | 24 |
| Table 15 – DeviceSet definition | 25 |
| Table 16 – ProtocolType definition | 26 |
| Table 17 – BlockType definition | 27 |
| Table 18 – ConfigurableObjectType definition..... | 29 |
| Table 19 – NetworkType definition | 31 |
| Table 20 – ConnectionPointType definition..... | 32 |
| Table 21 – ConnectsTo ReferenceType..... | 34 |
| Table 22 – ConnectsToParent ReferenceType..... | 34 |
| Table 23 – NetworkSet definition..... | 34 |
| Table 24 – DeviceTopology definition..... | 37 |
| Table 25 – <i>IsOnline ReferenceType</i> | 39 |
| Table 26 – TransferServicesType definition | 40 |
| Table 27 – TransferToDevice Method arguments..... | 42 |
| Table 28 – TransferToDevice Method AddressSpace definition | 42 |
| Table 29 – TransferFromDevice Method arguments | 42 |
| Table 30 – TransferFromDevice Method AddressSpace definition | 43 |

| | |
|---|----|
| Table 31 – FetchTransferResultData Method Arguments..... | 44 |
| Table 32 – FetchTransferResultData Method AddressSpace definition | 44 |
| Table 33 – FetchResultDataType structure | 44 |
| Table 34 – TransferResultError DataType structure | 44 |
| Table 35 – TransferResultData DataType structure..... | 45 |
| Table 36 – LockingServicesType definition | 46 |
| Table 37 – MaxInactiveLockTime Property definition..... | 47 |
| Table 38 – InitLock Method Arguments..... | 48 |
| Table 39 – InitLock Method AddressSpace definition | 48 |
| Table 40 – ExitLock Method Arguments..... | 49 |
| Table 41 – ExitLock Method AddressSpace definition | 49 |
| Table 42 – RenewLock Method Arguments | 49 |
| Table 43 – RenewLock Method AddressSpace definition..... | 49 |
| Table 44 – BreakLock Method Arguments..... | 50 |
| Table 45 – BreakLock Method AddressSpace definition | 50 |
| Table 46 – BaseDevice_Server_Facet definition | 52 |
| Table 47 – DeviceIdentification_Server_Facet definition | 52 |
| Table 48 – BlockDevice_Server_Facet definition | 52 |
| Table 49 – Locking_Server_Facet definition | 52 |
| Table 50 – DeviceCommunication_Server_Facet definition | 53 |
| Table 51 – DeviceIntegrationHost_Server_Facet definition | 53 |
| Table 52 – BaseDevice_Client_Facet definition | 53 |
| Table 53 – DeviceIdentification_Client_Facet definition | 53 |
| Table 54 – BlockDevice_Client_Facet definition..... | 54 |
| Table 55 – Locking_Client_Facet definition..... | 54 |
| Table 56 – DeviceCommunication_Client_Facet definition | 54 |
| Table 57 – DeviceIntegrationHost_Client_Facet definition..... | 54 |

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPC UNIFIED ARCHITECTURE –

Part 100: Device Interface

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 62541-100 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 standard is based on the following documents:

| | |
|-------------|------------------|
| CDV | Report on voting |
| 65E/372/CDV | 65E/412/RVC |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

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

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

- 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.