IEC 62541-10

Edition 4.0 2025-12

INTERNATIONAL STANDARD

OPC unified architecture -
Part 10: Programs

ICS 25.040.40; 35.100.05

ISBN 978-2-8327-0876-7

IEC 62541-10:2025-12(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2025 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.

IEC Secretariat
3, rue de Varembé
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 It also gives information on projects, replaced and withdrawn publications.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.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD....3
1 Scope....5
2 Normative references....5
3 Terms, definitions and abbreviated terms....5
3.1 Terms and definitions....5
3.2 Abbreviated terms....6
4 Concepts....6
4.1 General....6
4.2 Programs....7
4.2.1 Overview....7
4.2.2 Security considerations....8
4.2.3 Program Finite State Machine....8
4.2.4 Program states....9
4.2.5 State transitions....9
4.2.6 Program state transition stimuli....9
4.2.7 Program Control Methods....10
4.2.8 Program state transition effects....10
4.2.9 Program result data....10
4.2.10 Program lifetime....11
5 Model....12
5.1 General....12
5.2 ProgramStateMachineType....13
5.2.1 Overview....13
5.2.2 ProgramStateMachineType Properties....14
5.2.3 ProgramStateMachineType components....15
5.2.4 ProgramStateMachineType causes (Methods)....19
5.2.5 ProgramStateMachineType effects (Events)....20
5.2.6 AuditProgramTransitionEventType....21
5.2.7 FinalResultData....22
5.2.8 ProgramDiagnostic2 DataType....22
5.2.9 ProgramDiagnostic2Type VariableType....23
Annex A (informative) Program example....24
A.1 Overview....24
A.2 DomainDownload Program....24
A.2.1 General....24
A.2.2 DomainDownload states....25
A.2.3 DomainDownload transitions....26
A.2.4 DomainDownload Methods....27
A.2.5 DomainDownload Events....27
A.2.6 DomainDownload model....27

Figure 1 – Automation facility control....6
Figure 2 – Program illustration....7
Figure 3 – Program states and transitions....8
Figure 4 – Program Type....12
Figure 5 – Program FSM References....15

Figure 6 – ProgramStateMachineType causes and effects 18
Figure A.1 – Program example 24
Figure A.2 – DomainDownload state diagram 25
Figure A.3 – DomainDownloadType partial state model 32
Figure A.4 – Ready To Running model 34
Figure A.5 – Opening To Sending To Closing model 36
Figure A.6 – Running To Suspended model 37
Figure A.7 – Suspended To Running model 38
Figure A.8 – Running To Halted – Aborted model 39
Figure A.9 – Suspended To Aborted model 40
Figure A.10 – Running To Completed model 41
Figure A.11 – Sequence of operations 42

Table 1 – Program Finite State Machine 8
Table 2 – Program states 9
Table 3 – Program state transitions 9
Table 4 – Program Control Methods 10
Table 5 – ProgramStateMachineType 13
Table 6 – ProgramStateMachineType Attribute values for child Nodes 14
Table 7 – ProgramStateMachineType Additional References 16
Table 8 – ProgramStateMachineType causes 19
Table 9 – ProgramTransitionEventType 20
Table 10 – AuditProgramTransitionEventType 21
Table 11 – ProgramDiagnostic2DataType structure 22
Table 12 – ProgramDiagnostic2DataType definition 23
Table 13 – ProgramDiagnostic2Type VariableType 23
Table A.1 – DomainDownload states 26
Table A.2 – DomainDownloadType 28
Table A.3 – TransferStateMachineType 29
Table A.4 – TransferStateMachineType Attribute values for child Nodes 30
Table A.5 – Finish State Machine Type 30
Table A.6 – FinishStateMachineType Attribute values for child Nodes 31
Table A.7 – DomainDownloadType Property Attributes variable values 31
Table A.8 – TransferStateMachineType Additional References 33
Table A.9 – Start Method additions 35
Table A.10 – StartArguments 35
Table A.11 – IntermediateResults Object 36
Table A.12 – Intermediate result data Variables 37
Table A.13 – FinalResultData 40

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

OPC unified architecture - Part 10: Programs

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62541-10 has been prepared by subcommittee 65E: Devices and integration in enterprise systems, of IEC technical committee 65: Industrial-process measurement, control and automation. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2020. This edition constitutes a technical revision.

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

a) StateMachine table format has been aligned.

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

Draft	Report on voting
65E/1057/CDV	65E/1094/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 the "Terms and definitions" clause in one of the parts of the IEC 62541 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, 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.

A list of all parts in 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,

– withdrawn, or

– revised.

1 Scope

This part of IEC 62541 defines the *Information Model* associated with *Programs* in OPC Unified Architecture (OPC UA). This includes the description of the *NodeClasses,* standard *Properties, Methods* and *Events* and associated behaviour and information for *Programs*.

The complete *AddressSpace* model including all *NodeClass*es and *Attributes* is specified in IEC 62541-3. The *Services* such as those used to invoke the *Methods* used to manage *Programs* are specified in IEC 62541-4.

An example for a DomainDownload *Program* is defined in Annex A.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 62541-16, *OPC Unified Architecture - Part 16: State Machines*