

INTERNATIONAL STANDARD

**OPC unified architecture -
Part 10: Programs**



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 Varembe
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 It also gives information on projects, replaced and withdrawn publications.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 *NodeClasses* 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*